

**DUAL N-CHANNEL ENHANCEMENT MODE MOSFET**

**Product Summary**

<b>BV<sub>DSS</sub></b>	<b>R<sub>DS(ON)</sub> Max</b>	<b>I<sub>D</sub> Max</b> <b>T<sub>A</sub> = +25°C</b>
60V	7.5Ω @ V <sub>GS</sub> = 5V	0.23A

**Description**

This MOSFET has been designed to minimize the on-state resistance (R<sub>DS(ON)</sub>) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

**Applications**

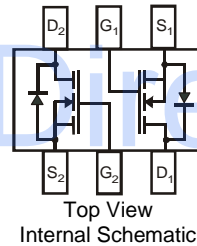
- Motor Control
- Power Management Functions

**Features**

- Dual N-Channel MOSFET
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Ultra-Small Surface Mount Package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Notes 3 & 4)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 5)**

**Mechanical Data**

- Case: SOT363
- Case Material: Molded Plastic. "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Alloy 42 Leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208 (3)
- Terminal Connections: See Diagram
- Weight: 0.006 grams (Approximate)

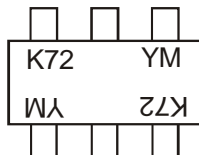


**Ordering Information** (Note 6)

Part Number	Compliance	Case	Packaging
2N7002DW-7-F	Standard	SOT363	3,000/Tape & Reel
2N7002DWQ-7-F	Automotive	SOT363	3,000/Tape & Reel
2N7002DW-13-F	Standard	SOT363	10,000/Tape & Reel
2N7002DWQ-13-F	Automotive	SOT363	10,000/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. Product manufactured with Date Code UO (week 40, 2007) and newer are built with Green Molding Compound. Product manufactured prior to Date Code UO are built with Non-Green Molding Compound and may contain Halogens or Sb<sub>2</sub>O<sub>3</sub> Fire Retardants.
  5. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to <https://www.diodes.com/quality/product-compliance-definitions/>.
  6. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

**Marking Information**



K72 = Product Type Marking Code  
 YM or YM = Date Code Marking  
 Y or Y = Year (ex: E = 2017)  
 M = Month (ex: 9 = September)

Date Code Key

Year	1998	1999	2000	2001	2002	2003	2004	...	2017	2018	2019	2020	2021	2022	2023
Code	J	K	L	M	N	P	R	...	E	F	G	H	I	J	K

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

**Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DSS</sub>	60	V
Drain-Gate Voltage R <sub>GS</sub> ≤ 1.0MΩ	V <sub>DGR</sub>	60	V
Gate-Source Voltage	Continuous	V <sub>GSS</sub>	±20
	Pulsed	V <sub>GSS</sub>	±40
Continuous Drain Current (Note 8) V <sub>GS</sub> = 5V	Steady State	T <sub>A</sub> = +25°C	0.23
		T <sub>A</sub> = +70°C	0.18
		T <sub>A</sub> = +100°C	0.14
Maximum Continuous Body Diode Forward Current (Note 8)	I <sub>S</sub>	0.53	A
Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)	I <sub>DM</sub>	0.8	A

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 7)	P <sub>D</sub>	T <sub>A</sub> = +25°C	0.31
		T <sub>A</sub> = +70°C	0.2
		T <sub>A</sub> = +100°C	0.12
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	R <sub>θJA</sub>	410
Total Power Dissipation (Note 8)	P <sub>D</sub>	T <sub>A</sub> = +25°C	0.4
		T <sub>A</sub> = +70°C	0.25
		T <sub>A</sub> = +100°C	0.15
Thermal Resistance, Junction to Ambient (Note 8)	Steady State	R <sub>θJA</sub>	318
Thermal Resistance, Junction to Case (Note 8)	Steady State	R <sub>θJC</sub>	135
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 9)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	60	70	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 10μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	1.0 500	μA	@ T <sub>C</sub> = +25°C @ T <sub>C</sub> = +125°C V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V
Gate-Body Leakage	I <sub>GSS</sub>	—	—	±10	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 9)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	1.0	—	2.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	3.2 4.4	7.5 13.5	Ω	@ T <sub>J</sub> = +25°C @ T <sub>J</sub> = +125°C V <sub>GS</sub> = 5.0V, I <sub>D</sub> = 0.05A V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.5A
On-State Drain Current	I <sub>D(ON)</sub>	0.5	1.0	—	A	V <sub>GS</sub> = 10V, V <sub>DS</sub> = 7.5V
Forward Transconductance	g <sub>FS</sub>	80	—	—	mS	V <sub>DS</sub> = 10V, I <sub>D</sub> = 0.2A
Diode Forward Voltage	V <sub>SD</sub>	—	0.78	1.5	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 115mA
<b>DYNAMIC CHARACTERISTICS (Note 10)</b>						
Input Capacitance	C <sub>ISS</sub>	—	22	50	pF	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>OSS</sub>	—	11	25	pF	
Reverse Transfer Capacitance	C <sub>RSS</sub>	—	2.0	5.0	pF	
<b>SWITCHING CHARACTERISTICS (Note 10)</b>						
Turn-On Delay Time	t <sub>D(ON)</sub>	—	7.0	20	ns	V <sub>DD</sub> = 30V, I <sub>D</sub> = 0.2A, R <sub>L</sub> = 150Ω, V <sub>GEN</sub> = 10V, R <sub>GEN</sub> = 25Ω
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	11.0	20		

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal vias to bottom layer 1inch square copper plate.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

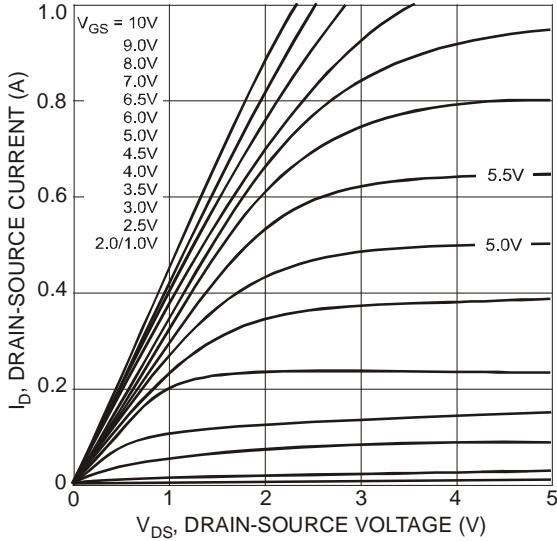


Figure 1 On-Region Characteristics

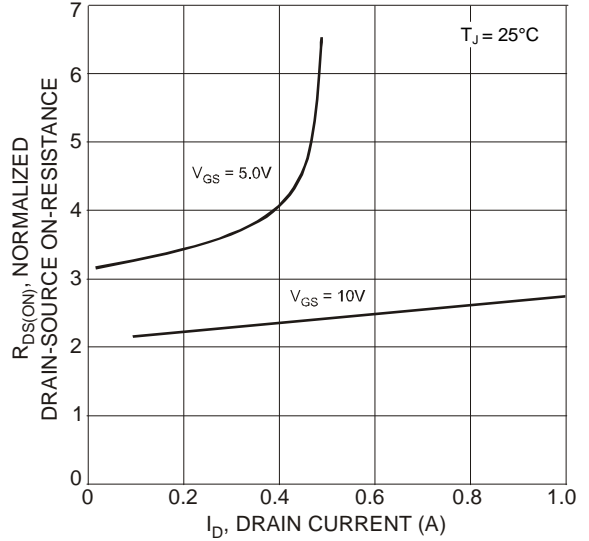


Figure 2 On-Resistance vs. Drain Current

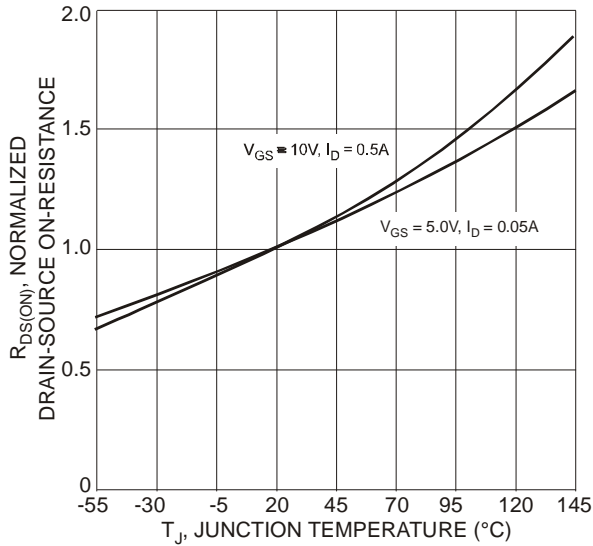


Figure 3 On-Resistance vs. Junction Temperature

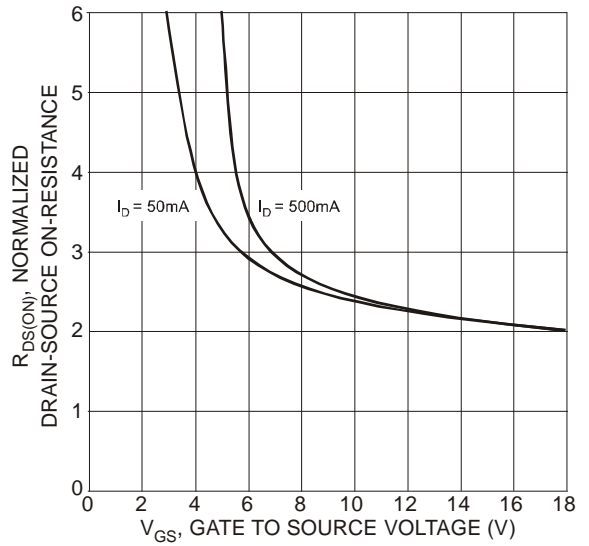


Figure 4 On-Resistance vs. Gate-Source Voltage

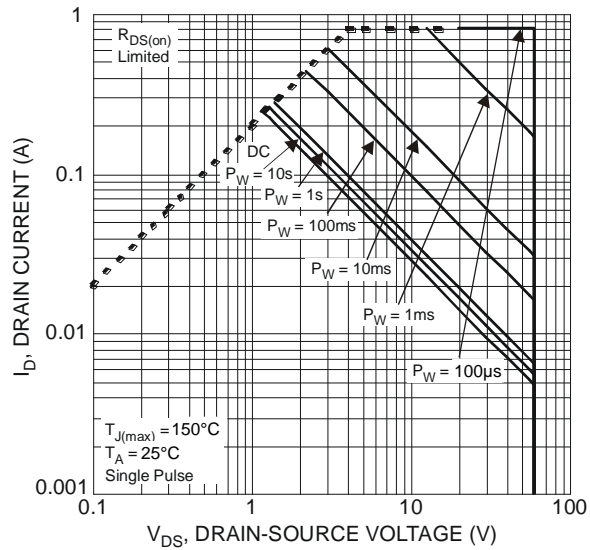
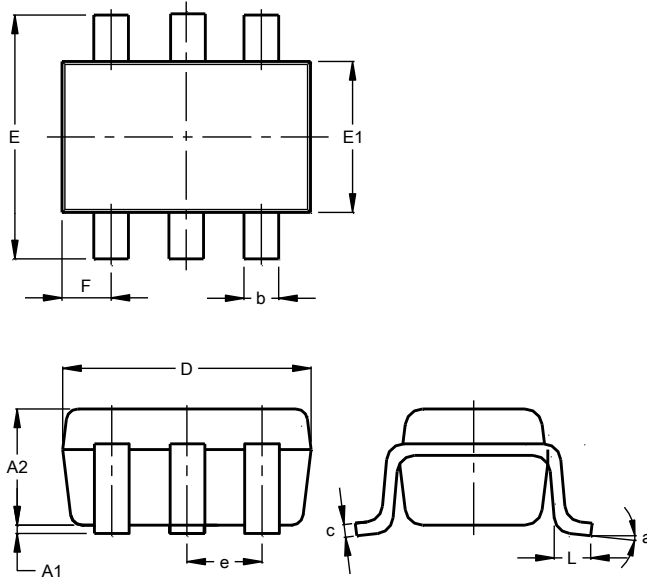


Figure 5 SOA, Safe Operation Area

**Package Outline Dimensions**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT363

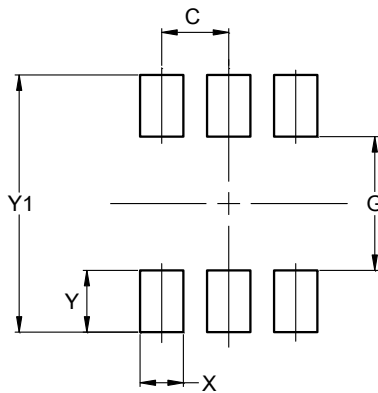


SOT363			
Dim	Min	Max	Typ
A1	0.00	0.10	0.05
A2	0.90	1.00	1.00
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
All Dimensions in mm			

**Suggested Pad Layout**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT363



Dimensions	Value (in mm)
C	0.650
G	1.300
X	0.420
Y	0.600
Y1	2.500

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