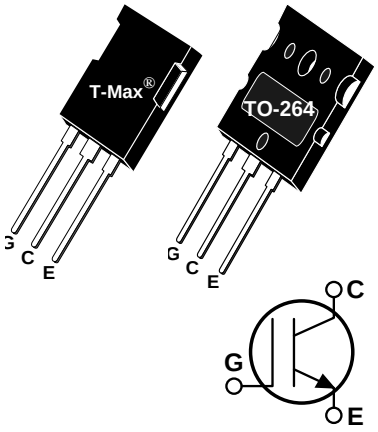
APT50GF120B2R
APT50GF120LR
1200V 80A

Fast IGBT



The Fast IGBT is a new generation of high voltage power IGBTs. Using Non-Punch Through Technology the Fast IGBT offers superior ruggedness, fast switching speed and low Collector-Emitter On voltage.

- **Low Forward Voltage Drop**
- **High Freq. Switching to 20KHz**
- **Low Tail Current**
- **Ultra Low Leakage Current**
- **Avalanche Rated**
- **RBSOA and SCSOA Rated**

MAXIMUM RATINGS All Ratings: T_C = 25°C unless otherwise specified.

Symbol	Parameter	APT50GF120B2R/LR	UNIT
V_{CES}	Collector-Emitter Voltage	1200	Volts
V_{CGR}	Collector-Gate Voltage (R_{GE} = 20KΩ)	1200	
V_{GE}	Gate-Emitter Voltage	±20	
I_{C1}	Continuous Collector Current @ T_C = 25°C	80	Amps
I_{C2}	Continuous Collector Current @ T_C = 100°C	50	
I_{CM}	Pulsed Collector Current ① @ T_C = 25°C	160	
I_{LM}	RBSOA Clamped Inductive Load Current @ R_g = 11Ω T_C = 90°C	100	
E_{AS}	Single Pulse Avalanche Energy ②	85	mJ
P_D	Total Power Dissipation	520	Watts
T_J,T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150	°C
T_L	Max. Lead Temp. for Soldering: 0.063" from Case for 10 Sec.	300	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
BV_{CES}	Collector-Emitter Breakdown Voltage (V_{GE} = 0V, I_C = 0.5mA)	1200			Volts
$V_{GE}(TH)$	Gate Threshold Voltage (V_{CE} = V_{GE}, I_C = 700µA, T_j = 25°C)	4.5	5.5	6.5	
$V_{CE}(ON)$	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = 50A, T_j = 25°C)		2.9	3.4	
	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = 50A, T_j = 125°C)		3.5	4.1	
I_{CES}	Collector Cut-off Current (V_{CE} = V_{CES}, V_{GE} = 0V, T_j = 25°C)			0.5	mA
	Collector Cut-off Current (V_{CE} = V_{CES}, V_{GE} = 0V, T_j = 125°C)			5.0	
I_{GES}	Gate-Emitter Leakage Current (V_{GE} = ±20V, V_{CE} = 0V)			±100	nA

CAUTION: These Devices are Sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

APT Website - http://www.advancedpower.com

USA 405 S.W. Columbia Street Bend, Oregon 97702-1035 Phone: (541) 382-8028 FAX: (541) 388-0364

EUROPE Chemin de Magret F-33700 Merignac - France Phone: (33) 5 57 92 15 15 FAX: (33) 5 56 47 97 61

052-6216 Rev C 6-2002

DYNAMIC CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{ies}	Input Capacitance	**Capacitance** V_{GE} = 0V, V_{CE} = 25V, f = 1 MHz		3450	4200	pF
C_{oes}	Output Capacitance			330	470	
C_{res}	Reverse Transfer Capacitance			230	350	
Q_g	Total Gate Charge ③	**Gate Charge** V_{GE} = 15V, V_{CC} = 0.5V_{CES}, I_C = I_{C2}		325	490	nC
Q_{ge}	Gate-Emitter Charge			35	40	
Q_{gc}	Gate-Collector ("Miller") Charge			195	300	
t_d(on)	Turn-on Delay Time	**Resistive Switching (25°C)** V_{GE} = 15V, V_{CC} = 0.5V_{CES}, I_C = I_{C2}, R_G = 10Ω		47	94	ns
t_r	Rise Time			178	360	
t_d(off)	Turn-off Delay Time			320	480	
t_f	Fall Time			190	380	
t_d(on)	Turn-on Delay Time	**Inductive Switching (150°C)** V_{CLAMP}(Peak) = 0.66V_{CES}, V_{GE} = 15V, I_C = I_{C2}, R_G = 10Ω, T_J = +150°C		45	90	ns
t_r	Rise Time			102	210	
t_d(off)	Turn-off Delay Time			440	880	
t_f	Fall Time			102	210	
E_{on}	Turn-on Switching Energy			6.4	13	mJ
E_{off}	Turn-off Switching Energy			5.6	12	
E_{ts}	Total Switching Losses			12.0	25	
t_d(on)	Turn-on Delay Time	**Inductive Switching (25°C)** V_{CLAMP}(Peak) = 0.66V_{CES}, V_{GE} = 15V, I_C = I_{C2}, R_G = 10Ω, T_J = +25°C		46	100	ns
t_r	Rise Time			115	230	
t_d(off)	Turn-off Delay Time			390	790	
t_f	Fall Time			100	210	
E_{ts}	Total Switching Losses			10.8	22	mJ
gfe	Forward Transconductance	V_{CE} = 20V, I_C = I_{C2}	8			S

THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\Theta JC}$	Junction to Case			0.24	°C/W
$R_{\Theta JA}$	Junction to Ambient			40	
W_T	Package Weight		0.22		oz
			6.1		gm

① Repetitive Rating: Pulse width limited by maximum junction temperature.

② I_C = I_{C2}, R_{GE} = 25Ω, L = 68µH, T_j = 25°C

③ See MIL-STD-750 Method 3471

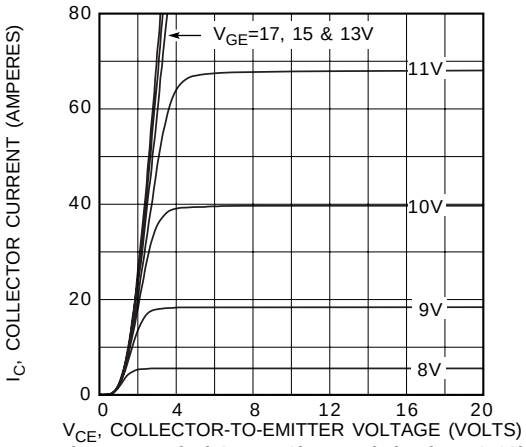


Figure 1, Typical Output Characteristics (T_J = 25°C)

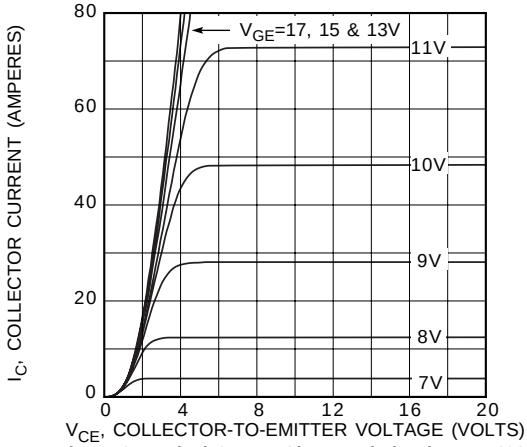


Figure 2, Typical Output Characteristics (T_J = 150°C)

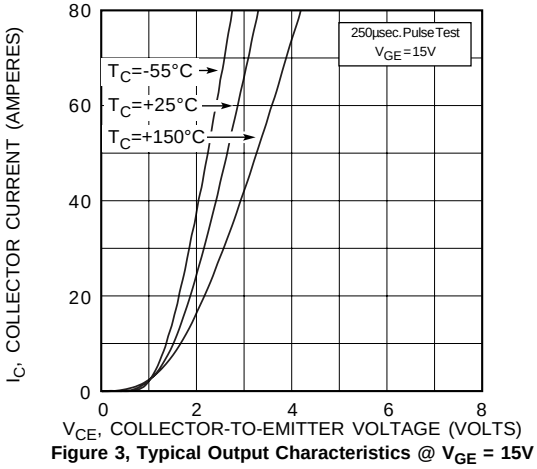


Figure 3, Typical Output Characteristics @ V_{GE} = 15V

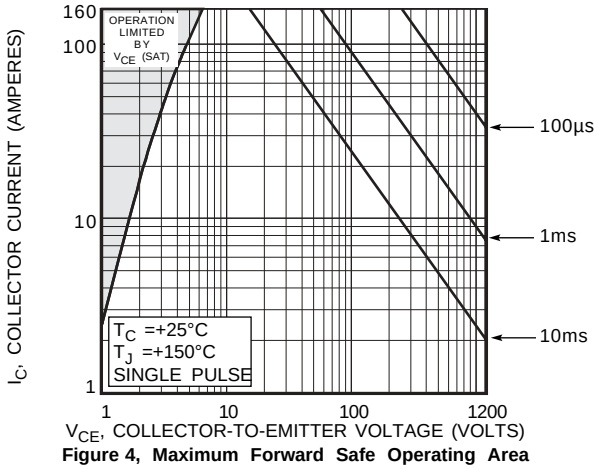


Figure 4, Maximum Forward Safe Operating Area

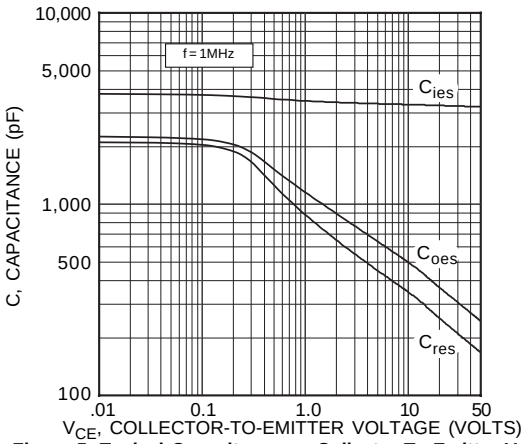


Figure 5, Typical Capacitance vs Collector-To-Emitter Voltage

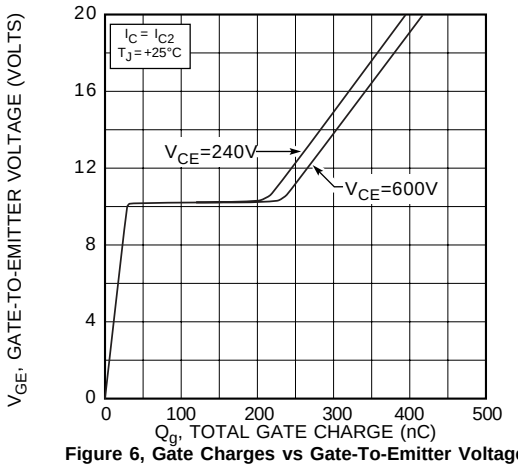


Figure 6, Gate Charges vs Gate-To-Emitter Voltage

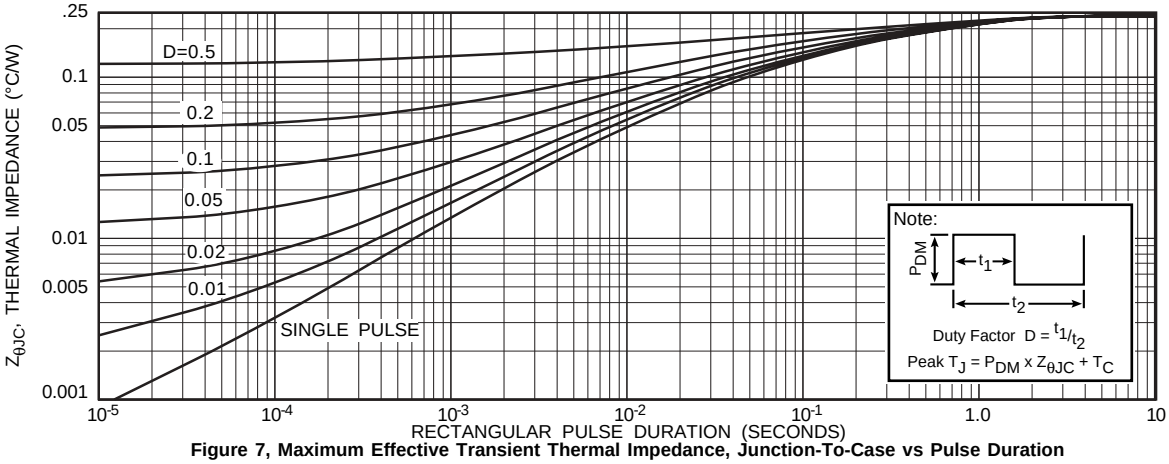


Figure 7, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

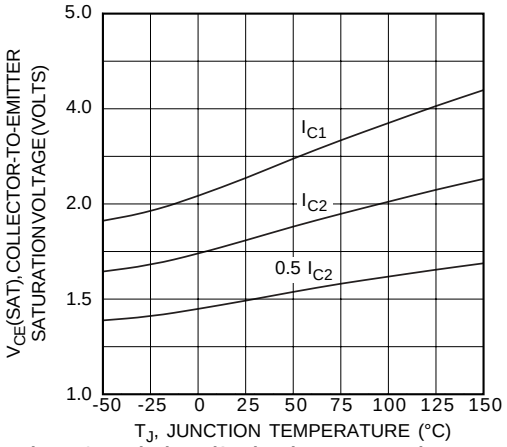


Figure 8, Typical V_{CE}(SAT) Voltage vs Junction Temperature

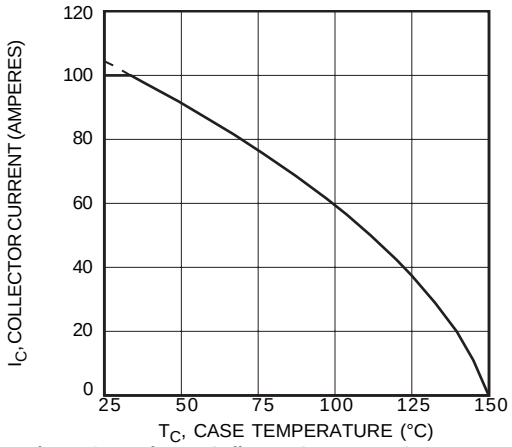


Figure 9, Maximum Collector Current vs Case Temperature

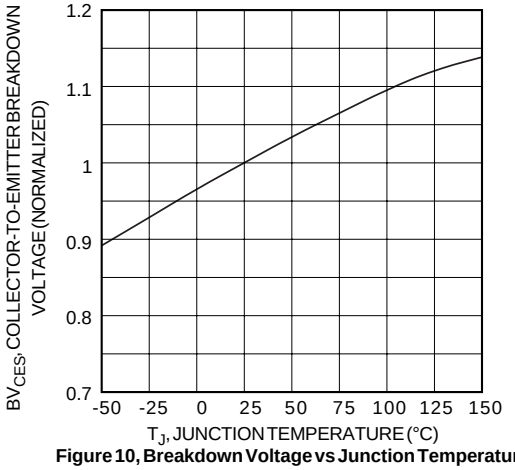


Figure 10, Breakdown Voltage vs Junction Temperature

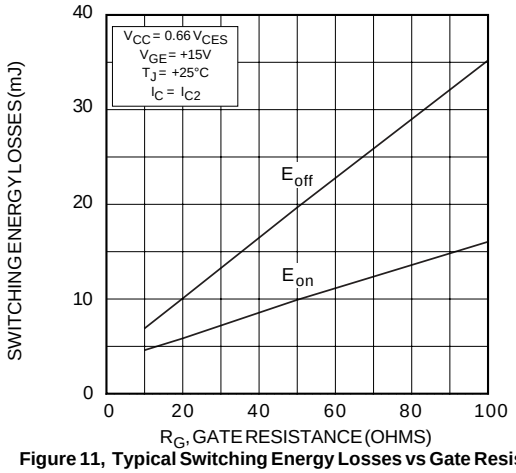


Figure 11, Typical Switching Energy Losses vs Gate Resistance

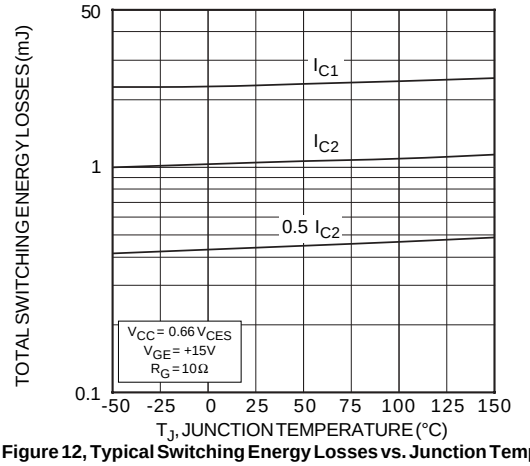


Figure 12, Typical Switching Energy Losses vs. Junction Temperature

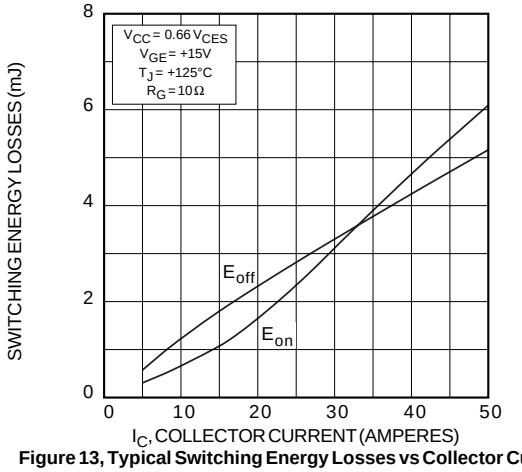


Figure 13, Typical Switching Energy Losses vs Collector Current

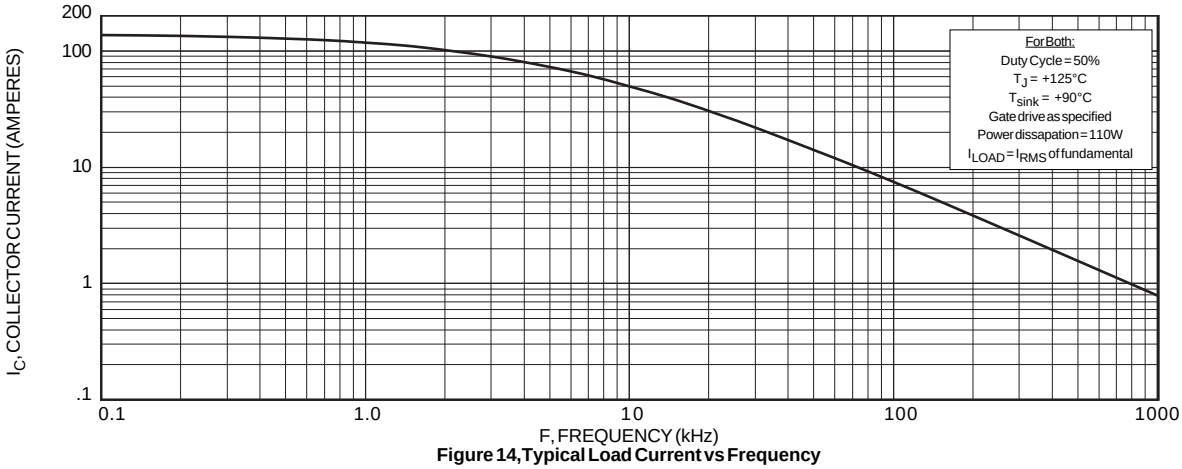


Figure 14, Typical Load Current vs Frequency

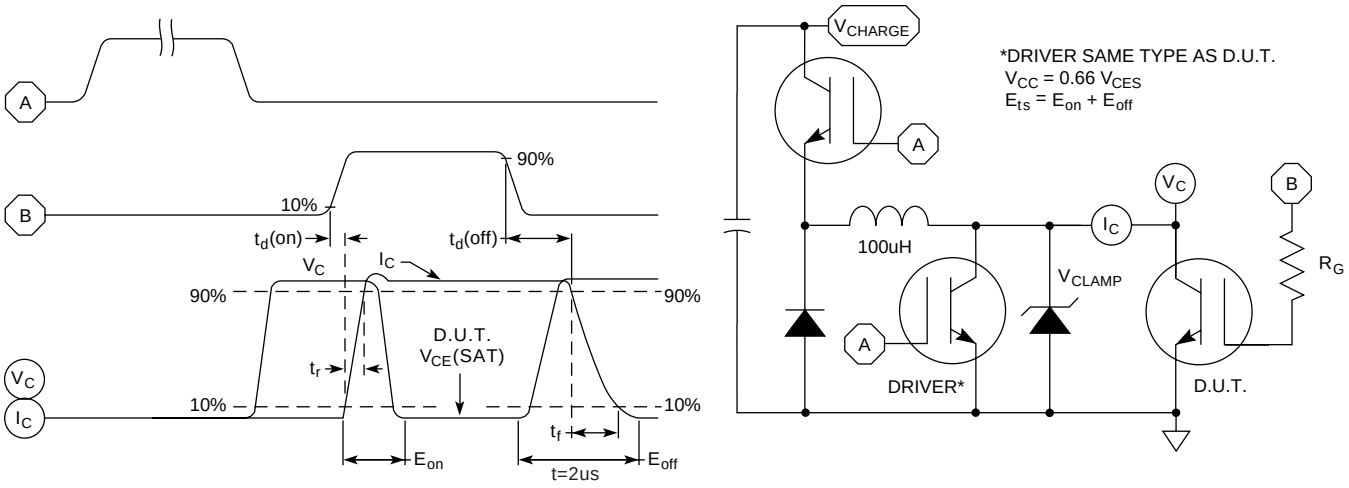


Figure 15, Switching Loss Test Circuit and Waveforms

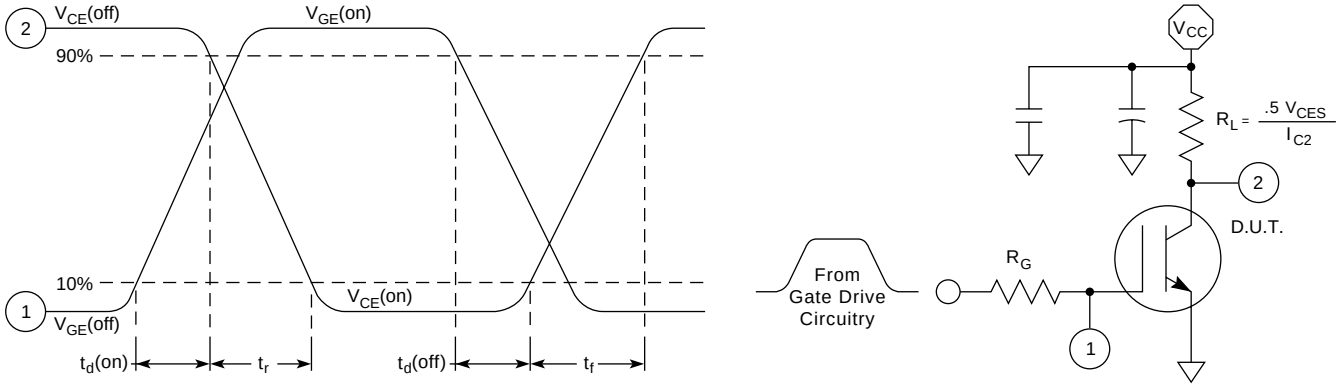
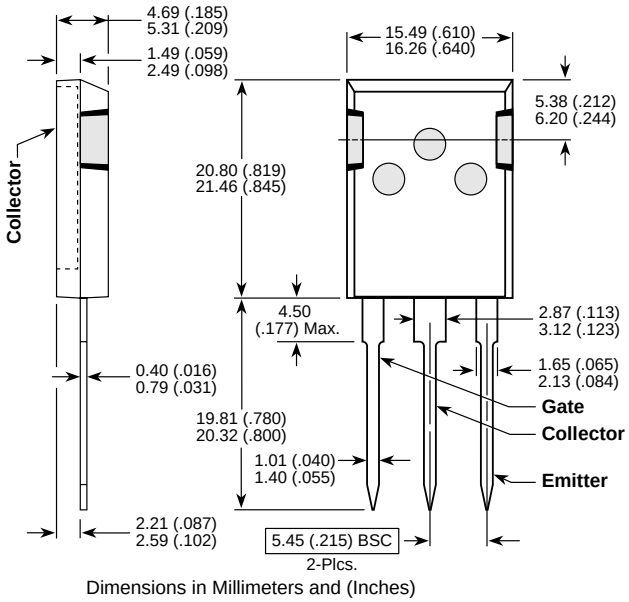


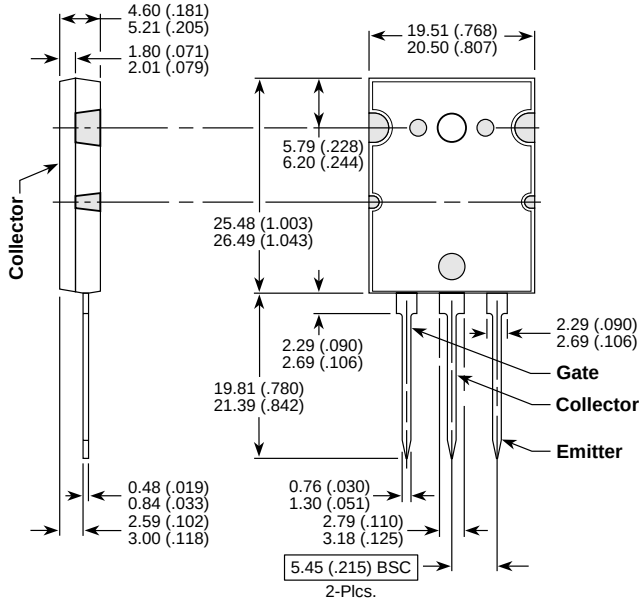
Figure 16, Resistive Switching Time Test Circuit and Waveforms

T-MAX® (B2) Package Outline



Dimensions in Millimeters and (Inches)

TO-264 (L) Package Outline



Dimensions in Millimeters and (Inches)