

# Ultimate POWER – Perfect Control

## COMPLETE Automotive Solutions from Infineon

Datasheet Directory

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Never stop thinking.

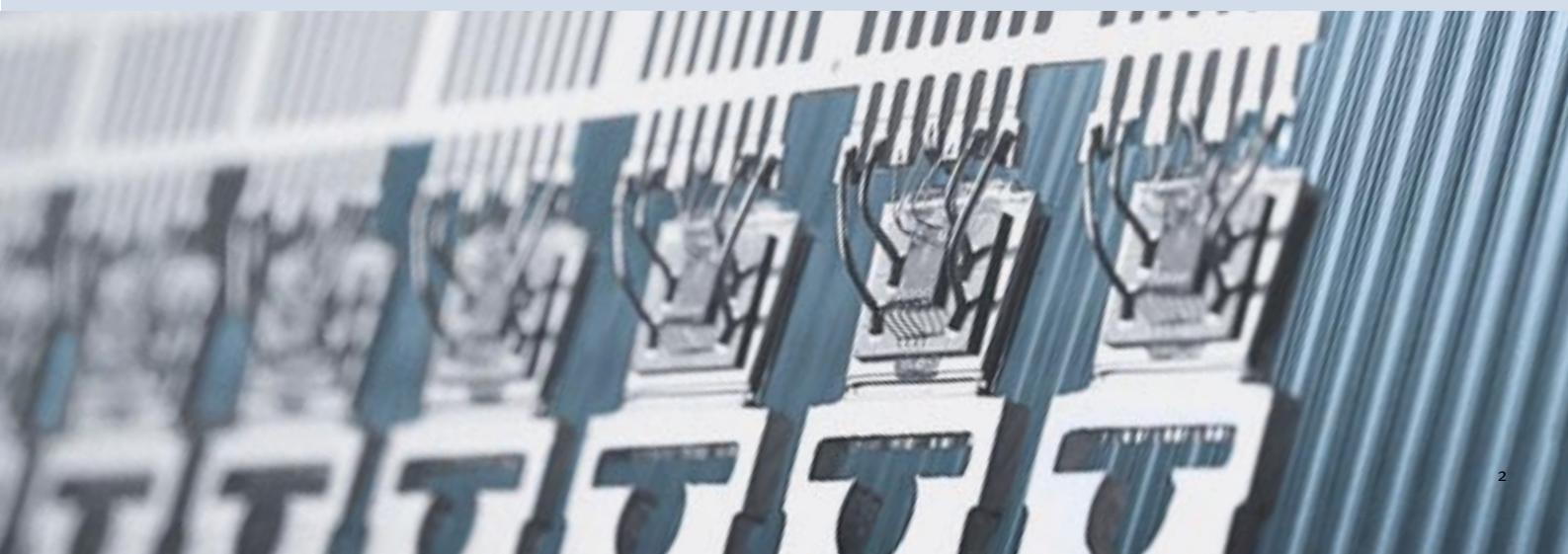
# Introduction

## Power and Control – a Successful Combination

DO YOU NEED to control more power? With increasing accuracy? Do you need lower quiescent currents? Do you have less board space? Do your reliability requirements increase? Infineon has the answer to the challenges you are facing when creating innovations in automotive electronics. Our products are designed to meet the highest automotive standards and enable you to create the perfect solution for your automotive application. Infineon's innovative design concepts and technologies not only guarantee leading edge performance but, in addition, offer both minimum form factor and maximum value to cost.

THIS SELECTION GUIDE PROVIDES an overview of our state-of-the-art product offerings including all key components which meet current market demands.

FOR MORE DETAILED INFORMATION, please visit our website at [www.infineon.com/power](http://www.infineon.com/power) or contact your sales partner listed on the back of this selection guide.



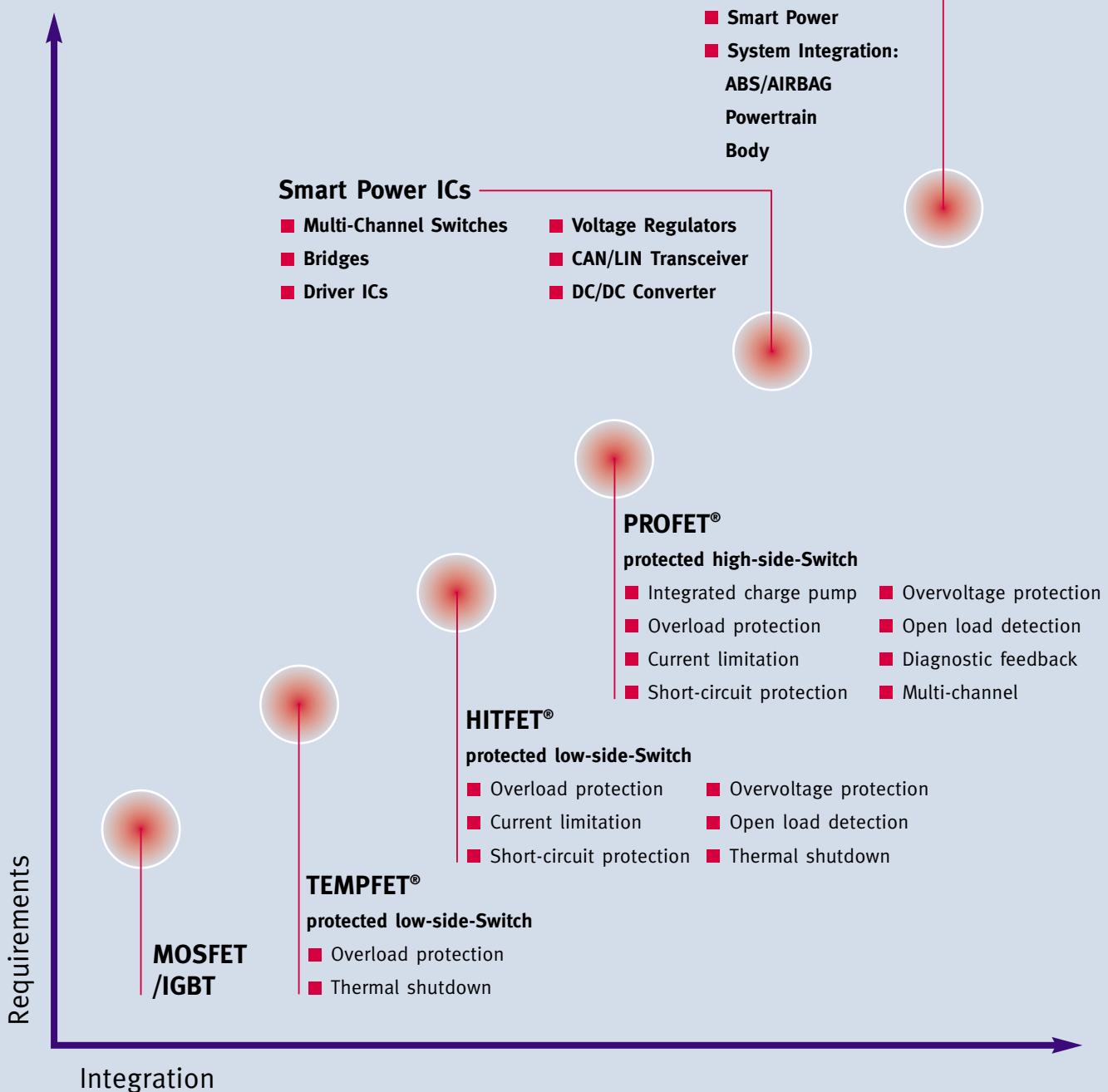
# S y m b o l s

$I_D$	: DC Drain Current
$I_{D(\text{ISO})}$	: ISO Drain Current $(T_C = 85^\circ\text{C}, \text{ voltage drop} \leq 0.5 \text{ V}, T_j \leq T_{j \text{ max.}})$
$I_{D(\text{lim})}$	: Drain Current Limit
$I_{D(\text{NOM})}$	: Nominal Drain Current $(T_a = 85^\circ\text{C, specified PCB})$
$I_{IS}$	: Current Sense Output Current
$I_{L(\text{ISO})}$	: ISO Load Current $(T_C = 85^\circ\text{C, voltage drop} \leq 0.5 \text{ V, } T_j \leq T_{j \text{ max.}})$
$I_{L(\text{NOM})}$	: Load Current ( $T_a = 85^\circ\text{C, specified PCB}$ )
$I_{L(\text{lim})}$	: Load Current Limit
$I_{L(\text{sat})}$	: Saturation Load Current
$I_{L(\text{SCR})}$	: Short-circuit Current Limit at Thermal Shutdown

$R_{CC}$	: Current Sense Resistor
$R_{DS(\text{on})}$	: Drain Source Resistance in ON state ( $T_j = 25^\circ\text{C}$ )
$V_{bb(\text{AZ})}$	: Supply Voltage (active zener)
$V_{bb(\text{op.})}$	: Operation Supply Voltage
$V_{CE}$	: Collector Emitter Voltage
$V_{CE(\text{sat})}$	: Saturation Collector Emitter Voltage
$V_{DS}$	: Drain Source Voltage
$V_{DS(\text{AZ})}$	: Drain Source Voltage (active zener)
$V_S$	: Supply Voltage
Inverse	: Normal $V_{bb}$ polarity and inverse load current
Reverse	: Reverse $V_{bb}$ polarity and reverse load current



## We Meet All Requirements for Cost-effective Application Solutions



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# OptiMOS-T / OptiMOS®: N-Channel MOSFET

INFINEON TECHNOLOGIES consistently develops dedicated technologies and assembly processes to better serve the automotive industry, setting the industry's highest standards for a wide range of applications.

A COMPONENT OF OUR Automotive Excellence Program, the Robust Package improves the reliability of both the component and the application. This new package concept enables the electronics industry to address the new requirements of the lead-free approach. The Robust OptiMOS (and OptiMOS-T) are capable of sustaining up to 260°C reflows. In addition, Infineon also initiated extended qualification to go beyond the AEC Q101 specifications.

INFINEON'S NEW automotive trench technology OptiMOS-T makes it possible to lower conduction losses in any application, and for customers to implement "Green manufacturing" (OptiMOS-T MOSFETs are "GREEN" and "ROBUST").

INFINEON NOW OFFERS a new product which has been optimized for linear mode applications, and provides extended durability in applications where large power dissipation constraints exist. Allows system cost reduction due to elimination of other passive components (no EMI issues).

IN ORDER TO ADDRESS high-current applications, Infineon has developed and released its PowerBond back-end technology. It lowers the  $R_{DS(ON)}$ , significantly improves the current capability of the power MOSFET (up to 160 A), and keeps the bonding "cooler," thus reducing the stress of the device and improving reliability.



## Naming System

I P B 80 N o3 S2 L - o3

Company: \_\_\_\_\_

**S** for products developed before 2004

**I** for products developed in 2004 or later

Device: \_\_\_\_\_

**P** for Power-MOSFET

Package Type: \_\_\_\_\_

**P** for TO220

**B** for P-TO263/D<sup>2</sup>-PAK

**D** for D-PAK (TO252)

**I** for I<sup>2</sup>-PAK (TO262)

Continuous Drain Current/I<sub>Dmax</sub>: \_\_\_\_\_

**P** for p-Channel \_\_\_\_\_

**N** for n-Channel \_\_\_\_\_

Breakdown Voltage divided by 10: \_\_\_\_\_

**S** for SIPMOS® Planar \_\_\_\_\_

**S<sub>2</sub>** for OptiMOS® Planar \_\_\_\_\_

**S<sub>3</sub>** for OptiMOS-T Trench \_\_\_\_\_

**L** for Logic Level \_\_\_\_\_

R<sub>DS(on)</sub> in mΩ: \_\_\_\_\_

H5 for 5.5 mΩ \_\_\_\_\_

OptiMOS-T/OptiMOS®:  
N-Channel MOSFET

TEMPFET®/HITFET®/  
Multiple-Channel:  
Low-Side-Switches

PROFET®:  
High-Side-Switches

Bridge  
Driver ICs

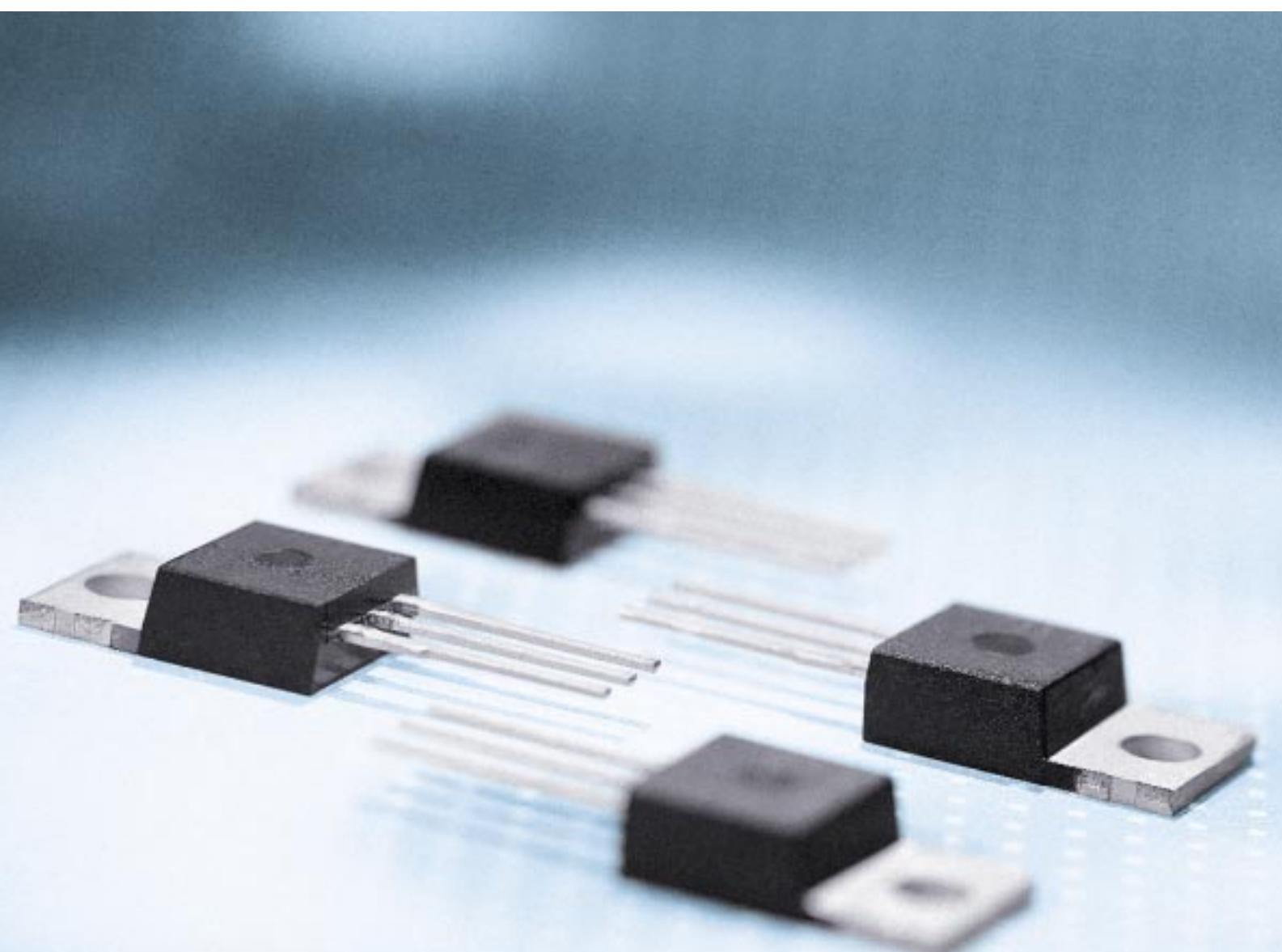
DC Motor  
Bridges

Power  
Supply

Automotive  
Transceivers

Automotive  
System ICs

## OptiMOS™-T: N-Channel MOSFET



LEAD TIME FOR OPTIMOS-T sample deliveries up to 3 months  
 (until mid 2005). All OptiMOS-T are “green” (and “robust” per definition).  
 D-PAK are available from mid 2005 onward.

## 55 V

OptiMOS-T 55 V	$R_{DS(on)}$ max. [mΩ]	$I_D$ [A]	$R_{thJC}$ max. [K/W]	Package*
IPD 90No6S3L-05	5.2	90	1.1	(10)
IPD 90No6S3-06	6.1	90	1.1	(10)
IPD 50No6S3L-06	6	50	1.1	(10)
IPD 50No6S3-07	6.9	50	1.1	(10)
IPD 90No6S3L-07	7.2	90	1.4	(10)
IPD 80No6S3-09	8.5	80	1.4	(10)
IPD 50No6S3L-08	7.8	50	1.4	(10)
IPD 50No6S3-09	9.1	50	1.4	(10)
IPD 50No6S3L-13	12.5	50	2	(10)
IPD 50No6S3-15	15	50	2	(10)
IPD 30No6S3L-20	20	30	2.8	(10)
IPD 30No6S3-23	23.4	30	2.8	(10)
IPP/I 100No6S3L-03	3	100	0.5	(2), (9)
IPP/I 100No6S3-03	3.3	100	0.5	(2), (9)
IPP/I 100No6S3L-04	4	100	0.7	(2), (9)
IPP/I 100No6S3-05	4.5	100	0.7	(2), (9)
IPP/I 80No6S3L-05	4.8	80	0.9	(2), (9)
IPP/I 80No6S3-H5	5.4	80	0.9	(2), (9)
IPP/I 80No6S3L-06	5.9	80	1.1	(2), (9)
IPP/I 80No6S3-07	6.8	80	1.1	(2), (9)
IPP/I 80No6S3L-08	7.9	80	1.4	(2), (9)
IPP/I 77No6S3-09	9.1	77	1.4	(2), (9)
IPP/I 45No6S3L-14	13.5	45	2	(2), (9)
IPP/I 45No6S3-16	15.7	45	2	(2), (9)
IPP/I 25No6S3L-22	21.6	25	2.8	(2), (9)
IPP/I 25No6S3-25	25.2	25	2.8	(2), (9)
IPB 100No6S3L-03	2.7	100	0.5	(12)
IPB 100No6S3-03	3	100	0.5	(12)
IPB 100No6S3L-04	3.7	100	0.7	(12)
IPB 100No6S3-05	4.2	100	0.7	(12)
IPB 80No6S3L-05	4.5	80	0.9	(12)
IPB 80No6S3-H5	5.1	80	0.9	(12)
IPB 80No6S3L-06	5.6	80	1.1	(12)
IPB 80No6S3-07	6.5	80	1.1	(12)
IPB 80No6S3L-08	7.6	80	1.4	(12)
IPB 77No6S3-09	8.8	77	1.4	(12)
IPB 45No6S3L-14	13.2	45	2	(12)
IPB 45No6S3-16	15.4	45	2	(12)
IPB 25No6S3L-22	21.3	25	2.8	(12)
IPB 25No6S3-25	24.9	25	2.8	(12)

\*See packages on page 58

# OptiMOS®: N-Channel MOSFET

**30 V**

OptiMOS® 30 V	$R_{DS(on)}$ typ. [mΩ]	$R_{DS(on)}$ max. [mΩ]	$I_D$ [A]	$R_{thJC}$ max. [K/W]	Package*
BSO 4420	6.7	7.8	13	30	(22)
SPD 50N03S2L-06	5.3	6.4	50	1.2	(10)
SPD 50N03S2-07	5.8	7.3	50	1.2	(10)
SPD 30N03S2L-07	5.6	6.7	30	1.2	(10)
SPD 30N03S2L-10	8.1	10	30	1.8	(10)
SPD 30N03S2L-20	15.3	20	30	3.6	(10)
SPP/B 100N03S2L-03	2	3	100	0.5	(2), (12)
SPP/B 100N03S2-03	2.3	3.3	100	0.5	(2), (12)
SPP/B 80N03S2L-03	2.5	3.1	80	0.5	(2), (12)
SPP/B 80N03S2-03	2.6	3.4	80	0.5	(2), (12)
SPP/B 80N03S2L-04	3.6	4.2	80	0.8	(2), (12)
SPP/B 80N03S2L-05	3.9	5.2	80	0.9	(2), (12)
SPP/B 80N03S2L-06	4.8	6.2	80	1	(2), (12)
SPP/B 73N03S2L-08	6.3	8.4	73	1.6	(2), (12)
SPP/B 42N03S2L-13	9.5	12.9	42	2.3	(2), (12)

\*See packages on page 58

**40 V**

OptiMOS® 40 V	$R_{DS(on)}$ typ. [mΩ]	$R_{DS(on)}$ max. [mΩ]	$I_D$ [A]	$R_{thJC}$ max. [K/W]	Package*
SPP/B 100N04S2L-03	2.6	3.3	100	0.5	(2), (12)
SPP/B 100N04S2-04	2.9	3.6	100	0.5	(2), (12)
SPP/B 80N04S2L-03	2.7	3.4	80	0.5	(2), (12)
SPP/B/I 80N04S2-04	3	3.7	80	0.5	(2), (9), (12)
SPP/B/I 80N04S2-H4	3.4	4	80	0.5	(2), (9), (12)
SPB 160N04S2-03	2.3	2.9	160	0.5	(16)
SPB 160N04S2L-03	2.1	2.7	160	0.5	(16)

\*See packages on page 58

**55 V**

OptiMOS® 55 V	$R_{DS(on)}$ typ. [mΩ]	$R_{DS(on)}$ max. [mΩ]	$I_D$ [A]	$R_{thJC}$ max. [K/W]	Package*
SPD 50N06S2L-13	9.5	12.6	50	1.1	(11)
SPD 50N06S2-14	10.7	14.3	50	1.1	(11)
SPD 30N06S2L-13	9.8	13	30	1.1	(11)

\*See packages on page 58

## 55 V (continued)

OptiMOS® 55 V	$R_{DS(on)}$ typ. [mΩ]	$R_{DS(on)}$ max. [mΩ]	$I_D$ [A]	$R_{thJC}$ max. [K/W]	Package*
SPD 30No6S2-15	11	14.7	30	1.1	(11)
SPD 30No6S2L-23	17.3	23	30	1.5	(11)
SPD 30No6S2-23	17.9	23	30	1.5	(10)
SPD 26No6S2L-35	26	35	26	2.3	(11)
SPD 25No6S2-40	30	40	25	2.3	(11)
SPD 15No6S2L-64	48	64	15	3.5	(11)
SPD 14No6S2-80	60	80	14	3.5	(11)
BSP 603S2L	21	33	5.2	20	(21)
BSP 615S2L	59	90	2.8	23	(21)
BSO 604NS2	2 x 27	2 x 35	5	50	(22)
BSS 670S2L	500	650	0.5	—	(20)
SPP/B 100No6S2L-05	3.9	4.7	100	0.5	(2), (12)
SPP/B 100No6S2-05	3.7	5	100	0.5	(2), (12)
SPP/B/I 80No6S2L-05	4	4.8	80	0.5	(2), (9), (12)
SPP/B 80No6S2-05	3.8	5.1	80	0.5	(2), (12)
SPP/B 80No6S2L-H5	4.1	5	80	0.5	(2), (12)
SPP/B 80No6S2-H5	4.6	5.5	80	0.5	(2), (12)
SPP/B 80No6S2L-06	5.3	6.3	80	0.6	(2), (12)
SPP/B/I 80No6S2-07	5.6	6.6	80	0.6	(2), (9), (12)
SPP/B 80No6S2L-07	5.3	7	80	0.7	(2), (12)
SPP/B/I 80No6S2-08	6	8	80	0.7	(2), (9), (12)
SPP/B 80No6S2L-09	7	8.5	80	0.8	(2), (12)
SPP/B 80No6S2-09	7.8	9.1	80	0.8	(2), (12)
SPP/B 80No6S2L-11	8.6	11	80	0.95	(2), (12)
SPP/B 77No6S2-12	9.2	12	77	0.95	(2), (12)

\*See packages on page 58

## 55 V

SIPMOS® 55 V	$R_{DS(on)}$ typ. [mΩ]	$R_{DS(on)}$ max. [mΩ]	$I_D$ [A]	$R_{thJC}$ max. [K/W]	Package*
SPP/B 80No6S-08	6.5	8	80	0.5	(2), (9), (12)

\*See packages on page 58

## 75 V

OptiMOS® 75 V	$R_{DS(on)}$ typ. [mΩ]	$R_{DS(on)}$ max. [mΩ]	$I_D$ [A]	$R_{thJC}$ max. [K/W]	Package*
SPD 22No8S2L-50	38	50	22	2.2	(11)
SPD 30No8S2L-21	15.3	20.5	30	1.1	(11)
SPD 30No8S2-22	16	21.5	30	1.1	(11)
SPP/B 100No8S2L-07	5.1	6.8	100	0.5	(2), (12)
SPP/B 100No8S2-07	5.3	7.1	100	0.5	(2), (12)
SPP/B 80No8S2L-07	5.3	7.1	80	0.5	(2), (12)
SPP/B 80No8S2-07	5.6	7.4	80	0.5	(2), (12)
SPI 80No8S2-07R	6.4	7.3	80	0.5	(9)
SI PC 42S2N08	2.8	4.2	227	—	Chip
SI PC 60S2N08	2.3	2.8	305	—	Chip

\*See packages on page 58

# TEMPFET® / HITFET® / Multiple-Channel: Low-Side-Switches

## Overview

	$R_{DS(on)}$ [mΩ]	1/2 Channel	4 Channel	6 Channel	8/16/18 Channel	Page	Package*
Multiple-Channel	$I_L: 2 \times 0.4 \text{ A}$ $I_L: 4 \times 0.05 \text{ A}$			TLE 4226 G		15	(28)
	4 x 620						
	6 x 320						
	6 x 300						
	2 x 220						
	8 x 1000						
	8 x 350						
	8 x 1700						
	8 x 750						
	8 x 800						
	8 x 550						
	6 x 150						
	2 x 450						
	4 x 250						
	4 x 1700			TLE 6225 G		15	(26)
	2 x 200			TLE 6216 GP			(27)
	2 x 350			TLE 6217 GP		15	(27)
	2 x 280			TLE 7229 R			(31)
	2 x 230						
	4 x 320						
	2 x 210	TLE 6215 G				15	(28)
	2 x 180	TLE 6214 L				15	(23)
HITFET	2 x 550	BTS 3408 <sup>1)</sup>				14	(22)
	550	BSP 75 N <sup>1)</sup>				14	(21)
	2 x 200	BTS 3410 G <sup>1)</sup> BSP 76 <sup>1)</sup> BTS 3110 N <sup>2)</sup>				14	(22)
	100	BSP 77 <sup>1)</sup> BTS 117 <sup>2)</sup> BTS 118 D <sup>1)</sup> BTS 3118 D <sup>2)</sup> BTS 3118 N <sup>2)</sup>				14	(21)
	50	BSP 78 <sup>1)</sup> BTS 133 <sup>2)</sup> BTS 134 D <sup>1)</sup> BTS 3134 D <sup>2)</sup> BTS 3134 N <sup>2)</sup>				14	(21)
	28	BTS 141 <sup>2)</sup> BTS 142 D <sup>1)</sup> BTS 3142 D <sup>2)</sup>				14	(2), (12)
	18	BTS 149 <sup>2)</sup> BTS 949 <sup>2)</sup>				14	(10)
	13	BTS 247 Z BTS 244 Z				13	(3), (4), (13)
	6.5	BTS 282 Z				13	(3), (4), (13)

<sup>1)</sup>Thermal shutdown with auto-restart<sup>2)</sup>Thermal shutdown with latch

\*See packages on page 58

## SPEED-TEMPFET® (S-FET Technology)

### Features:

- Logic level input
- Analog driving capability

- Potential free temperature sensor
- Overload protection and thermal shutdown with external circuit

- High-speed switching (1 MHz)
- Avalanche rated

### Logic Level Enhancement Types (N-Channel) at $V_{IN}=10\text{ V}$

Type	$V_{DS}$ [V]	$R_{DS(on)\ max.}$ [ $\text{m}\Omega$ ]	$I_{D(ISO)}$ [A]	$I_{D\ max.}$ at $T_c = 100^\circ\text{C}$ [A]	Package*
BTS 247 Z	55	18	19	33	(3),(4),(13)
BTS 244 Z	55	13	26	35	(3),(4),(13)
BTS 282 Z	49	6.5	36	80	(6),(17)

\*See packages on page 58

### Function Table

Devices	BTS 244 BTS 247 BTS 282	BSP 76, 77, 78 BTS 118 D BTS 134 D BTS 142 D BTS 3410 G	BSP 75 N BTS 3408	BTS 117 BTS 133 BTS 141 BTS 149 BTS 949
Technology	S-FET	Smart	SPT	Smart MOS
Power stage	MOS	MOS	MOS	MOS
Analog driving capability	•	•		•
Logic level input	•	•	TTL/CMOS	•
Overload protection	•	•	•	•
Current limitation	•	•	•	•
Short-circuit protection	•	•	•	•
Thermal shutdown	•	•	•	•
Fast switching (up to 1 MHz)	•			
Oversupply protection		•	•	•
ESD protection		•	•	•
Status/diagnostic	single <sup>1)</sup>		single <sup>1)</sup>	single <sup>1)</sup>

<sup>1)</sup> Status by a voltage drop across an external resistor at input

# TEMPFET® / HITFET® / Multiple-Channel: Low-Side-Switches

## HITFET®

(Smart SIPMOS<sup>®</sup><sup>a)</sup>/SPT<sup>b)</sup> Technology)

### Features:

- Overtemperature protection
- Overload protection
- Current limitation
- Short-circuit protection
- Thermal shutdown with auto-restart or latch behavior
- Overvoltage protection
- Logic level input
- Electrostatic discharge (ESD) protection
- Analog driving capability
- Status feedback:
  - digital flag
  - analogous with external resistor at input

Type	$V_{DS(AZ)}$ [V]	$R_{DS(on)}$ <sup>3)</sup> [mΩ]	$I_{D(ISO)}$ min. / $I_{D(NOM)}$ min. [A]	$I_{D(lim)}$ min. [A]	Package*
BTS 117 <sup>2)</sup>	60	100	3.5 ISO	7	(2), (12)
BTS 133 <sup>2)</sup>	60	50	7 ISO	21	(2), (12)
BTS 141 <sup>2)</sup>	60	28	12 ISO	25	(2), (12)
BTS 149 <sup>2)</sup>	60	18	19 ISO	30	(2), (12)
BTS 949 <sup>2)</sup>	60	18	19 ISO	9.5	(3), (4), (13)

\*See packages on page 58

Type	$V_{DS(AZ)}$ [V]	$R_{DS(on)}$ <sup>3)</sup> [mΩ]	$I_{D(ISO)}$ min. / $I_{D(NOM)}$ min. [A]	$I_{D(lim)}$ min. [A]	Package*
BSP 75 N <sup>1)</sup>	55	550	0.7 NOM	1	(21)
BSP 76 <sup>1)</sup>	42	200	1.4 NOM	5	(21)
BSP 77 <sup>1)</sup>	42	100	2.17 NOM	10	(21)
BSP 78 <sup>1)</sup>	42	50	3 NOM	18	(21)
BTS 118 D <sup>1)</sup>	42	100	2.4 NOM	10	(10)
BTS 134 D <sup>1)</sup>	42	50	3.5 NOM	18	(10)
BTS 142 D <sup>1)</sup>	42	28	4.6 NOM	30	(10)
BTS 3110 N <sup>2)</sup>	42	200	1.4 NOM	5	(21)
BTS 3118 D <sup>2)</sup>	42	100	2.4 NOM	10	(10)
BTS 3118 N <sup>2)</sup>	42	100	2.4 NOM	10	(21)
BTS 3134 D <sup>2)</sup>	42	50	3.5 NOM	18	(10)
BTS 3134 N <sup>2)</sup>	42	50	3.5 NOM	18	(21)
BTS 3142 D <sup>2)</sup>	42	28	4.6 NOM	30	(10)
BTS 3408 <sup>1)</sup>	60	2 X 550	0.7 NOM	1	(22)
BTS 3410 G <sup>1)</sup>	42	2 X 200	1.3 NOM	5	(22)

<sup>1)</sup> Thermal shutdown with auto-restart

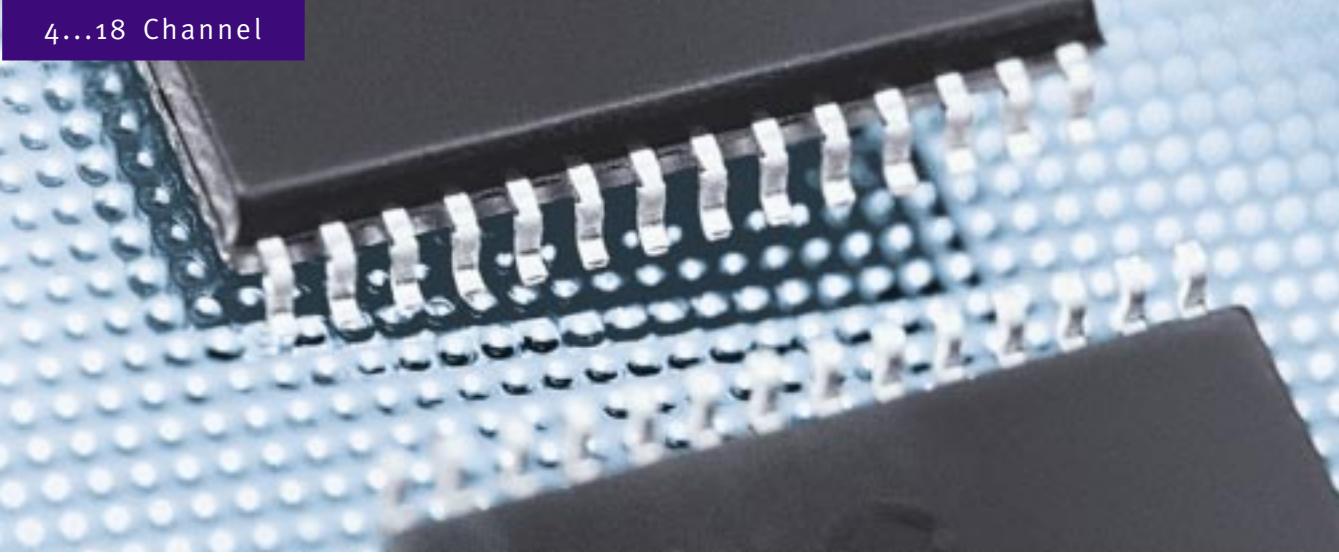
<sup>a)</sup> Smart SIPMOS = Smart Power MOS

\*See packages on page 58

<sup>2)</sup> Thermal shutdown with latch

<sup>b)</sup> SPT = Smart Power Technology

<sup>3)</sup>  $R_{DS(on)}$  Max. at 25°C



## Multiple-Channel Switches

General features:

- Overload protection
- Current limitation
- Short-circuit protection
- Thermal shutdown
- Overvoltage protection
- Diagnostic feedback

■ Open load detection

in ON or OFF condition

■ TTL and CMOS compatible input

■ Electrostatic discharge (ESD) protection

Additional Features:

■ SPI interface, 2-bit diagnosis per channel

■ Serial and parallel control of the output

■ Standby mode

■ Parallel inputs high/low active programmable

■ General fault pin

■ Compatible with 3.3 V µC

■ Short to GND detection

## In Smart Power Technology SPT

Type	$V_S$ [V]	$V_{DS(AZ)}$ max. [V]	$R_{DS(on)}$ typ. at $T_j = 25^\circ\text{C}$ [ $\text{m}\Omega$ ]	$I_{D(NOM)}$ [A]	$I_{L(lim)}$ min. [A]	Package*
TLE 6214 L	4.5...5.5	60	2 x 180	2 x 2	2 x 5	(23)
TLE 6215 G	6.5...40	60	2 x 210	2 x 1.3	2 x 4	(28)
TLE 6216 GP	4.8...32	60	2 x 200 2 x 350	2 x 2 2 x 1	2 x 5 2 x 3	(27)
TLE 6217 GP	4.8...32	60	2 x 200 2 x 350	2 x 2 2 x 1	2 x 5 2 x 3	(27)
TLE 6220 GP	5	60	4 x 320	4 x 1.5	4 x 3	(27)
TLE 6225 G	4.5...32	60	4 x 1700	4 x 0.25	4 x 0.5	(26)
TLE 6228 GP	4.8...32	60	2 x 280 2 x 230	2 x 1 2 x 2	2 x 3 2 x 5	(27)
TLE 6230 GP	5	55	8 x 750	8 x 0.5	8 x 1	(31)
TLE 6232 GP	5	60	4 x 250 2 x 450	4 x 2 2 x 1	4 x 3 2 x 1.5	(31)
TLE 6236 G	5	60	8 x 1700	8 x 0.2	8 x 0.5	(29)
TLE 6240 GP	5	60	8 x 350 8 x 1000	8 x 0.5 8 x 1.5	8 x 1 8 x 3	(31)
TLE 6244 X	5	50/77	6 x 320 (70 V) 6 x 300 2 x 220 4 x 620	6 x 1.5 6 x 1.5 2 x 2 4 x 0.5	6 x 2.2 6 x 2.2 2 x 3 4 x 1.1	(32)
TLE 6288 R	4.5...5.5	40	6 x 0.15	programmable	3 x 3 3 x 4	(31)
TLE 7229 R	4.8...18	60	2 x 200 2 x 350	2 x 1 2 x 1.6	2 x 3 2 x 5	(31)
TLE 7230 G	4.5...5.5	60	8 x 800	8 x 0.30	8 x 1	(28)
TLE 7230 R	4.5...5.5	60	8 x 800	8 x 0.5	8 x 1	(31)
TLE 7233 G	4.5...5.5	60	8 x 550	8 x 0.5	8 x 1	(30)

\*See packages on page 58

## In DOP<sup>1)</sup> Technology (bipolar)

Type	$V_S$ [V]	$V_{CE}$ max. [V]	$V_{CE(sat)}$ [V]	$I_{L(sat)}$ at $V_{CE(sat)}$ [A]	$I_{L(lim)}$ min. [A]	Package*
TLE 4226 G	5	35	2 x 0.5 4 x 0.4	2 x 0.4 4 x 0.05	2 x 0.5 4 x 0.06	(28)

<sup>1)</sup> DOPL = Smart Bipolar Technology

\*See packages on page 58

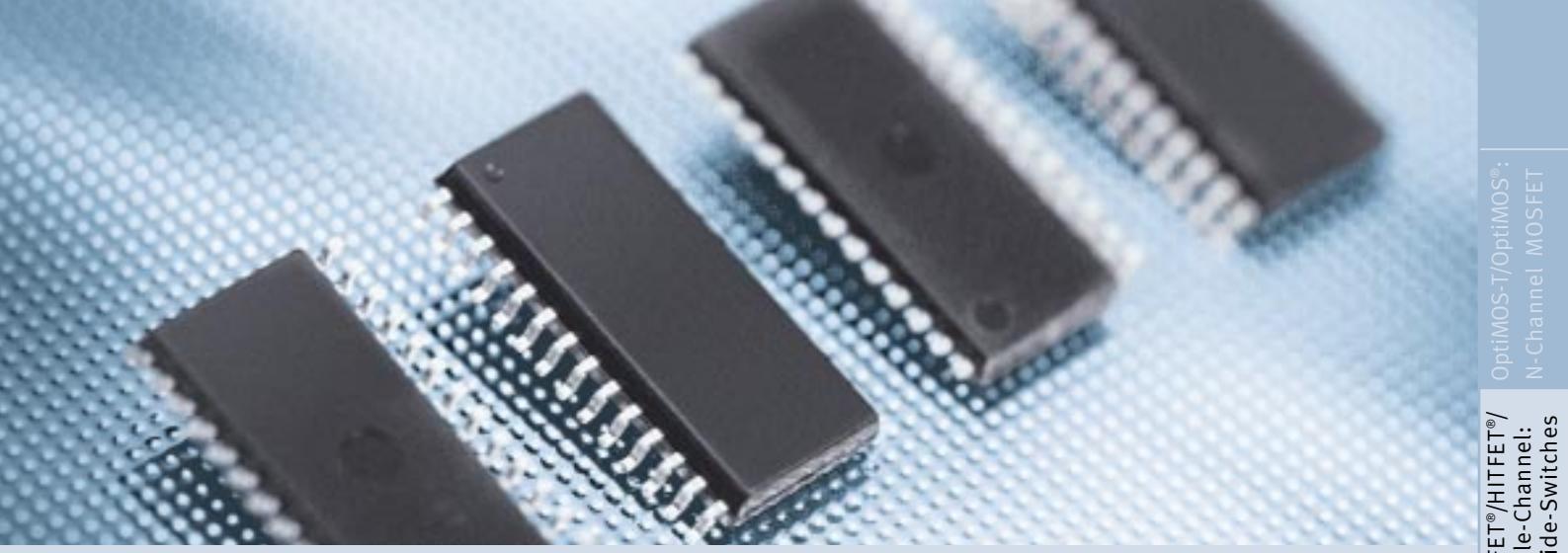
# TEMPFET® / HITFET® / Multiple-Channel: Low-Side-Switches

General features for all devices:

- Overtemperature shutdown
- Short-circuit/overload protection
- Overvoltage protection
- ESD protection
- 5 V supply
- Enable/reset pin
- 3.3 V µC compatible
- Open load detection off state
- Overtemperature/overload diagnosis

**Function Table**

Name	TLE 6214 L	TLE 6215 G	TLE 6216 GP	TLE 6217 GP	TLE 6220 GP	TLE 62...
Output channels	2	2	4	4	4	4
$R_{DS(on)}$ max. at $T_J = 25^\circ\text{C}$ [mΩ]	2 x 220	2 x 250	2 x 260 2 x 400	2 x 260 2 x 400	400	200
Nominal current [A]	2 x 2	2 x 1.3	2/1	2/1	1	0.3
Parallel channel control	2	2	4	4	4	4
<b>Special features</b>						
Overload shutdown	•	•	•	•		
Current limitation	•				•	•
Overload switch-off delay time	•	•	•	•		
Delayed status for pulse with operation		•	•	•		
Failure extension time for status					•	
Short to GND detection	•	•	•	•	•	
Open load detection state	off/on	off/on	off/on	off/on	off	off
Standby mode	•		•	•	•	•
Extended supply voltage		•	•	•		•
Hi/low active programmable inputs						•
1 status/output	•	•	•	•		•
General fault flag	•					•
SPI	8 bit				8 bit	
Open load program pin						
Undervoltage shutdown	•				•	•
Daisychain possibility	•				•	•
Autorestart	•				•	•
Latch after shutdown	•	•	•	•		



25 G	TLE 6228 GP	TLE 6230 GP	TLE 6232 GP	TLE 6236 G	TLE 6240 GP	TLE 6244 X	TLE 6288 R	TLE 7229 R	TLE 7230G/R	TLE 7233G	
	4	8	6	8	16	18	6	4	8	8	
0	2 x 260 2 x 400	1000	4 x 280 2 x 550	2300	8 x 400 8 x 1300	6 x 400(70 V) 6 x 380 2 x 280 4 x 780	6 x 0.71	2 x 260 2 x 400	8 x 1000	8 x 700	PROFET®: High-Side-Switches
5	2/1	6 x 1.5 0.5	2/1	0.2 4 x 0.5	1/0.5	4 x 1.1 12 x 2.2 2 x 3	P & H	2 x 3 2 x 5	8 x 0.30 8 x 0.50	8 x 0.5	TEMPFET®/HITFET®/ Multiple-Channel: Low-Side-Switches
	4	4	6	4	8	16	6	4	4	2	Bridge Driver ICs
	•					•		•	•	•	DC Motor Bridges
		•	•	•	•	•	•		•	•	
	•					•		•	•	•	
	•							•			
	•							•			
	•							•			
	•	•			•	•	•	•	•	•	
f	off/on	off	off	off	off	off	off	off/on	off	off	
	•		•	•	•	•	•		•	•	Power Supply
	•							•			
	•	•			•				•		
	•							•			
	•	•	•	•	•			•			
	16 bit	16 bit	8 bit	16 bit	16 bit	16 bit			16 bit	16 bit	Automotive Transceivers
	•		•	•	•	•	•		•	•	Automotive System ICs
			•				•		•	•	
	•	•	•	•	•	•	•		•	•	
	•		•	•	•	•	•		•	•	
	•			•	•	•	•		•	•	
	•					•	•		•	•	

OptiMOS-T/OptiMOS®:  
N-Channel MOSFET

TEMPFET®/HITFET®/  
Multiple-Channel:  
Low-Side-Switches

Bridge  
Driver ICs

DC Motor  
Bridges

Automotive  
Transceivers

Automotive  
System ICs

# PROFET®: High-Side-Switches

THE HIGHLY INTEGRATED PROFET® family (PROtected FET) incorporates a broad range of smart features. PROFET intelligent power switches consist of a DMOS power transistor and CMOS logic circuitry for complete built-in protection.

THE PROFET FAMILY offers protection against: overload, overvoltages, short-circuits, excess temperature, ground loss, power supply loss, and electrostatic discharge. The PROFET family products are also capable of protecting against dynamic overvoltage such as load dump and inductive load turn-off. For the benefits and the functionality of the protection features, please refer to details in the datasheets ([www.infineon.com/profet](http://www.infineon.com/profet)).

THE PROFET DIAGNOSTICS offer the choice of either status or current sense features, or a combination of both. In the event of a malfunction, the status feature is able to diagnose over temperature or open load. The PROFET diagnostic features also provide the user with precise information about switch and load. Diagnostic feedback and load current sensing minimize costs by eliminating the need for additional discrete circuitry and assembly.

THIS VAST RANGE of smart features makes the PROFET ideal for a variety of automotive and industrial applications.

## ■ PROFET® (SMART SIPMOS® and SMART 5 Technologies)

Please refer to [www.infineon.com/smarts5](http://www.infineon.com/smarts5) for more information

## ■ High Current PROFET (SMART SIPMOS<sup>1)</sup> Technology)

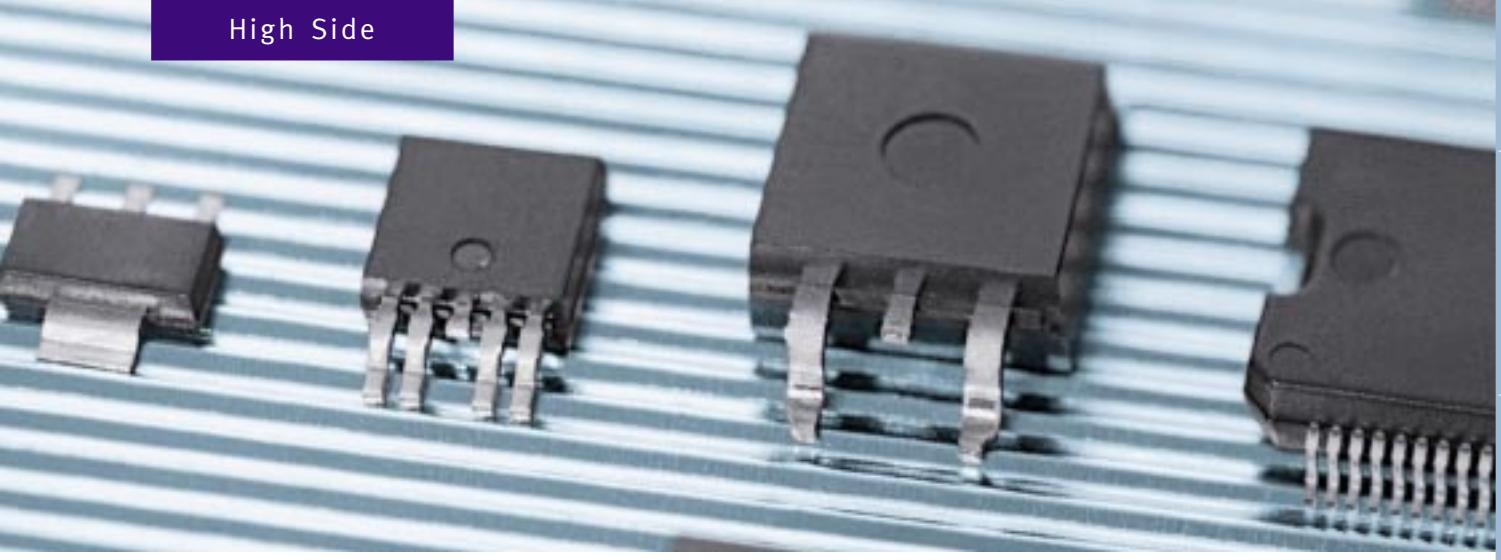
## ■ miniPROFET (SMART SIPMOS<sup>1)</sup> Technology)

### General features

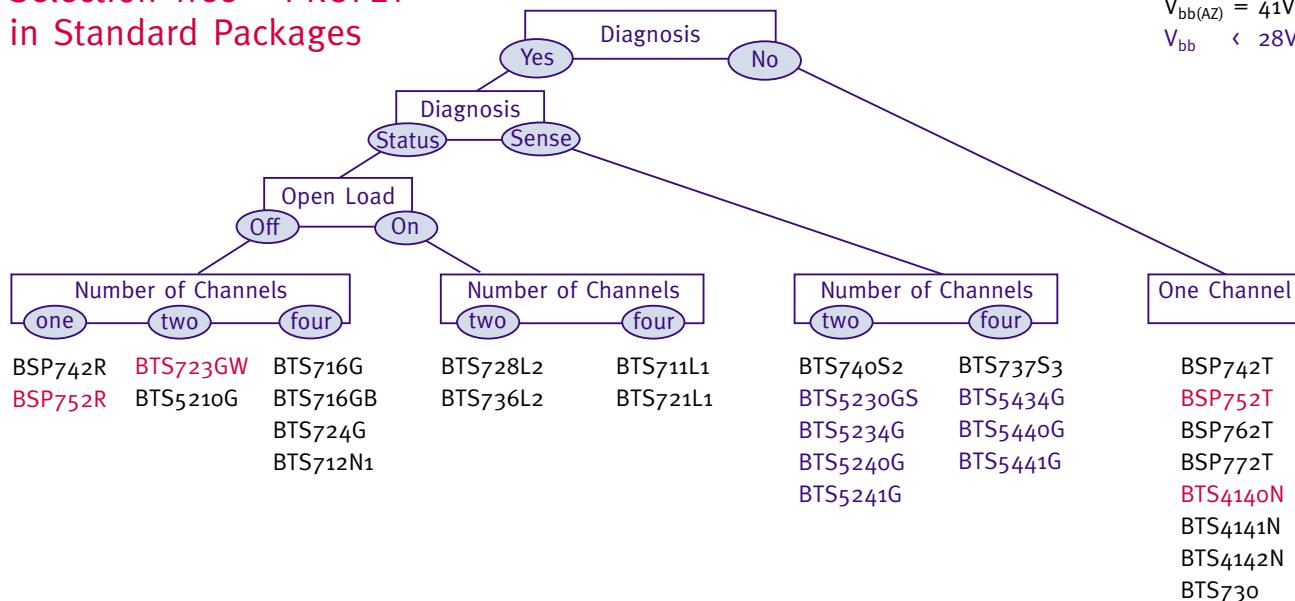
(for all three families):

- Overload protection
- Current limitation
- Short-circuit protection
- Thermal shutdown
- Overvoltage protection (including load dump)
- Fast demagnetization of inductive loads
- Reverse battery protection with external resistor
- Undervoltage and overvoltage shutdown with auto-restart and hysteresis (optional)
- Diagnostic feedback
- Open load detection
- CMOS and TTL compatible input
- Loss of ground and loss of  $V_{bb}$  protection
- Electrostatic discharge (ESD) protection
- Proportional load current sense (optional)

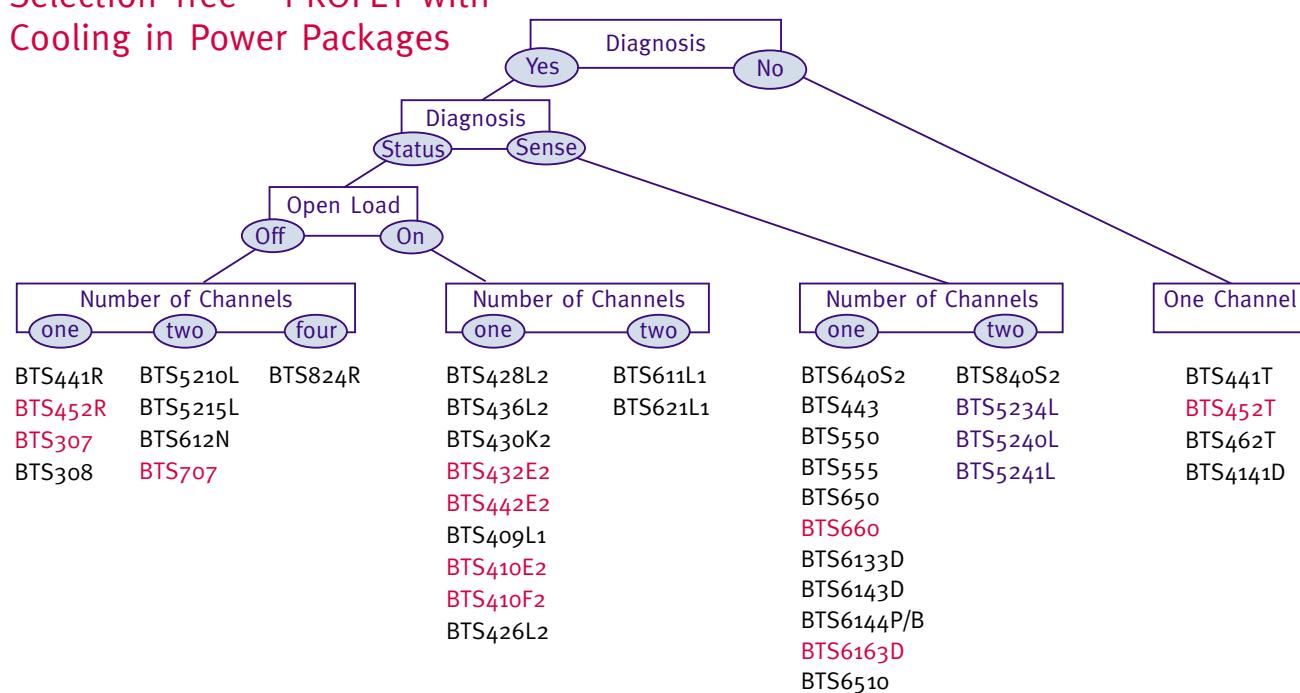
<sup>1)</sup>SMART SIPMOS = SMART Power MOS



## Selection Tree – PROFET in Standard Packages



## Selection Tree – PROFET with Cooling in Power Packages



# Overview PROFET®

## In Smart SIPMOS® or Smart Power Technology

$R_{ON}$ [mΩ]	1 Channel	Page	2 Channel	Page	4 Channel	Page	8 Channel	Page	Package*
1000	BTS 4140 N	21							(21)
400	BSP 742 T / 742 R	21							(22)
300	BTS 308	21							(3), (4), (14)
250	BTS 307	21	BTS 707	22					(3), (4), (14) (26)
220	BTS 410 E2 BTS 410 F2	21 21							(3), (4), (14) (3), (4), (14)
200	BSP 452 BTS 409 L1 BSP 752 T / 752 R BTS 452 T / 452 R BTS 4141 D / 4141 N BTS 4142 N	21 21 21 21 21 21	BTS 611 L1 BTS 612 N1	22 22	BTS 711 L1 BTS 712 N1	23 23	BTS 4880 R	23	(21) (3), (4), (14) (22) (11) (11), (21) (21) (6), (7), (16) (6), (7), (16) (26) (26) (31)
140			BTS 5210 L/G BTS 5230 GS	22 22	BTS 716 GB BTS 716 G	23 23			(23), (24) (24) (26) (26)
100	BSP 762 T BTS 462 T	21 21	BTS 621 L1	22	BTS 721 L1	23			(22) (11) (6), (7), (16) (26)
95			BTS 723 GW	22					(24)
90			BTS 5215 L	22	BTS 724 G BTS 824 R	23 23			(23) (26) (27)
65	BTS 730	21							(11), (26)
60	BSP 772 T BTS 428 L2 BTS 426 L1	21 21 21		BTS 5234 G BTS 5234 L BTS 728 L2	22 22 22	BTS 5434 G	23		(22) (11) (3), (4), (14) (24) (23) (26) (29)
38	BTS 436 L2 BTS 432 E2 BTS 430 K2	21 21 21	BTS 736 L2	22					(3), (4), (14) (3), (4), (14) (3) (26)
35					BTS 737-S3	23			(29)
30	BSP 640 S2	21	BTS 740 S2 BTS 840 S2	22 22					(6), (7), (16) (26) (27)
25				BTS 5240 L BTS 5241 G BTS 5241 L	22 22 22	BTS 5441 G BTS 5440 G	23 23		(23) (24) (23) (29) (29)
20	BTS 6163 D BTS 441 T / 441 R	21 21							(11) (3), (4), (14)
18	BTS 442 E2	21							(3), (4), (14)
16	BTS 443 P	21							(11)
10	BTS 6143 D BTS 6133 D	21 21							(11) (11)
9	BTS 660 P BTS 6144 P / B	21 21							(6), (17) (6), (7), (17)
6	BTS 650 P BTS 6510	21 21							(6), (17) (17)
3.6	BTS 550 P	21							(1)
2.5	BTS 555	21							(1)

\*See packages on page 58

# PROFET®: High-Side-Switches

## 1 Channel Switches

Type	$V_{bb(AZ)}$ [V]	$R_{ON\ max.}$ [mΩ]	$I_{L(ISO)}/I_{L(NOM)}$ [A]	$I_{L(SC)}$ [A]	Package*
BTS 4140 N	65	1000	0.2 NOM	0.7	(21)
BSP 742 R <sup>4)</sup>	41	400	>0.4 NOM	1	(22)
BSP 742 T <sup>4)</sup>	41	400	1.1 NOM	3	(22)
BTS 308	59	300	1.3 ISO	4	(3),(4),(14)
BTS 307	65	250	1.7 ISO	10	(3),(4),(14)
BTS 410 E2	65	220	1.8 ISO	5	(3),(4),(14)
BTS 410 F2	65	220	1.8 ISO	2.7	(3),(4),(14)
BTS 4141 N	47	200	0.7 NOM	1.1	(21)
BTS 4142 N	47	200	1.4 NOM	2.2	(21)
BSP 452	41	200	>0.7 NOM	—	(21)
BSP 752 T <sup>4)</sup>	62	200	1.7 NOM	6	(22)
BSP 752 R <sup>4)</sup>	62	200	1.7 NOM	6	(22)
BTS 4141 D	47	200	0.7 NOM	—	(11)
BTS 409 L1	> 40	200	2.3 ISO	4	(3),(4),(14)
BTS 452 T <sup>3), 4)</sup>	62	200	2.2 ISO	6	(11)
BTS 452 R <sup>4)</sup>	62	200	2.2 ISO	6	(11)
BSP 762 T <sup>4)</sup>	41	100	2.4 NOM	7	(22)
BTS 462 T <sup>3), 4)</sup>	41	100	4.4 ISO	10	(11)
BTS 730	> 40	65	3 ISO	20	(11),(26)
BSP 772 T <sup>4)</sup>	41	60	3.1 NOM	12	(22)
BTS 426 L1	> 40	60	7 ISO	16	(3),(4),(14)
BTS 428 L2 <sup>1),4)</sup>	> 40	60	7 ISO	17	(11)
BTS 432 E2 <sup>2),7)</sup>	> 60	38	11 ISO	35	(3),(4),(14)
BTS 436 L2 <sup>4)</sup>	> 40	38	9.8 ISO	21	(3),(4),(14)
BTS 430 K2 <sup>7)</sup>	50	38	11 ISO	—	(3)
BTS 640 S2 <sup>6)</sup>	> 40	30	12.6 ISO	24	(3),(4),(14)
BTS 6163 D <sup>6)</sup>	63	20	—	70	(11)
BTS 441 T <sup>3), 4)</sup>	> 40	20	21 ISO	40	(3),(4),(14)
BTS 441 R <sup>4)</sup>	> 40	20	21 ISO	40	(3),(4),(14)
BTS 442 E2 <sup>7)</sup>	> 60	18	21 ISO	70	(3),(4),(14)
BTS 443 D <sup>4)</sup>	> 38	16	23 ISO	50	(11)
BTS 6133 D	39	10	33/8 ISO	75	(11)
BTS 6143 D <sup>6)</sup>	39	10	37 ISO	75	(11)
BTS 660 P <sup>6)</sup>	> 60	9	44 ISO	145	(6),(17)
BTS 6144 P <sup>5)/B</sup>	39	9	37.5/9.5 ISO	90	(6),(7),(17)
BTS 6510	> 42	6	70 ISO	130	(17)
BTS 650 P <sup>6)</sup>	> 42	6	70 ISO	130	(6),(17)
BTS 550 P <sup>6)</sup>	> 42	3.6	115 ISO	220	(1)
BTS 555 <sup>6)</sup>	> 42	2.5	165 ISO	520	(1)

<sup>3)</sup> Should be used instead of BTS 425 L1 or BTS 426 L1  
Without overvoltage and undervoltage shutdown

<sup>2)</sup> BTS 436 should be used instead of BTS 432 x 2

<sup>3)</sup> Without status

<sup>4)</sup> Without undervoltage and overvoltage shutdown

<sup>5)</sup> Should be used instead of BTS 725 L1 or BTS 726 L1  
Without overvoltage and undervoltage shutdown

<sup>6)</sup> With proportional load current sense

<sup>7)</sup> Not recommended for new designs

\*See packages on page 58



# PROFET®: High-Side-Switches

## 2 Channel Switches

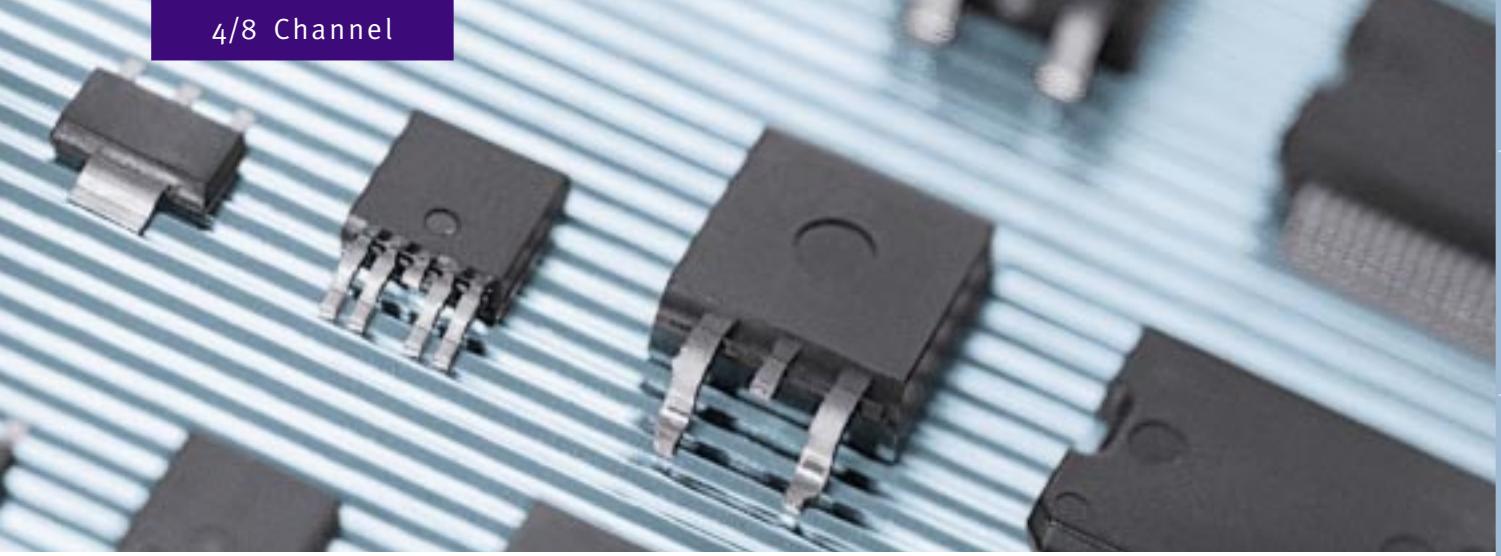
Type	$V_{bb(AZ)}$ [V]	$R_{ON\ max.}$ [ $m\Omega$ ]	$I_{L(NOM)}/I_{L(ISO)}$ [A] One channel active	$I_{L(NOM)}/I_{L(ISO)}$ [A] All channels parallel	$I_{L(SCr)}$ [A]	Package*
BTS 707	65	2 x 250	1.9 NOM	2.8 NOM	10	(26)
BTS 611 L1	> 40	2 x 200	2.3 ISO	4.4 ISO	4	(6), (7), (16)
BTS 612 N1	> 40	2 x 200	2.3 ISO	4.4 ISO	4	(6), (7), (16)
BTS 5210 L	> 40	2 x 140	2.4 NOM	3.9 NOM	6.5	(23)
BTS 5210 G	> 40	2 x 140	2.4 NOM	3.9 NOM	6.5	(24)
BTS 5230 GS <sup>3)</sup>	> 40	2 x 140	2.4 NOM	3.9 NOM	2.5 ( $10^4$ )	(24)
BTS 723 GW <sup>1)</sup>	> 65	2 x 105	2.9 NOM	4.2 NOM	10	(24)
BTS 621 L1	> 40	2 x 100	4.4 ISO	8.5 ISO	8	(6), (7), (16)
BTS 5215 L	> 40	2 x 90	3.7 NOM	7.4 NOM	15	(23)
BTS 728 L2 <sup>2)</sup>	> 40	2 x 60	4 NOM	6 NOM	17	(26)
BTS 5234 G <sup>3)</sup>	> 40	2 x 60	3.3 NOM	5 NOM	6 ( $24^4$ )	(26)
BTS 5234 L <sup>3)</sup>	> 40	2 x 60	3.5 NOM	5.2 NOM	6 ( $24^4$ )	(23)
BTS 736 L2	> 40	2 x 40	4.8 NOM	7.3 NOM	30	(26)
BTS 740 S2 <sup>3)</sup>	> 40	2 x 30	5.5 NOM	8.5 NOM	24	(26)
BTS 840 S2 <sup>3)</sup>	> 40	2 x 30	12 ISO	24 ISO	24	(27)
BTS 5240 L <sup>3)</sup>	> 40	2 x 25	6 NOM	9.1 NOM	10/ $40^5)$	(23)
BTS 5240 G <sup>3)</sup>	> 40	2 x 25	5.9 NOM	8.4 NOM	10/ $40^5)$	(26)
BTS 5241 L <sup>3)</sup>	> 40	2 x 25	5.7 NOM	8.8 NOM	7 ( $40^4$ )	(23)
BTS 5241 G <sup>3)</sup>	> 40	2 x 25	5.5 NOM	7.8 NOM	7 ( $40^4$ )	(26)

<sup>1)</sup> Can replace BTS 707<sup>3)</sup> With proportional load current sense<sup>5)</sup> Adjustable

\*See packages on page 58

<sup>2)</sup> Should be used instead of BTS 725 L1 or BTS 726 L1.<sup>4)</sup>  $t_{L(lim)}$ 

Without overvoltage and undervoltage shutdown



## 4 Channel Switches

Type	$V_{bb(AZ)}$ [V]	$R_{ON\ max.}$ [ $m\Omega$ ]	$I_{L(NOM)}$ [A] One Channel Active	$I_{L(NOM)}$ [A] All Channels Parallel	$I_{L(SC)}$ [A]	Package*
BTS 711 L1	> 40	4 x 200	1.9 NOM	4.4 NOM	4	(26)
BTS 712 N1	> 40	4 x 200	1.9 NOM	4.4 NOM	4	(26)
BTS 716 G	> 40	4 x 140	2.6 NOM	5.3 NOM	6.5	(26)
BTS 716 GB	> 40	4 x 140	2.6 NOM	5.3 NOM	6.5	(26)
BTS 721 L1	> 40	4 x 100	2.9 NOM	6.3 NOM	8	(26)
BTS 724 G	> 40	4 x 90	3.3 NOM	7.3 NOM	12	(26)
BTS 824 R	> 40	4 x 90	4.7 NOM	19 NOM	12	(27)
BTS 5434 G <sup>1)</sup>	> 40	4 x 60	3.4 NOM	6.8 NOM	6 (24 <sup>3)</sup> )	(29)
BTS 737 S3 <sup>1)</sup>	> 40	4 x 35	5.4 NOM	11.1 NOM	21	(29)
BTS 5440 G <sup>1)</sup>	> 40	4 x 25	6.2 NOM	13.9 NOM	10 / 40 <sup>2)</sup>	(29)
BTS 5441 G <sup>1)</sup>	> 40	4 x 25	5.6 NOM	12.8 NOM	7 (40 <sup>3)</sup> )	(29)

<sup>1)</sup> With proportional load current sense

<sup>3)</sup>  $T_{L(lim)}$

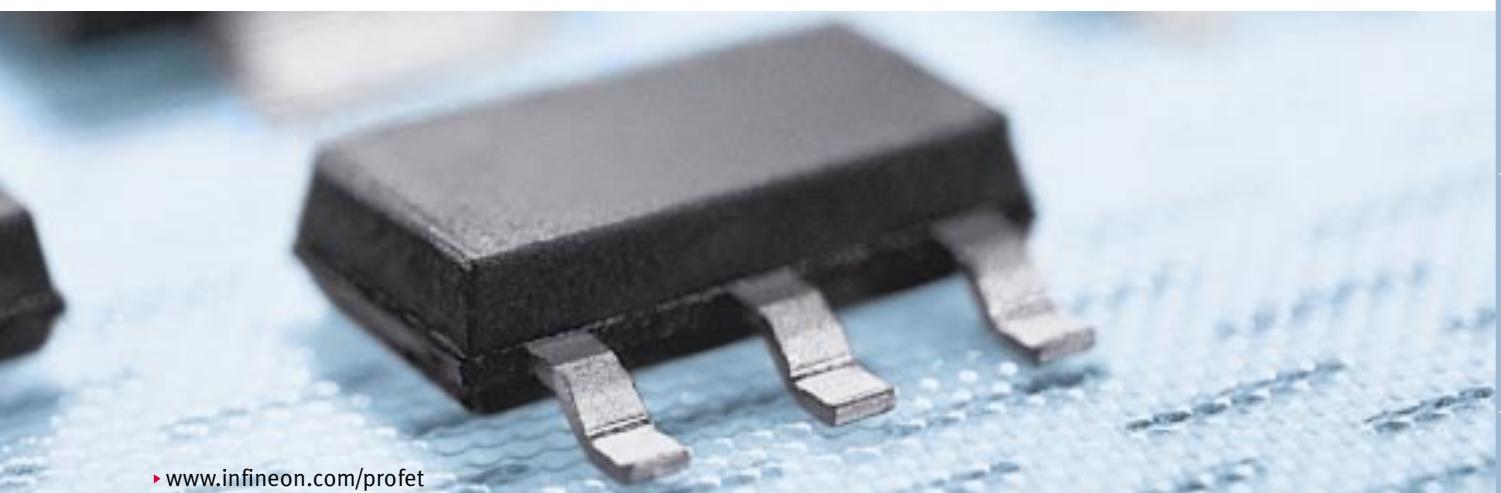
\*See packages on page 58

<sup>2)</sup> Adjustable

## 8 Channel Switches

Type	$V_{bb(op.)}$ [V]	$R_{ON\ max.}$ [ $m\Omega$ ]	$I_{L(ISO)} / I_{L(NOM)}$ [A]	$I_{L(lim)\ min.}$ [A]	$I_{L(SC)}$ [A]	Package*
BTS 4880 R	11...45	8 x 200	–	1.4	1.1	(31)

\*See packages on page 58



# PROFET®: High-Side-Switches

	miniPROFET										
DEVICE BTS... / BSP...	BSP 452	BSP 742 752	BSP 742 752 762 772	BTS 4140	BTS 4141 4142	BTS 4880	BTS 307 707	BTS 308	BTS 409 426 726	BTS 410	BTS 428 436 728 736
Logic Version	R	T				R		L1	F2	L2	
<b>Load current limit</b>			●	●					●		
high level (can handle loads with high inrush currents)	●									●	
low level (better protection for inductive loads)				●	●	●	●		●		
two level			●								
<b>Short-circuit to GND protection</b>							2.5 V		●		
switches off when $V_{bb} \cdot V_{OUT} > 3.5$ V typ. (when first turned on after approx. 200 µs)											
switches off when $V_{bb} \cdot V_{OUT} > 8.5$ V typ. (when first turned on after approx. 200 µs)										●	
achieved through overtemperature protection	●	●	●	●	●	●	●	●	●	●	
<b>Overtemperature protection</b>											
$T_j > 150^\circ\text{C}$ , latch function								●		●	
$T_j > 150^\circ\text{C}$ , with auto-restart and hysteresis	●	●	●	●		●	●	●	●	●	
$T_j > 135^\circ\text{C}$ , with auto-restart and hysteresis					●	●					
<b>Input protection (ESD)</b>	●	●	●	●	●		●	●	●	●	
<b>Output negative voltage transient limit</b>											
clamp to $V_{bb} \cdot V_{ON(CL)}$	●	●	●	●	●	●	●	●	●	●	
<b>Undervoltage</b>											
shutdown with auto-restart	●				●	●	●	●	●	●	
<b>Oversupply</b>								●	●	●	
shutdown with auto-restart	●							●	●	●	
<b>Protection against loss of GND</b>											
protected	●	●	●	●	●	●	●	●	●	●	
<b>Protection against loss of <math>V_{bb}</math> with charged ind. load</b>											
with additional external diode										●	
protected	●	●	●	● <sup>1)</sup>	●	●	●	●	●	●	
<b>Reverse battery protection</b>											
protected										●	
protected with additional external resistor	●	●	●	●	●	●	●	●	●	●	
<b>Inverse current operation capability</b>											
<b>Load dump protection</b>	●	●	●	●	●		●	●	●	●	
<b>Status output type</b>											
CMOS											
Open drain	●						3)	●	●	●	
<b>Status feedback for</b>											
overtemperature	●							●	●	●	
short-circuit to GND		●						●	●	●	
short to $V_{bb}$			●					●	●	●	
open load ON				●					●		
open load OFF					●			●	●	●	
undervoltage										●	
oversupply										● <sup>1)</sup>	
<b>Open load detection</b>											
in OFF-state with test current 30 µA typ.								●	●		
in OFF-state with external pull up resistor											
in ON-state with testing voltage drop											
across power transistor										●	
<b>Current sense</b>											
analog signal proportional to load current											
advanced sense (=sense + digital status)											
<b>Sense Enable</b>											

<sup>1)</sup> External INPUT protection necessary<sup>2)</sup> With external resistor between OUTPUT and  $V_{bb}$ <sup>3)</sup> Common diagnostic for all channels (LED driver)<sup>4)</sup> BTS5x41, BTS5x34, BTS5x30 clamp to -15 V

PROFET															HIGH CURRENT								TEMPFET®/HITFET® Multiple-Channel: Low-Side-Switches	OptIMOS-T/OptIMOS®: N-Channel MOSFET
BTS 611 621 711 721	BTS 612 712	BTS 640 740 840	BTS 723	BTS 730	BTS 5210 5215 716 724 824	BTS 5230 5234 5241 5434 5441	BTS 5240 5440	BTS 430	BTS 432 442	BTS 441	BTS 441	BTS 443	BTS 550 650 660	BTS 555	BTS 6143 6144 6163 6133									
L <sub>1</sub>	N <sub>1</sub>	S <sub>2</sub>						K <sub>2</sub>	E <sub>2</sub>	T	R	P	P											
●	●	●						●	●	●	●	●	●	●									3.5 V	
			●																					
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
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●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
● <sup>2)</sup>	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	● <sup>2)</sup>	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	● <sup>2)</sup>	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
● <sup>1)</sup>	● <sup>1)</sup>	● <sup>2)</sup>	● <sup>2)</sup>	● <sup>2)</sup>	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	

# Bridge Driver ICs

	TLE 6280/87/89 GP 3-phase Driver	TLE 6281 G H-bridge Driver	TLE 6282 G H-Bridge Driver / Half-bridge Driver
Package	Power SO36	P-DSO20	P-DSO20
Operating range	8 V – 24 V	6.5 V – 60 V	6.5 V – 60 V
Diagnostic	●	●	●
SC protection	●	●	●
100% DC		●	●
Switching time*	300ns	600ns	600ns
Main application	EPS <sup>1)</sup> , EHPS <sup>2)</sup> , Fan Control	Wiper, Gearbox Window Lift	EVT <sup>3)</sup> , VVA <sup>4)</sup> , Common Rail

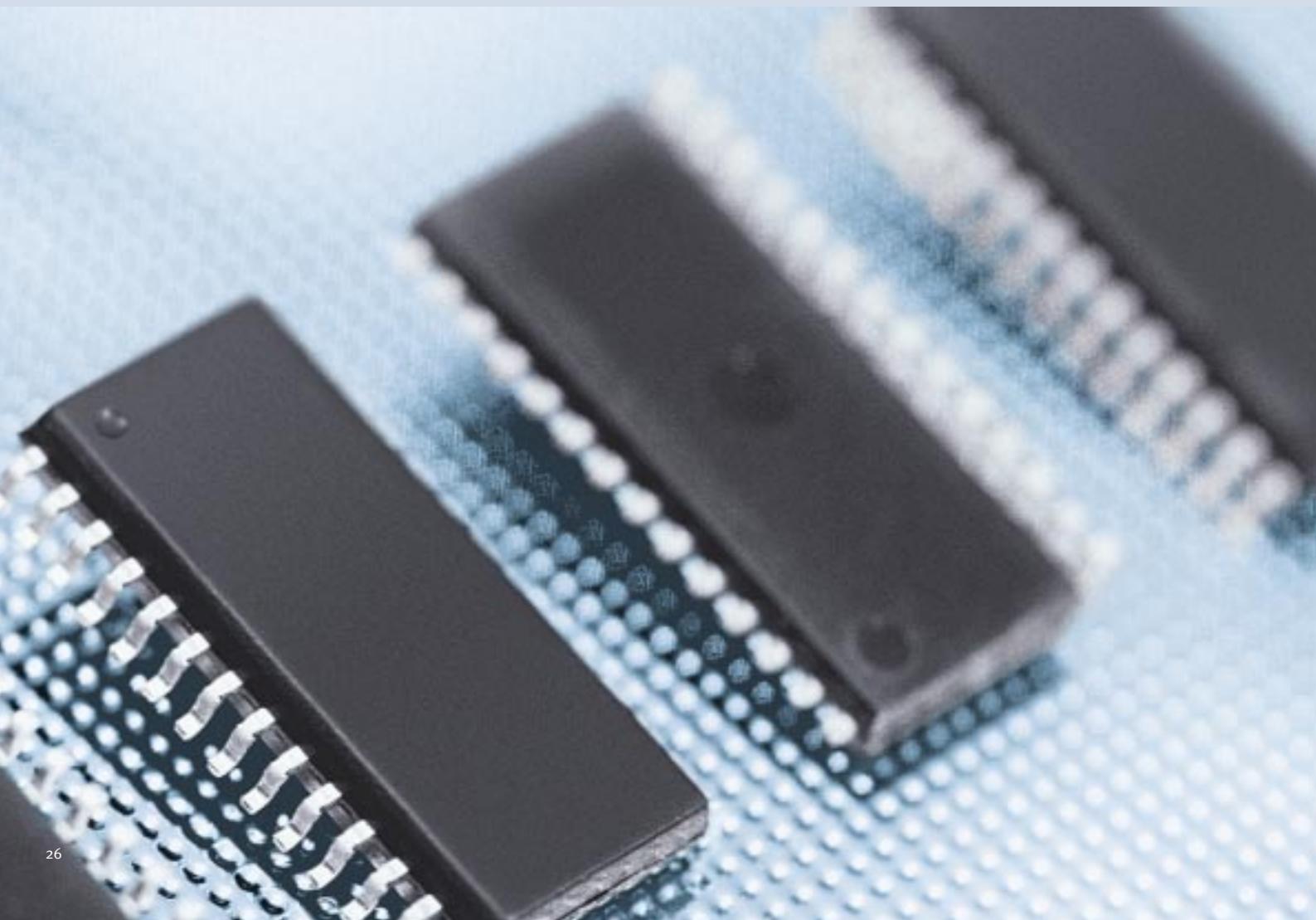
\* Calculated for SPB80N04S2-H4 (TO 263, 40 V, 4 mOhm, Normal Level Device)

<sup>1)</sup> Electronic Power Steering

<sup>2)</sup> Electronic Hydraulic Power Steering

<sup>3)</sup> Electronic Valve Train

<sup>4)</sup> Variable Valve Actuator





## TLE 6280 GP 3-phase Driver

### Main features

- High driver capacity ( six times 2–4 mΩ MOSFETs )
- Driver IC for 3-Φbridge
  - ▶ Dedicated for EPS and EHPS applications
- Excellent thermal properties of the P-DS036 package
  - ▶ Usable at  $T_{Ambient} = 125^{\circ}\text{C}$
- Adjustable dI/dt limitation
  - ▶ Allows use of low-voltage class MOSFETs
  - ▶ Reduces EME
- Bootstrap principle guarantees fast switching of all MOSFETs
  - ▶ Active freewheeling reduces power dissipation
- Separated source connection for each MOSFET
  - ▶ Low sensitivity to inductive noise
- Short-circuit protection for the MOSFETs with adjustable current limitation
  - ▶ Protection for the bridge without ext. components
- Charge pump guarantees full  $R_{DS(on)}$  with  $V_{BAT} > 9 \text{ V}$ 
  - ▶ Usable in automotive power net without extra voltage supply
- Error flag
  - ▶ Diagnostic feedback

## TLE 6289 GP 3-phase Driver

### Additional features to TLE 6280 GP

- Short-circuit detection optimized for low ohmic MOSFETs

▶ [www.infineon.com/bridges](http://www.infineon.com/bridges)

## TLE 6287 GP 3-phase Driver

### Additional features to TLE 6280 GP

- Additional pin for charge pump trigger
- No di/dt control

## TLE 6281 G H-bridge Driver IC

- Driver IC for 6.5...60 V supply voltage
- Short-circuit protection. Detection levels down to 0.75 V  $V_{DS}$  allows reliable detection even with low ohmic MOSFETs
- PWM / DIR input structure
  - ▶ Dedicated to drive DC-brush motors
- Low quiescent current (inhibit mode)
  - ▶ Direct supply from battery
- Two-bit ERR flag for detailed diagnosis
  - ▶ Undervoltage and short-circuit shutdown
  - ▶ Overtemperature warning
- Adjustable dead time / deactivation possible
  - ▶ Adjustable to different requirements

## TLE 6282 G Dual Half-bridge Driver IC

### Differences to TLE 6281 G

- Flexible input structure
  - ▶ Independent use of all four switches
- High side switches can be used for low side
  - ▶ Use as H-bridge / two half-bridge / four low side...
- Split of outputs allows connection of load between high + low side switch
  - ▶ Drives valves and injectors
- Diagnosis
  - ▶ One ERR flag
- Adjustable short-circuit protection. Detection levels down to 0.75 V  $V_{DS}$  allows reliable detection even with low ohmic MOSFETs

OptiMOS®-T/OptiMOS®:  
N-Channel MOSFET

TEMPFET®/HITFET®/  
Multiple-Channel:  
Low-Side-Switches

PROFET®:  
High-Side-Switches

Bridge  
Driver ICs

DC Motor  
Bridges

Power  
Supply

Automotive  
Transceivers

Automotive  
System ICs

# High Power Control DC Motor Bridges

## TrilithICs

Feature	1 sec pulse current [A]	Peak current [A]	Quiescent current [ $\mu$ A]	Operating range [V]	Path $R_{DS(on)}$ typ. [ $m\Omega$ ]	Path $R_{DS(on)}$ max. [ $m\Omega$ ]	Switching frequency $f$ max.	Short-circuit protection	Self protection	Error flag	HIGHLIGHT	Package*
BTS 7700 G	4.3	9	8	5 – 42	200		HSS: 1 kHz LSS: 1 kHz	Load + GND	OT + OC <sup>3)</sup>	OT <sup>2)</sup>	High Peak Current Capability	(29)
BTS 7710 G	5.8	15	8	5 – 42	110	260	HSS: 1 kHz LSS: 1 kHz	Load + GND	OT + OC	OT	High Peak Current Capability	(29)
BTS 7710 GP	9	15	8	5 – 42	110	260	HSS: 1 kHz LSS: 1 kHz	Load + GND	OT + OC	OT	High Peak Current Capability	(18)
BTS 7740 G	4.2	8	8	5 – 42	210	500	HSS: 1 kHz LSS: 1 kHz	Fully Protected	OT + OC	OT	High Peak Current Capability with Full Protected Outputs	(29)
BTS 7741 G	4.2	8	8	5 – 42	210	500	HSS: 1 kHz LSS: 1 kHz	Fully Protected	OT + OC	OT + OL <sup>1)</sup>	High Peak Current Capability with Full Protected Outputs	(29)
BTS 7750 G	5.6	12	8	5 – 42	115	285	HSS: 1 kHz LSS: 1 kHz	Fully Protected	OT + OC	OT	High Peak Current Capability with Full Protected Outputs	(29)
BTS 7751 G	5.6	12	8	5 – 42	115	285	HSS: 1 kHz LSS: 1 kHz	Fully Protected	OT + OC	OT + OL	High Peak Current Capability with Full Protected Outputs	(29)
BTS 7750 GP	7	12	8	5 – 42	115	285	HSS: 1 kHz LSS: 1 kHz	Fully Protected	OT + OC	OT	High Peak Current Capability with Full Protected Outputs	(18)
BTS 7810 K	25	42	9	5 – 42	40	100	HSS: 1 kHz LSS: 1 kHz	Load + GND	OT + OC	OT + OL	Very High Peak Current Capability	(18)
BTS 7811 K	25	42	9	5 – 42	40	100	HSS: 1 kHz LSS: 20 kHz <sup>4)</sup>	Load + GND	OT + OC	OT + OL	Very High Peak Current Capability	(18)

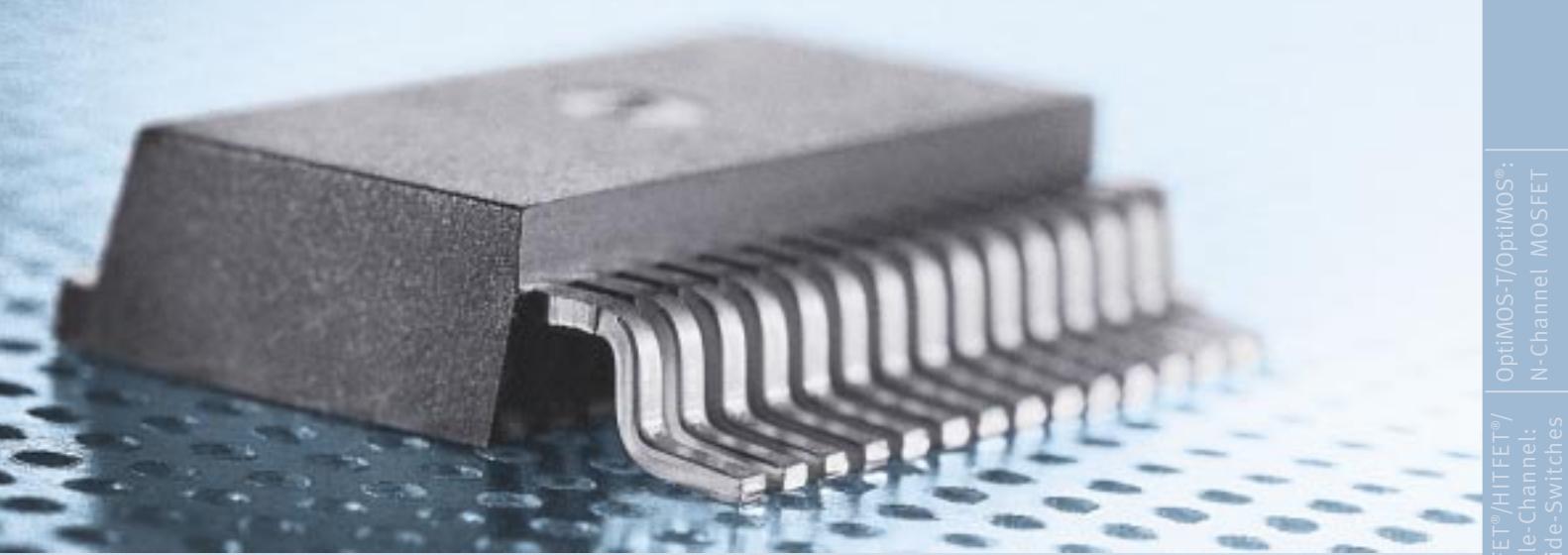
<sup>1)</sup> OL = Open load<sup>2)</sup> OT = Overtemperature<sup>3)</sup> OC = Overcurrent<sup>4)</sup> above 5 A load current 1 kHz

\*See packages on page 58

## NovalithICs

Feature	1 sec pulse current [A]	Peak current [A]	Quiescent current [mA]	Operating range [V]	Path $R_{DS(on)}$ typ. [ $m\Omega$ ]	Path $R_{DS(on)}$ max. [ $m\Omega$ ]	Switching frequency $f$ max.	Short-circuit protection	Self protection	Error flag	HIGHLIGHT	Package*
BTS 7960 B	40	50	0.01	5 – 28	15	21	20 kHz	Fully Protected	OT + OC	OT + current	Highest Current Capability 20 kHz current sense	(17)

\*See packages on page 58



# Smart Power DC Motor Bridges

## Bridges for Idle Speed and Throttle Control

Feature	Output current [A]	Peak current [A]	Quiescent current [mA]	Operating range [V]	Short-circuit protection	Diagnostic interface	HIGHLIGHT	$R_{DS(on)}$	Package*
TLE 5205-2	4	5	10	6 – 40	Fully Protected	Status Flag	Open Load Detection	220 mΩ/switch	(6),(7) (17),(27)
TLE 5206-2	4	5	10	6 – 40	Fully Protected	Status Flag	Break High and Low	220 mΩ/switch	(6),(7) (17),(27)
TLE 6209	6	7	0.02	5 – 40	Fully Protected	SPI	SPI, Chopper Current Limitation, Temp Prewarning	150 mΩ/switch	(27)
TLE 7209	6	7	20	5 – 40	Fully Protected	SPI / Status Flag	SPI, Chopper Current Limitation, Temp Prewarning	150 mΩ/switch	(27)

\*See packages on page 58

## Multi Half Bridges

Feature	Output current [A]	Peak current [A]	Quiescent current [ $\mu$ A]	Operating range [V]	Short-circuit protection	Diagnostic interface	HIGHLIGHT	$R_{DS(on)}$	Package*
TLE 4207	2 x 0.8	2 x 1	20	6 – 18	Fully Protected	Status Flag	Very Low Saturation Voltage + Error Det.	1.4 V at 0.6 A <sup>1)</sup>	(24)
TLE 4208	4 x 0.8	4 x 1	20	6 – 18	Fully Protected	Status Flag	Dual Full Bridge Driver Very Low Saturation	1.4 V at 0.6 A <sup>1)</sup>	(29)
TLE 6208-3	3 x 0.8	3 x 1.5	10	6 – 40	Fully Protected	16-Bit SPI	3-fold Half Bridge	800 mΩ/switch	(24)
TLE 6208-6	6 x 0.8	6 x 1.5	10	6 – 40	Fully Protected	16-Bit SPI	6-fold Half Bridge 12-fold Driver	800 mΩ/switch	(29)

<sup>1)</sup> Total drop i.e. drop of HSS + LSS

\*See packages on page 58

# Smart Power DC Motor Bridges

## Stepper Motor Drivers

Feature	Output current [A]	Peak current [A]	Step operations	Operating range [V]	Short-circuit	Diagnostic interface protection	HIGHLIGHT	Package*
TCA 3727	2 x 0.75	2 x 1	Full to Mini Step	5 – 50	Short to GND	Status Flag	High Operating Voltage	(28),(36)
TLE 4726	2 x 0.75	2 x 1	Full to Mini Step	5 – 50	Short to GND	Status Flag	Low Quiescent Current	(28)
TLE 4727	2 x 0.75	2 x 1	Full to Mini Step	5 – 16	Fully Protected	Status Flag	Full Protection	(36)
TLE 4728	2 x 0.75	2 x 1	Full to Mini Step	5 – 16	Fully Protected	Status Flag	Two Error Flags	(28)
TLE 4729	2 x 0.75	2 x 1	Full to Mini Step	5 – 16	Fully Protected	Status Flag	Inhibit, Very Low Quiescent Current	(28)

\*See packages on page 58

## Servo Drivers

Feature	Output current [A]	Peak current [A]	Quiescent current [mA]	Operating range [V]	Short-circuit protection	Inhibit	HIGHLIGHT	$V_{sat}/R_{DS(on)}$	Package*
TLE 4205	0.8	1	0.01	6 – 32	to GND	✓	Dual Power Comparator for Higher Supply Voltage	2.1 V at 0.6 A <sup>1)</sup>	(26),(35)
TLE 4206	0.8	1	10	6 – 18	Fully Protected	No	Servo Driver with Current Peak Blanking	1.4 V at 0.6 A <sup>1)</sup>	(24)
TLE 4209	0.8	1	10	6 – 18	Fully Protected	No	Servo Driver	1.4 V at 0.6 A <sup>1)</sup>	(34)

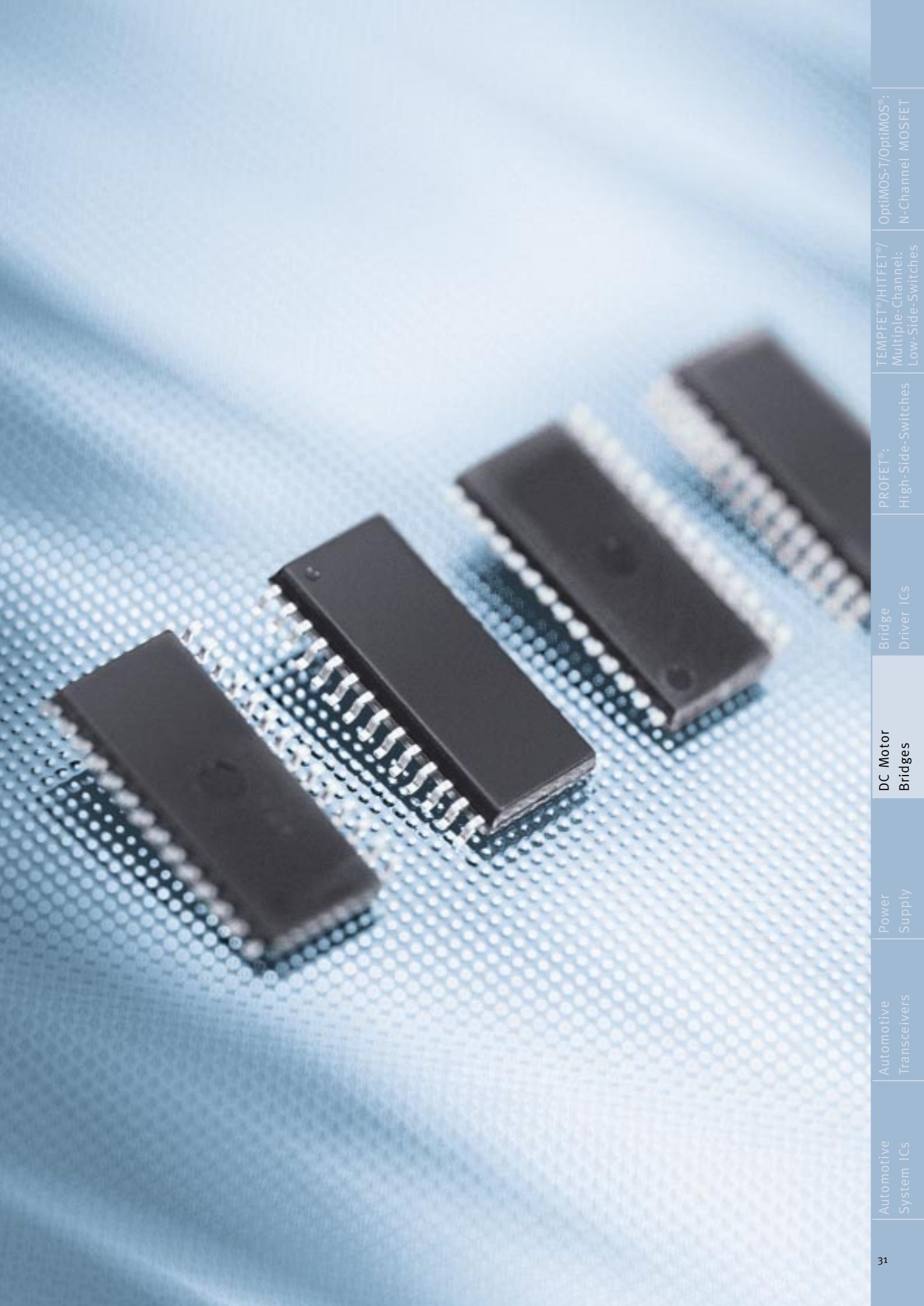
<sup>1)</sup> Total drop i.e. drop of HSS + LSS

\*See packages on page 58

## Multiple Driver IC, Door Module IC

Feature	Output	Peak current [A]	Driver stage	Quiescent current [ $\mu$ A]	Operating range [V]	Protection	Diagnostic + programming	Package*
TLE7201	Out 1.2 Out 3.4 Out 5.6 Out 7 Out 8 – 11	8 3 1.25 6.25 3	Half-bridge Half-bridge Half-bridge High-Side-Switches High-Side-Switches	3	5 – 20	fully protected	SPI	(31)

\*See packages on page 58



OptiMOS-T/OptiMOS®:  
N-Channel MOSFET

TEMPFET®/HITFET®/  
Multiple-Channel:  
Low-Side-Switches

PROFET®:  
High-Side-Switches

Bridge  
Driver ICs

DC Motor  
Bridges

Power  
Supply

Automotive  
Transceivers

Automotive  
System ICs

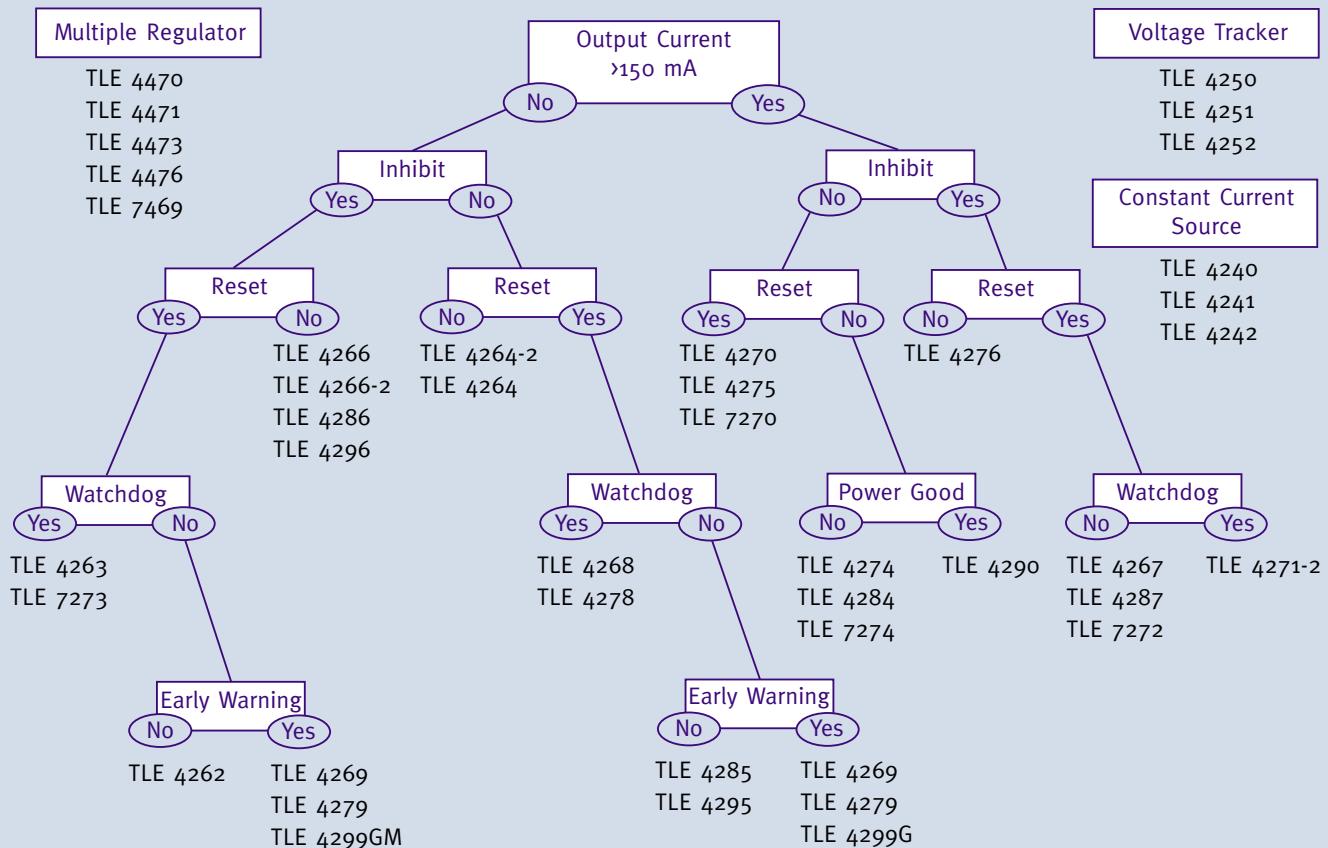
31

# Power Supply

## Short description

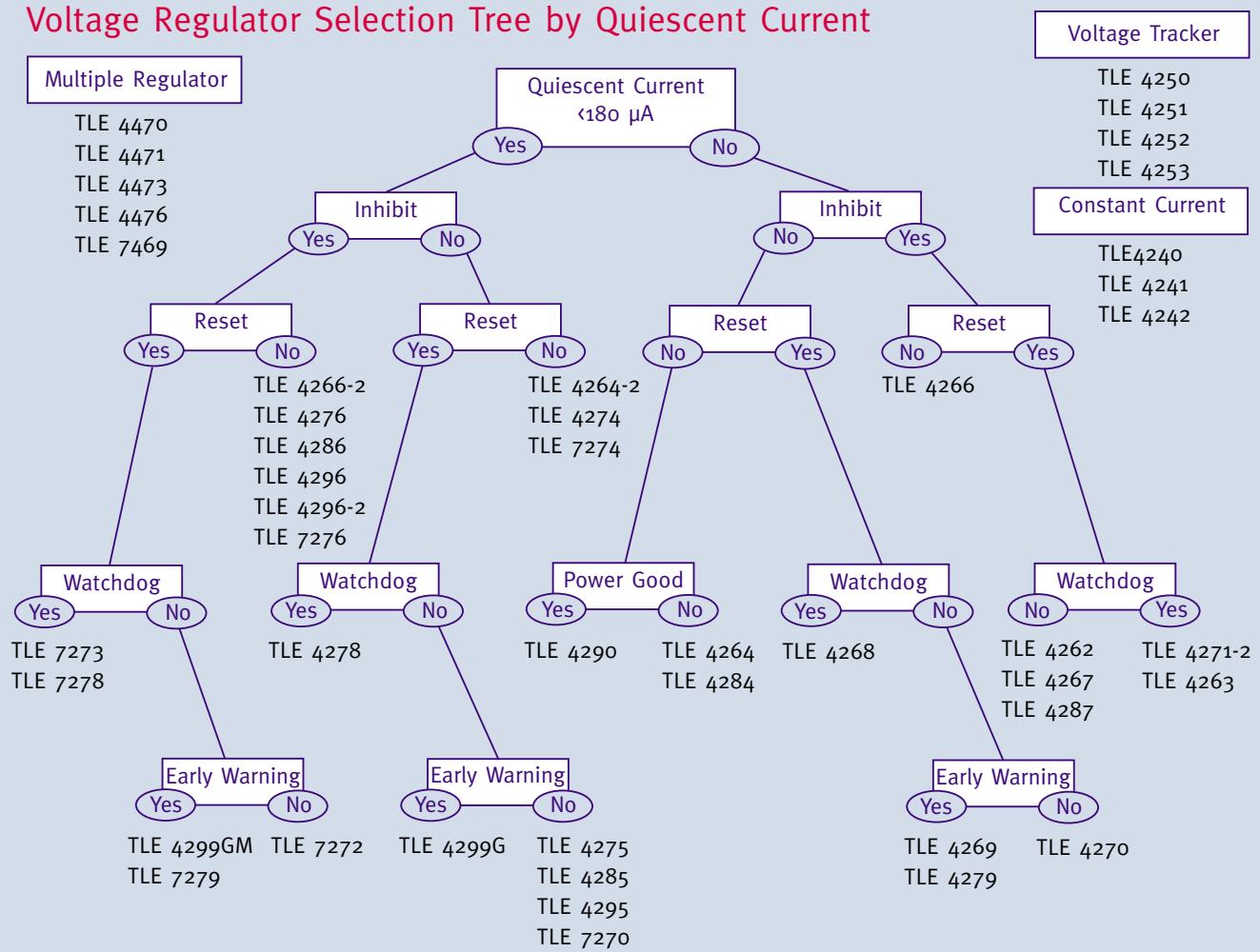
- Low quiescent current consumption in standby mode
- Disable function for main output
- Wide operation range: up to 45 V
- Wide temperature range: -40°C up to +150°C
- Very low dropout
- Power-On-Reset circuit sensing the standby voltage
- Early warning comparator for supply undervoltage
- Output protected against short-circuit
- Wide temperature range
- Overtemperature protection
- Overload protection

## Voltage Regulator Selection Tree by Output Current





## Voltage Regulator Selection Tree by Quiescent Current



OptiMOS-T/OptiMOS®:  
N-Channel MOSFET

TEMPFET®/HITFET®/  
Multiple-Channel:  
Low-Side-Switches

PROFET®:  
High-Side-Switches

Bridge  
Driver ICs

DC Motor  
Bridges

Power  
Supply

Automotive  
Transceivers

Automotive  
System ICs

# Power Supply by Output Current

## Single Regulators

Type	Output current [mA]	Operating range [V]	Output voltage [V]	Load dump protection [V]	Drop voltage [V]	Accuracy (%)	Leakage off-mode [ $\mu$ A]	Quiescent current on-mode [ $\mu$ A]
TLE 4284	800	45	adj. 1.25;3.3		1.2	4		100
TLE 4270	600	42	5	65	0.35	2		900
TLE 4271-2	600	42	5	65	0.35	2	0	1000
TLE 4275	450	45	5		0.25	2		150
TLE 4290	450	45	5		0.25	2		200
TLE 4267	400	42	5	65	0.35	2	0	1300
TLE 4274	400	45	5;8.5;10		0.25	4		100
TLE 4274 <sup>2)</sup>	400	45	2.5;3.3		0.25	4		100
TLE 4276	400	45	adj. 5;8.5;10		0.25	2	0	100
TLE 7270	300	42	5		0.25	2		30
TLE 7272	300	42	5		0.25	2	5	35
TLE 7274	300	42	5		0.25	2		20
TLE 7276	300	42	5		0.25	2	5	25
TLE 4287	250	45	5		1.5	2	0	2000
TLE 4262	200	45	5		0.25	2	0	720
TLE 4263	200	45	5		0.25	2	0	850
TLE 4268	200	45	5		0.25	2		270
TLE 7273	200	42	2.6;3.3;5		0.25	2	5	35
TLE 4278	160	45	5		0.25	2		160
TLE 4269	150	45	5		0.25	2		150
TLE 4279	150	45	5		0.25	2		150
TLE 4299GM	150	45	3.3; 5		0.25	2		65
TLE 4299G	150	45	3.3; 5		0.25	2		65
TLE 4264	120	45	5		0.25	2		250
TLE 4264-2	120	45	5		0.25	2		40
TLE 4266	120	45	5; 10		0.25	2		250
TLE 4266-2	120	45	3.3; 5		0.25	2		40
TLE 4295	30	45	2.6;3.3;3.5		0.25	4		60
TLE 4296	30	45	3;3.3;5		0.25	4	10	60
TLE 4285	20	45	5		1	4		80
TLE 4286	20	45	5		1	4	0	50

<sup>1)</sup> Power good<sup>2)</sup> Stable with ceramic cap



Short-circuit protection	Ovvoltage protection	Ovtemperatur protection	Reset	Adjustable reset threshold	Inhibit input	Watchdog circuit	Early warning	Package*
X		X						(10)
X	X	X	X					(3),(5),(11),(15)
X	X	X	X		X	X		(6),(8),(17)
X		X	X					(3),(5),(11)
X		X					X <sup>1)</sup>	(3),(11),(15)
X	X	X	X		X			(6),(7),(17),(24)
X		X						(2),(10)
X		X						(21),(10)
X		X			X			(3),(4),(11),(15)
X		X	X					(11)
X		X	X		X			(11)
X		X						(11)
X		X			X			(11)
X		X	X		X			(24)
X		X	X	X	X			(24)
X		X	X	X	X	X		(22),(24),(26)
X		X	X	X		X		(22),(26)
X		X	X		X	X		(24)
X		X	X	X		X		(24)
X		X	X	X			X	(22),(24),(26)
X		X	X	X			X	(22),(24),(26)
X		X	X	X	X			(24)
X		X	X	X			X	(22)
X		X						(21)
X		X						(21)
X		X			X			(21)
X		X			X			(21)
X		X	X					(19)
X		X			X			(19)
X		X	X					(19)
X			X		X			(19)

\*See packages on page 58

OptIMOS-T/OptIMOS®:  
N-Channel MOSFET

TEMPFET®/HITFET®/  
Multiple-Channel:  
Low-Side-Switches

PROFET®:  
High-Side-Switches

Bridge  
Driver ICs

DC Motor  
Bridges

Power  
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Automotive  
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System ICs

# Power Supply by Quiescent Current

## Single Regulators

	Quiescent current on-mode [ $\mu$ A]	Operating range [V]	Output voltage [V]	Load dump protection [V]	Drop voltage [V]	Accuracy (%)	Leakage off-mode [ $\mu$ A]	Output current [mA]
TLE 7274	20	42	5		0.25	2		300
TLE 7276	25	42	5		0.25	2	5	300
TLE 7270	30	42	5		0.25	2		300
TLE 7272	35	42	5		0.25	2	5	300
TLE 7273	35	42	2.6;3.3;5		0.25	2	5	200
TLE 4264-2	40	45	5		0.25	2		120
TLE 4266-2	40	45	3.3;5		0.25	2		120
TLE 4286	50	45	5			1	4	0
TLE 4295	60	45	2.6;3;3.3;5		0.25	4		30
TLE 4296	60	45	3;3.3;5		0.25	4	10	30
TLE 4299G	65	45	3.3;5		0.25	2		150
TLE 4299GM	65	45	3.3;5		0.25	2		150
TLE 4285	80	45	5		1	4		20
TLE 4276	100	45	adj.5;8.5;10		0.25	2	0	400
TLE 4274	100	45	5;8.5;10		0.25	4		400
TLE 4274 <sup>2)</sup>	100	45	2.5;3.3		0.25	4		400
TLE 4284	100	45	adj. 1.25;3.3		1.2	4		800
TLE 4269	150	45	5		0.25	2		150
TLE 4275	150	45	5		0.25	2		450
TLE 4279	150	45	5		0.25	2		150
TLE 4278	160	45	5		0.25	2		160
TLE 4290	200	45	5		0.25	2		450
TLE 4264	250	45	5		0.25	2		120
TLE 4266	250	45	5;10		0.25	2		120
TLE 4268	270	45	5		0.25	2		200
TLE 4262	720	45	5		0.25	2	0	200
TLE 4263	850	45	5		0.25	2	0	200
TLE 4270	900	42	5	65	0.35	2		600
TLE 4271-2	1000	42	5	65	0.35	2	0	600
TLE 4267	1300	42	5	65	0.35	2	0	400
TLE 4287	2000	45	5		1.5	2	0	250

<sup>1)</sup> Power good<sup>2)</sup> Stable with ceramic cap



Short-circuit protection	Ovvoltage protection	Overttemperature protection	Reset	Adjustable reset threshold	Inhibit input	Watchdog circuit	Early warning	Package*	
X		X						(11)	
X		X			X			(11)	
X		X	X					(11)	
X		X	X		X			(11)	
X		X	X		X	X		(24)	
X		X						(21)	
X		X			X			(21)	
20	X		X			X		(19)	
X		X	X					(19)	
X		X			X			(19)	
X		X	X	X			X	(22)	
X		X	X	X	X		X	(24)	
X		X	X					(19)	
X		X			X			(3),(4),(11),(15)	
X		X						(2),(10)	
X		X						(2),(10)	
X		X						(10)	
X		X	X	X			X	(22),(24),(26)	
X		X	X					(3),(4),(11),(15)	
X		X	X	X			X	(22),(24),(26)	
X		X	X	X		X		(24)	
X		X					X <sup>1)</sup>	(3),(11),(15)	
X		X						(21)	
X		X			X			(21)	
X		X	X	X			X	(22),(26)	
X		X	X	X	X			(24)	
X		X	X	X	X	X		(22),(24),(26)	
X	X	X	X					(3),(4),(11),(15)	
X	X	X	X		X		X	(6),(8),(17)	
X	X	X	X		X			(6),(7),(17),(24)	
X		X	X		X			(24)	

\*See packages on page 58

OptiMOS-T/OptiMOS®:  
N-Channel MOSFET

TEMPFET®/HITFET®/  
Multiple-Channel  
Low-Side-Switches

PROFET®:  
High-Side-Switches

Bridge  
Driver ICs

DC Motor  
Bridges

Power  
Supply

Automotive  
Transceivers

Automotive  
System ICs

# Power Supply

## Multiple Regulators

	Output current one [mA]	Output current two/three [mA]	Operating range [V]	Output voltage one [V]	Output voltage two/three [V]	Load dump protection [V]	Drop voltage [V]	Accuracy (%)	Leakage current [ $\mu$ A]
TLE 4470	350	180	45	5	adj.		0.25	2	
TLE 4471	500	100 + 50	42	5	5 + 5	65	0.35	2	10
TLE 4473	350	200	45	5	3.3 or 2.6		0.3	2	1
TLE 4476	430	350	42	5	3.3	65	0.35	4	10
TLE 7469	220	200	45	5	3.3 or 2.6		0.3	2	1

## Tracker

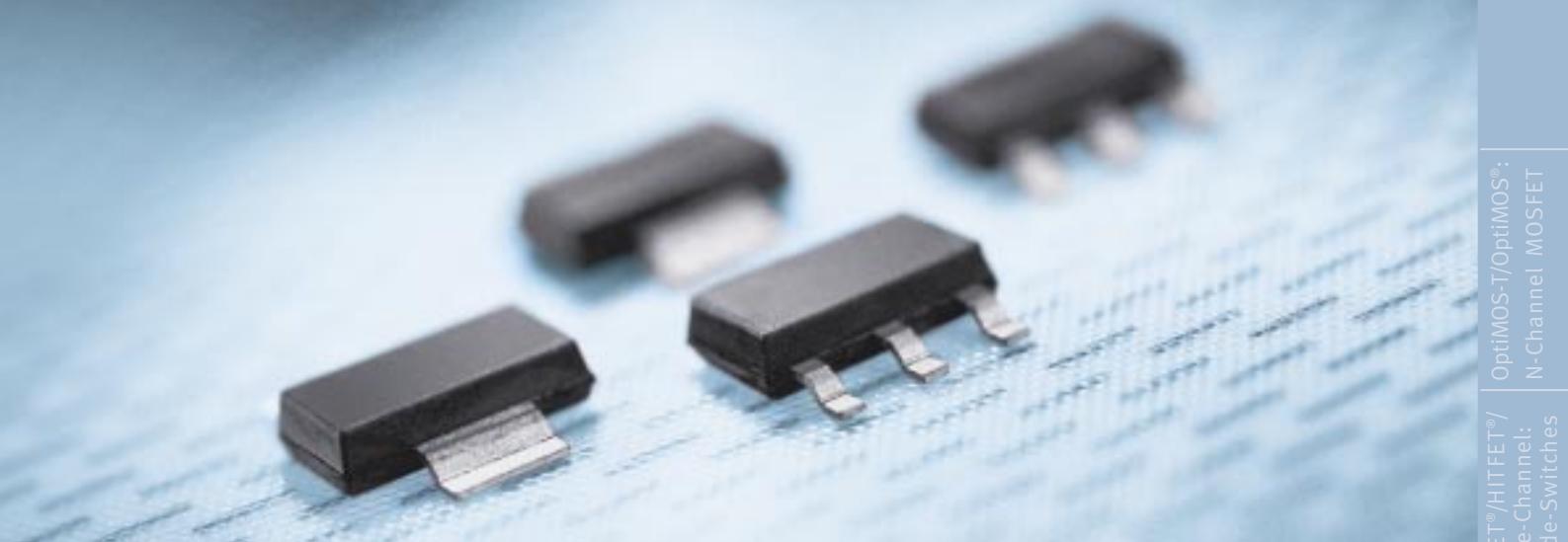
	Output current one [mA]	Output current two/three [mA]	Operating range [V]	Output voltage one [V]	Output voltage two/three [V]	Load dump protection [V]	Drop voltage [V]	Accuracy (%)	Leakage current [ $\mu$ A]
TLE 4250	50		45	adj.			0.25	0.5	10
TLE 4251	400		45	adj.			0.25	0.5	0
TLE 4252	250		45	adj.			0.25	0.5	0

## Constant Current Source

### Short description

- Constant output current, therefore constant brightness and extended LED lifetime
- Wide input voltage range
- Low drop voltage
- Open load detection
- Overtemperature protection
- Short-circuit proof
- Reverse polarity proof
- Wide temperature range
- Very small SMD-packages

Parameters	Output current [mA]	Output current [mA]	Operating range [V]	Drop voltage [V]	Accuracy (%)	Quiescent curr. IQ = 1mA/ $\mu$ A
TLE 4241	8/65	adj.	45	0.3		
TLE 4242	600	adj.	45	0.35	5	0



Quiescent curr. IQ = 1 mA	Short-circuit protection	Ovvoltage protection	Overtemperature protection	Reset	Adjustable reset threshold	Inhibit input	Watchdog circuit	Early warning	Package*
200	X		X	X	X	X		X	(24)
500	X	X	X	X	X	X	X		(26)
200	X		X	X		X	X		(23)
250	X	X	X			X			(11)
55	X		X	X		X	X		(23)

\*See packages on page 58

OptiMOS-T/OptiMOS®:  
N-Channel MOSFET

TEMPFET®/HITFET®/  
Multiple-Channel:  
Low-Side-Switches

PROFET®:  
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Bridge  
Driver ICs

DC Motor  
Bridges

Power  
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Automotive  
Transceivers

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System ICs

Quiescent curr. IQ = 1 mA	Short-circuit protection	Ovvoltage protection	Overtemperature protection	Reset	Adjustable reset threshold	Inhibit input	Watchdog circuit	Early warning	Package*
60	X		X			X			(19)
100	X		X			X			(11,14)
100	X		X			X			(11)

\*See packages on page 58

Short-circuit protection	Ovvoltage protection	Overtemperature protection	Reset	Adjustable reset threshold	Inhibit input	PWM	Package*
X	X	X	X	X	X	X	(22)
X	X	X	X	X	X	X	(17)

\*See packages on page 58

# Power Supply

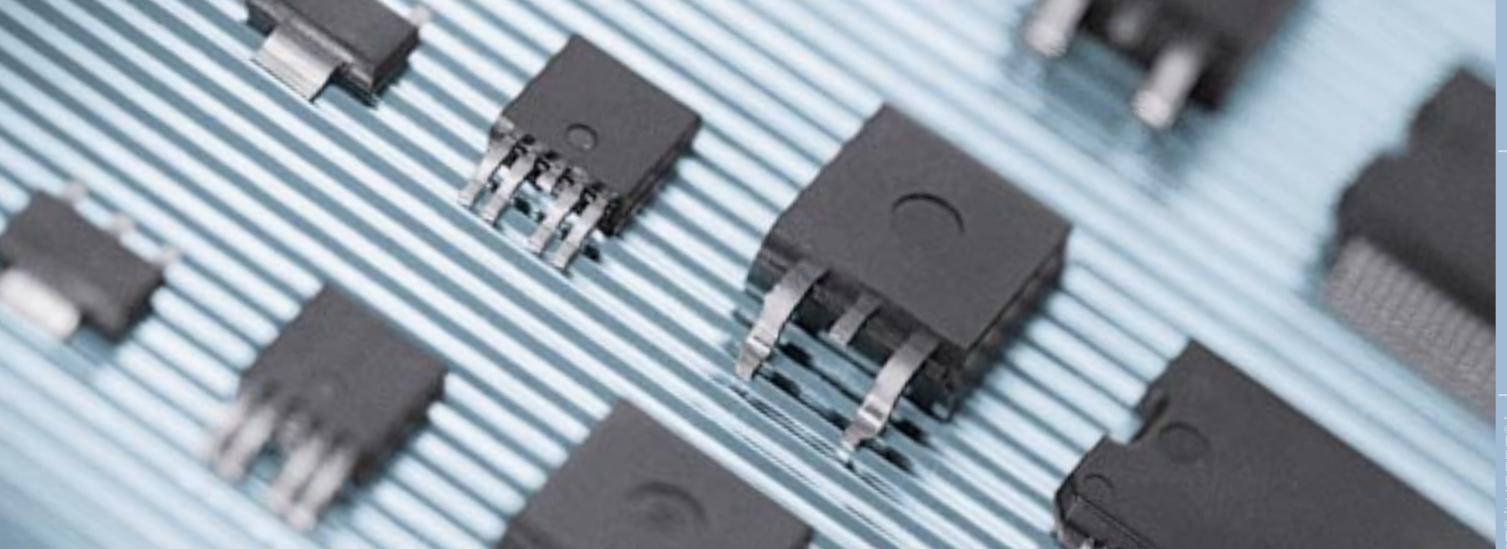
## Short description

- Step up and step down converters
- High-efficiency regulators
- Wide supply voltage operation range
- Very low current consumption operation
- Suitable for standard 12 V/24 V and 42 V PowerNets
- Output under-voltage-reset with delay
- Overtemperature shutdown
- Wide ambient operation range: -40°C up to +125°C

## DC/DC

Type	Topology	Input voltage range [V]	Output voltage 1 [V]	Output voltage 2 [V]	Output voltage 3 [V]	Output voltage 4 [V]	Output voltage 5 [V]	Output current 1 [mA]	Output current 2 [mA]	Output current 3 [mA]	Output current 4 [mA]	Output current 5 [mA]	Accuracy 1 (%)	Accuracy 2 (%)
TLE 6361	Buck plus Linear	8 (5.5) – 60	5.5	5	2.6 or 3.3	5 or 3.3	6 x 5	1500	800	500	350	6 x 17	10	2
TLE 6368	Buck plus Linear	5.5 – 60	5.5	5	2.6 or 3.3	2.6 or 3.3	6 x 5	1500	800	500	350	6 x 17	10	2
TLE 6363	Boost plus Buck	4 – 40	adj. up to 33 V	5				1000	700				10	2
TLE 6365	Buck	8 – 40	5					400					2	
TLE 6389GV	Buck	12 – 60	adj.	5				adj.					3	
TLE 6389G50	Buck	5 – 60	5					adj.					3	
TLE6389G50-1	Buck	5 – 60	5					adj.					3	

\* 1 Volt Reset Hysteresis



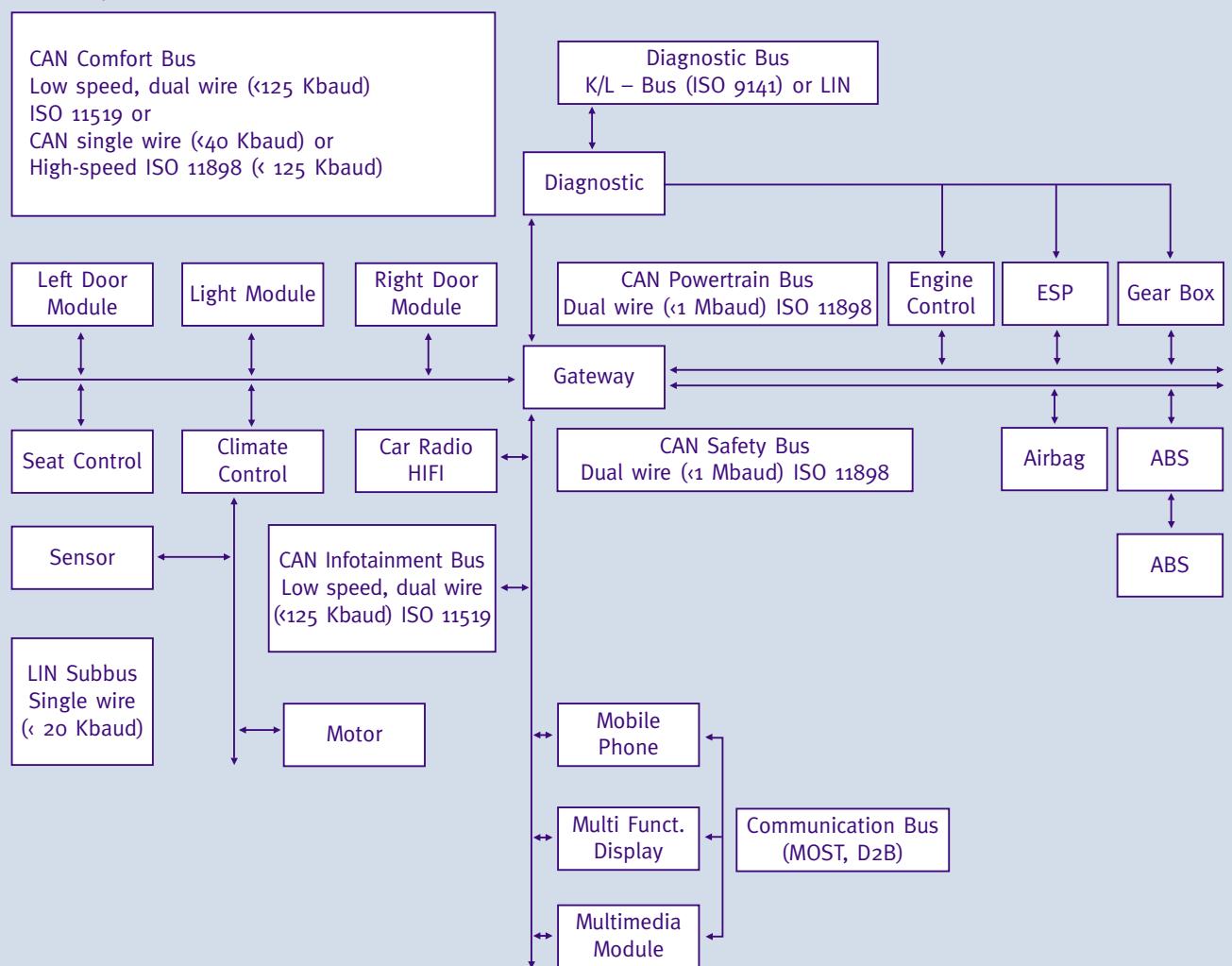
Accuracy 3 (%)	Accuracy 4 (%)	Accuracy 5 (%)	Quiescent current IQ = 1mA/µA	Standby regulator	PFM operation	Short-circuit protection	Over-temperature protection	Reset	Window watchdog	SPI and add logic	Enable/disable possibility	Early warning	Package*
5	4	+0.1 to -0.3	50	X		X	X	X	X	X	X		(31)
5	4	+0.1 to -0.3	50	X		X	X	X	X	X	X		(31)
			4000			X	X	X	X				(24)
			4000			X	X	X					(22)
			100		X	X	X	X			X	X	(24)
			100		X	X	X	X			X	X	(24)
			100		X	X	X	X*			X	X	(24)

\*See packages on page 58

Automotive System ICs	Power Supply	Bridge Driver ICs	PROFET®: High-Side-Switches	TEMPFET®/HITFET® Multiple-Channel: Low-Side-Switches	TEMPFET®/HITFET® Multiple-Channel: Low-Side-Switches	OptiMOS-T/OptiMOS®: N-Channel MOSFET
Automotive Transceivers	DC Motor Bridges					
Automotive System ICs						

# Automotive Transceivers

## Bus Systems



## Product Overview

Type	Transceiver type	Transmission rate	Voltage regulator output
Stand-alone Transceiver			
TLE 6250	High-speed CAN	1 Mbaud	No
TLE 6254-3	Medium-speed CAN	125 kbaud	No
TLE 6255	Single Wire CAN	33 kbaud	No
TLE 6258-2	Low-speed LIN	20 kbaud	No
TLE 6259-2	Low-speed LIN, with Inhibit Output	20 kbaud	No
TLE 7259	Low-speed LIN, with Inhibit Output	20 kbaud	No
Communication and Supply ICs			
TLE 6263	Standard Body, Low-speed CAN	125 kbaud	120 mA, @ 5 V
TLE 6266	SBC with Relay Driver, Low-speed CAN	125 kbaud	150 mA, @ 5 V
TLE 6285	Standard LIN-LDO with Reset Function	20 kbaud	150 mA, @ 5 V
TLE 6286	Standard LIN-LDO with Watchdog Function	20 kbaud	150 mA, @ 5 V

# Automotive Transceivers

## Feature Matrix

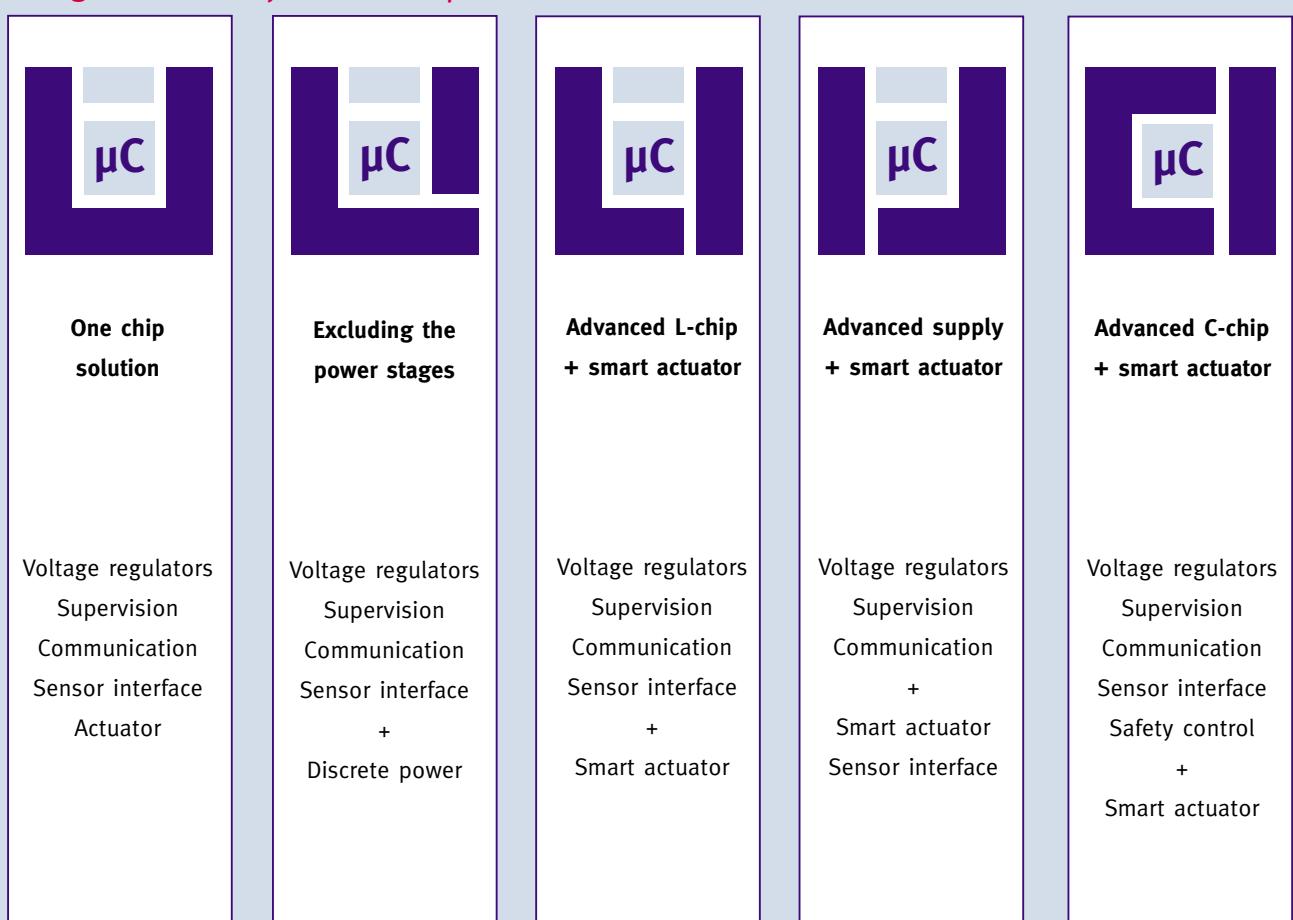
Type	Transceiver type	Transmission rate	Quiescent current	Standby current	Bus wakeup capability
TLE 6250 G	HighSpeedCAN ISO11898-2	1 MBaud	< 10 µA @5V standby	< 10 mA receive only	No
TLE 6250 GV33	HighSpeedCAN ISO11898-2	1 MBaud	< 10 µA @5V standby	< 10 mA receive only	No
TLE 6251 G	HighSpeedCAN ISO11898-5	1 Mbaud	< 50 µA sleep mode	< 100 µA	Yes
TLE 6251 DS	HighSpeedCAN ISO11898-5	1 Mbaud	< 30 µA @5V standby	< 30 µA	Yes
TLE 6254-3 G	FaultTolerantCAN ISO 11519/ISO 11898-3	125 kBaud	< 55 µA sleep mode	< 6 mA receive only	Yes
TLE 6255 G	SingleWireCAN GMLAN 3089	33 kBaud	< 40 µA sleep mode	< 6 mA	Yes
TLE 6258-2 G	SingleWireLIN/k-line and ISO9141	20 kBaud	< 40 µA sleep mode	N/A	No
TLE 7259 G	SingleWireLIN/k-line and ISO9141	20 kBaud	< 10 µA sleep mode	N/A	Yes
TLE 6259-2 G	SingleWireLIN/k-line and ISO9141	20 kBaud	< 30 µA sleep mode	N/A	Yes
TLE 6263 G	FaultTolerantCAN ISO 11519/ISO 11898-3	125 kBaud	< 60 µA sleep mode	< 400 µA @ 5 V standby	Yes
TLE 6266 G	FaultTolerantCAN ISO 11519/ISO 11898-3	125 kBaud	< 70 µA @ 5 V standby	< 400 µA @ 5 V on	Yes
TLE 6285 G	SingleWireLIN/k-line and ISO9141	20 kBaud	< 50 µA sleep mode	< 140 µA @ 5 V standby	Yes
TLE 6286 G	SingleWireLIN/k-line and ISO9141	20 kBaud	< 50 µA sleep mode	< 140 µA @ 5 V standby	Yes

\*See packages on page 58

Automotive System ICs							Automotive Transceivers	DC Motor Bridges	Bridge Driver ICs	TEMPFET®/HITFET® Multiple-Channel Low-Side-Switches	PROFET®: High-Side-Switches	OptiMOS-T/OptiMOS®: N-Channel MOSFET
Suitable for applications	Voltage regulator output	Wakeup inputs	Watchdog	Output drivers	Bus failure management	Package*						
12 + 24 V applications	No	No	No	No	No	(22)						
12 + 24 V applications	No	No	No	No	No	(22)						
12 + 24 V applications	No	bus wakeup + wakeup pin	No	No	bus failure detection	(24)						
12 + 24 V applications	No	bus wakeup	No	No	No	(22)						
12 V applications	No	bus wakeup + wakeup pin	No	No	fault tolerant failure management	(24)						
12 + 24 V applications	No	bus wakeup	No	No	No	(24)						
12 V applications	No	No	No	No	No	(22)						
12 + 24 V applications	No	bus wakeup + wakeup pin	No	No	LIN bus to GND short-circuit detection	(22)						
12 V applications	No	bus wakeup	No	No	LIN bus to GND short-circuit detection	(22)						
12 V applications	120 mA, @ 5 V	2 wakeup in bus wakeup	window watchdog	1 high side switch 150 mA	fault tolerant failure management	(29)						
12 V applications	150 mA, @ 5 V	bus wakeup	window watchdog	2 low side relay driver 3 high side driver	fault tolerant failure management	(29)						
12 V applications	150 mA, @ 5 V	bus wakeup	No	No	LIN bus to GND short-circuit detection	(25)						
12 V applications	150 mA, @ 5 V	bus wakeup	watchdog	No	LIN bus to GND short-circuit detection	(25)						

# Automotive System ICs

## Integration of System Components



## Body System ICs

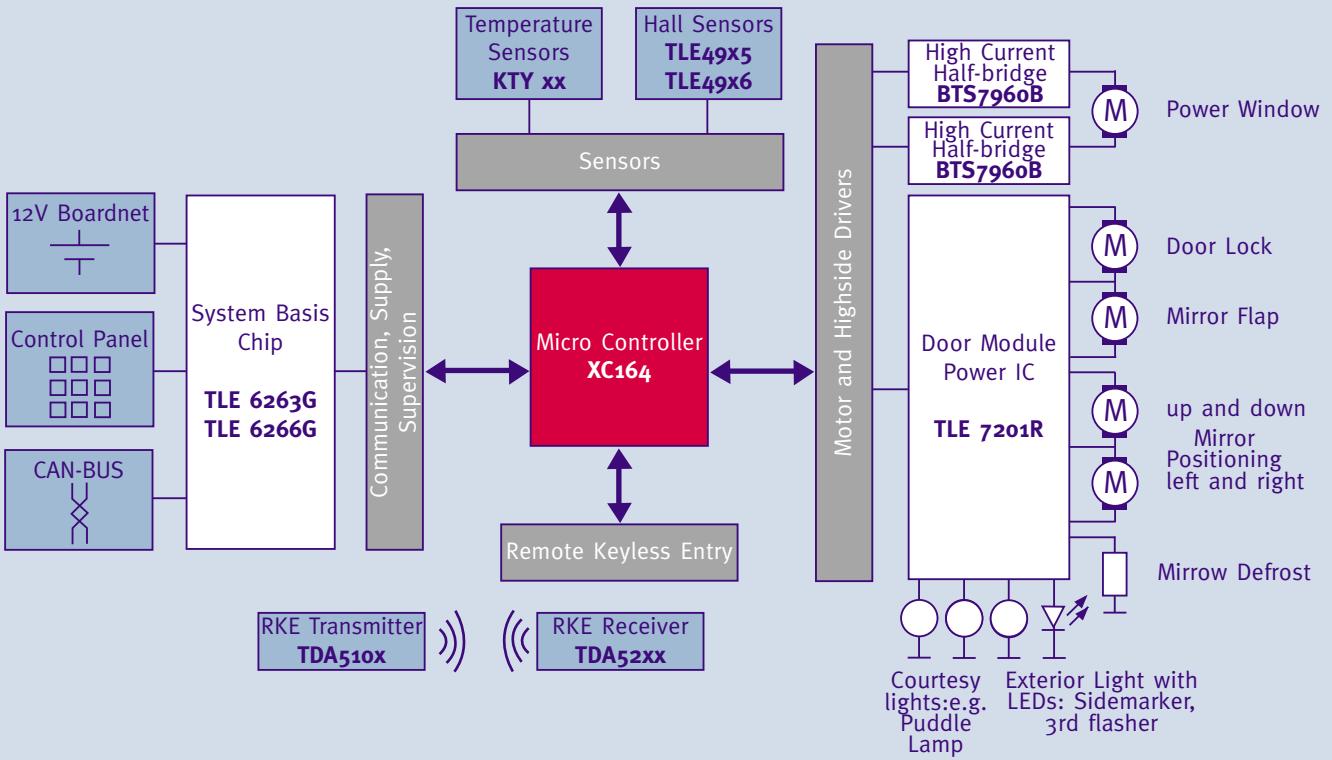
### System Basis Chips

Type	Transceiver type	Transmission rate	Quiescent current	Standby current	Bus wake-up capability	Suitable for
TLE 6263 G	FaultTolerantCAN ISO11519 / ISO 11898-3	125 kBaud	≤60 µA sleep mode	≤400 µA @ 5V standby	Yes	12V
TLE 6266 G	FaultTolerantCAN ISO11519 / ISO 11898-3	125 kBaud	≤70 µA @ 5V standby	≤400 µA @ 5V On	Yes	12V

► [www.infineon.com/transceiver](http://www.infineon.com/transceiver)

## Comfort Management

### Door Module



### Door Module IC

Feature	Output current A DC	Peak A	Driver stage	Quiescent current $\mu$ A	Operating range	Protection	Diagnostic + programming	Package*
TLE7201	Out 1..2 8	15	Half-bridge	3	8 – 20	Fully Protected	SPI	(31)
	Out 3..4 4	8	Half-bridge					
	Out 5..6 1..5	2..5	Half-bridge					
	Out 7 8	111	High Side Switches					
	Out 8 – 11 2..4	3..5	High Side Switches					

► [www.infineon.com/bridges](http://www.infineon.com/bridges)

\*See packages on page 58

Voltage regulator output	Wake up inputs	Watchdog	Output drivers	Bus failure management	Package*
120 mA, @ 5V	2 wakeup and bus wakeup	window watchdog	1 high side switch 150 mA	fault tolerant failure management	(29)
150 mA, @ 5V	bus wakeup	window watchdog	2 low side relay driver 3 high side driver	fault tolerant failure management	(29)

\*See packages on page 58

Automotive System ICs	Automotive Transceivers	Power Supply	DC Motor Bridges	Bridge Driver ICs	PROFET®: High-Side-Switches	TEMPFET®/HITFET® Multiple-Channel Low-Side-Switches	TLE 7201R: OptimIMOS-T/OptimIMOS®: N-Channel MOSFET
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# Automotive System ICs

## Powertrain System ICs

Type	$V_s$ [V]	$V_{DS(AZ)}$ max. [V]	$R_{DS(on)}$ typ.at $T_j=25^\circ C$ [mΩ]	$I_{D(NOM)}$ [A]	$I_{L(lim) min.}$ [A]	HIGHLIGHTS	Package*
TLE 6244 X	5	50/77	6x320 (70 V) 6x300 2x220 4x620	6x1.5 6x1.5 2x2 4x0.5	6x2.2 6x2.2 2x3 4x1.1	18-fold low side switch with SPI and microsecond bus, including six channels optimized for fuel injectors	(22)
TLE 6288 R	4.5 ... 5.5	40	6x0.270	6x2	programmable	six channel peak and hold driver optimized for p&h transmission valves	(31)

► [www.infineon.com/multi-channel-switches](http://www.infineon.com/multi-channel-switches)

\*See packages on page 58

## Bridges for Throttle Control

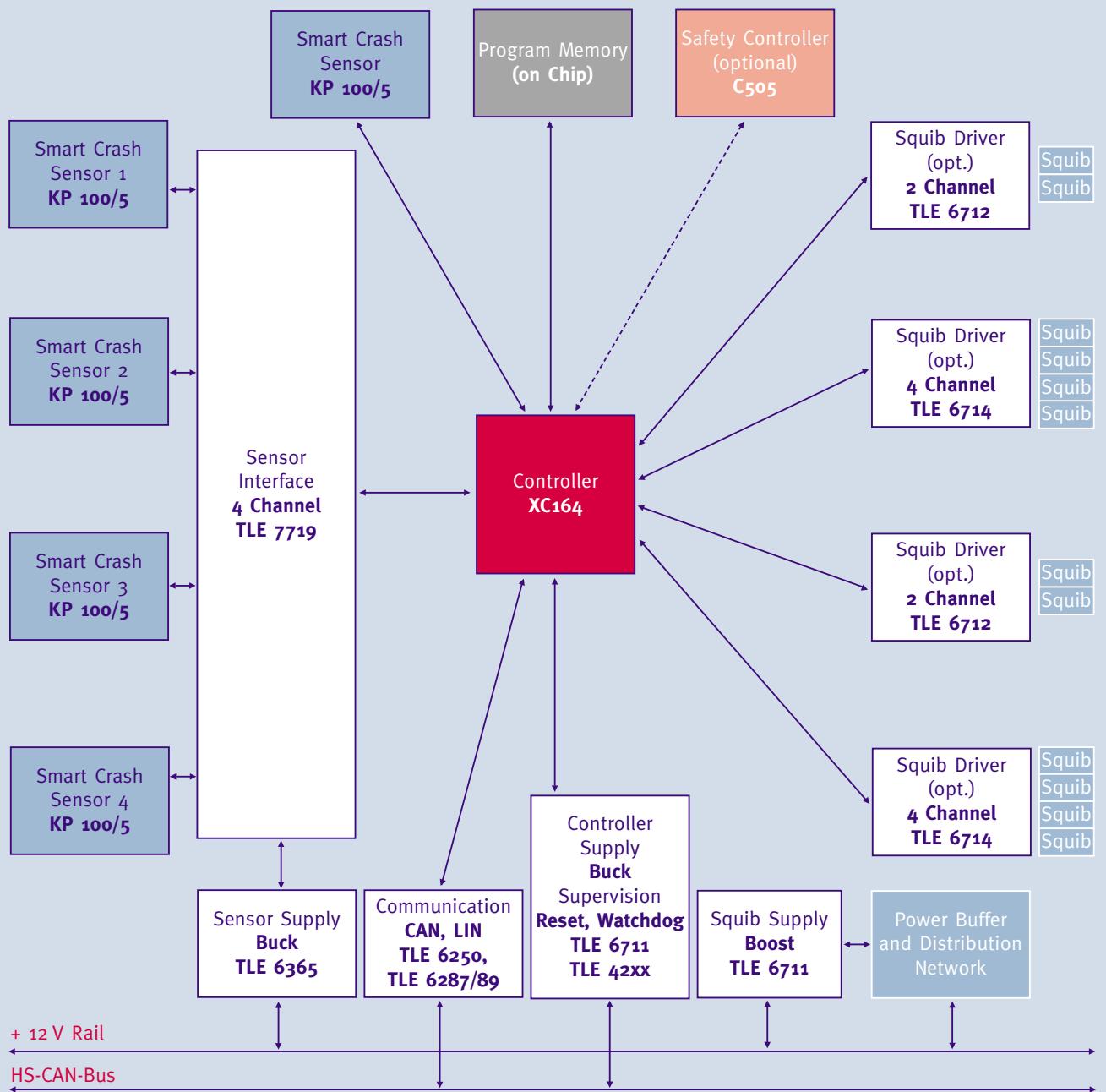
Feature	Output current [A]	Peak current [A]	Quiescent current [mA]	Operating range [V]	Short-circuit protection	Diagnostic interface	HIGHLIGHT	$R_{DS(on)}$	Package*
TLE 6209	6	7	0.02	5 – 40	Fully Protected	SPI	SPI, Chopper Current Limitation, Temp Prewarning	150 mΩ/switch	(27)
TLE 7209-2R	6	7	20	5 – 40	Fully Protected	SPI	SPI, Chopper Current Limitation, Temp Prewarning	150 mΩ/switch	(27)

► [www.infineon.com/bridges](http://www.infineon.com/bridges)

\*See packages on page 58



## Restraint System System Block Diagram



# Automotive System ICs

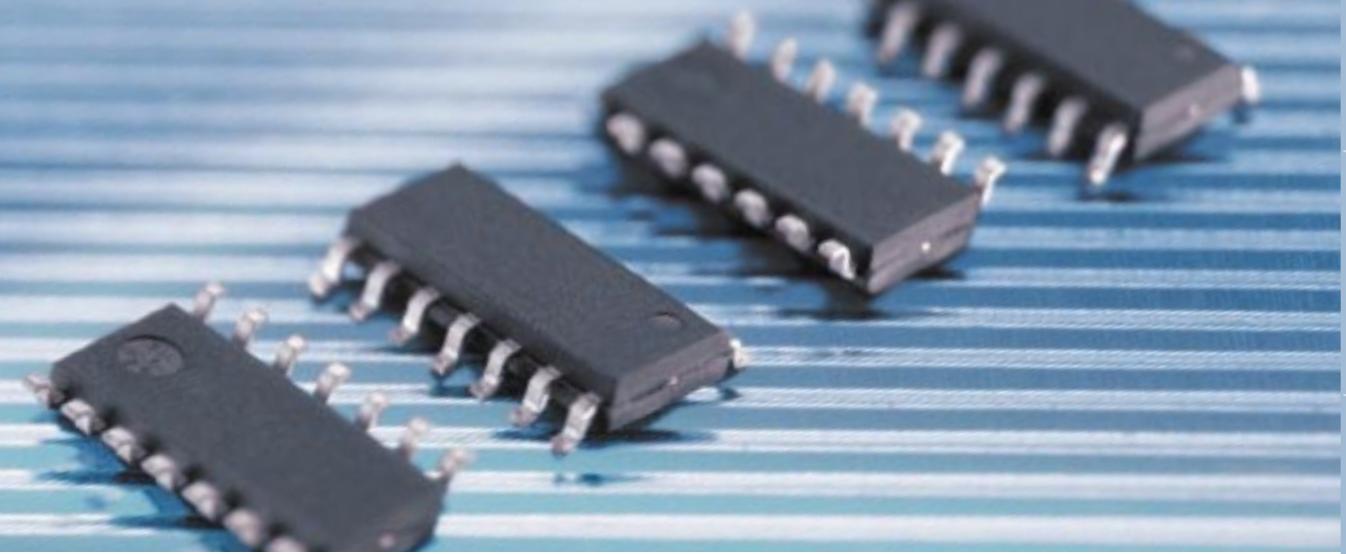
## TLE 6712 2 Channel Airbag Firing IC

- Two independent thermally protected firing squib drivers
- High side and low side switch for each firing circuit
- Maximum firing current limitation for each firing circuit
- Discrete level output for minimum firing current detection
- Precision squib resistance measurement (with programmable gain) and analog outputs
- Squib leakage measurement to ground or to battery supply set by external resistor with analog or digital output
- Voltage measurements multiplexed to an analog output pin
- Serial Peripheral Interface (SPI)
- Logic and analog output signals for sensing and diagnostics
- Two hardware firing loop enable inputs
- Buckle switch detection
- Package P-DSO-24

## TLE 6714 4 Channel Airbag Firing IC

- Four independent thermally protected firing squib drivers
- High side and low side switch for each firing circuit
- Maximum firing current limitation for each firing circuit
- Discrete level output for minimum firing current detection
- Precision squib resistance measurement (with programmable gain) and analog outputs
- Squib leakage measurement to ground or to battery supply set by external resistor with analog or digital output
- Voltage measurements multiplexed to an analog output pin
- Serial Peripheral Interface (SPI)
- Logic and analog output signals for sensing and diagnostics
- Two hardware firing loop enable inputs
- Buckle switch detection
- Package P-DSO-28





## TLE 6710 Combined Airbag Power Supply and 4 Channel Firing IC

- Step up converter 30 V (Boost Converter)
- Step down converter 5 V (Buck Converter)
- Four independent firing squib drivers with current limitation
- High side and low side switch for each firing circuit
- Digital output for firing current detection
- Squib resistance measurement with analog outputs
- Selectable gain factor (10 / 30) for squib resistance measurement
- Programmable squib leakage measurement to ground or to battery
- Several supply voltage measurements on external pins
- Digital output for detection of safing sensor closure
- Power on / off reset generator and watchdog circuit
- Precise 100 kHz oscillator
- Serial interface line driver (ISO 9141 and TTL-level)
- Four voltage/current sources for diagnostic purposes
- Two warning lamp driver with diagnostic
- Serial Peripheral Interface (SPI)
- Logic and analog output signals for diagnostics
- Package P-MQFP-64

## TLE 6711 Multifunctional Regulator and Watchdog

- Boost converter 30 V
- Boost over and undervoltage lockout
- Buck converter 5 V
- Logic over and undervoltage lockout
- Power on / off reset generator
- System enable output
- Low voltage detection
- Very low current consumption
- Package P-DSO-14 or P-DSO-20

## TLE 7719 T 4 Channel Satellite Receiver IC (SatRIC)<sup>TM</sup>

- Receives data from four satellite channels
- Max. data rate by current modulation 125 KBAud
- Decoding of current modulated data:
  - UART (8-bit, 9-bit, 16-bit)
  - Manchester Code (up to 16-bit)
- Programmable sample clock generator with two clock options: internal system clock (1 MHz) or external clock line (4 ... 20 MHz)
- Supplies satellite channels with four independent +10 V voltage regulators
- Digital voltage output for transmitted satellite signal (V/I-converter)
- Logic operating voltage 5 V
- 16-bit SPI-interface
- Diagnostic interface, leakage detection and overtemperature switch-off for all channels
- Package P-TSSOP-28

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N-Channel MOSFET

TEMPFET<sup>®</sup>/HITFET<sup>®</sup>/  
Multiple-Channel:  
Low-Side-Switches

PROFET<sup>®</sup>:  
High-Side-Switches

Bridge  
Driver ICs

DC Motor  
Bridges

Power  
Supply

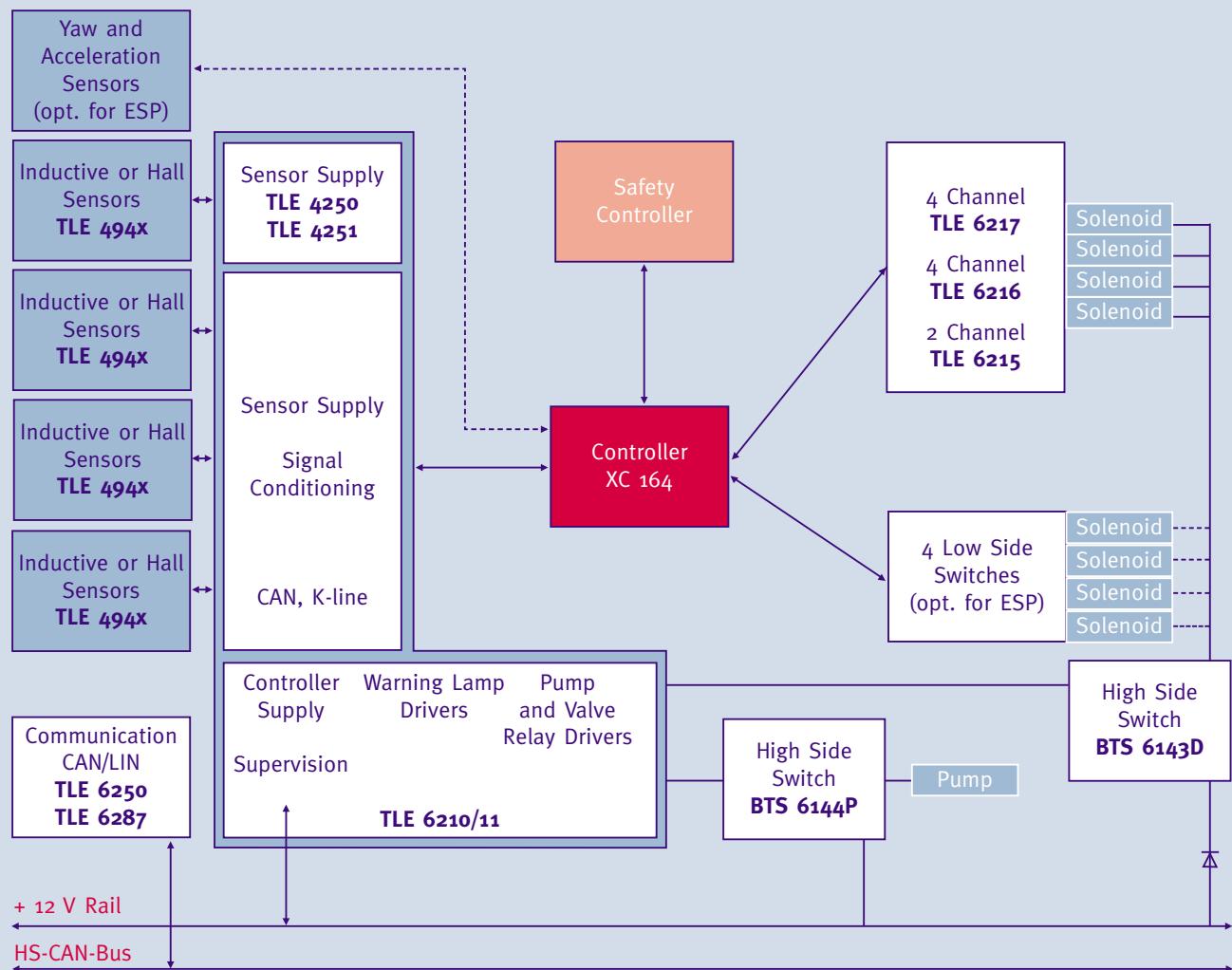
Automotive  
Transceivers

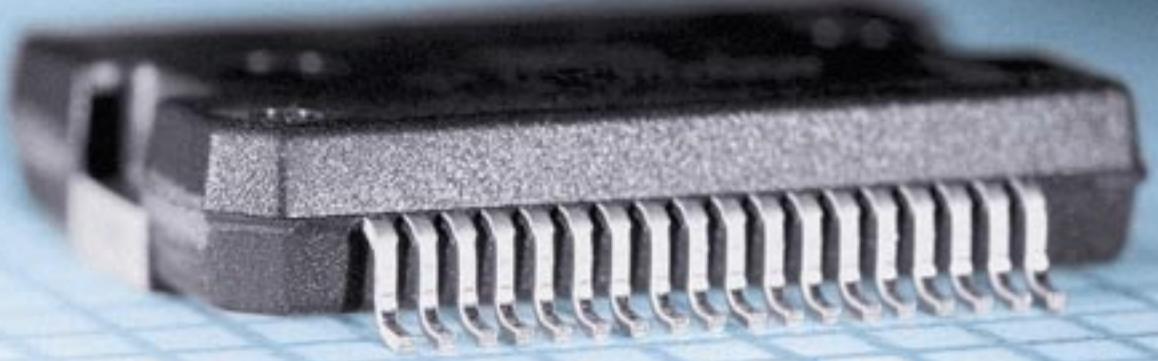
Automotive  
System ICs

# Automotive System ICs

## ABS/ESP System

System Block Diagram





## TLE 6215 2-fold Low Side Switch

- Protection against short-circuit, overtemperature, overvoltage, ESD and overload
- Diagnostic feedback
- µC compatible input
- Pin and function compatible to TLE 5224
- Two open drain output stages
- $R_{on} = 0.21 \Omega$ ,  $ID = 2 \times 4 A$
- P-DSO-24-3 package or bare die

## TLE 6228 4-fold Low Side Switch

- All kinds of resistive and inductive loads (relays, electromagnetic valves)
- Protection against short-circuit, overtemperature, overvoltage and ESD
- Parallel control of the inputs (PWM applications)
- Open load (on/off)
- Separate diagnostic pin for each channel
- Standby mode with low current consumption
- µC compatible input
- Four open drain output stages
- $R_{on \ 1..2} = 0.2 \Omega$ ,  $R_{on \ 3..4} = 0.35 \Omega$ ,  
 $ID_{1..2} = 2 \times 5 A$ ,  $ID_{3..4} = 2 \times 3 A$
- P-DSO-20-12 (Power-SO) package or bare die

## TLE 6216 4-fold Low Side Switch

- EMV optimised version of TLE 6228
- With cross open load detection
- P-DSO-20-12 (Power-SO) package or bare die

## TLE 6217 4-fold Low Side Switch

- EMV optimised version of TLE 6228
- P-DSO-20-12 (Power-SO) package or bare die

## TLE 6210/11 System-IC

- 5 V, 800 mA linear regulator
- Undervoltage / overvoltage reset
- Undervoltage / overvoltage logout
- Digital watchdog supervision for two µC
- (Motor) relay driver
- (Valve) relay driver
- Inverted or non-inverted lamp relay driver
- Enable output
- Overtemperature and overcurrent protection
- P-DSO-20-12 (Power-SO) package or bare die

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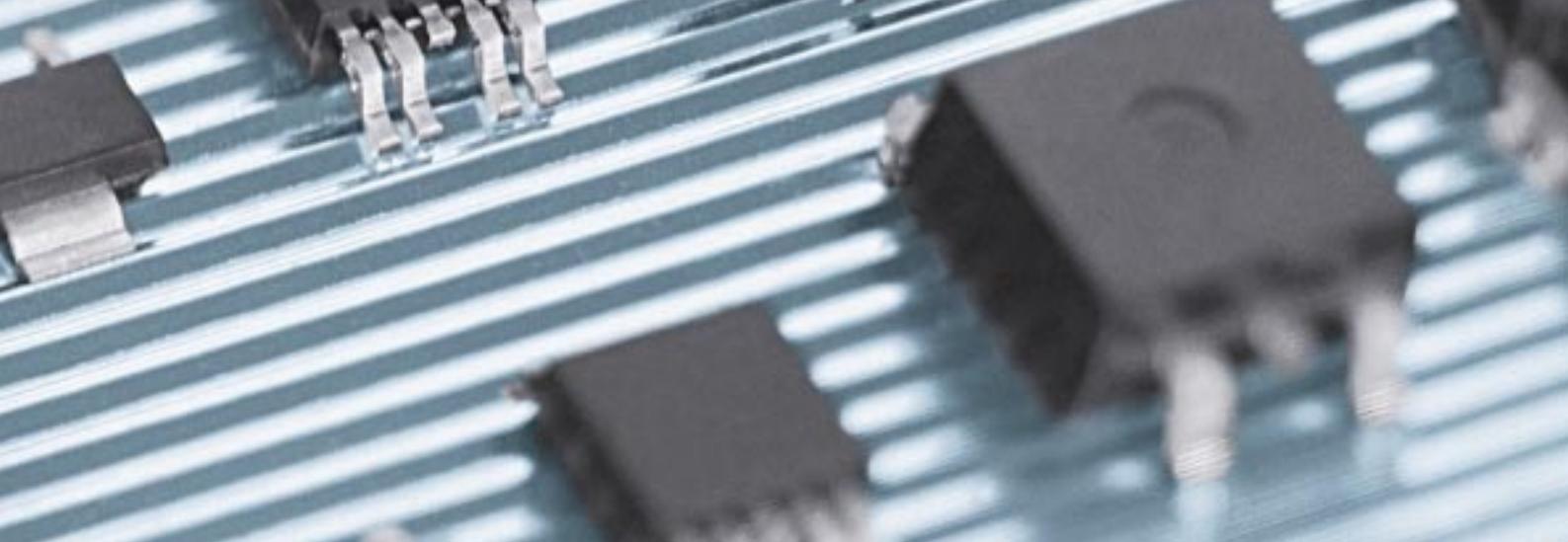
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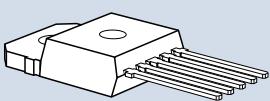
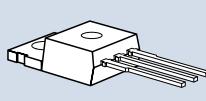
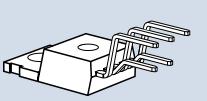
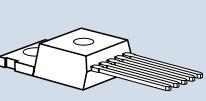
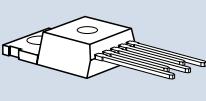
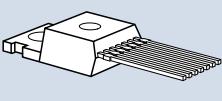
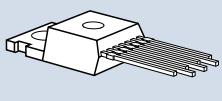
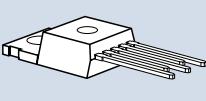
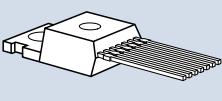
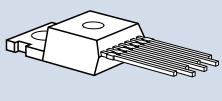
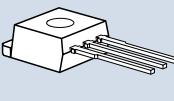
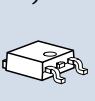
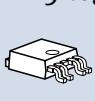
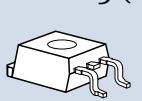
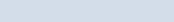
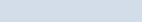
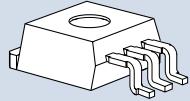
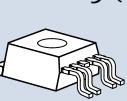
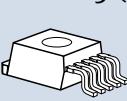
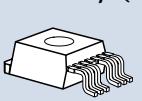
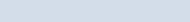
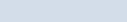
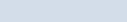
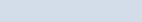
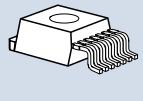
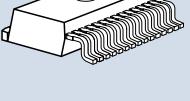
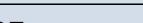
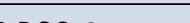
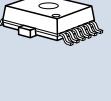
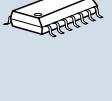
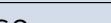
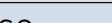
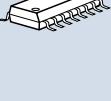
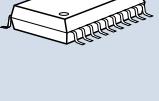
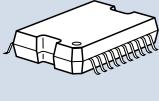
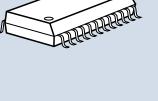
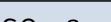
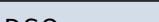
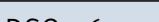
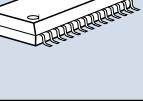
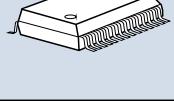
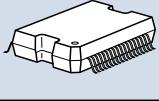
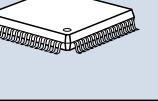
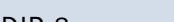
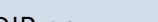
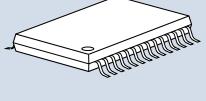
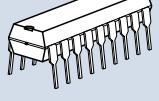
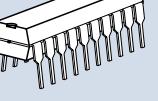
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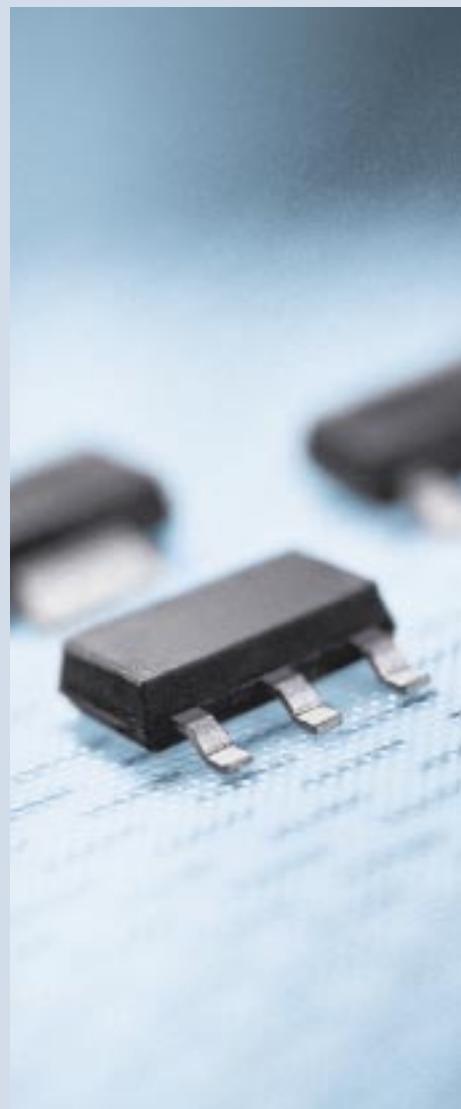
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