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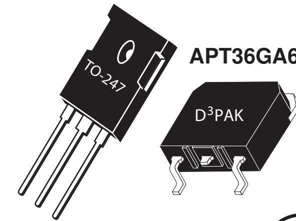
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

APT36GA60B
APT36GA60S

600V

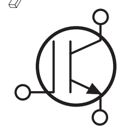
High Speed PT IGBT

POWER MOS 8® is a high speed Punch-Through switch-mode IGBT. Low E_{off} is achieved through leading technology silicon design and lifetime control processes. A reduced E_{off} - $V_{CE(ON)}$ tradeoff results in superior efficiency compared to other IGBT technologies. Low gate charge and a greatly reduced ratio of C_{res}/C_{ies} provide excellent noise immunity, short delay times and simple gate drive. The intrinsic chip gate resistance and capacitance of the poly-silicone gate structure help control di/dt during switching, resulting in low EMI, even when switching at high frequency.



APT36GA60S

APT36GA60B



Single die IGBT

FEATURES

- **Fast switching with low EMI**
- **Very Low E_{off} for maximum efficiency**
- **Ultra low C_{res} for improved noise immunity**
- **Low conduction loss**
- **Low gate charge**
- **Increased intrinsic gate resistance for low EMI**
- **RoHS compliant**

TYPICAL APPLICATIONS

- **ZVS phase shifted and other full bridge**
- **Half bridge**
- **High power PFC boost**
- **Welding**
- **UPS, solar, and other inverters**
- **High frequency, high efficiency industrial**

Absolute Maximum Ratings

Symbol	Parameter	Ratings	Unit
V_{ces}	Collector Emitter Voltage	600	V
I_{C1}	Continuous Collector Current @ T_C = 25°C	65	A
I_{C2}	Continuous Collector Current @ T_C = 100°C	36	
I_{CM}	Pulsed Collector Current [1]	109	
V_{GE}	Gate-Emitter Voltage [2]	±30	V
P_D	Total Power Dissipation @ T_C = 25°C	290	W
SSOA	Switching Safe Operating Area @ T_J = 150°C	109A @ 600V	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150	°C
T_L	Lead Temperature for Soldering: 0.063" from Case for 10 Seconds	300	

Static Characteristics T_J = 25°C unless otherwise specified

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
$V_{BR(CES)}$	Collector-Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 1.0mA		600			V
$V_{CE(on)}$	Collector-Emitter On Voltage	V_{GE} = 15V, I_C = 20A	T_J = 25°C		2.0	2.5	
			T_J = 125°C		1.9		
$V_{GE(th)}$	Gate Emitter Threshold Voltage	V_{GE} = V_{CE} , I_C = 1mA		3	4.5	6	
I_{CES}	Zero Gate Voltage Collector Current	V_{CE} = 600V, V_{GE} = 0V	T_J = 25°C			250	μA
			T_J = 125°C			2500	
I_{GES}	Gate-Emitter Leakage Current	V_{GS} = ±30V				±100	nA

Thermal and Mechanical Characteristics

Symbol	Characteristic	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction to Case Thermal Resistance	-	-	0.43	°C/W
W_T	Package Weight	-	5.9	-	g
Torque	Mounting Torque (TO-247 Package), 4-40 or M3 screw			10	in·lbf

052-6327 Rev C 5 - 2011

Dynamic Characteristics T_J = 25°C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	Capacitance		2880		pF
C_{oes}	Output Capacitance	V_{GE} = 0V, V_{CE} = 25V		226		
C_{res}	Reverse Transfer Capacitance	f = 1MHz		328		
Q_g	Total Gate Charge	Gate Charge		102		nC
Q_{ge}	Gate-Emitter Charge	V_{GE} = 15V		18		
Q_{gc}	Gate- Collector Charge	V_{CE}= 300V I_C = 20A		34		
SSOA	Switching Safe Operating Area	T_J = 150°C, R_G = 10Ω[4], V_{GE} = 15V, L= 100uH, V_{CE} = 600V	109			A
$t_{d(on)}$	Turn-On Delay Time	Inductive Switching (25°C)		16		ns
t_r	Current Rise Time	V_{CC} = 400V		14		
$t_{d(off)}$	Turn-Off Delay Time	V_{GE} = 15V		122		
t_f	Current Fall Time	I_C = 20A		77		
E_{on2}	Turn-On Switching Energy	R_G = 10Ω[4]		307		μJ
E_{off}[6]	Turn-Off Switching Energy	T_J = +25°C		254		
$t_{d(on}$	Turn-On Delay Time	Inductive Switching (125°C)		14		ns
t_r	Current Rise Time	V_{CC} = 400V		15		
$t_{d(off)}$	Turn-Off Delay Time	V_{GE} = 15V		149		
t_f	Current Fall Time	I_C = 20A		113		
E_{on2}	Turn-On Switching Energy	R_G = 10Ω[4]		508		μJ
E_{off}[6]	Turn-Off Switching Energy	T_J = +125°C		439		

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

2 Pulse test: Pulse Width < 380*μs*, duty cycle < 2%.

3 See Mil-Std-750 Method 3471

4 R_G is external gate resistance, not including internal gate resistance or gate driver impedance. (MIC4452)

5 E_{on2} is the clamped inductive turn on energy that includes a commutating diode reverse recovery current in the IGBT turn on energy loss. A combi device is used for the clamping diode.

6 E_{off} is the clamped inductive turn-off energy measured in accordance with JEDEC standard JESD24-1.

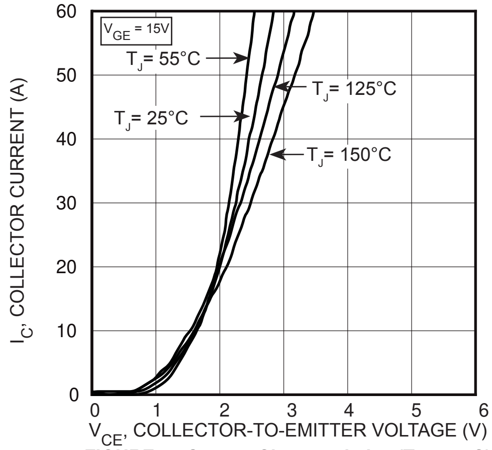


FIGURE 1, Output Characteristics (T_J = 25°C)

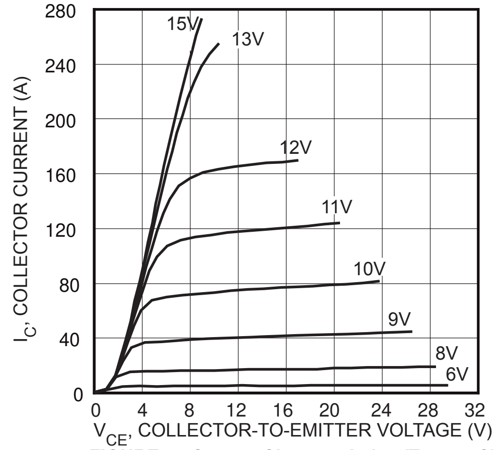


FIGURE 2, Output Characteristics (T_J = 25°C)

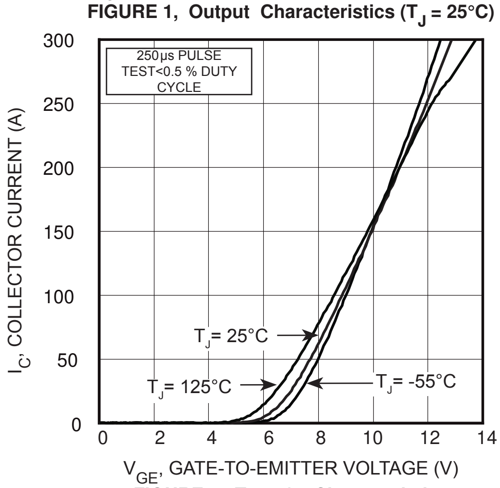


FIGURE 3, Transfer Characteristics

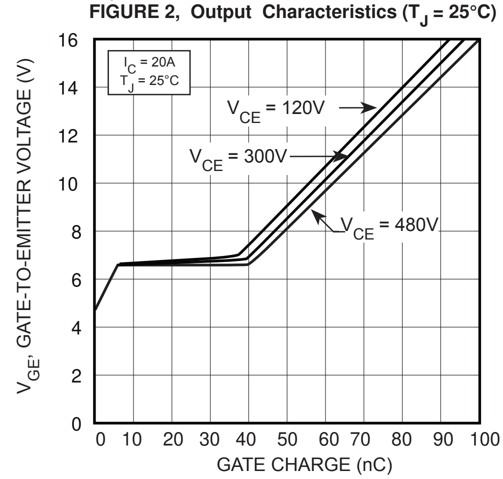


FIGURE 4, Gate charge

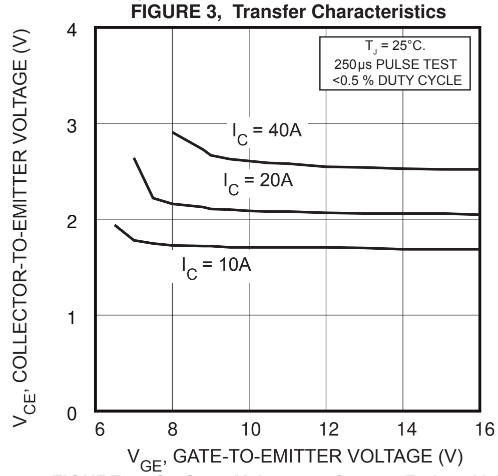


FIGURE 5, On State Voltage vs Gate-to-Emitter Voltage

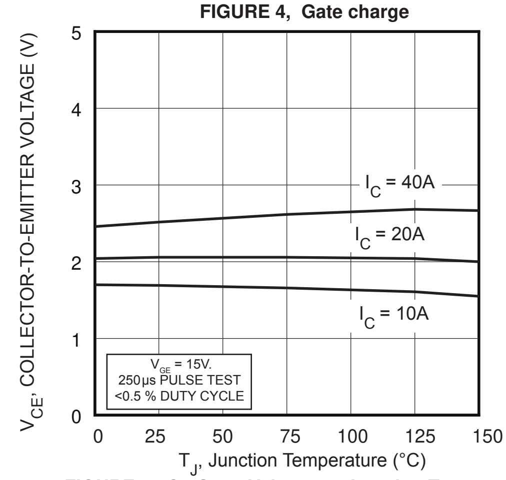


FIGURE 6, On State Voltage vs Junction Temperature

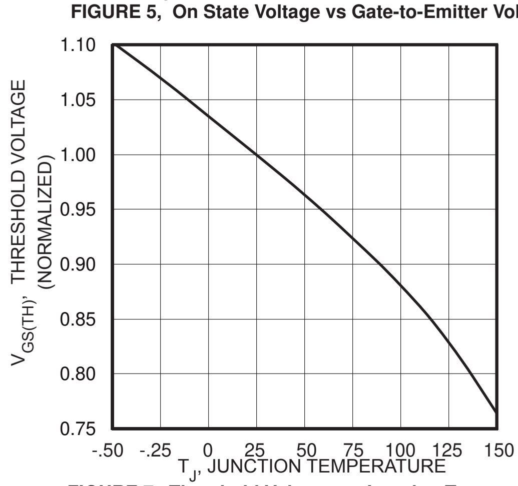


FIGURE 7, Threshold Voltage vs Junction Temperature

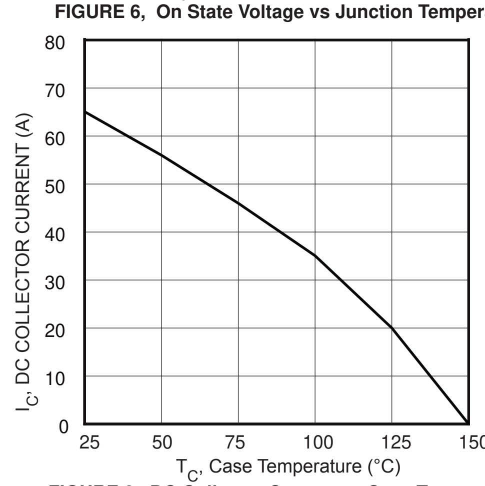


FIGURE 8, DC Collector Current vs Case Temperature

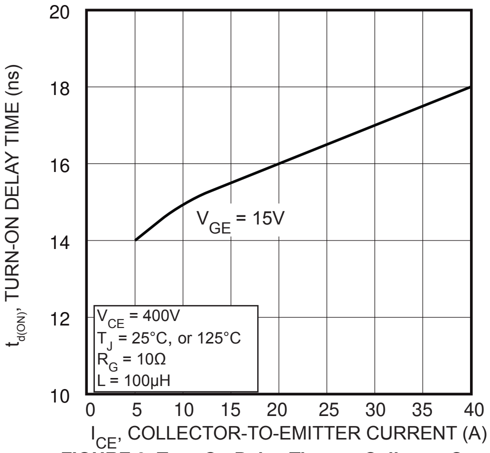


FIGURE 9, Turn-On Delay Time vs Collector Current

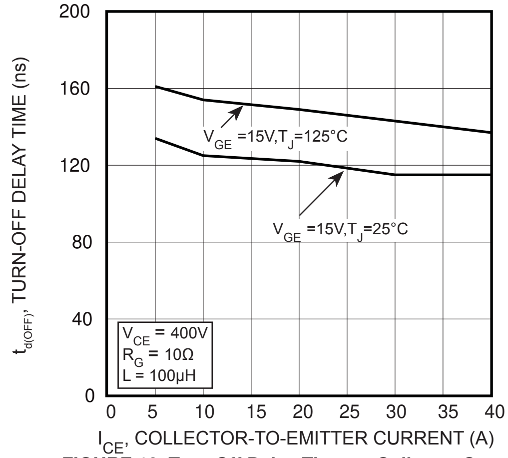


FIGURE 10, Turn-Off Delay Time vs Collector Current

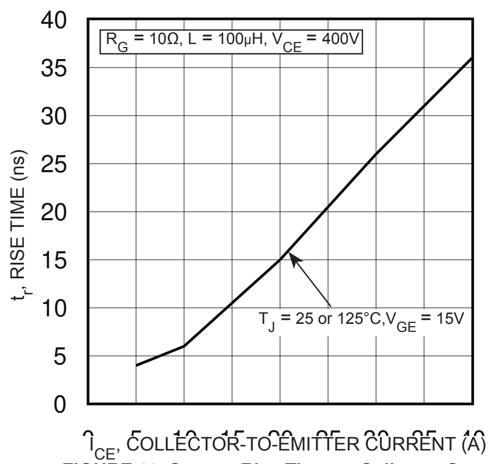


FIGURE 11, Current Rise Time vs Collector Current

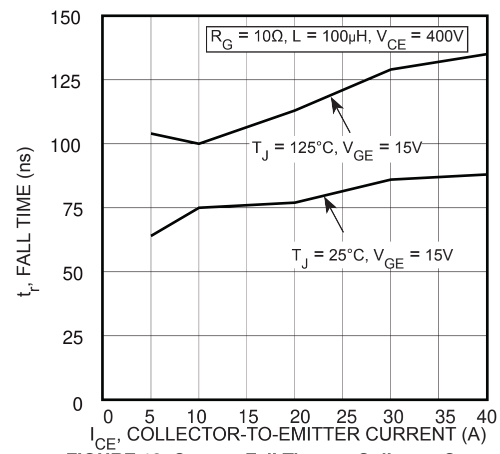


FIGURE 12, Current Fall Time vs Collector Current

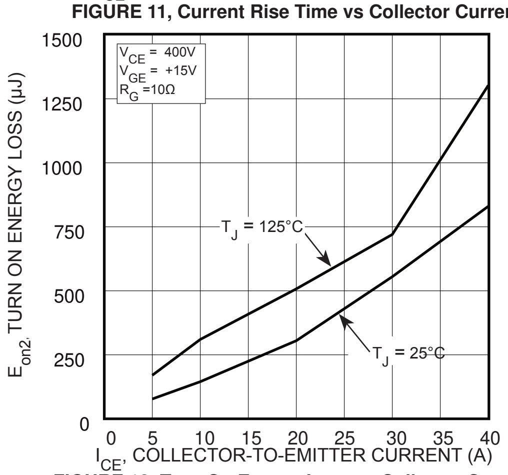


FIGURE 13, Turn-On Energy Loss vs Collector Current

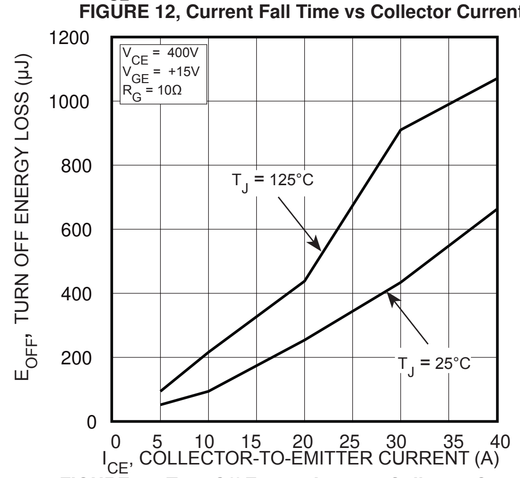


FIGURE 14, Turn-Off Energy Loss vs Collector Current

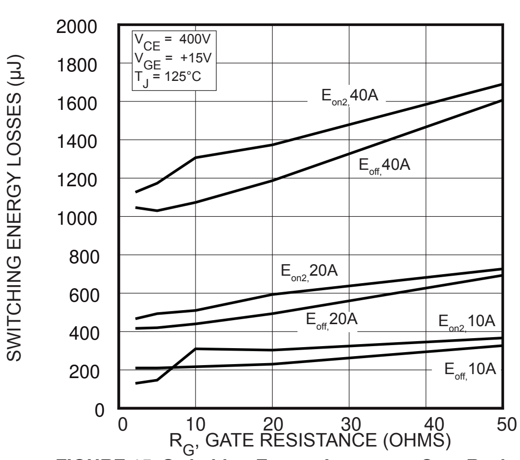


FIGURE 15, Switching Energy Losses vs Gate Resistance

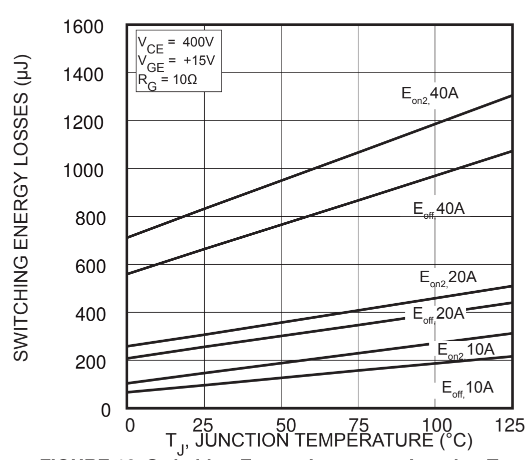


FIGURE 16, Switching Energy Losses vs Junction Temperature

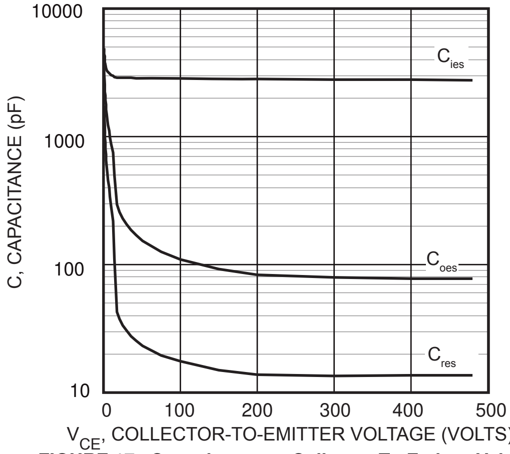


FIGURE 17, Capacitance vs Collector-To-Emitter Voltage

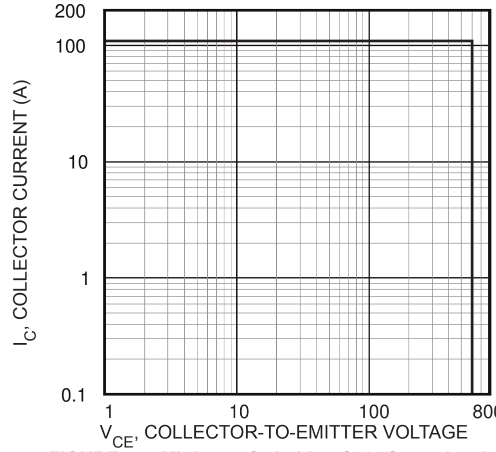


FIGURE 18, Minimum Switching Safe Operating Area

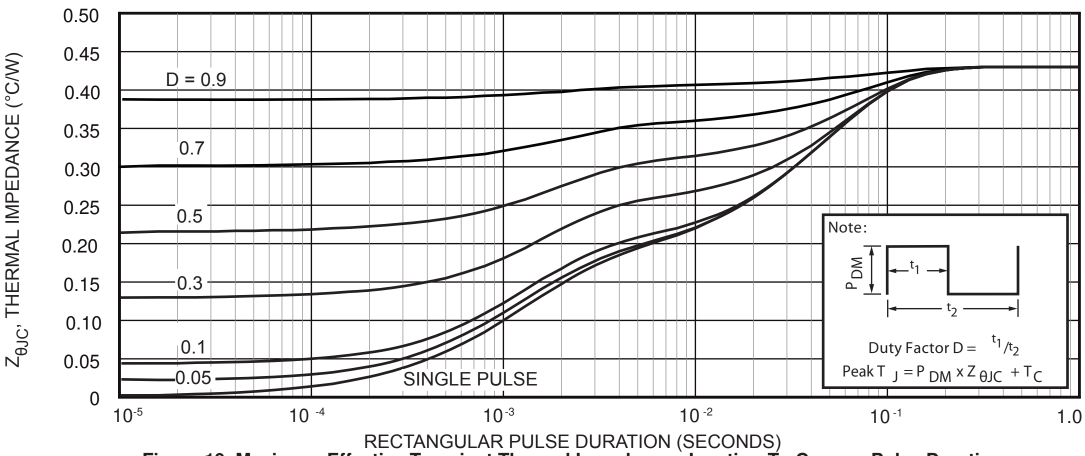


Figure 19, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

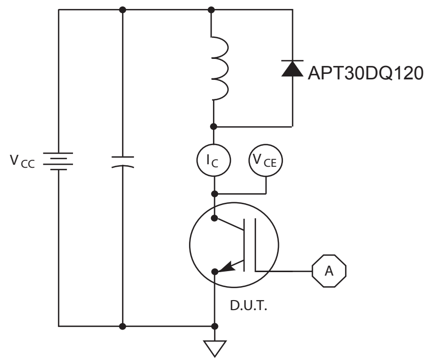


Figure 20, Inductive Switching Test Circuit

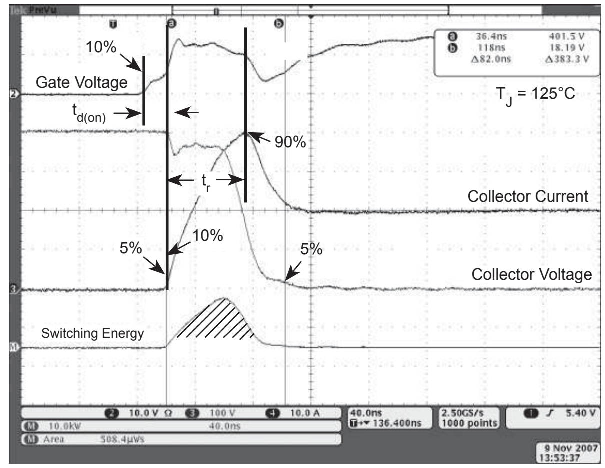


Figure 21, Turn-on Switching Waveforms and Definitions

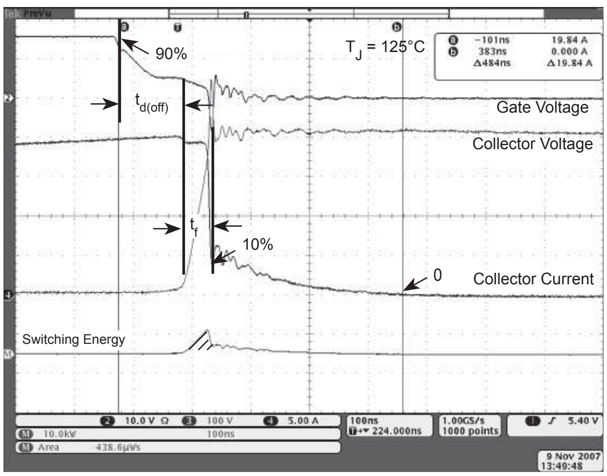
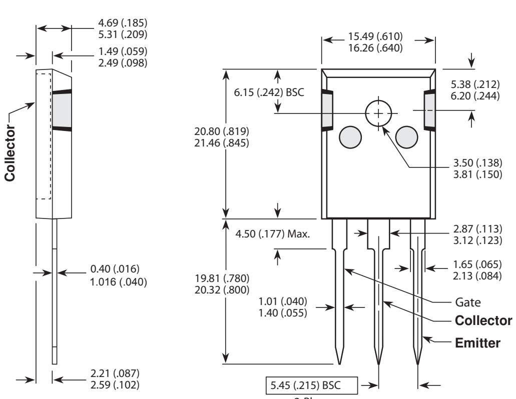


Figure 22, Turn-off Switching Waveforms and Definitions

TO-247 (B) Package Outline

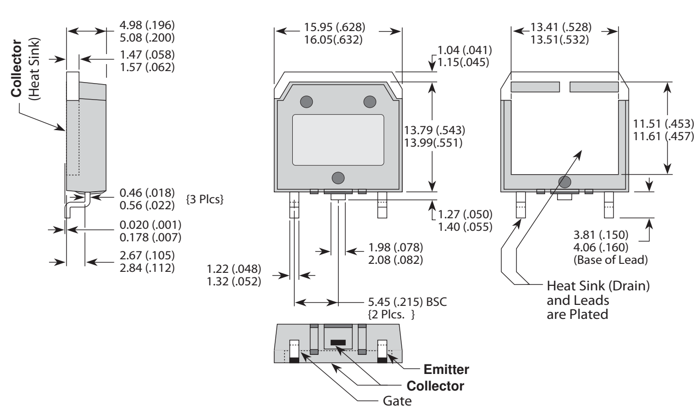
(e1) SAC: Tin, Silver, Copper



Dimensions in Millimeters (Inches)

D³PAK Package Outline

(e3) 100% Sn Plated



Dimensions in Millimeters (Inches)