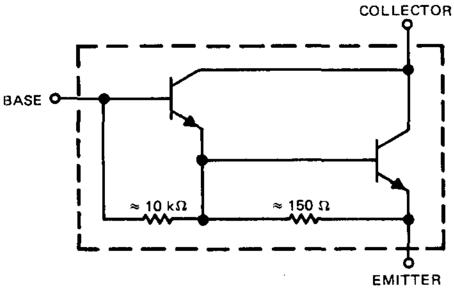
DESIGNED FOR COMPLEMENTARY USE WITH TIP125, TIP126, TIP127

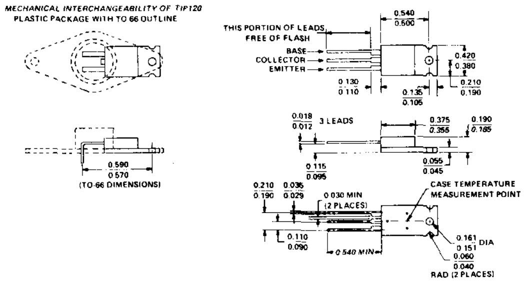
- 65 W at 25°C Case Temperature
- 5 A Rated Collector Current
- Min h_{FE} of 1000 at 3 V, 3 A
- 50 mJ Reverse Energy Rating

device schematic



mechanical data

THE COLLECTOR IS IN ELECTRICAL CONTACT WITH THE MOUNTING TAB



ALL DIMENSIONS ARE IN INCHES

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

	TIP120	TIP121	TIP122
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	← 5 A →		
Peak Collector Current (See Note 2)	← 8 A →		
Continuous Base Current	← 0.1 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)	← 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)	← 50 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. 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 0.52 W/°C or refer to Dissipation Derating Curve, Figure 9.
4. Derate linearly to 150°C free-air temperature at the rate of 16 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 Ω, V_{BB2} = 0 V, R_S = 0.1 Ω, V_{CC} = 20 V. Energy ≈ $I_C{}^2L/2$.

electrical characteristics at 25°C case temperature

PARAMETER		TEST CONDITIONS		TIP120 MIN	TIP120 MAX	TIP121 MIN	TIP121 MAX	TIP122 MIN	TIP122 MAX	UNIT
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 30$ mA, $I_B = 0$,	See Note 6	60		80		100		V
I_{CEO}	Collector Cutoff Current	$V_{CE} = 30$ V, $I_B = 0$			0.5					mA
		$V_{CE} = 40$ V, $I_B = 0$					0.5			mA
		$V_{CE} = 50$ V, $I_B = 0$							0.5	mA
I_{CBO}	Collector Cutoff Current	$V_{CB} = 60$ V, $I_E = 0$			0.2					mA
		$V_{CB} = 80$ V, $I_E = 0$					0.2			mA
		$V_{CB} = 100$ V, $I_E = 0$							0.2	mA
I_{EBO}	Emitter Cutoff Current	$V_{EB} = 5$ V, $I_C = 0$			2		2		2	mA
h_{FE}	Static Forward Current Transfer Ratio	$V_{CE} = 3$ V, $I_C = 0.5$ A	See Notes 6 and 7	1000		1000		1000		
		$V_{CE} = 3$ V, $I_C = 3$ A	See Notes 6 and 7	1000		1000		1000		
V_{BE}	Base-Emitter Voltage	$V_{CE} = 3$ V, $I_C = 3$ A,	See Notes 6 and 7		2.5		2.5		2.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_B = 12$ mA, $I_C = 3$ A	See Notes 6 and 7		2		2		2	V
		$I_B = 20$ mA, $I_C = 5$ A	See Notes 6 and 7		4		4		4	V

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

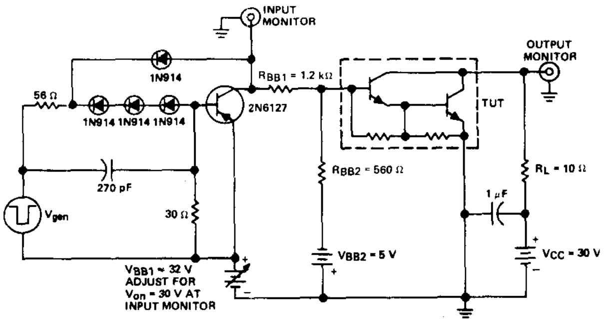
7. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts and located within 0.125 inch from the device body.

switching characteristics at 25°C case temperature

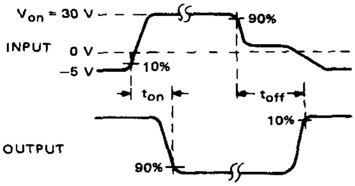
PARAMETER		TEST CONDITIONS†	TYP	UNIT
t_{on}	Turn-On Time	$I_C = 3$ A, $I_{B(1)} = 12$ mA, $I_{B(2)} = -12$ mA,	1.5	μs
t_{off}	Turn-Off Time	$V_{BE(off)} = -5$ V, $R_L = 10\ \Omega$, See Figure 1	8.5	μs

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

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

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: $t_r \leq 15$ ns, $t_f \leq 15$ ns, $Z_{out} = 50\ \Omega$, $t_w = 20$ μs, duty cycle ≤ 2%.

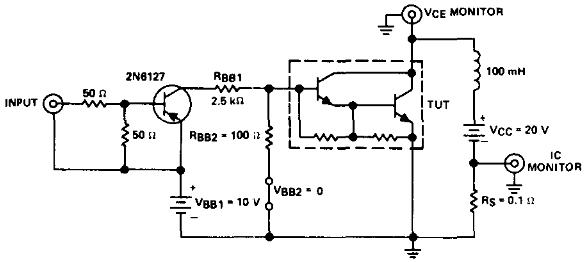
C. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leq 15$ ns, $R_{in} \geq 10$ MΩ, $C_{in} \leq 11.5$ pF.

D. Resistors must be noninductive types.

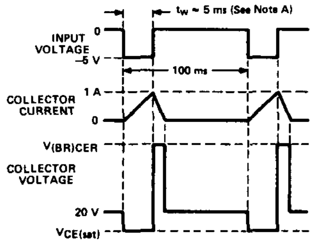
E. The d-c power supplies may require additional bypassing in order to minimize ringing.

FIGURE 1

INDUCTIVE LOAD SWITCHING



TEST CIRCUIT



VOLTAGE AND CURRENT WAVEFORMS

NOTE A: Input pulse width is increased until I_{CM} = 1 A.

FIGURE 2

TYPICAL CHARACTERISTICS

STATIC FORWARD CURRENT TRANSFER RATIO
vs
COLLECTOR CURRENT

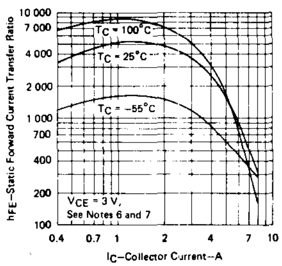


FIGURE 3

BASE-EMITTER VOLTAGE
vs
CASE TEMPERATURE

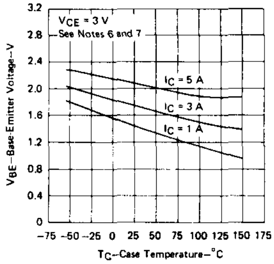


FIGURE 4

COLLECTOR-EMITTER SATURATION VOLTAGE
vs
CASE TEMPERATURE

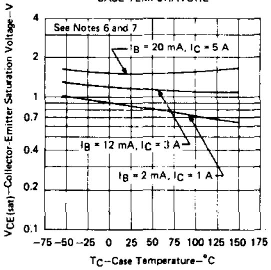


FIGURE 5

SMALL-SIGNAL COMMON-EMITTER
FORWARD CURRENT TRANSFER RATIO
vs
FREQUENCY

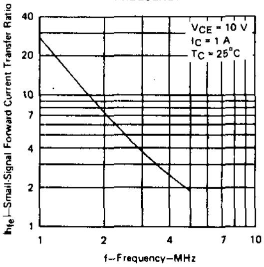


FIGURE 6

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 and located within 0.125 inch from the device body.

MAXIMUM SAFE OPERATING AREAS

MAXIMUM COLLECTOR CURRENT
vs
COLLECTOR-EMITTER VOLTAGE

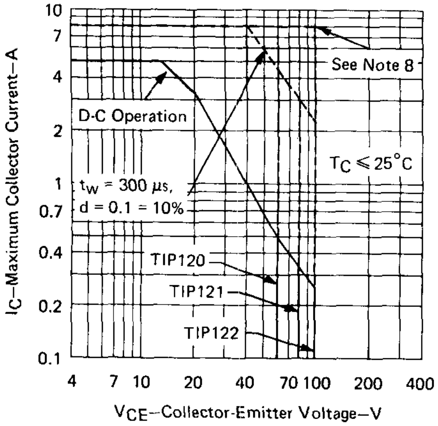


FIGURE 7

MAXIMUM COLLECTOR CURRENT
vs
UNCLAMPED INDUCTIVE LOAD

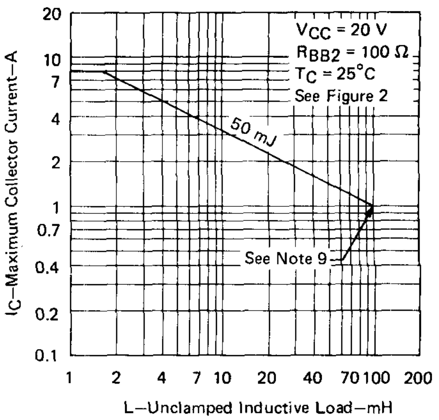


FIGURE 8

NOTES: 8. This combination of maximum voltage and current may be achieved only when switching from saturation to cutoff with a clamped inductive load.
9. Above this point the safe operating area has not been defined.

THERMAL INFORMATION

CASE TEMPERATURE
DISSIPATION DERATING CURVE

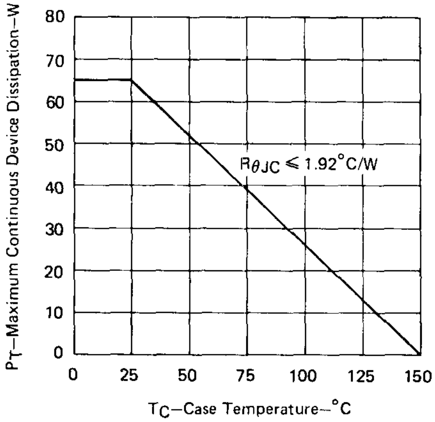


FIGURE 9

FREE-AIR TEMPERATURE
DISSIPATION DERATING CURVE

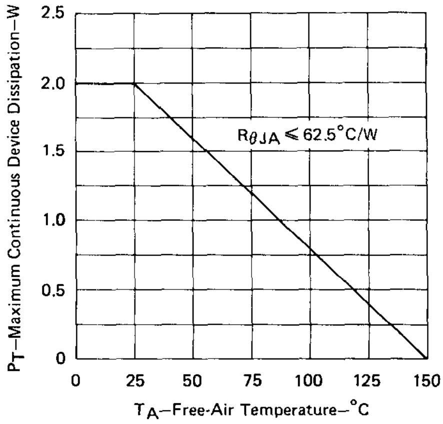


FIGURE 10

Typ type NPN	PNP	P_{tot} @ T_C = 25 °C (100 °C) W	V_{CEO} min	I_{CD} max A	h_{FE} min	h_{FE} max	@ I_C A
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	BD738	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} @ T_A = 25 °C (100 °C) W	T_C = 25 °C (100 °C) W	V_{CEO} min V	I_{CD} max A	h_{FE} min	h_{FE} max	@ I_C A
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-66 TO-66 TO-66	
			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	