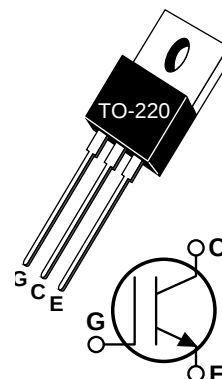


Thunderbolt IGBT™

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
- Low Tail Current
- Avalanche Rated
- High Freq. Switching to 150KHz
- Ultra Low Leakage Current
- RBSOA and SCSOA Rated



MAXIMUM RATINGS

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

Symbol	Parameter	APT30GT60KR	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 @ $T_C = 25^\circ\text{C}$	58	Amps
I_{C2}	Continuous Collector Current @ $T_C = 90^\circ\text{C}$	30	
I_{CM}	Pulsed Collector Current ^① @ $T_C = 25^\circ\text{C}$	110	
I_{LM}	RBSOA Clamped Inductive Load Current @ $R_g = 11\Omega$ $T_C = 125^\circ\text{C}$	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	$^\circ\text{C}$
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 ($V_{GE} = 0V, I_C = 0.25mA$)	600			Volts
$V_{GE(TH)}$	Gate Threshold Voltage ($V_{CE} = V_{GE}, I_C = 700\mu A, T_J = 25^\circ\text{C}$)	3	4	5	
$V_{CE(ON)}$	Collector-Emitter On Voltage ($V_{GE} = 15V, I_C = I_{C2}, T_J = 25^\circ\text{C}$)		2.0	2.5	
	Collector-Emitter On Voltage ($V_{GE} = 15V, I_C = I_{C2}, T_J = 125^\circ\text{C}$)		2.2	2.8	
I_{CES}	Collector Cut-off Current ($V_{CE} = V_{CES}, V_{GE} = 0V, T_J = 25^\circ\text{C}$)			40	μA
	Collector Cut-off Current ($V_{CE} = V_{CES}, V_{GE} = 0V, T_J = 125^\circ\text{C}$)			1000	
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

APT30GT60KR

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{ies}	Input Capacitance	Capacitance $V_{GE} = 0V$ $V_{CE} = 25V$ $f = 1\text{ MHz}$		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) $V_{GE} = 15V$ $V_{CC} = 0.5V_{CES}$ $I_C = I_{C2}$ $R_G = 10\Omega$		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) $V_{CLAMP(Peak)} = 0.66V_{CES}$ $V_{GE} = 15V$ $I_C = I_{C2}$ $R_G = 10\Omega$ $T_J = +150^\circ C$		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	$R_G = 10\Omega$ $T_J = +150^\circ C$		.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) $V_{CLAMP(Peak)} = 0.66V_{CES}$ $V_{GE} = 15V$ $I_C = I_{C2}$ $R_G = 10\Omega$ $T_J = +25^\circ C$		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
g_{fe}	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			80	
W_T	Package Weight		0.07		oz
			1.9		gm
Torque	Mounting Torque (using a 6-32 or 3mm Binding Head Machine Screw)			10	lb•in
				1.1	N•m

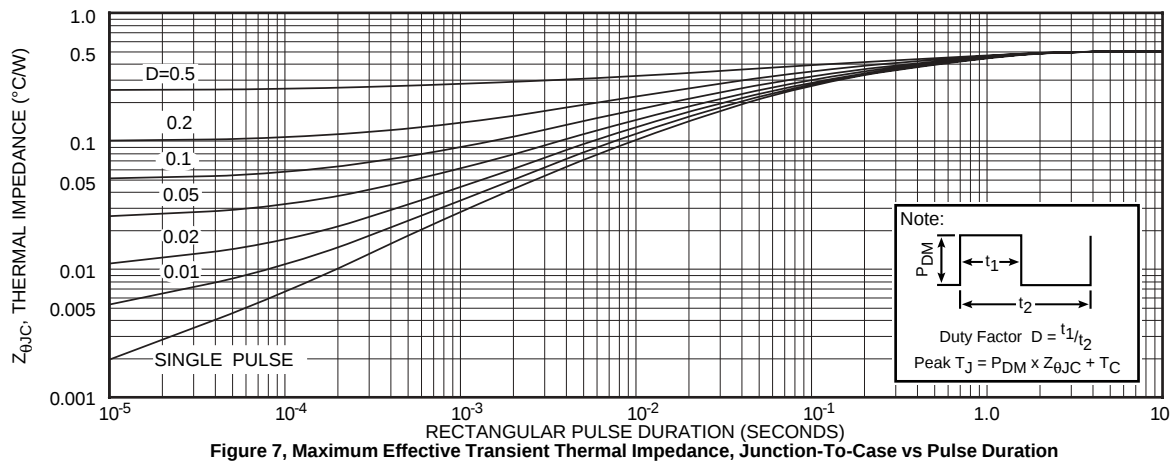
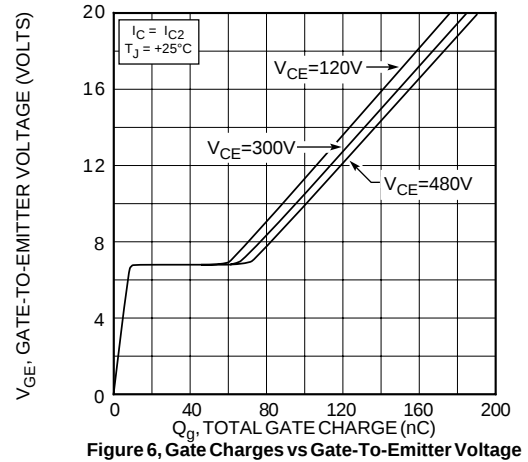
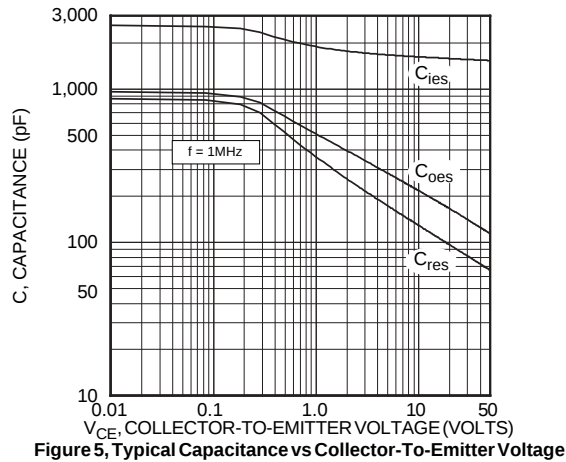
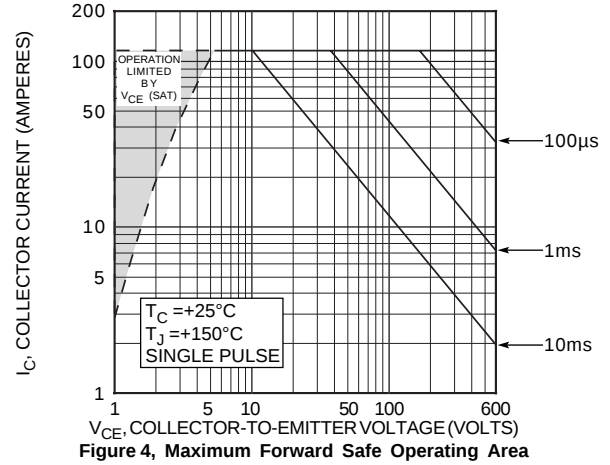
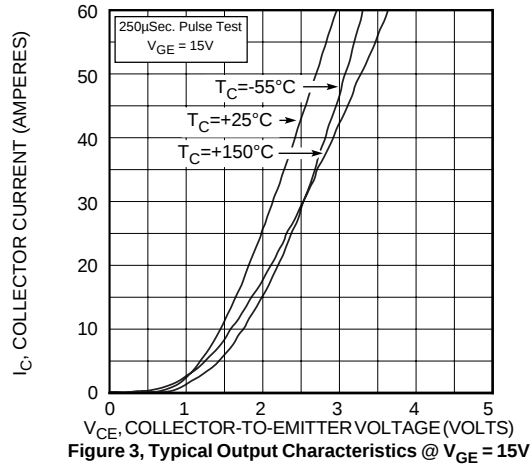
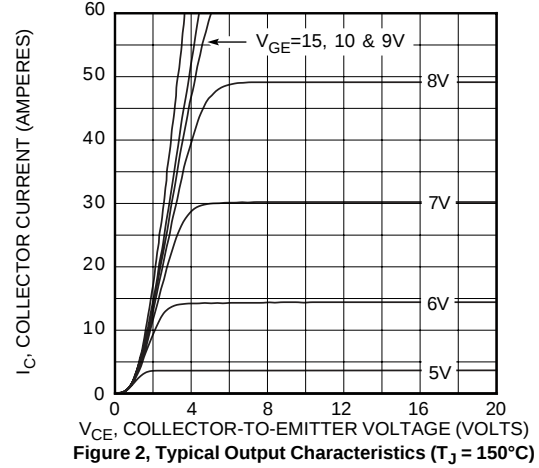
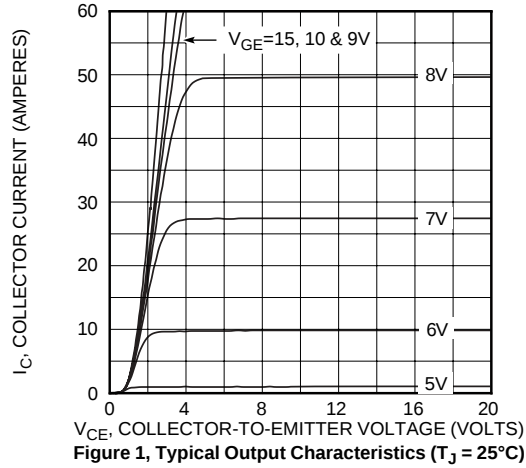
① Repetitive Rating: Pulse width limited by maximum junction temperature.

② $I_C = I_{C2}, V_{CC} = 50V, R_{GE} = 25\Omega, L = 144\mu H, T_J = 25^\circ C$

③ See MIL-STD-750 Method 3471

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

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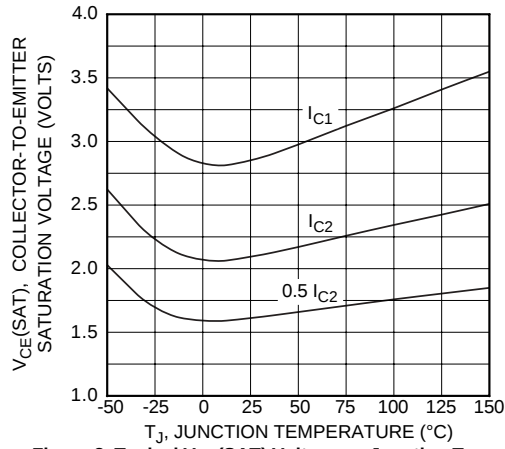


Figure 8, Typical $V_{CE(SAT)}$ Voltage vs Junction Temperature

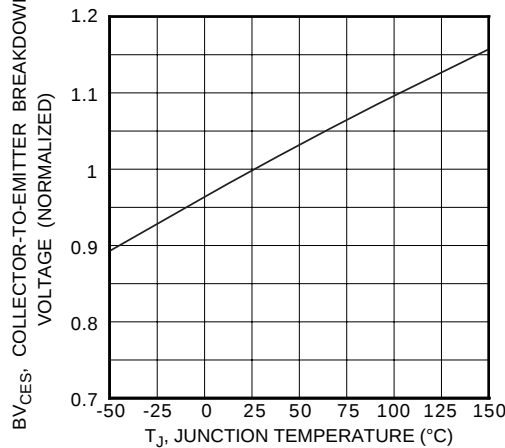


Figure 10, Breakdown Voltage vs Junction Temperature

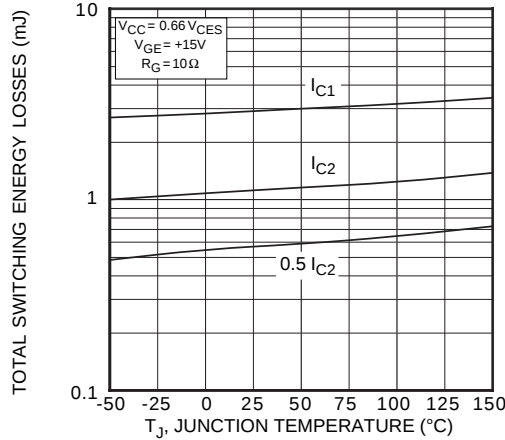


Figure 12, Typical Switching Energy Losses vs. Junction Temperature

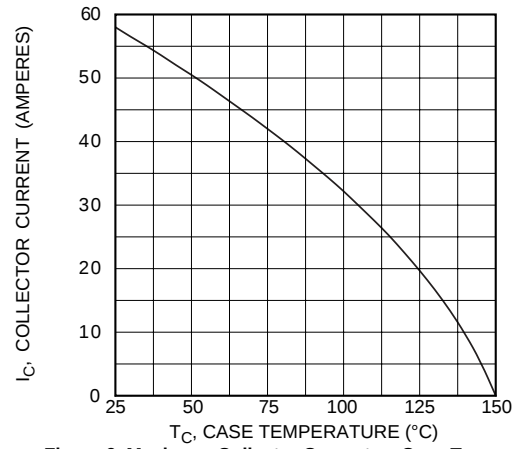


Figure 9, Maximum Collector Current vs Case Temperature

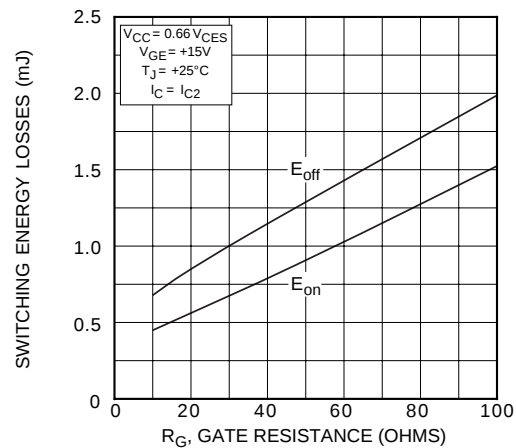


Figure 11, Typical Switching Energy Losses vs Gate Resistance

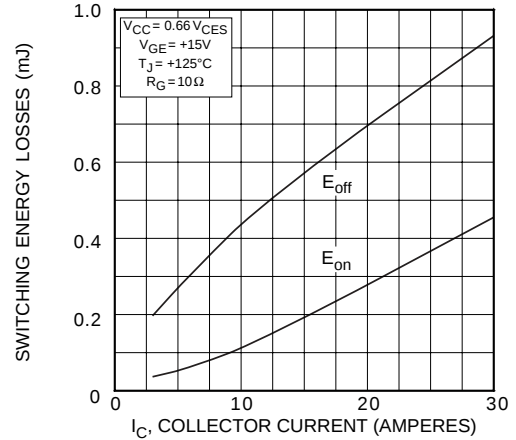


Figure 13, Typical Switching Energy Losses vs Collector Current

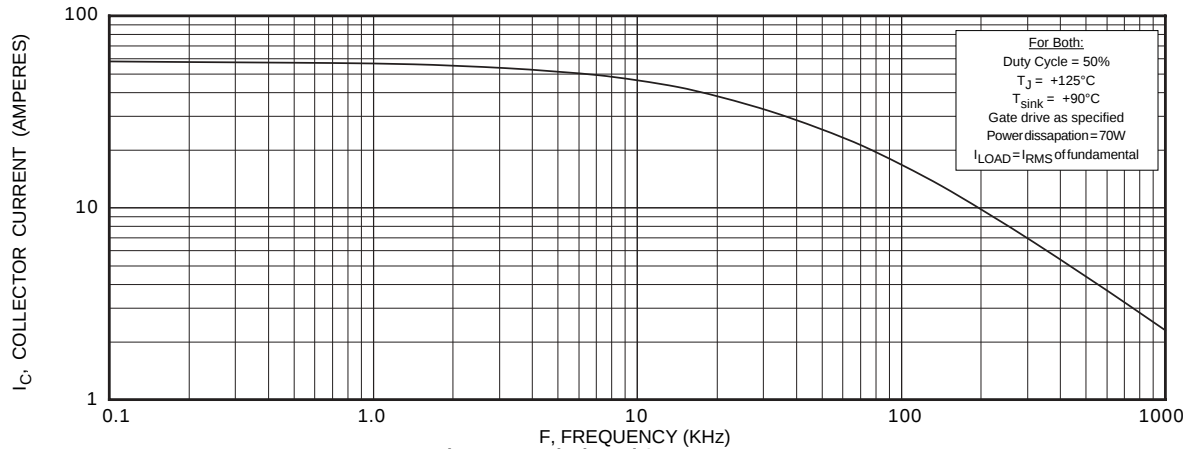


Figure 14, Typical Load Current vs Frequency

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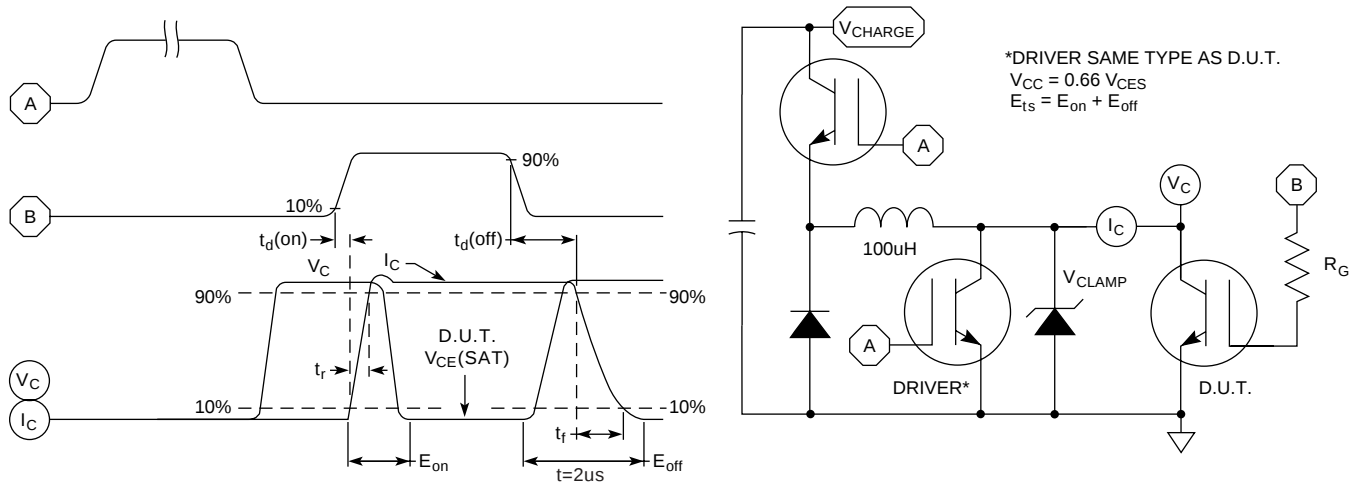


Figure 15, Switching Loss Test Circuit and Waveforms

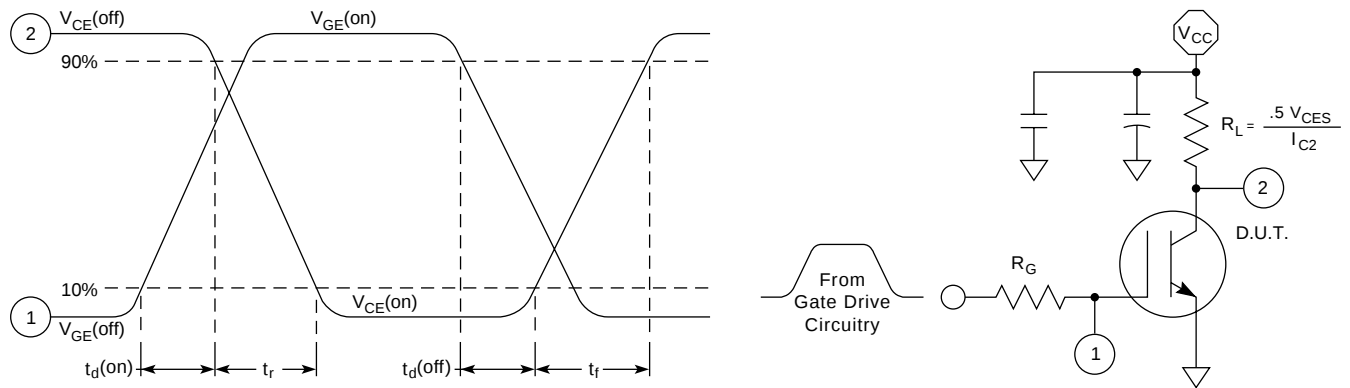
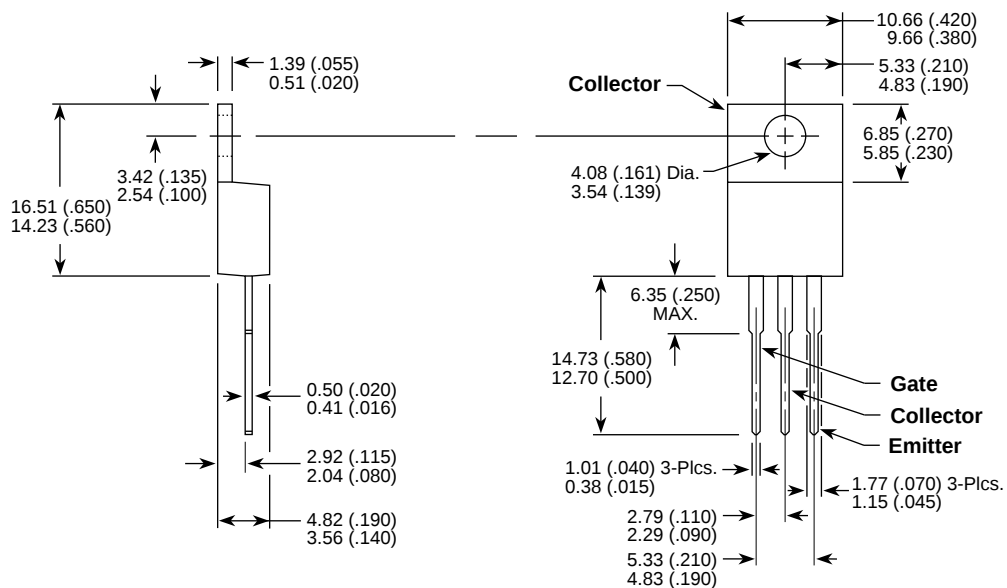


Figure 16, Resistive Switching Time Test Circuit and Waveforms

TO-220AC Package Outline



Dimensions in Millimeters and (Inches)