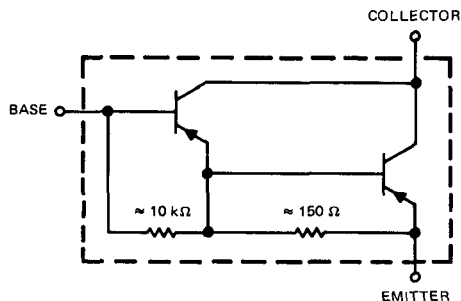


TYPES TIP145, TIP146, TIP147 P-N-P DARLINGTON-CONNECTED SILICON POWER TRANSISTORS

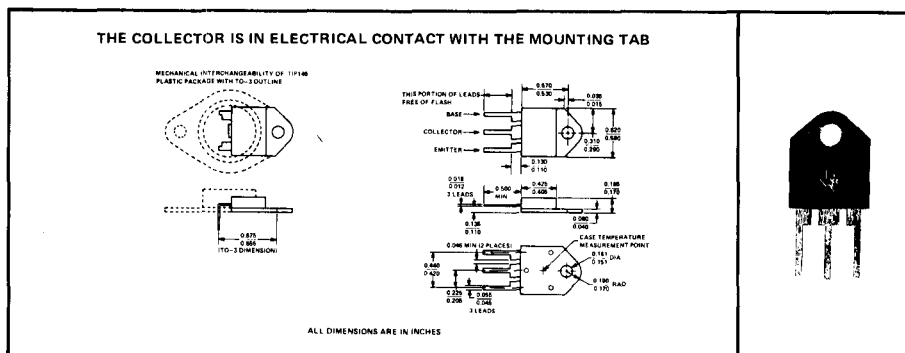
DESIGNED FOR COMPLEMENTARY USE WITH TIP140, TIP141, TIP142

- 125 W at 25°C Case Temperature
- 10-A Rated Collector Current
- Min h_{FE} of 1000 at 4 V, 5 A
- 100 mJ Reverse Energy Rating

device schematic



mechanical data



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

	TIP145	TIP146	TIP147
Collector-Base Voltage	-60 V	-80 V	-100 V
Collector-Emitter Voltage (See Note 1)	-60 V	-80 V	-100 V
Emitter-Base Voltage	-5 V	-5 V	-5 V
Continuous Collector Current	10 A	10 A	10 A
Peak Collector Current (See Note 2)	15 A	15 A	15 A
Continuous Base Current	0.5 A	0.5 A	0.5 A
Safe Operating Areas at (or below) 25°C Case Temperature	See Figures 7 and 8		
Continuous Device Dissipation at (or below) 25°C Case Temperature (See Note 3)	125 W	125 W	125 W
Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 4)	3.5 W	3.5 W	3.5 W
Unclamped Inductive Load Energy (See Note 5)	100 mJ	100 mJ	100 mJ
Operating Collector Junction Temperature Range	-65°C to 150°C	-65°C to 150°C	-65°C to 150°C
Storage Temperature Range	-65°C to 150°C	-65°C to 150°C	-65°C to 150°C
Lead Temperature 1/8 Inch from Case for 10 Seconds	260°C	260°C	260°C

- NOTES: 1. These values apply 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 1 W/°C or refer to Dissipation Derating Curve, Figure 9.
4. Derate linearly to 150°C free-air temperature at the rate of 28 mW/°C or refer to Dissipation Derating Curve, Figure 10.
5. This rating is based on the capability of the transistors to operate safely in the circuit of Figure 2. $L = 100$ mH, $R_{BB2} = 100 \Omega$, $V_{BB2} = 0$ V, $R_S = 0.1 \Omega$, $V_{CC} = 20$ V. Energy $\approx I_C^2 L/2$.

TYPES TIP145, TIP146, TIP147

P-N-P DARLINGTON-CONNECTED SILICON POWER TRANSISTORS

electrical characteristics at 25°C case temperature

PARAMETER	TEST CONDITIONS	TIP145		TIP146		TIP147		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
$V_{(BR)CEO}$ Collector-Emitter Breakdown Voltage	$I_C = -30 \text{ mA}$, $I_B = 0$, See Note 6	-60		-80		-100		V
I_{CEO} Collector Cutoff Current	$V_{CE} = -30 \text{ V}$, $I_B = 0$	-2						mA
	$V_{CE} = -40 \text{ V}$, $I_B = 0$			-2				
	$V_{CE} = -50 \text{ V}$, $I_B = 0$					-2		
I_{CBO} Collector Cutoff Current	$V_{CB} = -60 \text{ V}$, $I_E = 0$	-1						mA
	$V_{CB} = -80 \text{ V}$, $I_E = 0$			-1				
	$V_{CB} = -100 \text{ V}$, $I_E = 0$					-1		
I_{EBO} Emitter Cutoff Current	$V_{EB} = -5 \text{ V}$, $I_C = 0$	-2		-2		-2		mA
h_{FE} Static Forward Current Transfer Ratio	$V_{CE} = -4 \text{ V}$, $I_C = -5 \text{ A}$	1000		1000		1000		
	$V_{CE} = -4 \text{ V}$, $I_C = -10 \text{ A}$	500		500		500		
V_{BE} Base-Emitter Voltage	$V_{CE} = -4 \text{ V}$, $I_C = -10 \text{ A}$, See Notes 6 and 7	-3		-3		-3		V
$V_{CE(sat)}$ Collector-Emitter Saturation Voltage	$I_B = -10 \text{ mA}$, $I_C = -5 \text{ A}$	-2		-2		-2		V
	$I_B = -40 \text{ mA}$, $I_C = -10 \text{ A}$	-3		-3		-3		

NOTES: 6. These parameters must be measured using pulse techniques. $t_w = 300 \mu\text{s}$, duty cycle $\leq 2\%$.

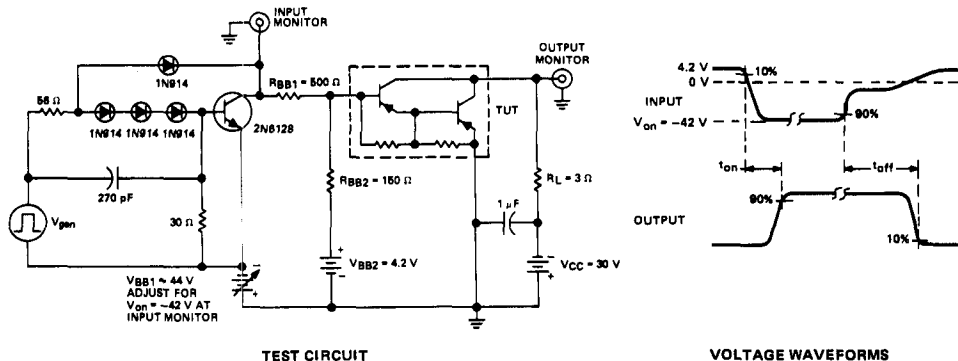
7. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts and located within 0.125 inch from the device body.

switching characteristics at 25°C case temperature

PARAMETER	TEST CONDITIONS†	TYP	UNIT
t_{on} Turn-On Time	$I_C = -10 \text{ A}$, $I_{B(1)} = -40 \text{ mA}$, $I_{B(2)} = 40 \text{ mA}$, $V_{BE(off)} = 4.2 \text{ V}$, $R_L = 3 \Omega$, See Figure 1	0.9	μs
t_{off} Turn-Off Time		11	

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

PARAMETER MEASUREMENT INFORMATION



NOTES: A. V_{gen} is a 30-V pulse (from 0 V) into a 50- Ω termination.

B. The V_{gen} waveform is supplied by a generator with the following characteristics: $t_r \leq 15 \text{ ns}$, $t_f \leq 15 \text{ ns}$, $Z_{out} = 50 \Omega$, $t_w = 20 \mu\text{s}$, 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.

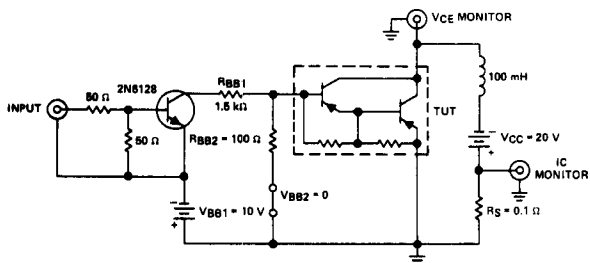
E. The d-c power supplies may require additional bypassing in order to minimize ringing.

FIGURE 1

TYPES TIP145, TIP146, TIP147

P-N-P DARLINGTON-CONNECTED SILICON POWER TRANSISTORS

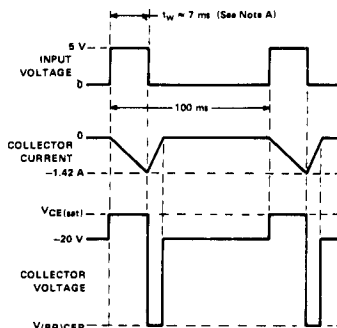
INDUCTIVE LOAD SWITCHING



TEST CIRCUIT

NOTE A: Input pulse width is increased until $I_{CM} = -1.42$ A.

FIGURE 2



VOLTAGE AND CURRENT WAVEFORMS

TYPICAL CHARACTERISTICS

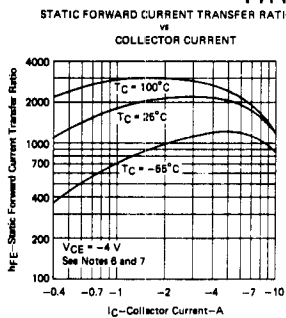


FIGURE 3

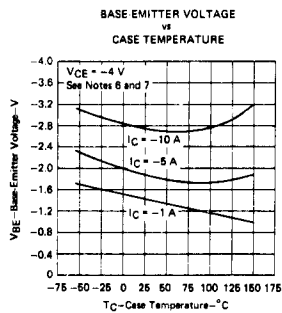


FIGURE 4

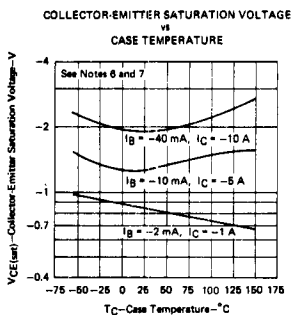


FIGURE 5

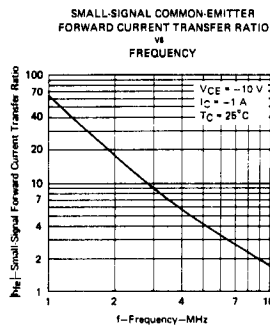


FIGURE 6

NOTES: 6. These parameters must be measured using pulse techniques. $t_w = 300 \mu s$, duty cycle $\leq 2\%$.

7. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts and located within 0.125 inch from the device body.

TYPES TIP145, TIP146, TIP147

P-N-P DARLINGTON-CONNECTED SILICON POWER TRANSISTORS

MAXIMUM SAFE OPERATING AREAS

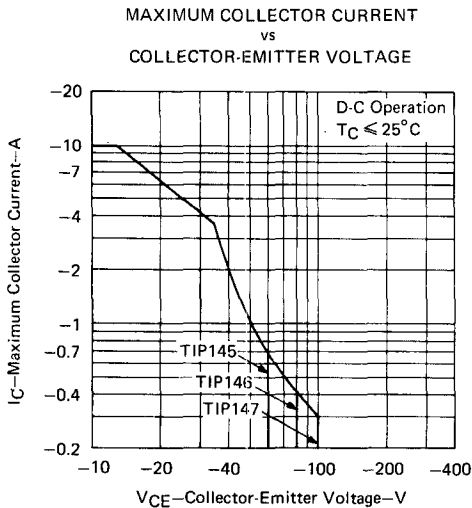


FIGURE 7

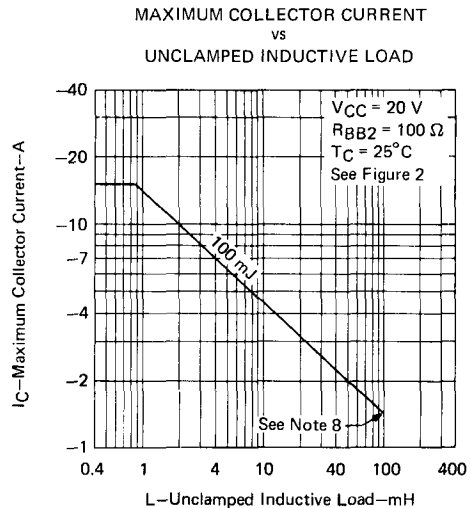


FIGURE 8

NOTE 8: Above this point the safe operating area has not been defined.

THERMAL INFORMATION

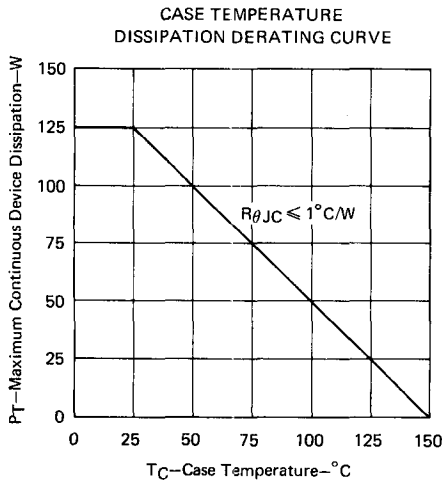


FIGURE 9

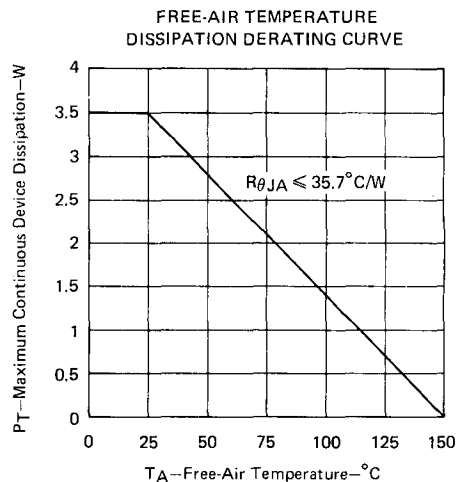


FIGURE 10

Type type		$P_{tot} @$ $T_C = 25^\circ C$ (100 °C)	V_{CEO} min	I_{CD} max A	min	h_{FE} max	@	I_C A
NPN	PNP	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

Type type	$T_A = 25^\circ C$ (100 °C)	$P_{tot} @$ $T_C = 25^\circ C$ (100 °C)	V_{CEO} min V	I_{CD} max A	min	h_{FE} max	@	I_C A
	W	W						
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 TO-66 TO-66	Komplementär Endstufen for complementary output stages
				TO-66P TO-66P TO-66P	Darlington
				TO-66P TO-66P TO-66P	Verstärker, Schalter amplifier, switch Darlington
				TO-3P TO-3P TO-3P	Darlington
f _T min MHz	I _{CES} (I _{CEO}) μA	@	V _{VE} 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	