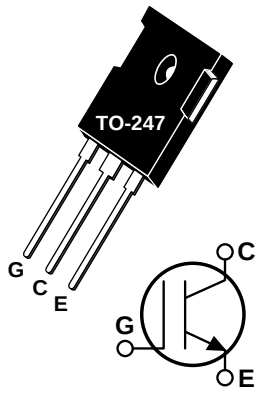
APT30GT60BR

600V 58A

Thunderbolt IGBT™



The Thunderbolt IGBT™ is a new generation of high voltage power IGBTs. Using Non-Punch Through Technology the Thunderbolt IGBT™ offers superior ruggedness and ultrafast switching speed.

- **Low Forward Voltage Drop**
- **High Freq. Switching to 150KHz**
- **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	APT30GT60BR	UNIT
V_{CES}	Collector-Emitter Voltage	600	Volts
V_{CGR}	Collector-Gate Voltage (R_{GE} = 20KΩ)	600	
V_{EC}	Emitter-Collector Voltage	15	
V_{GE}	Gate-Emitter Voltage	±20	
I_{C1}	Continuous Collector Current @ T_C = 25°C	58	Amps
I_{C2}	Continuous Collector Current @ T_C = 90°C	30	
I_{CM}	Pulsed Collector Current ① @ T_C = 25°C	110	
I_{LM}	RBSOA Clamped Inductive Load Current @ R_g = 11Ω T_C = 125°C	60	
E_{AS}	Single Pulse Avalanche Energy ②	65	mJ
P_D	Total Power Dissipation	250	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 = 0.25mA)	600			Volts
RBV_{CES}	Collector-Emitter Reverse Breakdown Voltage (V_{GE} = 0V, I_C = 50mA)	-15			
$V_{GE}(TH)$	Gate Threshold Voltage (V_{CE} = V_{GE}, I_C = 700µA, T_j = 25°C)	3	4	5	
$V_{CE}(ON)$	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = I_{C2}, T_j = 25°C)	1.6	2.0	2.5	
	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = I_{C2}, T_j = 125°C)		2.2	2.8	
I_{CES}	Collector Cut-off Current (V_{CE} = V_{CES}, V_{GE} = 0V, T_j = 25°C)			40	µA
	Collector Cut-off Current (V_{CE} = V_{CES}, V_{GE} = 0V, T_j = 125°C)			1000	
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

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052-6211 Rev C 9-2001

DYNAMIC CHARACTERISTICS

APT30GT60BR

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{ies}	Input Capacitance	**Capacitance** V_{GE} = 0V, V_{CE} = 25V, f = 1 MHz		1600	1850	pF
C_{oes}	Output Capacitance			150	220	
C_{res}	Reverse Transfer Capacitance			90	150	
Q_g	Total Gate Charge ③	**Gate Charge** V_{GE} = 15V, V_{CC} = 0.5V_{CES}, I_C = I_{C2}		140	210	nC
Q_{ge}	Gate-Emitter Charge			10	15	
Q_{gc}	Gate-Collector ("Miller") Charge			60	90	
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		13	26	ns
t_r	Rise Time			41	80	
t_d(off)	Turn-off Delay Time			147	220	
t_f	Fall Time			200	400	
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		15	30	ns
t_r	Rise Time			27	50	
t_d(off)	Turn-off Delay Time			265	400	
t_f	Fall Time			41	80	
E_{on}	Turn-on Switching Energy			.5	1.0	mJ
E_{off}	Turn-off Switching Energy			1.0	2.0	
E_{ts}	Total Switching Losses			1.5	3.0	
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		17	30	ns
t_r	Rise Time			28	60	
t_d(off)	Turn-off Delay Time			242	360	
t_f	Fall Time			34	70	
E_{ts}	Total Switching Losses			1.2	2.0	mJ
gfe	Forward Transconductance	V_{CE} = 20V, I_C = I_{C2}	6			S

THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\Theta JC}$	Junction to Case			0.5	°C/W
$R_{\Theta JA}$	Junction to Ambient			40	
W_T	Package Weight		0.22		oz
			6.1		gm
Torque	Mounting Torque (using a 6-32 or 3mm Binding Head Machine Screw)			10	lb•in
				1.1	N•m

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

② I_C = I_{C2}, V_{CC} = 50V, R_{GE} = 25Ω, L = 144µH, T_j = 25°C

③ See MIL-STD-750 Method 3471

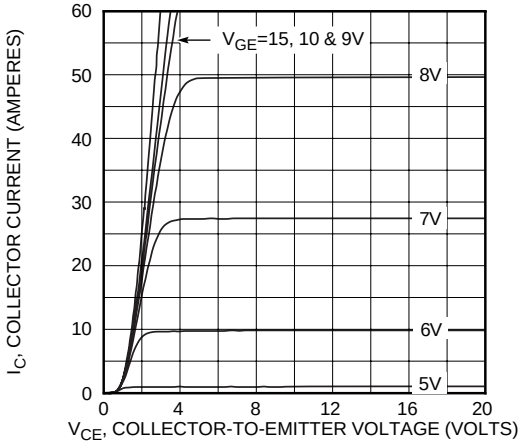


Figure 1, Typical Output Characteristics (T_J = 25°C)

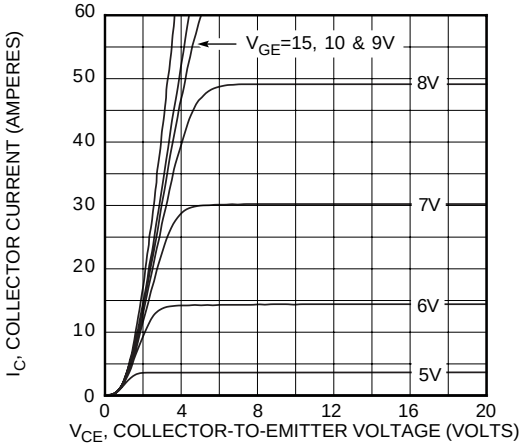


Figure 2, Typical Output Characteristics (T_J = 150°C)

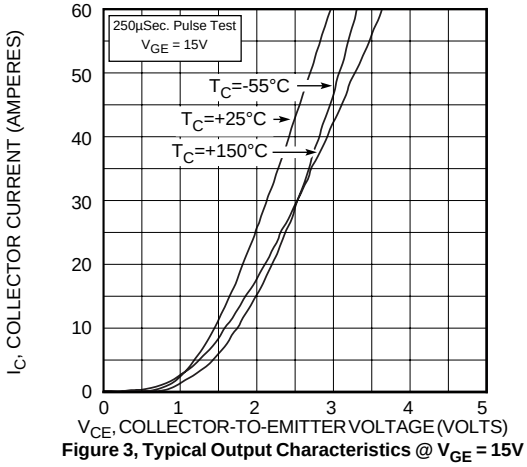


Figure 3, Typical Output Characteristics @ V_{GE} = 15V

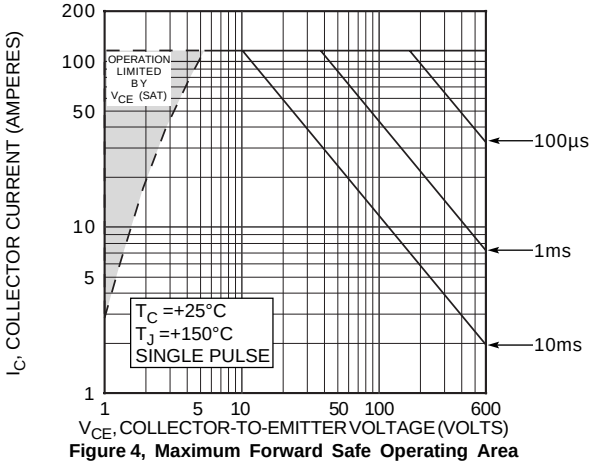


Figure 4, Maximum Forward Safe Operating Area

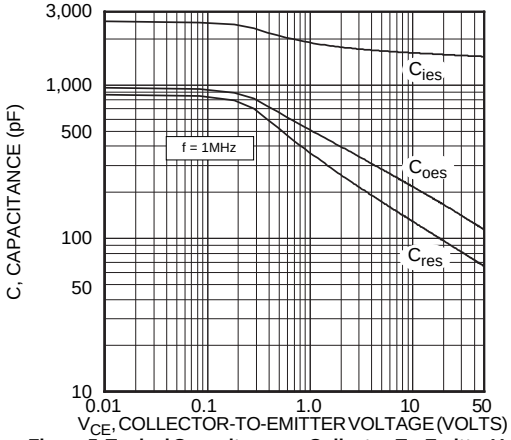


Figure 5, Typical Capacitance vs Collector-To-Emitter Voltage

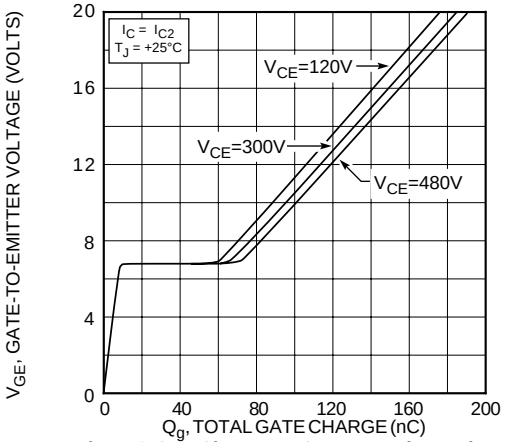


Figure 6, Gate Charges vs Gate-To-Emitter Voltage

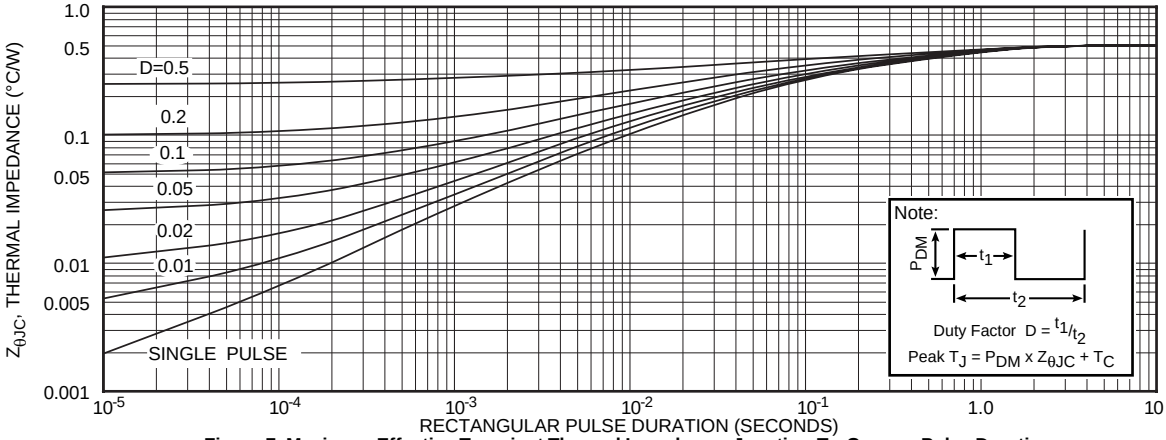


Figure 7, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

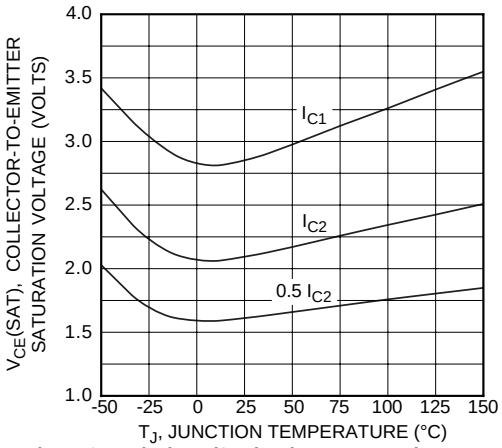


Figure 8, Typical V_{CE}(SAT) Voltage vs Junction Temperature

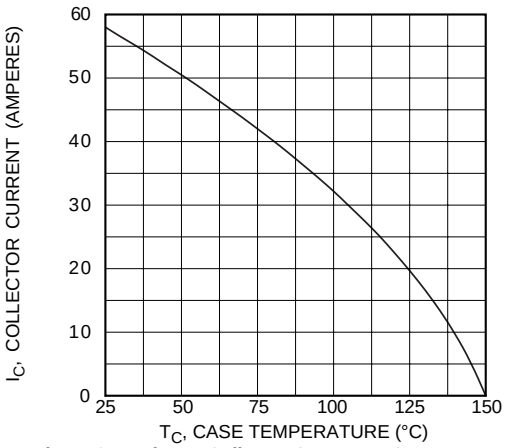


Figure 9, Maximum Collector Current vs Case Temperature

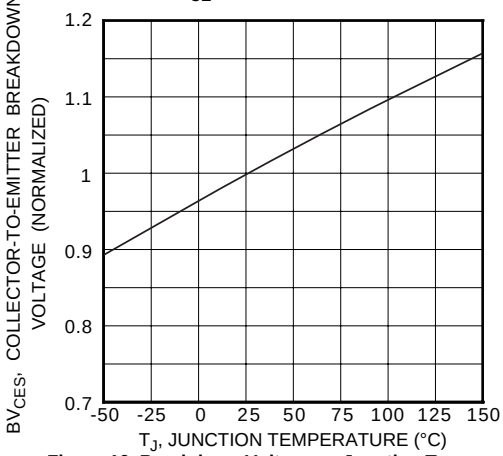


Figure 10, Breakdown Voltage vs Junction Temperature

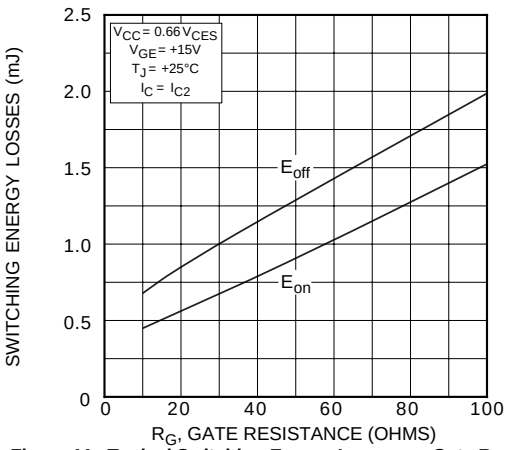


Figure 11, Typical Switching Energy Losses vs Gate Resistance

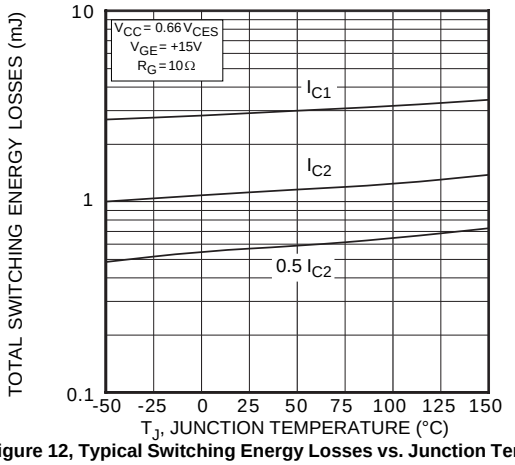


Figure 12, Typical Switching Energy Losses vs. Junction Temperature

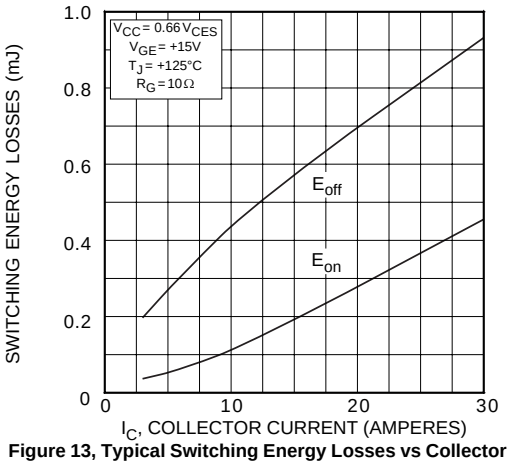


Figure 13, Typical Switching Energy Losses vs Collector Current

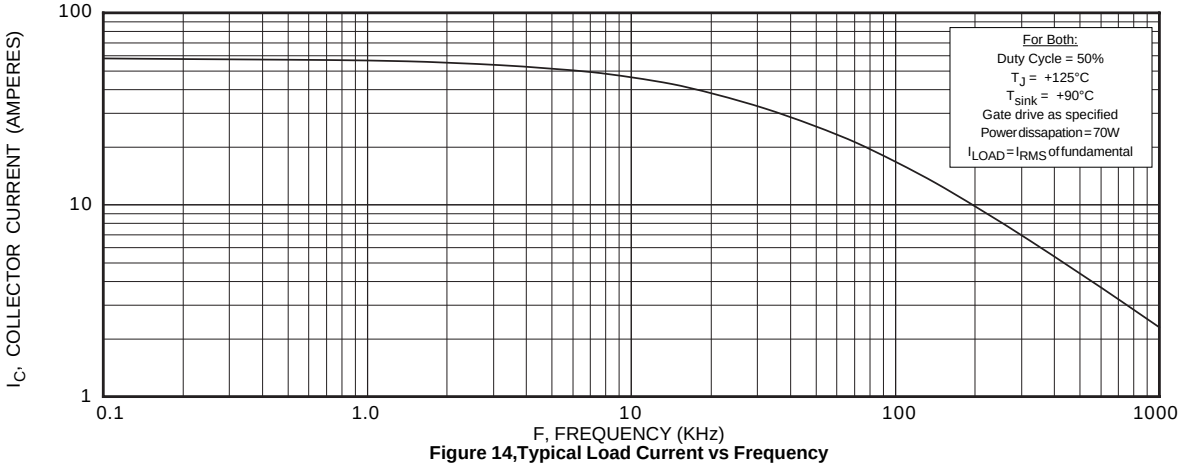


Figure 14,Typical Load Current vs Frequency

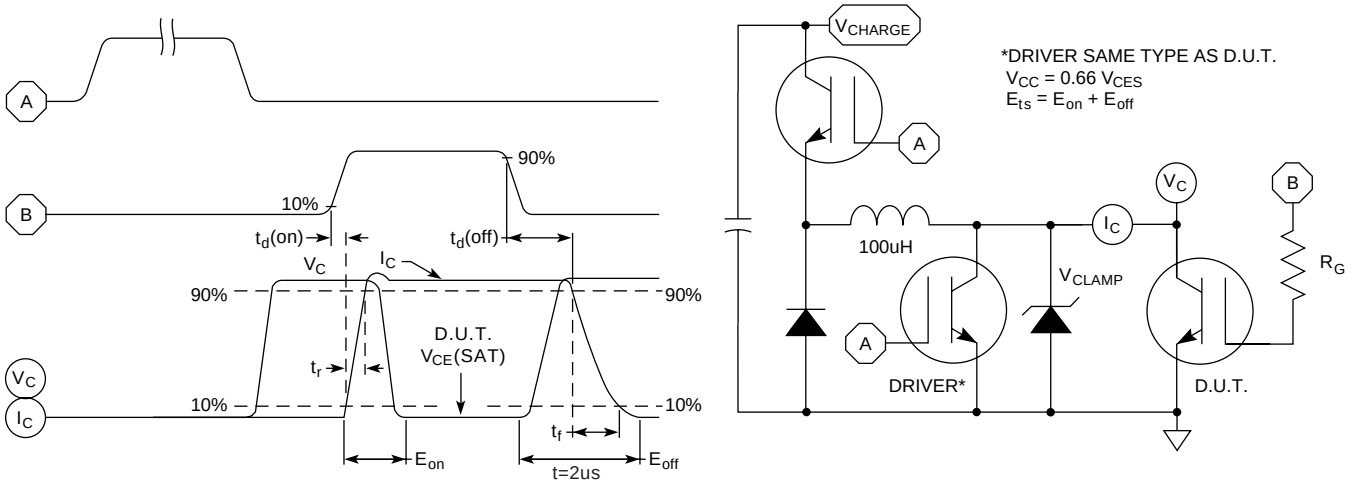


Figure 15, Switching Loss Test Circuit and Waveforms

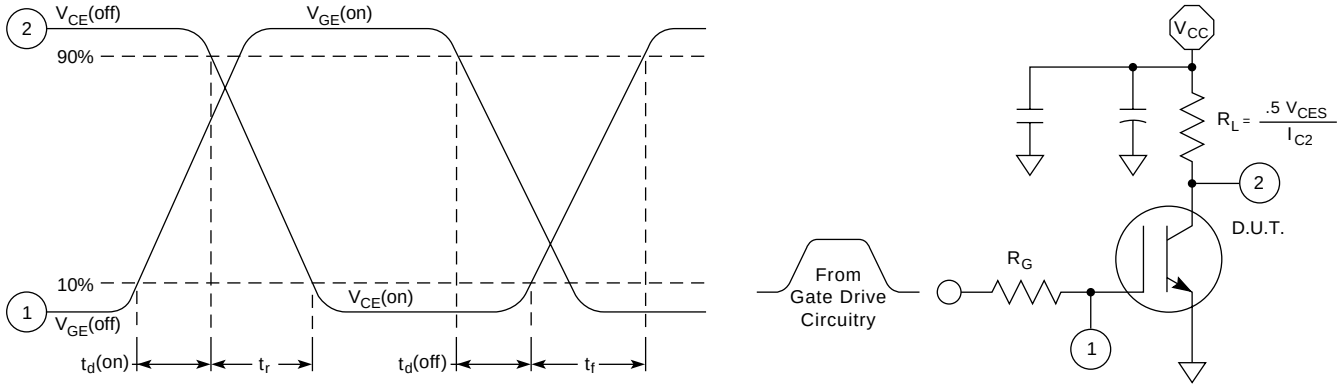
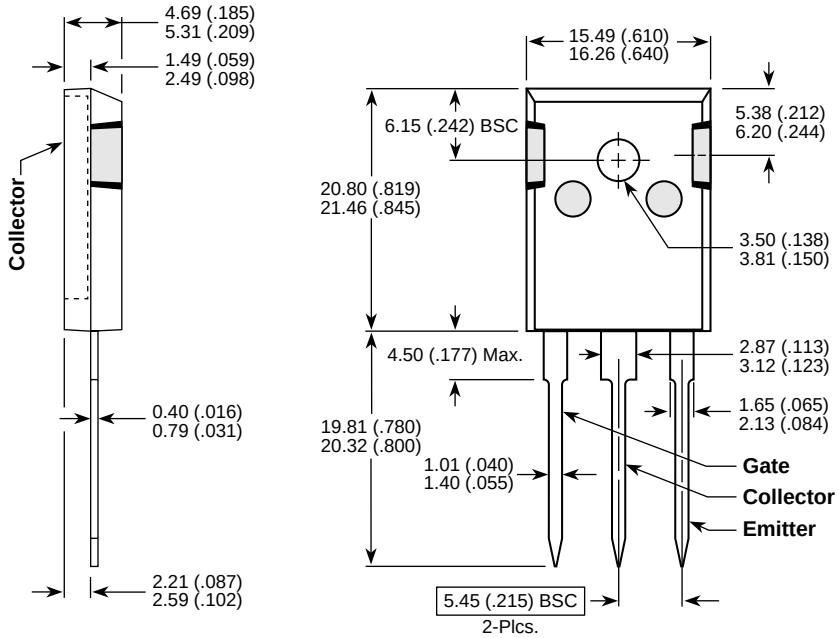


Figure 16, Resistive Switching Time Test Circuit and Waveforms

T0-247 Package Outline



Dimensions in Millimeters and (Inches)