

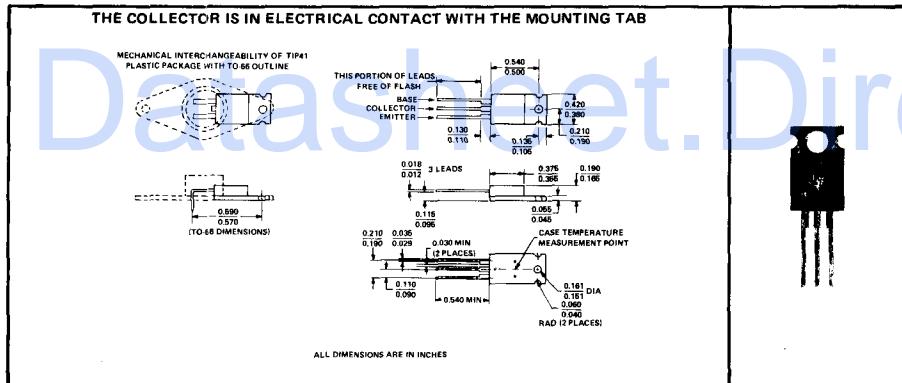
TYPES TIP41, TIP41A, TIP41B, TIP41C

N-P-N SINGLE-DIFFUSED MESA SILICON POWER TRANSISTORS

FOR POWER-AMPLIFIER AND HIGH-SPEED-SWITCHING APPLICATIONS
DESIGNED FOR COMPLEMENTARY USE WITH TIP42, TIP42A, TIP42B, TIP42C

- 65 W at 25°C Case Temperature
- 6 A Rated Collector Current
- Min f_T of 3 MHz at 10 V, 500 mA

mechanical data



absolute maximum ratings at 25°C case temperature (unless otherwise noted)

	TIP41	TIP41A	TIP41B	TIP41C
Collector-Base Voltage	40 V	60 V	80 V	100 V
Collector-Emitter Voltage (See Note 1)	40 V	60 V	80 V	100 V
Emitter-Base Voltage				
Continuous Collector Current				
Peak Collector Current (See Note 2)				
Continuous Base Current				
Safe Operating Region at (or below) 25°C Case Temperature				See Figure 5
Continuous Device Dissipation at (or below) 25°C Case Temperature (See Note 3)				65 W
Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 4)				2 W
Unclamped Inductive Load Energy (See Note 5)				62.5 mJ
Operating Collector Junction Temperature Range				-65°C to 150°C
Storage Temperature Range				-65°C to 150°C
Lead Temperature 1/8 Inch from Case for 10 Seconds				260°C

- NOTES:
1. This value applies when the base-emitter diode is open-circuited.
 2. This value applies for $t_W \leq 0.3$ ms, duty cycle $\leq 10\%$.
 3. Derate linearly to 150°C case temperature at the rate of 0.52 W/°C.
 4. Derate linearly to 150°C free-air temperature at the rate of 16 mW/°C.
 5. This rating is based on the capability of the transistor to operate safely in the circuit of Figure 2. $L = 20$ mH, $R_{BB2} = 100 \Omega$, $V_{BB2} = 0$ V, $R_G = 0.1 \Omega$. $V_{CC} = 10$ V. Energy $\approx I_C^2 L / 2$.

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electrical characteristics at 25°C case temperature

PARAMETER	TEST CONDITIONS	TIP41		TIP41A		TIP41B		TIP41C		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
V _{(BR)CEO} Collector-Emitter Breakdown Voltage	I _C = 30 mA, I _B = 0, See Note 6	40		60		80		100		V
I _{CEO} Collector Cutoff Current	V _{CE} = 30 V, I _B = 0 V _{CE} = 60 V, I _B = 0		0.7		0.7					mA
I _{CES} Collector Cutoff Current	V _{CE} = 40 V, V _{BE} = 0 V _{CE} = 60 V, V _{BE} = 0 V _{CE} = 80 V, V _{BE} = 0 V _{CE} = 100 V, V _{BE} = 0		0.4			0.4		0.4		mA
I _{EBO} Emitter Cutoff Current	V _{EB} = 5 V, I _C = 0			1		1		1		mA
h _{FE} Static Forward Current Transfer Ratio	V _{CE} = 4 V, I _C = 0.3 A, See Notes 6 and 7	30		30		30		30		
	V _{CE} = 4 V, I _C = 3 A, See Notes 6 and 7	15	75	15	75	15	75	15	75	
V _{BE} Base-Emitter Voltage	V _{CE} = 4 V, I _C = 6 A, See Notes 6 and 7		2		2		2		2	V
V _{CE(sat)} Collector-Emitter Saturation Voltage	I _B = 0.6 A, I _C = 6 A, See Notes 6 and 7		1.5		1.5		1.5		1.5	V
h _{fe} Small-Signal Common-Emitter Forward Current Transfer Ratio	V _{CE} = 10 V, I _C = 0.5 A, f = 1 kHz	20		20		20		20		
	V _{CE} = 10 V, I _C = 0.5 A, f = 1 MHz	3		3		3		3		

NOTES: 6. These parameters must be measured using pulse techniques. t_w = 300 μs, duty cycle ≤ 2%.

7. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts.

thermal characteristics

PARAMETER		MAX	UNIT
R _{θJC}	Junction-to-Case Thermal Resistance	1.92	°C/W
R _{θJA}	Junction-to-Free-Air Thermal Resistance	62.5	

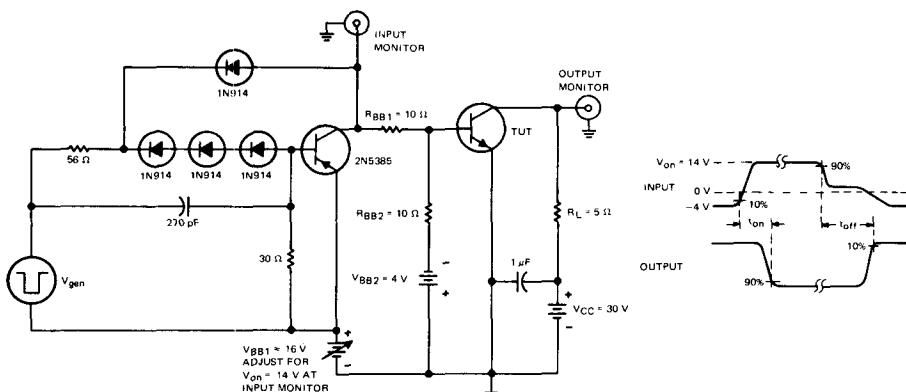
switching characteristics at 25°C case temperature

PARAMETER		TEST CONDITIONS [†]			TYP	UNIT
t _{on}	Turn-On Time	I _C = 6 A,	I _{B(1)} = 0.6 A,	I _{B(2)} ≈ -0.6 A,	0.6	
t _{off}	Turn-Off Time	V _{BE(off)} = -4 V,	R _L = 5 Ω,	See Figure 1	1	μs

[†]Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.

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PARAMETER MEASUREMENT INFORMATION

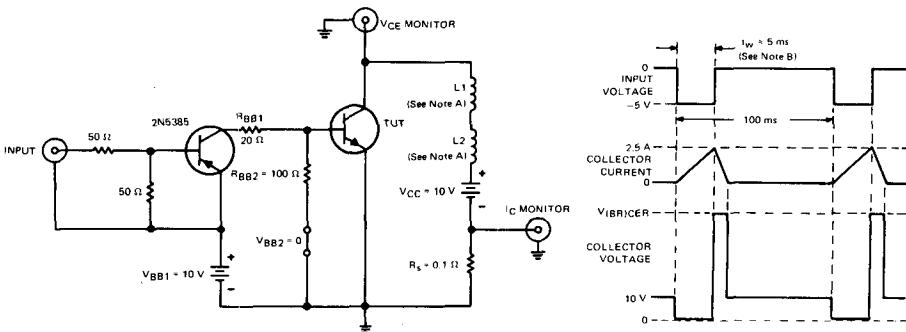


TEST CIRCUIT

VOLTAGE WAVEFORMS

- NOTES:**
- A. V_{gen} is a -30-V pulse (from 0 V) into a $50\text{-}\Omega$ termination.
 - B. The V_{gen} waveform is supplied by a generator with the following characteristics: $t_r \leq 15\text{ ns}$, $t_f \leq 15\text{ ns}$, $Z_{out} = 50\text{ }\Omega$, $t_w = 20\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 - C. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leq 15\text{ ns}$, $R_{in} \geq 10\text{ M}\Omega$, $C_{in} \leq 11.5\text{ pF}$.
 - D. Resistors must be noninductive types.
 - E. The d-c power supplies may require additional bypassing in order to minimize ringing.

FIGURE 1
INDUCTIVE LOAD SWITCHING



- NOTES:**
- A. L_1 and L_2 are 10 mH , $0.11\text{ }\Omega$, Chicago Standard Transformer Corporation C-2688, or equivalent.
 - B. Input pulse width is increased until $I_{CM} = 2.5\text{ A}$.

FIGURE 2

TYPES TIP41, TIP41A, TIP41B, TIP41C N-P-N SINGLE-DIFFUSED MESA SILICON POWER TRANSISTORS

TYPICAL CHARACTERISTICS

STATIC FORWARD CURRENT TRANSFER RATIO
vs
COLLECTOR CURRENT

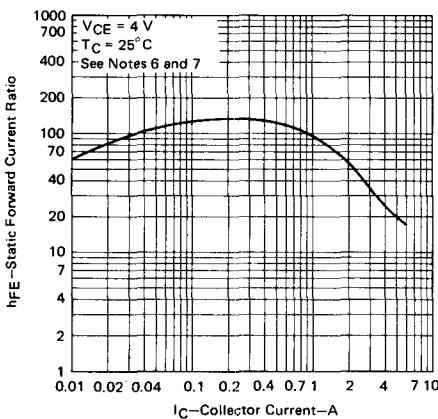


FIGURE 3

- NOTES: 6. These parameters must be measured using pulse techniques. $t_W = 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
7. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts.

THERMAL INFORMATION

DISSIPATION DERATING CURVE

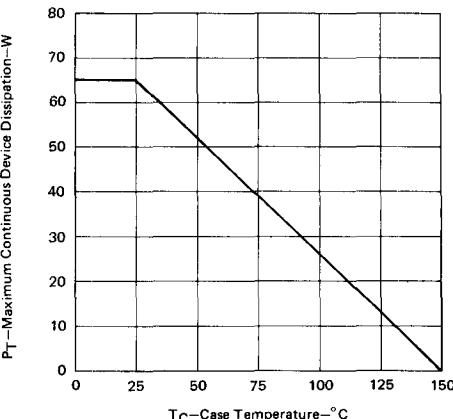


FIGURE 4

MAXIMUM SAFE OPERATING REGION

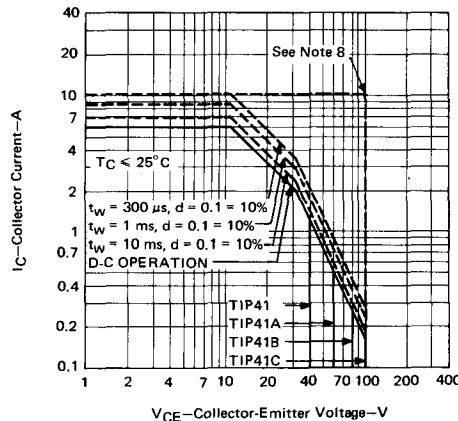


FIGURE 5

- NOTE 8: This combination of maximum voltage and current may be achieved only when switching from saturation to cutoff with a clamped inductive load.

Typ type NPN	PNP	$P_{tot} @$		V_{CEO} min	I_{CD} max A	min	hFE max	@	I_C A
		$T_C = 25^\circ C$ (100 °C)	W						
TIP 35 B	TIP 36 B	90	80	25		25	100		1,5
TIP 35 C	TIP 36 C	90	100	25		25	100		1,5
TIP 41	TIP 42	65	40	6		15	75	3	
TIP 41 A	TIP 42 A	65	60	6		15	75	3	
TIP 41 B	TIP 42 B	65	80	6		15	75	3	
TIP 41 C	TIP 42 C	65	100	6		15	75	3	
TIP 3055	TIP 5530	90	70	15		20			4
BD 633	BD 634	30	45	2		25			1
BD 635	BD 636	30	60	2		25			1
BD 637	BD 638	30	80	2		25			1
BD 733	BD 734	40	32	4		50			2
BD 735	BD 736	40	32	4		50			2
BD 737	BD 738	40	45	4		40			2
TIP 110	TIP 115	50	60	2		1000			1
TIP 111	TIP 116	50	80	2		1000			1
TIP 112	TIP 117	50	100	2		1000			1
TIP 120	TIP 125	65	60	5		1000			3
TIP 121	TIP 126	65	80	5		1000			3
TIP 122	TIP 127	65	100	5		1000			3
TIP 140	TIP 145	125	60	10		1000			5
TIP 141	TIP 146	125	80	10		1000			5
TIP 142	TIP 147	125	100	10		1000			5

Typ type	$P_{tot} @$		V_{CEO} min	I_{CD} max A	min	hFE max	@	I_C A
	$T_A = 25^\circ C$ (100 °C)	$T_C = 25^\circ C$ (100 °C)						
2N 4915	4	87,5	80	5	25	100		2,5
2N 4998	2	(20)	80	2	30	90		1
2N 5000	2	(20)	80	2	70	200		1
2N 5002		(33,3)	80	5	30	90		2,5
2N 5004		(33,3)	80	5	70	200		2,5
2N 5038	5	140	90	20	20	100		12
2N 5039	5	140	75	20	20	100		10
2N 5148	1	(4)	80	2	30	90		1
2N 5150	1	(4)	80	2	70	200		1
2N 5152		(6,7)	80	2	30	90		2,5
2N 5154		(6,7)	80	2	70	200		2,5
2N 5301	5	200	40	20	40	60		1
2N 5302	5	200	60	20	40	60		1
2N 5303	5	200	80	20	40	60		1

f_T min MHz	I_{CES} (I_{CEO}) μA	@ V _{CE} V	Gehäuse package	Anwendungen applications, remarks
3	700	80	TO-3P	Verstärker, Schalter, komplementär zu TIP 36 B amplifier, switch, complementary to TIP 36 B
3	700	100	TO-66P	Verstärker, Schalter, komplementär zu TIP 36 C amplifier, switch, complementary to TIP 36 C
3	400	40	TO-66P	Verstärker, Schalter, komplementär zu TIP 42 amplifier, switch, complementary to TIP 42
3	400	60	TO-66P	Verstärker, Schalter, komplementär zu TIP 42 A amplifier, switch, complementary to TIP 42 A
3	400	80	TO-66P	Verstärker, Schalter, komplementär zu TIP 42 B amplifier, switch, complementary to TIP 42 B
3	400	100	TO-66P	Verstärker, Schalter, komplementär zu TIP 42 C amplifier, switch, complementary to TIP 42 C
		TO-3P		
		TO-66		Komplementär
		TO-66		Endstufen
		TO-66		for complementary output stages
		TO-66		
		TO-66		
		TO-66		
		TO-66P		Darlington
		TO-66P		
		TO-66P		
		TO-66P		Verstärker, Schalter Darlington
		TO-66P		amplifier, switch
		TO-3P		Darlington
		TO-3P		
		TO-3P		
f_T min MHz	I_{CES} (I_{CEO}) μA	@ V _{EE} V	Gehäuse package	Anwendungen, Bemerkungen applications, remarks
4	(1000)	80	TO-3	Verstärker, Schalter amplifier, switch
50	(0,05)	40	TO-59	Für Computeranwendung
60	(0,05)	40	TO-59	komplementär zu 2N 4999, 2N 5001, 2N 5003, 2N 5005
60	(0,05)	40	TO-59	computer application
70	(0,05)	40	TO-59	complementary to 2N 4999, 2N 5001, 2N 5003, 2N 5005
60	50	140	TO-3	Verstärker und schnelle Schalter
60	50	110	TO-3	amplifier and high-speed switch
50	(0,05)	40	TO-39	Für Computeranwendung
60	(0,05)	40	TO-39	komplementär zu 2N 5147, 2N 5149, 2N 5151, 2N 5153
60	(0,05)	40	TO-39	computer application
70	(0,05)	40	TO-39	complementary to 2N 5147, 2N 5149, 2N 5151, 2N 5153
4	(5)	40	TO-3	Verstärker, Schalter
4	(5)	60	TO-3	amplifier, switch
4	(5)	80	TO-3	