

DYNAMIC CHARACTERISTICS

APT20GN60K(G)

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{ies}	Input Capacitance	Capacitance $V_{GE} = 0V, V_{CE} = 25V$ $f = 1 \text{ MHz}$		1110		pF
C_{oes}	Output Capacitance			50		
C_{res}	Reverse Transfer Capacitance			35		
V_{GEP}	Gate-to-Emitter Plateau Voltage	Gate Charge $V_{GE} = 15V$ $V_{CE} = 300V$ $I_C = 20A$		9.5		V
Q_g	Total Gate Charge ^③			120		nC
Q_{ge}	Gate-Emitter Charge			10		
Q_{gc}	Gate-Collector ("Miller") Charge			70		
SSOA	Switching Safe Operating Area	$T_J = 175^\circ\text{C}, R_G = 4.3\Omega^{⑦}, V_{GE} = 15V, L = 100\mu\text{H}, V_{CE} = 600V$	60			A
SCSOA	Short Circuit Safe Operating Area	$V_{CC} = 360V, V_{GE} = 15V, T_J = 150^\circ\text{C}, R_G = 4.3\Omega^{⑦}$	6			μs
$t_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{CC} = 400V$ $V_{GE} = 15V$ $I_C = 20A$ $R_G = 4.3\Omega^{⑦}$ $T_J = +25^\circ\text{C}$		9		ns
t_r	Current Rise Time			10		
$t_{d(off)}$	Turn-off Delay Time			140		
t_f	Current Fall Time			95		
E_{on1}	Turn-on Switching Energy ^④			230		μJ
E_{on2}	Turn-on Switching Energy (Diode) ^⑤			260		
E_{off}	Turn-off Switching Energy ^⑥			580		
$t_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C) $V_{CC} = 400V$ $V_{GE} = 15V$ $I_C = 20A$ $R_G = 4.3\Omega^{⑦}$ $T_J = +125^\circ\text{C}$		9		ns
t_r	Current Rise Time			10		
$t_{d(off)}$	Turn-off Delay Time			160		
t_f	Current Fall Time			130		
E_{on1}	Turn-on Switching Energy ^④			250		μJ
E_{on2}	Turn-on Switching Energy (Diode) ^⑤			450		
E_{off}	Turn-off Switching Energy ^⑥			750		

THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case (IGBT)			1.1	$^\circ\text{C/W}$
$R_{\theta JC}$	Junction to Case (DIODE)			N/A	
W_T	Package Weight		1.2		gm

- ① Repetitive Rating: Pulse width limited by maximum junction temperature.
- ② For Combi devices, I_{ces} includes both IGBT and FRED leakages
- ③ See MIL-STD-750 Method 3471.
- ④ E_{on1} is the clamped inductive turn-on energy of the IGBT only, without the effect of a commutating diode reverse recovery current adding to the IGBT turn-on loss. Tested in inductive switching test circuit shown in figure 21, but with a Silicon Carbide diode.
- ⑤ E_{on2} is the clamped inductive turn-on energy that includes a commutating diode reverse recovery current in the IGBT turn-on switching loss. (See Figures 21, 22.)
- ⑥ E_{off} is the clamped inductive turn-off energy measured in accordance with JEDEC standard JESD24-1. (See Figures 21, 23.)
- ⑦ R_G is external gate resistance, not including $R_{G(int)}$ nor gate driver impedance. (MIC4452)

Microsemi reserves the right to change, without notice, the specifications and information contained herein.

TYPICAL PERFORMANCE CURVES

APT20GN60K(G)

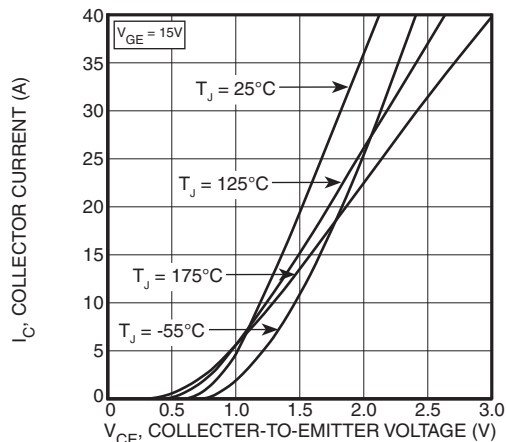


FIGURE 1, Output Characteristics($T_J = 25^\circ\text{C}$)

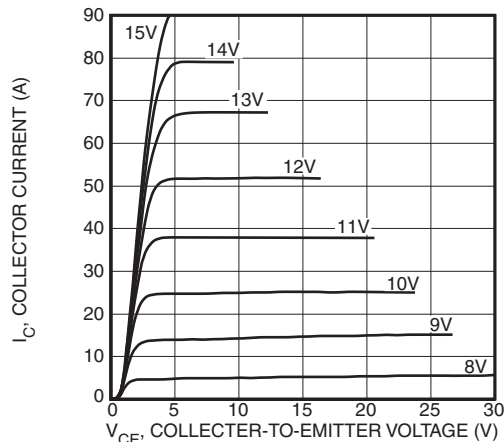


FIGURE 2, Output Characteristics ($T_J = 125^\circ\text{C}$)

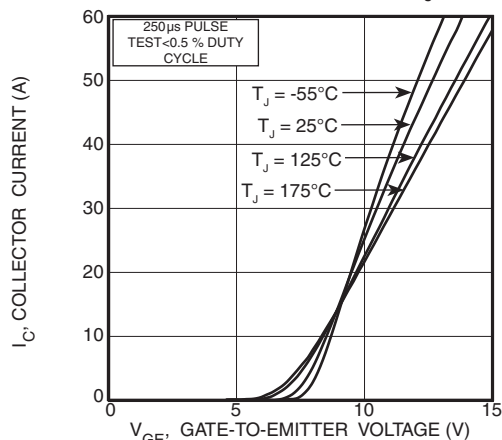


FIGURE 3, Transfer Characteristics

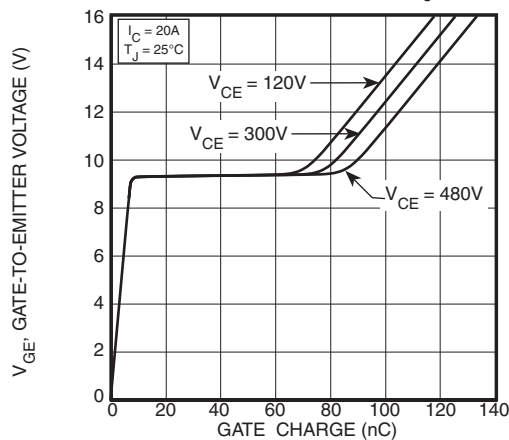


FIGURE 4, Gate Charge

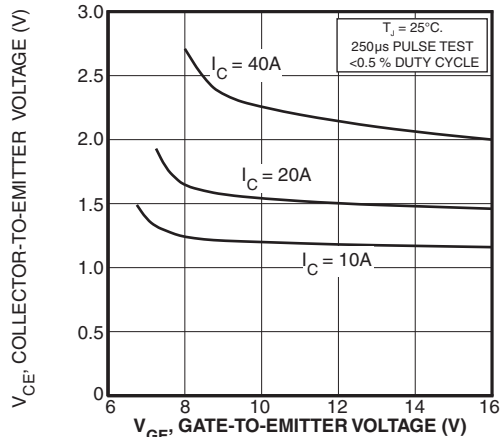


FIGURE 5, On State Voltage vs Gate-to-Emitter Voltage

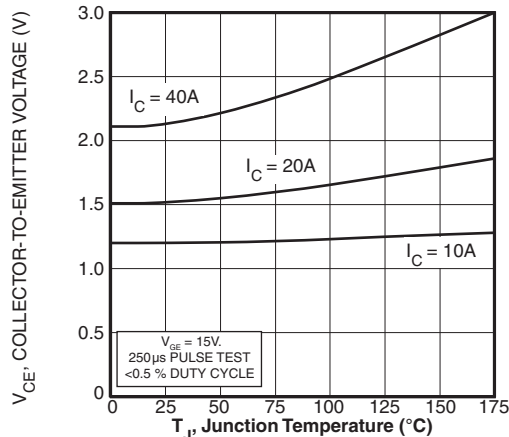


FIGURE 6, On State Voltage vs Junction Temperature

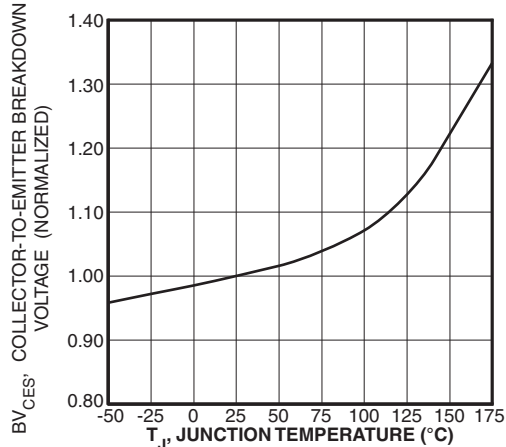


FIGURE 7, Breakdown Voltage vs. Junction Temperature

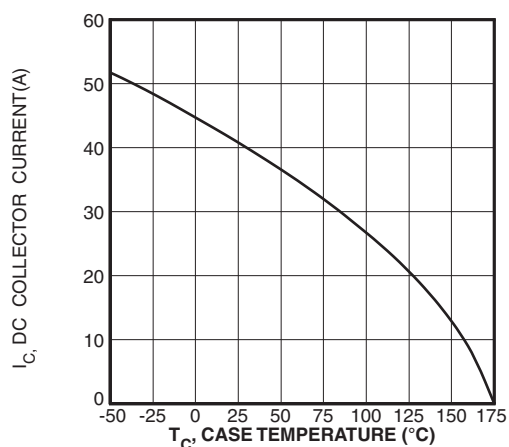


FIGURE 8, DC Collector Current vs Case Temperature

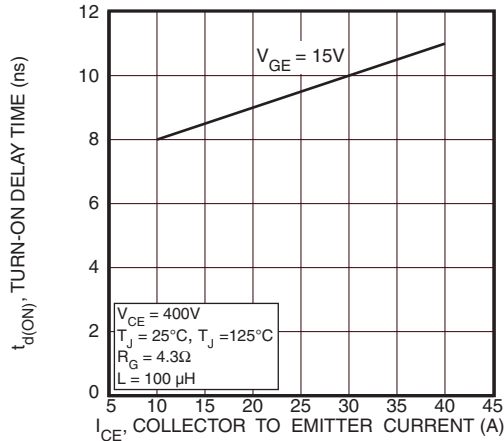


FIGURE 9, Turn-On Delay Time vs Collector Current

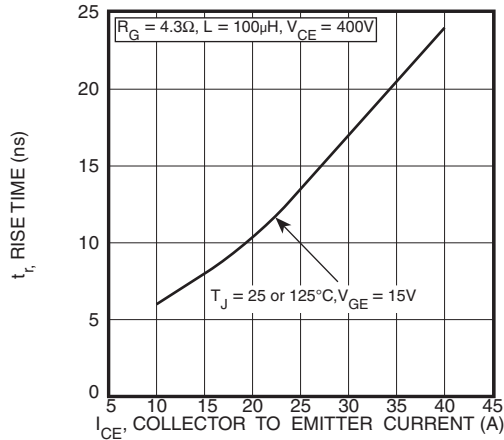


FIGURE 11, Current Rise Time vs Collector Current

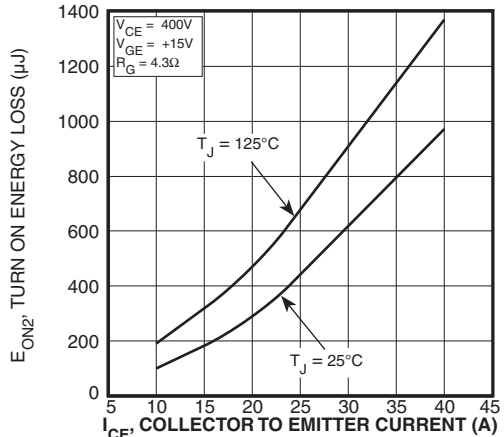


FIGURE 13, Turn-On Energy Loss vs Collector Current

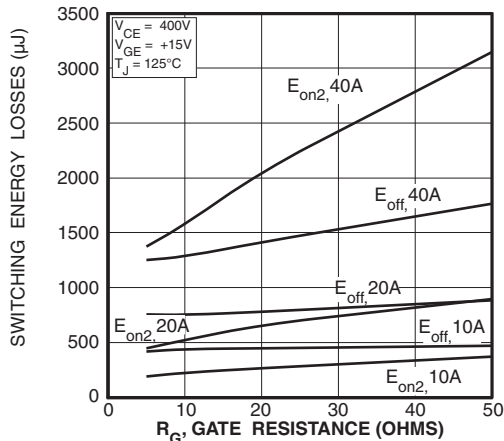


FIGURE 15, Switching Energy Losses vs. Gate Resistance

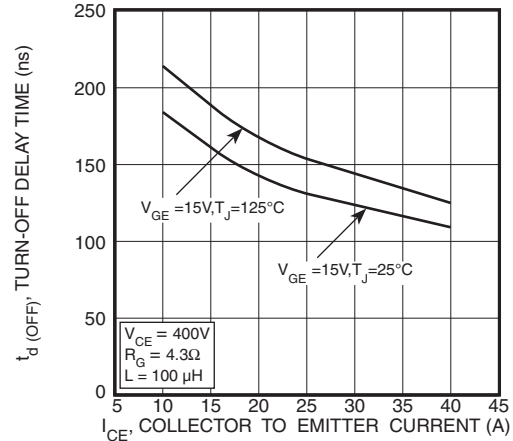


FIGURE 10, Turn-Off Delay Time vs Collector Current

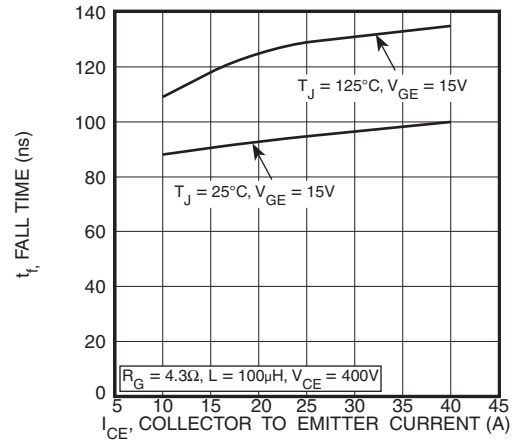


FIGURE 12, Current Fall Time vs Collector Current

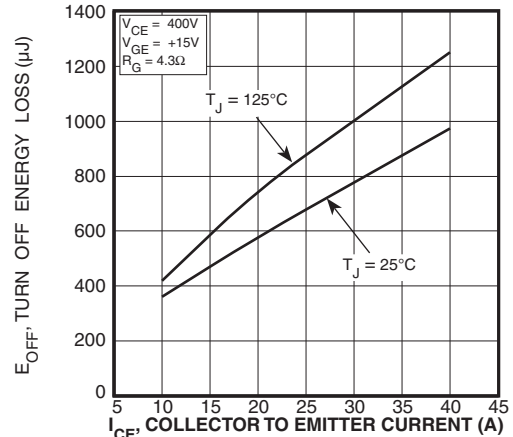


FIGURE 14, Turn Off Energy Loss vs Collector Current

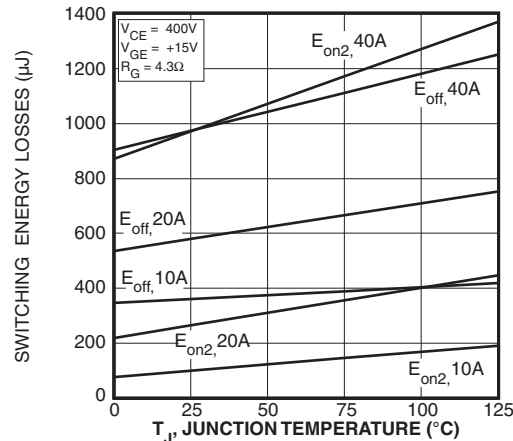


FIGURE 16, Switching Energy Losses vs Junction Temperature

TYPICAL PERFORMANCE CURVES

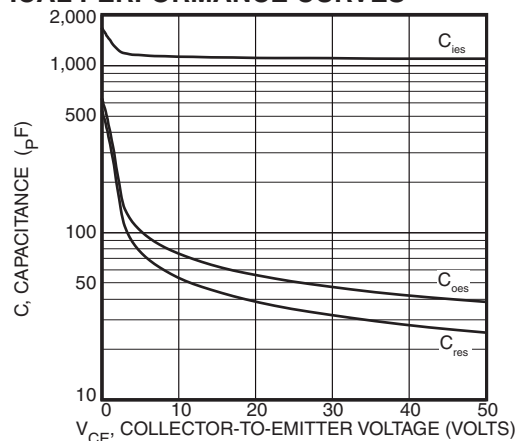


Figure 17, Capacitance vs Collector-To-Emitter Voltage

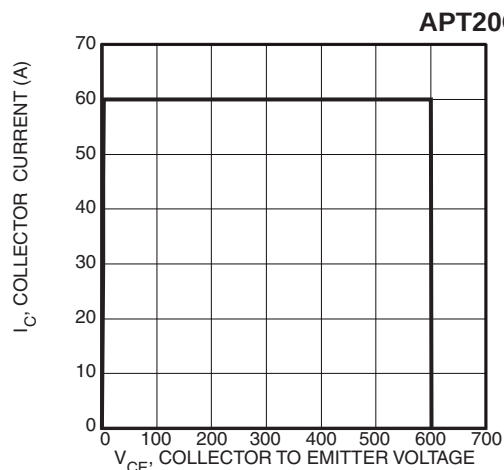


Figure 18, Minimum Switching Safe Operating Area

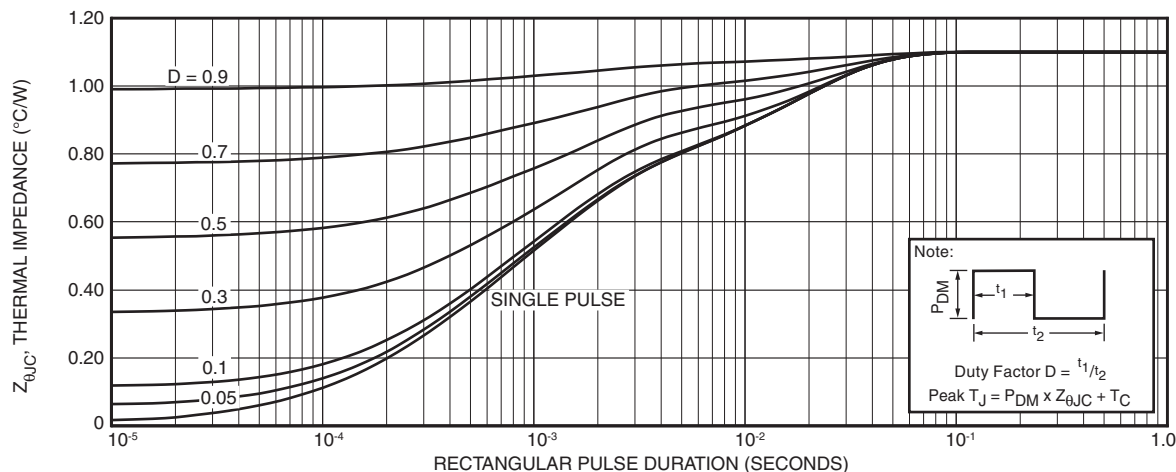


Figure 19a, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

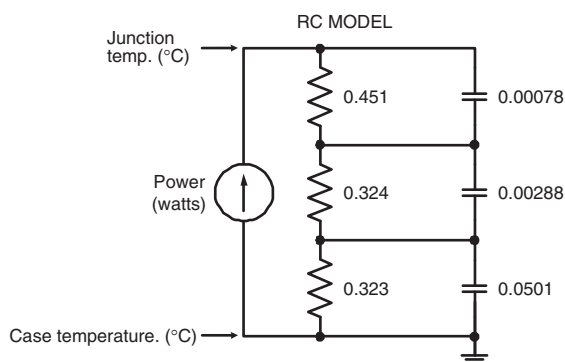


FIGURE 19b, TRANSIENT THERMAL IMPEDANCE MODEL

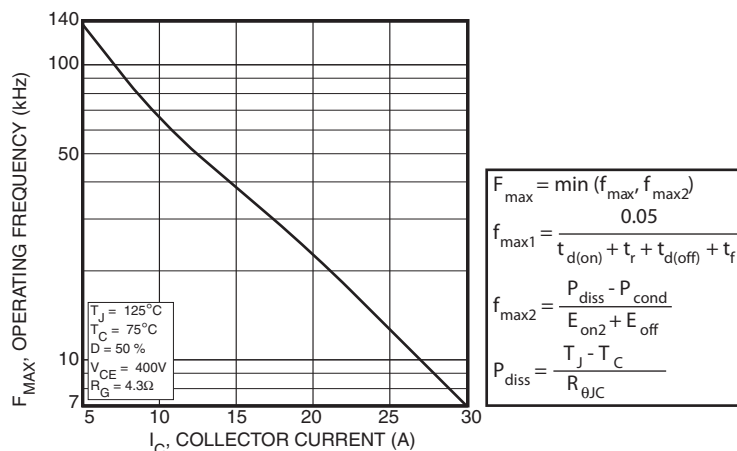


Figure 20, Operating Frequency vs Collector Current

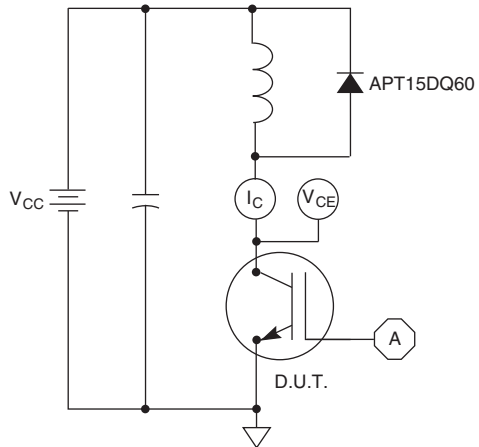


Figure 21, Inductive Switching Test Circuit

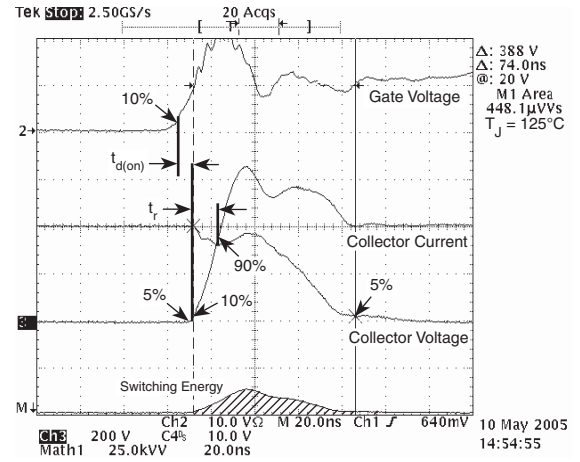


Figure 22, Turn-on Switching Waveforms and Definitions

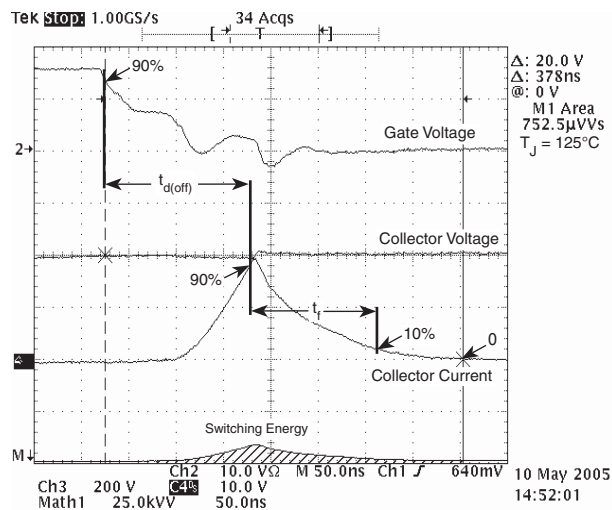
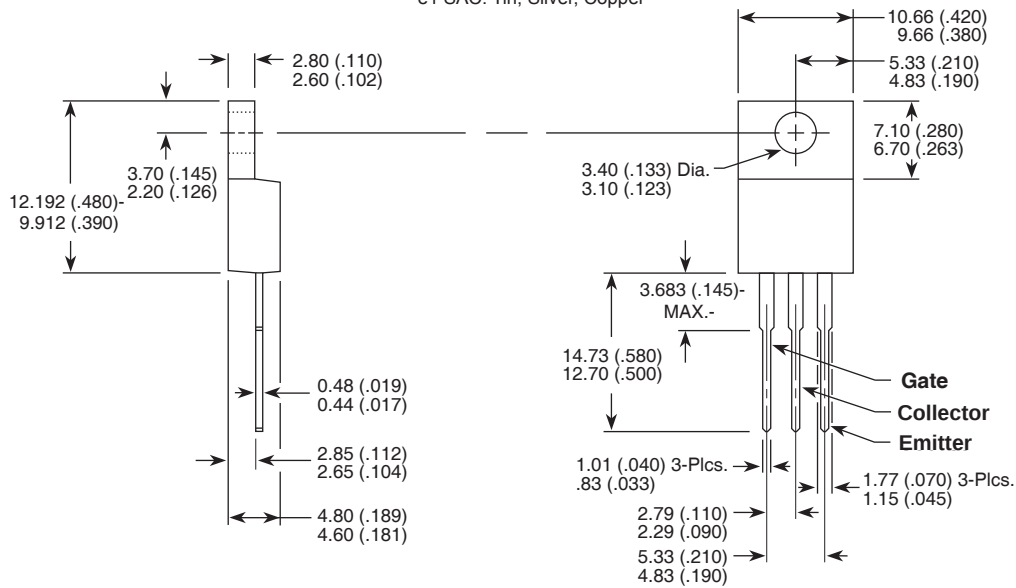


Figure 23, Turn-off Switching Waveforms and Definitions

TO-220 Package Outline

e1 SAC: Tin, Silver, Copper



Dimensions in Millimeters and (Inches)

Microsemi's products are covered by one or more of U.S. patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 6,939,743, 7,352,045 5,283,201 5,801,417 5,648,283 7,196,634 6,664,594 7,157,886 6,939,743 7,342,262 and foreign patents. US and Foreign patents pending. All Rights Reserved.