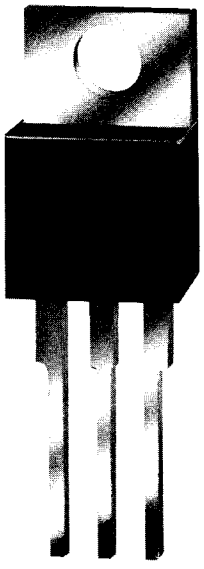
DATENBLATT

ISOLATED



TO-220 AB

TECCOR ELECTRONICS, INC.

NPN Isolated Power Transistor

T-TIP47-50L SERIES — ISOLATED CASE

General Description

Teccor Electronics' T-TIP-47-50L series of isolated case silicon transistors is a series of high voltage, NPN transistors designed for use in consumer and industrial applications.

Teccor transistors have glass passivated junctions which insures stable parameters under extreme environmental conditions.

Triple diffused construction, combined with high temperature metalization, provides superior energy handling capability.

Teccor's specially isolated construction gives the user a device which will withstand a high voltage test of 2500 VAC RMS minimum from the mounting surface to the leads over the device operating temperature range. For special applications, isolation potential capability of 4000 VAC is available on request.

Application Information

Compared to other "TIP" series transistors, which are non-isolated, the Teccor T-TIP47-50L transistor is internally isolated and is thermally superior to those devices that are mounted on a heat-sink with a mica insulator. As a result, the designer realizes manufacturing and power handling advantages without the additional cost of external isolation.

Features

- Electrically isolated case
- Glass passivated chip
- High reserve SOA
- High voltage operation

Applications

- High voltage switch
- Solenoid driver
- Deflection driver
- Amplifier
- Regulator

Electrical Specifications

Absolute Maximum Rating T_C = 25°C (unless otherwise noted)					
Symbol	**Identifications**	**Notes and Test Conditions**	**Min**	**Max**	**Units**
V_{CB}	Collector-Base Voltage	T-TIP47L T-TIP48L T-TIP49L T-TIP50L		350 400 450 500	V V V V
V_{CE}	Collector-Emitter Voltage	T-TIP47L T-TIP48L T-TIP49L T-TIP50L **NOTE 1**		250 300 350 400	V V V V
V_{EB}	Emitter-Base Volt			5	V
I_C	Continuous Collector Current			1	A
$I_{C(PK)}$	Peak Collector Current	**NOTE 2**		2	A
I_B	Continuous Base Current			0.6	A
$P_{T(CASE)}$	Continuous Device Dissipation at Case Temperature ≤ 25°C	**Fig. 6**		25	W
$P_{T(AMB)}$	Continuous Device Dissipation at Free-Air Temperature ≤ 25°C	**Fig. 7**		2	W
T_J	Operating Junction Temp.		− 65	+ 150	°C
T_{STG}	Storage Temp.		− 65	+ 150	°C
T_L	Lead Temp. ≤ 1/16" from Case — 10 Seconds Max.			230° C	°C
—	Unclamped Inductive Load Energy	**NOTE 3**		20	mJ

Electrical Characteristics Unless Stated Otherwise, T_C = 25°C.					
Symbol	**Identifications**	**Notes and Test Conditions**	**Min**	**Max**	**Units**
$V_{(BR)CEO}$	Collector-To-Emitter Breakdown Voltage	I_C = 30 mA, I_B = 0 **SEE NOTE 1** T-TIP47L / T-TIP48L / T-TIP49L / T-TIP50L	250 300 350 400		V
I_{CEO}	Collector Cutoff Current	(V_{CE} = 150 Vdc, I_B = 0) T-TIP47L (V_{CE} = 200 Vdc, I_B = 0) T-TIP48L (V_{CE} = 250 Vdc, I_B = 0) T-TIP49L (V_{CE} = 300 Vdc, I_B = 0) T-TIP50L		1.0	mA
I_{CES}	Collector Cutoff Current	(V_{CE} = 350 Vdc, V_{BE} = 0) T-TIP47L (V_{CE} = 400 Vdc, V_{BE} = 0) T-TIP48L (V_{CE} = 450 Vdc, V_{BE} = 0) T-TIP49L (V_{CE} = 500 Vdc, V_{BE} = 0) T-TIP50L		1.0	mA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 5.0 V; I_C = 0		1.0	mA
V_{BE}	Base-To-Emitter Voltage	V_{CE} = 10 V; I_C = 1.0 A **SEE NOTES 4&5**		1.5	V
$V_{CE(SAT)}$	Collector-To-Emitter Saturation Voltage	I_B = 0.2 A; I_C = 1.0 A **SEE NOTES 4&5**		1.0	V
h_{FE}	Forward-Current Transfer Ratio	V_{CE} = 10 V; I_C = 0.3 A **SEE NOTES 4&5**	30	150	
		V_{CE} = 10 V; I_C = 1.0 A **SEE NOTES 4&5**	10		
h_{fe}	Small-Signal Forward-Current Transfer Ratio	V_{CE} = 10 V; I_C = 0.2 A; f = 1.0 kHz	25		
h_{fe}	Small-Signal Forward-Current Transfer Ratio	V_{CE} = 10 V; I_C = 0.2 A; f = 2.0 MHz	5.0		

NOTES:
1. These values apply when the base-emitter diode is open circuited.
2. This value applies for t_w = 1 ms, duty cycle = 10%.
3. This rating is based on the capability of the transistor to operate safely in the circuit of Fig. 10. Energy = $I_C^2L/2$.
4. Pulse test: Duration, 300 microseconds; Duty Cycle 2.0 percent maximum.
5. Use voltage-sensing contacts that are separate from current-carrying contacts. Position contacts within 0.125 inch of device case.

switching characteristics at 25°C case temperature

PARAMETER		TEST CONDITIONS†			TYP	UNIT
t_{on}	Turn-On Time	I_C = 1 A,	$I_{B(1)}$ = 100 mA,	$I_{B(2)}$ = − 100 mA,	0.2	μs
t_{off}	Turn-Off Time	$V_{BE(off)}$ = −5 V,	R_L = 200 Ω,	See Figure 9	2	

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

Specifications (Continued)

TYPICAL CHARACTERISTICS

STATIC FORWARD CURRENT TRANSFER RATIO VS COLLECTOR CURRENT

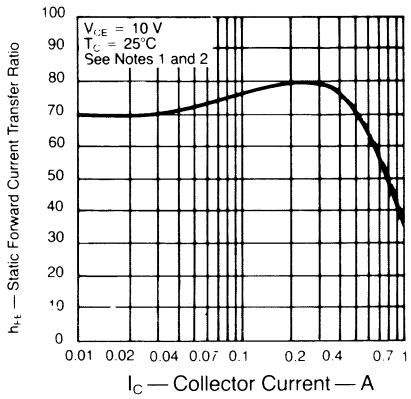


Figure 1

BASE-EMITTER VOLTAGE VS COLLECTOR CURRENT

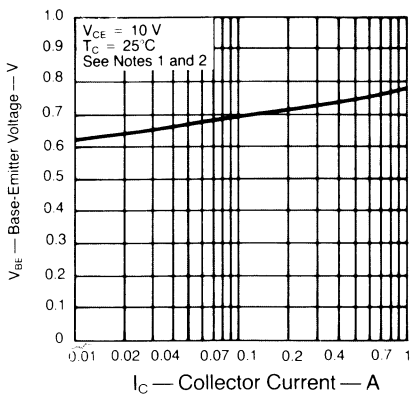


Figure 2

COLLECTOR-EMITTER SATURATION VOLTAGE VS COLLECTOR CURRENT

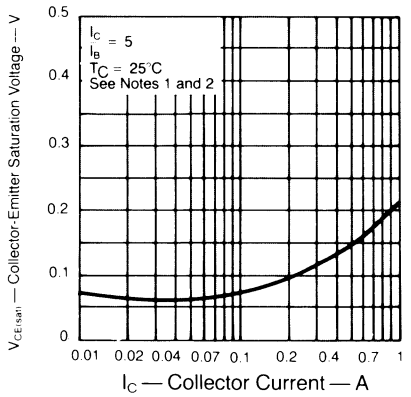


Figure 3

MAXIMUM SAFE OPERATING AREAS

MAXIMUM COLLECTOR CURRENT VS COLLECTOR-EMITTER VOLTAGE

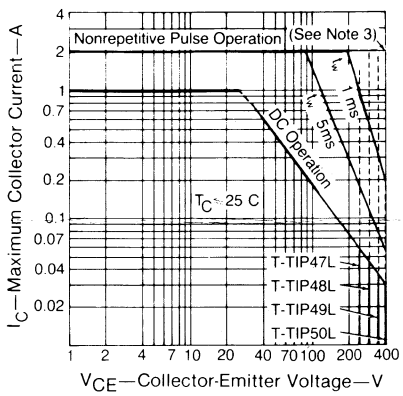


Figure 4

MAXIMUM COLLECTOR CURRENT VS UNCLAMPED INDUCTIVE LOAD

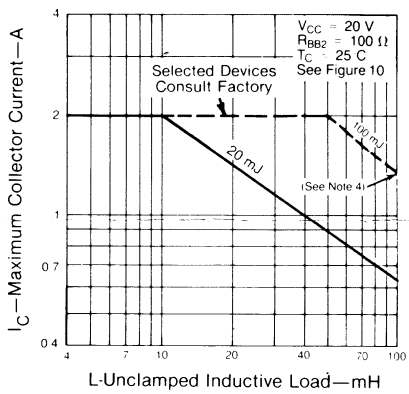


Figure 5

THERMAL INFORMATION

CASE TEMPERATURE DISSIPATION DERATING CURVE

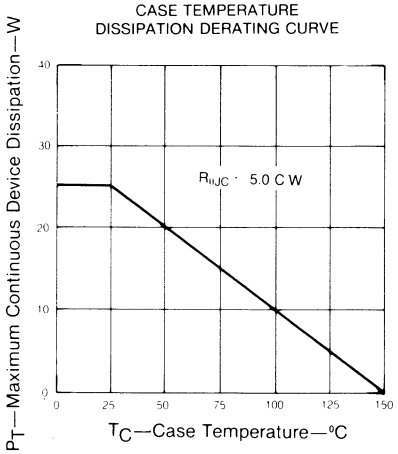


Figure 6

FREE-AIR TEMPERATURE DISSIPATION DERATING CURVE

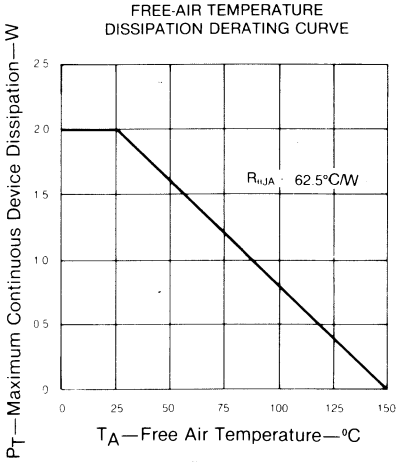


Figure 7

THERMAL RESPONSE

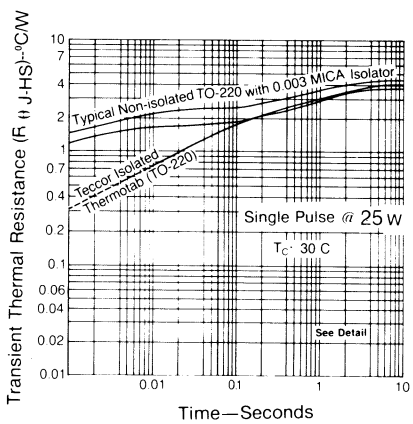
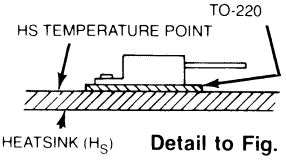


Figure 8

0.003 MICA FOR NON-ISOLATED TO-220



Detail to Fig. 8

NOTES TO FIGURES:

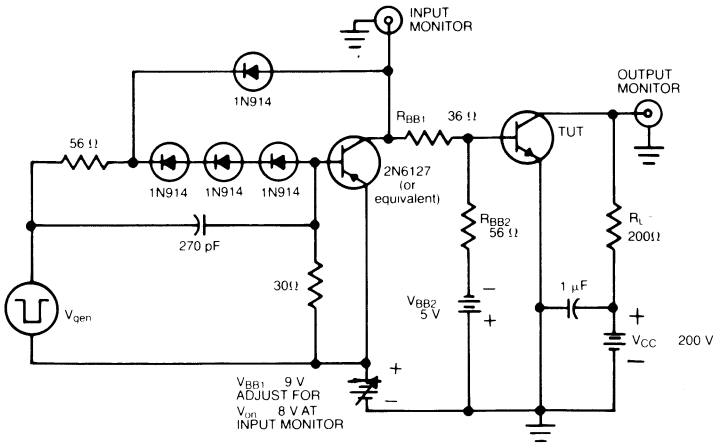
1. These parameters must be measured using pulse techniques. t_w = 300 μs, duty cycle 2%.
2. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts and located within 0.125 inch from the device body.
3. This combination of maximum voltage and current may be achieved only when switching from saturation to cutoff with a clamped inductive load.
4. Above this point the safe operating area has not been defined.

THERMAL CHARACTERISTICS

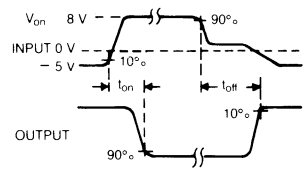
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	5	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	62.5	°C/W

Circuit Information

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT

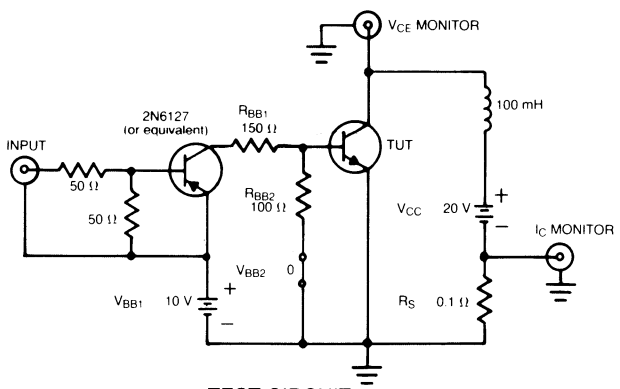


VOLTAGE WAVEFORMS

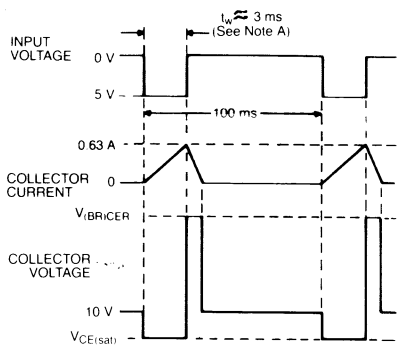
Figure 9

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: $t_r < 15$ ns, $Z_{out} = 50\ \Omega$, $t_w = 20\ \mu s$, duty cycle < 2%.
C. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r < 15$ ns, $R_{in} > 10$ mΩ, $C_{in} < 11.5$ pF.
D. Resistors must be noninductive types.
E. The d-c power supplies may require additional bypassing in order to minimize ringing.

INDUCTIVE LOAD SWITCHING



TEST CIRCUIT



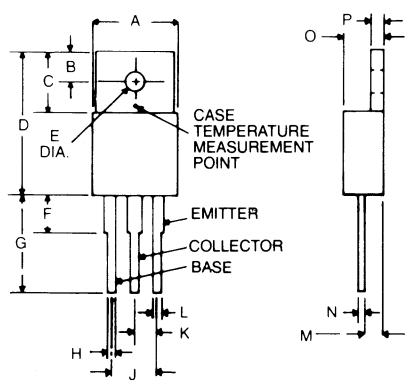
VOLTAGE AND CURRENT WAVEFORMS

Figure 10

NOTE A: Input pulse width is increased until $I_{CM} = 0.63A$

Package Configuration

"L" PACKAGE THERMOTAB® TO-220 AB
(Isolated)



DIMENSIONS

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	.380	.420	9.65	10.67
B	.100	.120	2.54	3.05
C	.230	.270	5.84	6,86
D	.560	.625	14.22	15.88
E	.139	.147	3.53	3.73
F		.250		6.35
G	.500	.562	12.70	14.27
H	.020	.045	.51	1.14

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
J	.190	.210	4.83	5.33
K	.090	.110	2.29	2.79
L	.045	.070	1.14	1.78
M	.080	.115	2.03	2.92
N	.012	.045	.30	1.14
O	.140	.190	3.56	4.83
P	.020	.055	.51	1.40

LEAD BENDING SPECIFICATIONS

Leads can be bent easily, and may be bent to various angles provided bend is made at minimum 1/16" (or 0.063 inches) away from the package body. Leads should be held firmly between package body and the bend, so that the strain on the leads is not transmitted to the package body. Sharp angle bends should be done only once, since repeated bending will fatigue or break the leads.