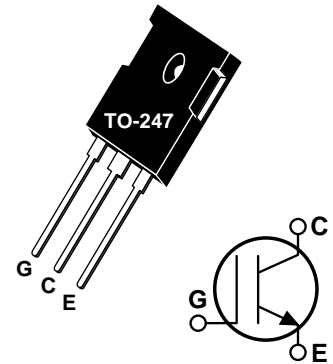


Fast IGBT

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




MAXIMUM RATINGS

All Ratings: $T_C = 25^\circ\text{C}$ unless otherwise specified.

Symbol	Parameter	APT50GF60BR	UNIT
V_{CES}	Collector-Emitter Voltage	600	Volts
V_{CGR}	Collector-Gate Voltage ($R_{GE} = 20K\Omega$)	600	
V_{GE}	Gate-Emitter Voltage	± 20	
I_{C1}	Continuous Collector Current @ $T_C = 25^\circ\text{C}$	75	Amps
I_{C2}	Continuous Collector Current @ $T_C = 90^\circ\text{C}$	50	
I_{CM}	Pulsed Collector Current ^① @ $T_C = 25^\circ\text{C}$	160	
I_{LM}	RBSOA Clamped Inductive Load Current @ $R_g = 11\Omega$ $T_C = 125^\circ\text{C}$	100	
E_{AS}	Single Pulse Avalanche Energy ^②	75	mJ
P_D	Total Power Dissipation	300	Watts
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150	$^\circ\text{C}$
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 ($V_{GE} = 0V, I_C = 1.0mA$)	600			Volts
$V_{GE(TH)}$	Gate Threshold Voltage ($V_{CE} = V_{GE}, I_C = 700\mu A, T_j = 25^\circ\text{C}$)	4.5	5.5	6.5	
$V_{CE(ON)}$	Collector-Emitter On Voltage ($V_{GE} = 15V, I_C = 50A, T_j = 25^\circ\text{C}$)		2.1	2.7	
	Collector-Emitter On Voltage ($V_{GE} = 15V, I_C = 50A, T_j = 125^\circ\text{C}$)		2.2	2.8	
I_{CES}	Collector Cut-off Current ($V_{CE} = V_{CES}, V_{GE} = 0V, T_j = 25^\circ\text{C}$)			0.5	mA
	Collector Cut-off Current ($V_{CE} = V_{CES}, V_{GE} = 0V, T_j = 125^\circ\text{C}$)			5.0	
I_{GES}	Gate-Emitter Leakage Current ($V_{GE} = \pm 20V, V_{CE} = 0V$)			± 100	nA

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

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

DYNAMIC CHARACTERISTICS

APT50GF60BR

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{ies}	Input Capacitance	Capacitance $V_{GE} = 0V$ $V_{CE} = 25V$ $f = 1\text{ MHz}$		2250		pF
C_{oes}	Output Capacitance			255		
C_{res}	Reverse Transfer Capacitance			155		
Q_g	Total Gate Charge ^③	Gate Charge $V_{GE} = 15V$ $V_{CC} = 0.66V_{CES}$ $I_C = I_{C2}$		175		nC
Q_{ge}	Gate-Emitter Charge			18		
Q_{gc}	Gate-Collector ("Miller") Charge			100		
$t_{d(on)}$	Turn-on Delay Time	Resistive Switching (25°C) $V_{GE} = 15V$ $V_{CC} = 0.66V_{CES}$ $I_C = I_{C2}$ $R_G = 10\Omega$		29		ns
t_r	Rise Time			118		
$t_{d(off)}$	Turn-off Delay Time			150		
t_f	Fall Time			190		
$t_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C) $V_{CLAMP(Peak)} = 0.66V_{CES}$ $V_{GE} = 15V$ $I_C = I_{C2}$ $R_G = 10\Omega$ $T_J = +150^\circ C$		28		ns
t_r	Rise Time			75		
$t_{d(off)}$	Turn-off Delay Time			265		
t_f	Fall Time			185		
E_{on}	Turn-on Switching Energy	$R_G = 10\Omega$ $T_J = +150^\circ C$		1.8		mJ
E_{off}	Turn-off Switching Energy			2.4		
E_{ts}	Total Switching Losses			4.2		
$t_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{CLAMP(Peak)} = 0.66V_{CES}$ $V_{GE} = 15V$ $I_C = I_{C2}$ $R_G = 10\Omega$ $T_J = +25^\circ C$		30		ns
t_r	Rise Time			80		
$t_{d(off)}$	Turn-off Delay Time			240		
t_f	Fall Time			43		
E_{ts}	Total Switching Losses			3.6		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			0.42	°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 $I_C = I_{C2}$, $R_{GE} = 25\Omega$, $L = 100\mu H$, $T_J = 25^\circ C$

③ See MIL-STD-750 Method 3471

APT Reserves the right to change, without notice, the specifications and information contained herein.

APT50GF60BR

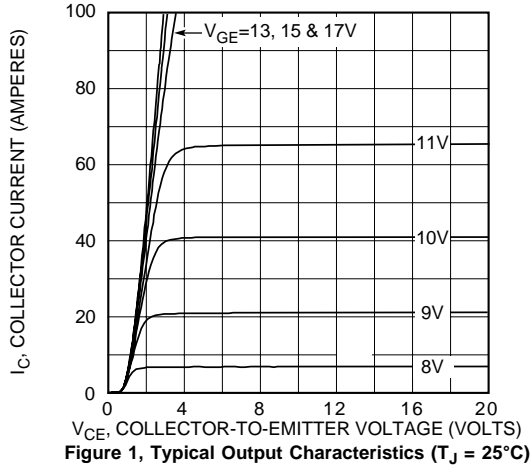


Figure 1, Typical Output Characteristics ($T_J = 25^\circ\text{C}$)

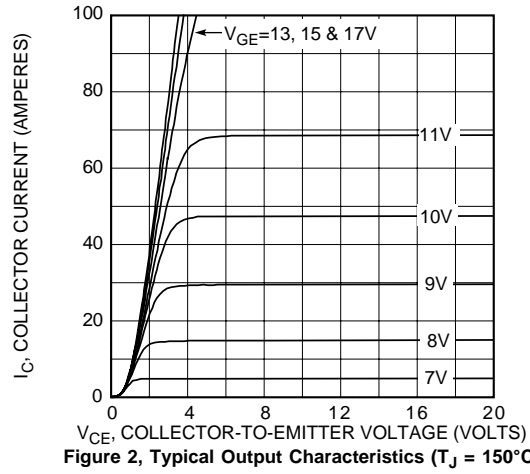


Figure 2, Typical Output Characteristics ($T_J = 150^\circ\text{C}$)

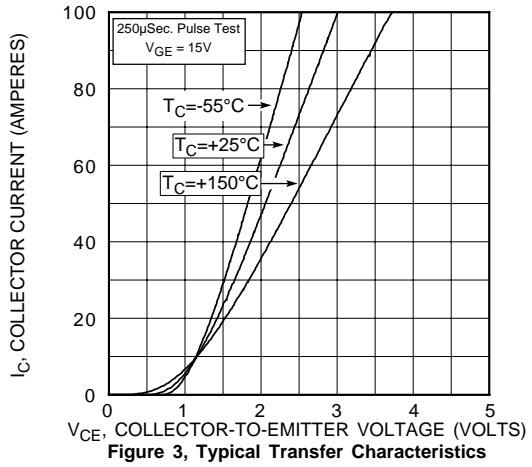


Figure 3, Typical Transfer Characteristics

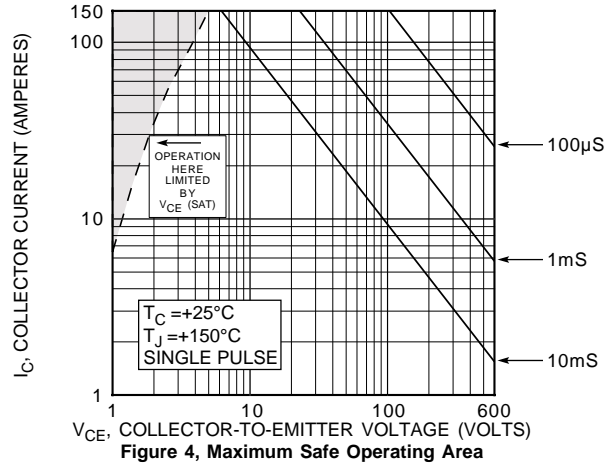


Figure 4, Maximum Safe Operating Area

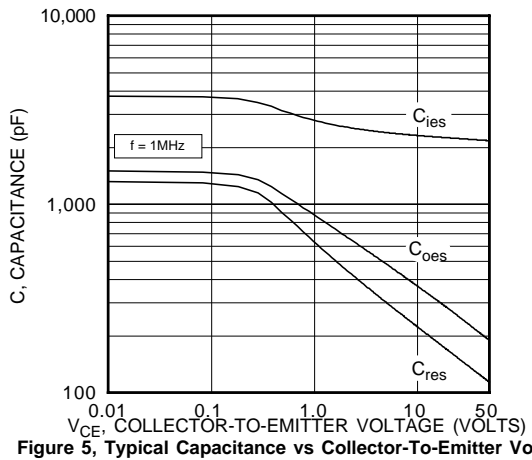


Figure 5, Typical Capacitance vs Collector-To-Emitter Voltage

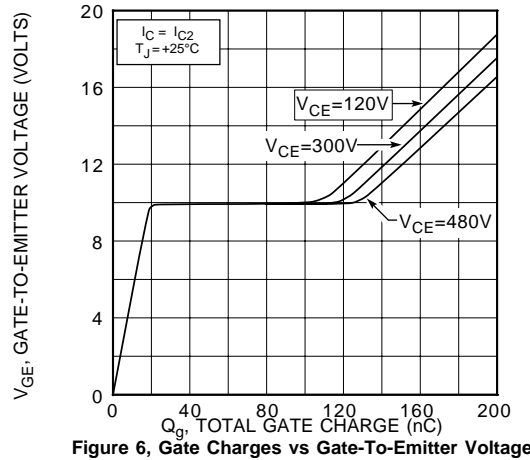


Figure 6, Gate Charges vs Gate-To-Emitter Voltage

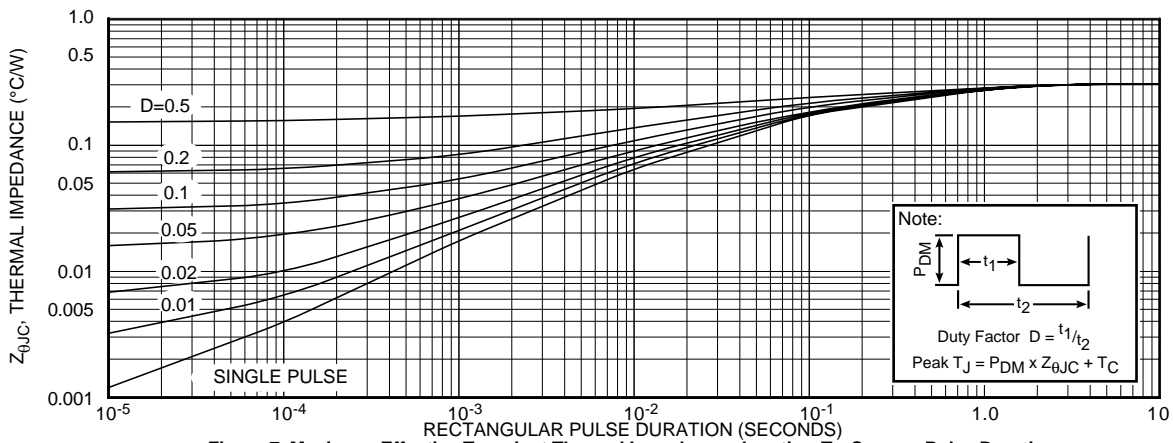


Figure 7, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

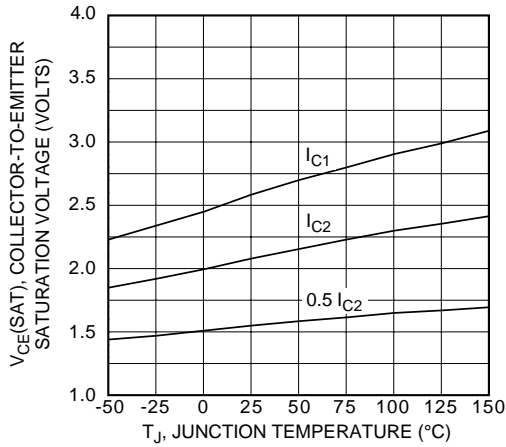


Figure 8, Typical $V_{CE(SAT)}$ Voltage vs Junction Temperature

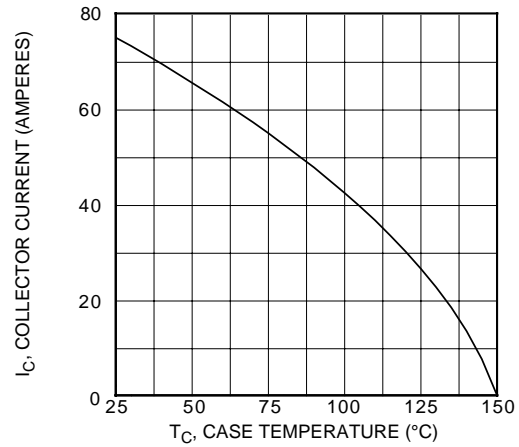


Figure 9, Maximum Collector Current vs Case Temperature

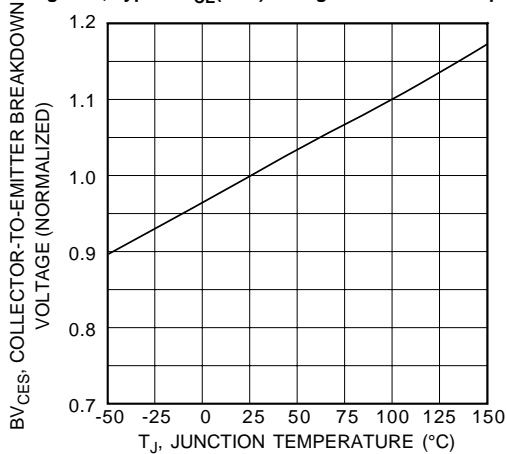


Figure 10, Breakdown Voltage vs Junction Temperature

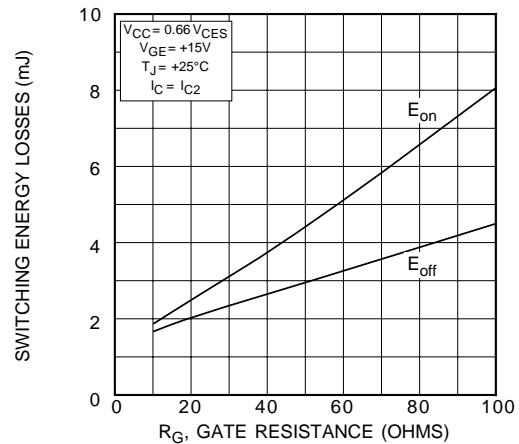


Figure 11, Typical Switching Energy Losses vs Gate Resistance

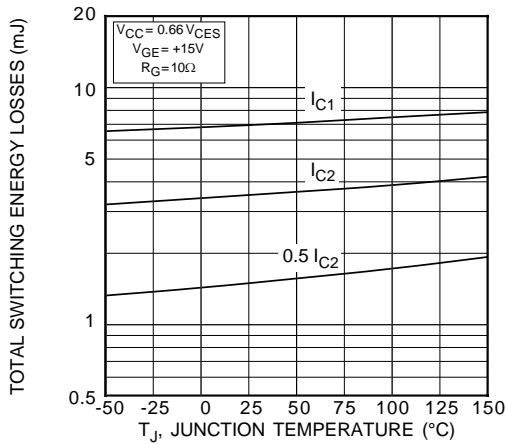


Figure 12, Typical Switching Energy Losses vs. Junction Temperature

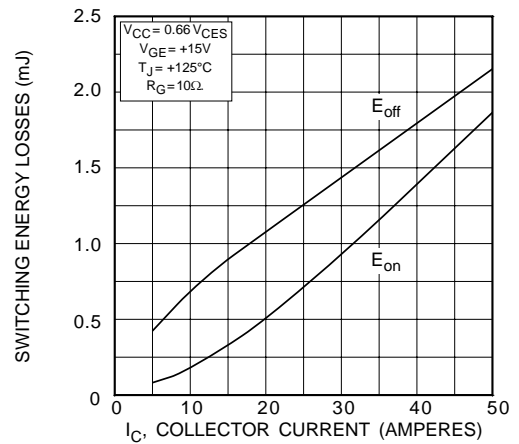


Figure 13, Typical Switching Energy Losses vs Collector Current

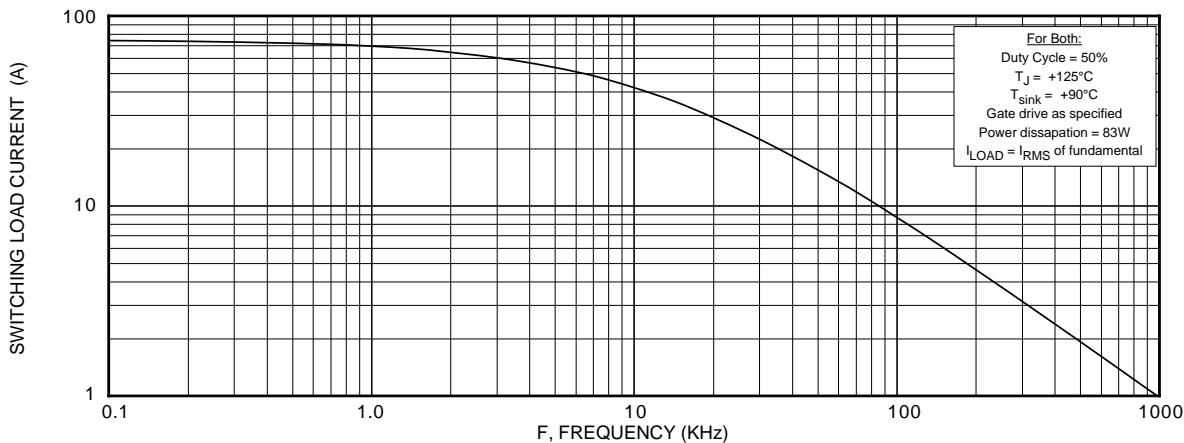


Figure 14, Typical Load Current vs Frequency

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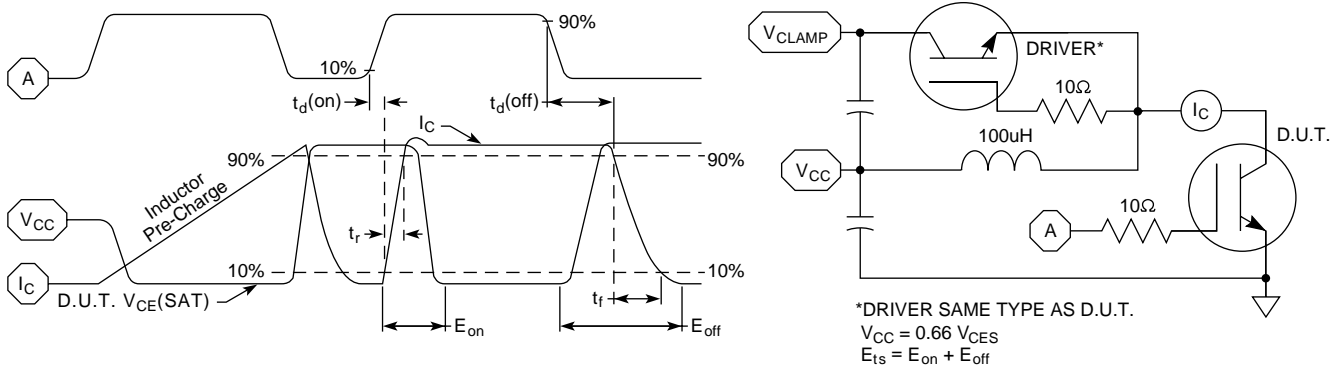


Figure 16, Switching Loss Test Circuit and Waveforms

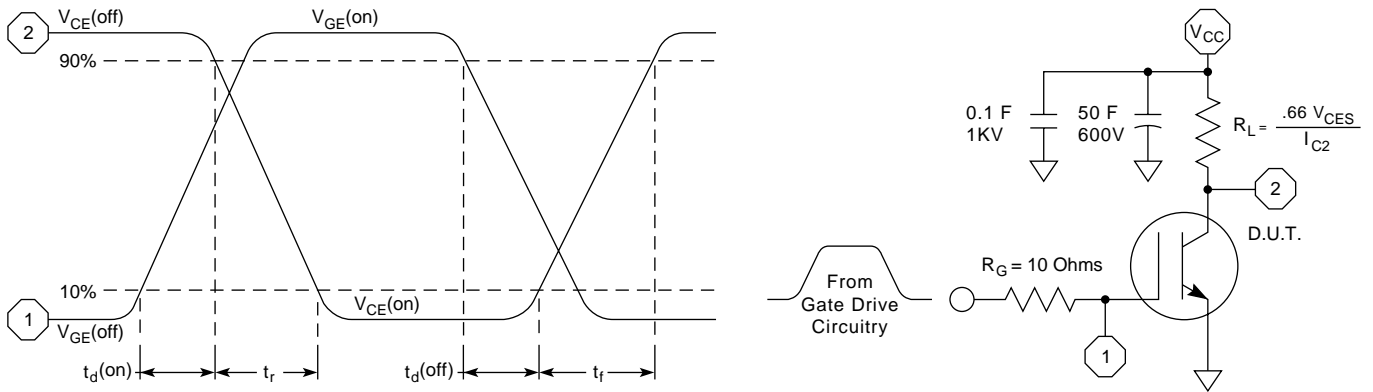
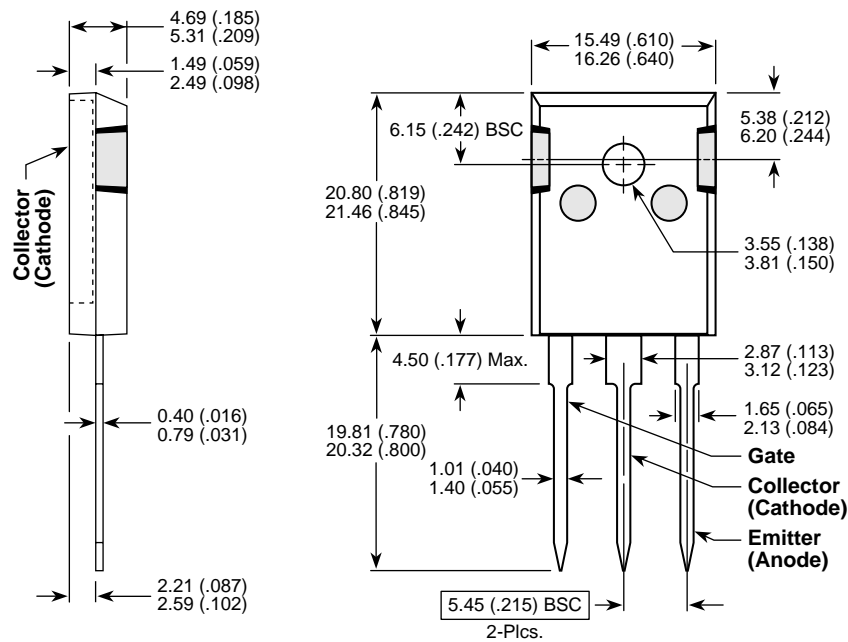


Figure 17, Resistive Switching Time Test Circuit and Waveforms

T0-247 Package Outline



Dimensions in Millimeters and (Inches)