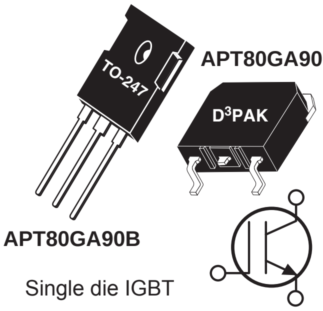
APT80GA90B
APT80GA90S

900V

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.



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	900	V
I_{C1}	Continuous Collector Current @ T_C = 25°C	145	A
I_{C2}	Continuous Collector Current @ T_C = 100°C	80	
I_{CM}	Pulsed Collector Current [1]	239	
V_{GE}	Gate-Emitter Voltage [2]	±30	V
P_D	Total Power Dissipation @ T_C = 25°C	625	W
SSOA	Switching Safe Operating Area @ T_J = 150°C	239A @ 900V	
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		900			V
$V_{CE(on)}$	Collector-Emitter On Voltage	V_{GE} = 15V, I_C = 47A	T_J = 25°C		2.5	3.1	
			T_J = 125°C		2.2		
$V_{GE(th)}$	Gate Emitter Threshold Voltage	V_{GE} =V_{CE} , I_C = 1mA		3	4.5	6	
I_{CES}	Zero Gate Voltage Collector Current	V_{CE} = 900V, V_{GE} = 0V	T_J = 25°C			250	μA
			T_J = 125°C			1000	
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	-	-	0.2	°C/W
W_T	Package Weight	-	5.9	-	g
Torque	Mounting Torque (TO-247 Package), 4-40 or M3 screw			10	in·lbf

Dynamic Characteristics T_J = 25°C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	Capacitance		4560		pF
C_{oes}	Output Capacitance	V_{GE} = 0V, V_{CE} = 25V		411		
C_{res}	Reverse Transfer Capacitance	f = 1MHz		62		
Q_g[3]	Total Gate Charge	Gate Charge		200		nC
Q_{ge}	Gate-Emitter Charge	V_{GE} = 15V		30		
Q_{gc}	Gate- Collector Charge	V_{CE}= 450V I_C = 47A		72		
SSOA	Switching Safe Operating Area	T_J = 150°C, R_G = 4.7Ω[4], V_{GE} = 15V, L= 100uH, V_{CE} = 900V	239			A
$t_{d(on)}$	Turn-On Delay Time	Inductive Switching (25°C)		18		ns
t_r	Current Rise Time	V_{CC} = 600V		29		
$t_{d(off)}$	Turn-Off Delay Time	V_{GE} = 15V		149		
t_f	Current Fall Time	I_C = 47A		85		
E_{on2}	Turn-On Switching Energy	R_G = 4.7Ω[4]		1652		μJ
E_{off}[6]	Turn-Off Switching Energy	T_J = +25°C		1389		
$t_{d(on}$	Turn-On Delay Time	Inductive Switching (125°C)		18		ns
t_r	Current Rise Time	V_{CC} = 600V		31		
$t_{d(off)}$	Turn-Off Delay Time	V_{GE} = 15V		192		
t_f	Current Fall Time	I_C = 47A		128		
E_{on2}	Turn-On Switching Energy	R_G = 4.7Ω[4]		2813		μJ
E_{off}[6]	Turn-Off Switching Energy	T_J = +125°C		2082		

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

2 Pulse test: Pulse Width < 380μs, 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.

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

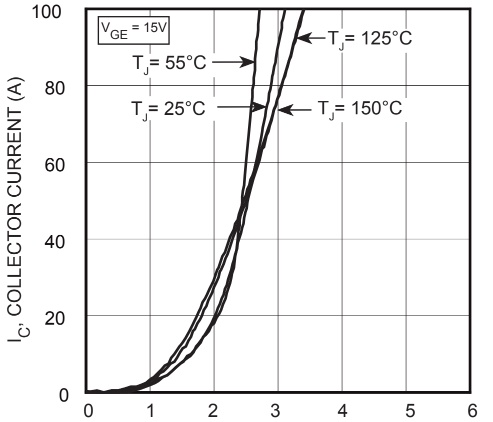


FIGURE 1, Output Characteristics (T_J = 25°C)

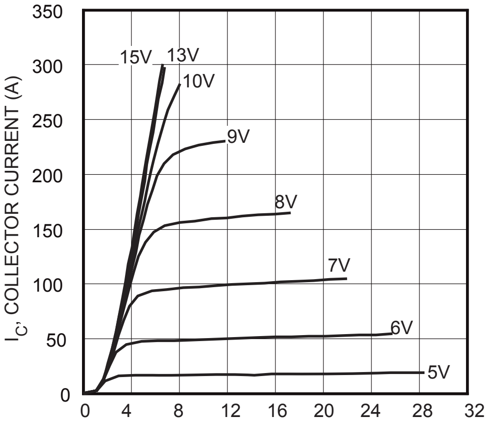


FIGURE 2, Output Characteristics (T_J = 25°C)

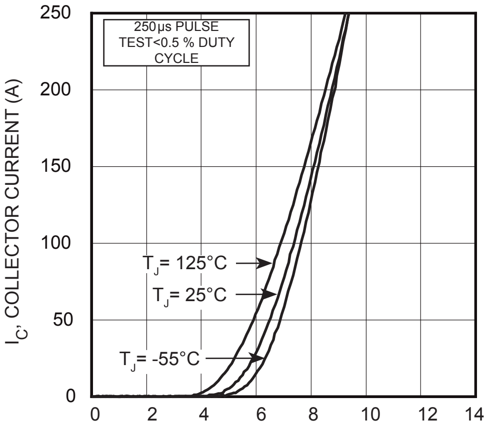


FIGURE 3, Transfer Characteristics

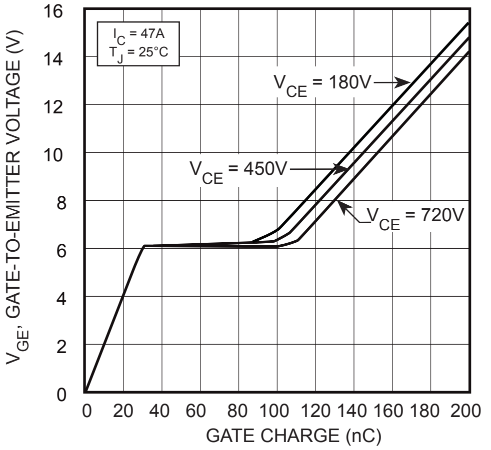


FIGURE 4, Gate charge

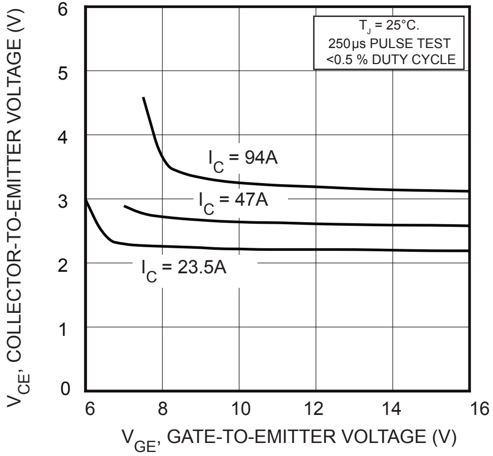


FIGURE 5, On State Voltage vs Gate-to-Emitter Voltage

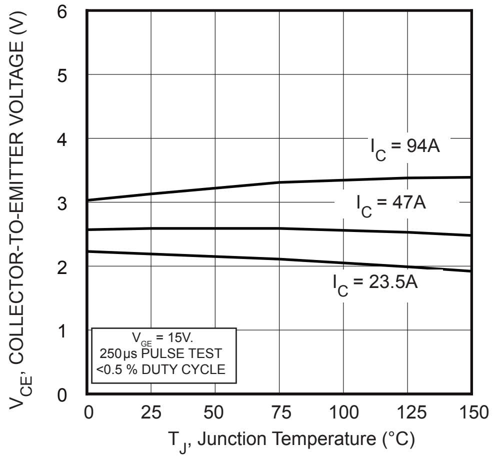


FIGURE 6, On State Voltage vs Junction Temperature

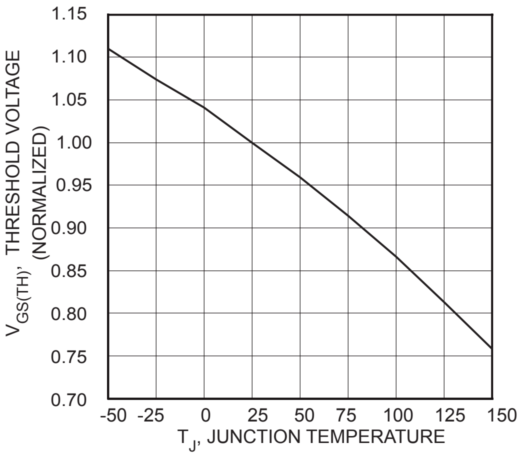


FIGURE 7, Threshold Voltage vs Junction Temperature

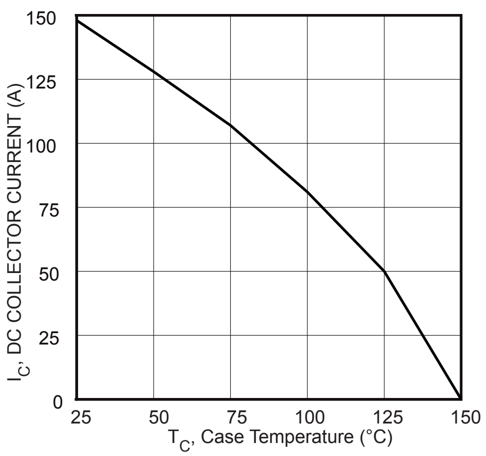


FIGURE 8, DC Collector Current vs Case Temperature

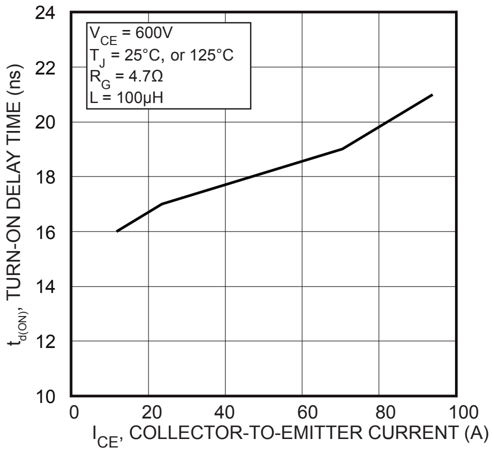


FIGURE 9, Turn-On Delay Time vs Collector Current

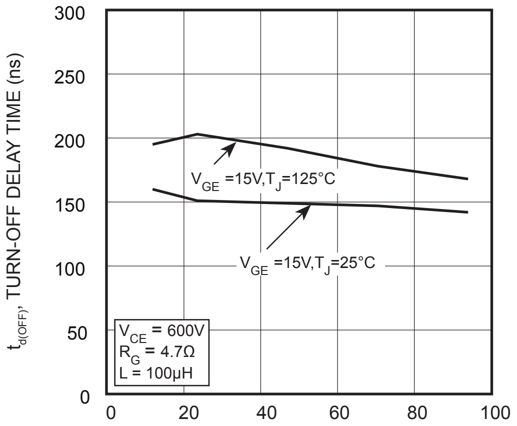


FIGURE 10, Turn-Off Delay Time vs Collector Current

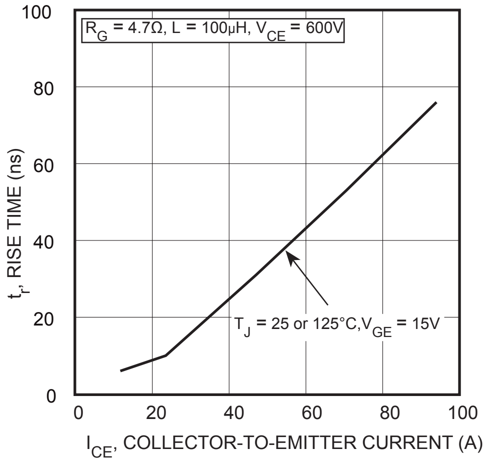


FIGURE 11, Current Rise Time vs Collector Current

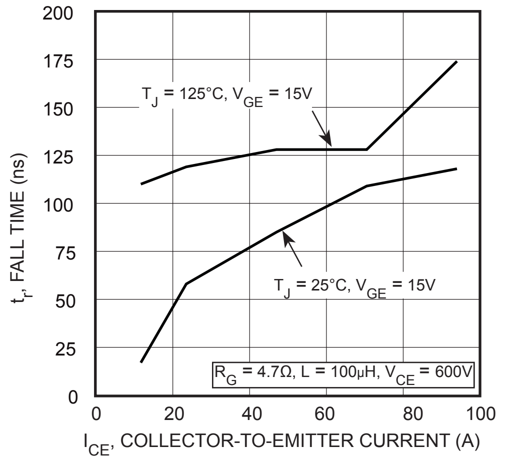


FIGURE 12, Current Fall Time vs Collector Current

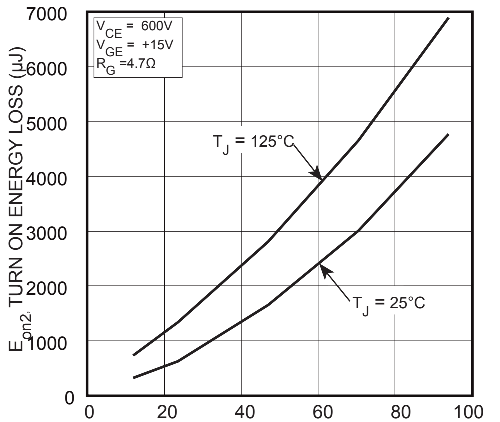


FIGURE 13, Turn-On Energy Loss vs Collector Current

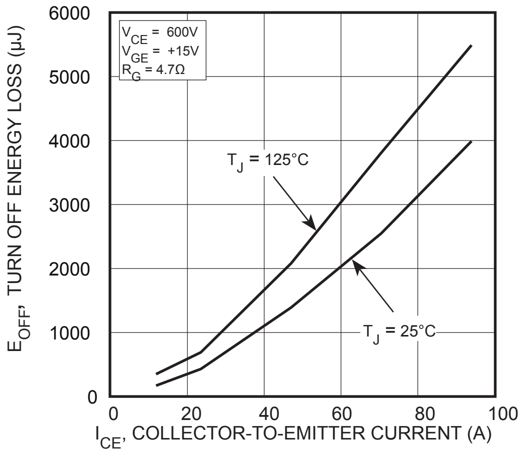


FIGURE 14, Turn-Off Energy Loss vs Collector Current

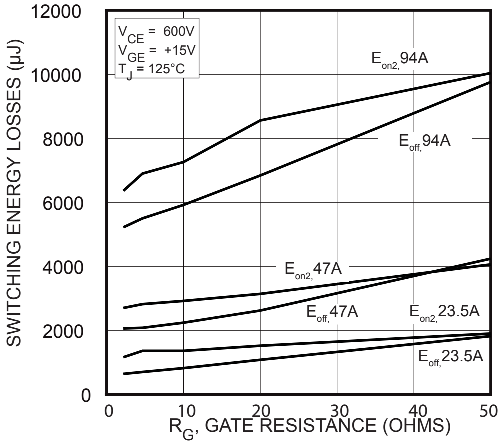


FIGURE 15, Switching Energy Losses vs Gate Resistance

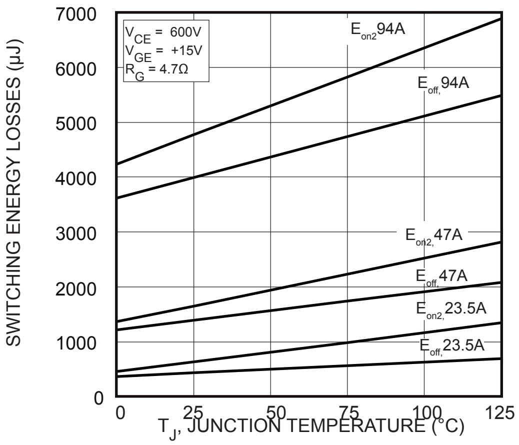


FIGURE 16, Switching Energy Losses vs Junction Temperature

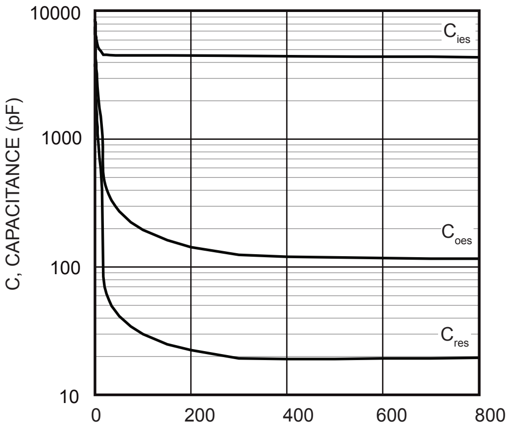


FIGURE 17, Capacitance vs Collector-To-Emitter Voltage

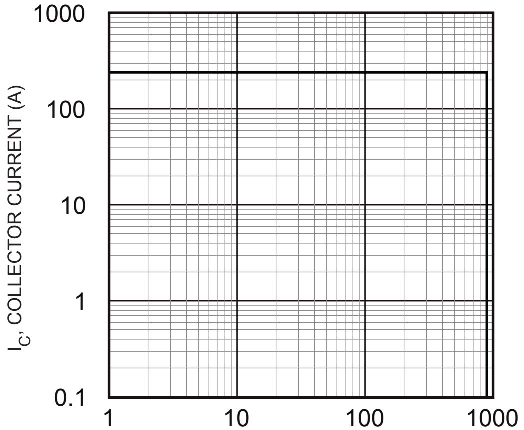


FIGURE 18, Minimum Switching Safe Operating Area

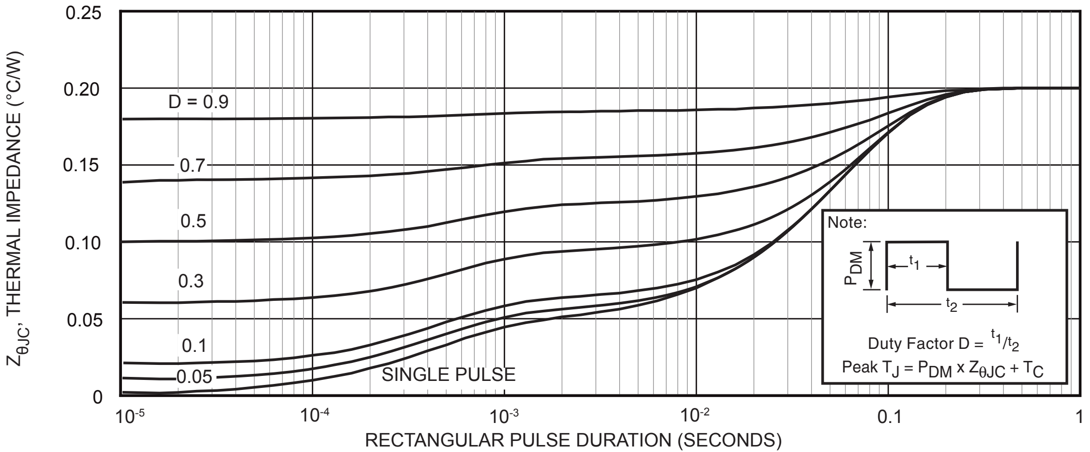
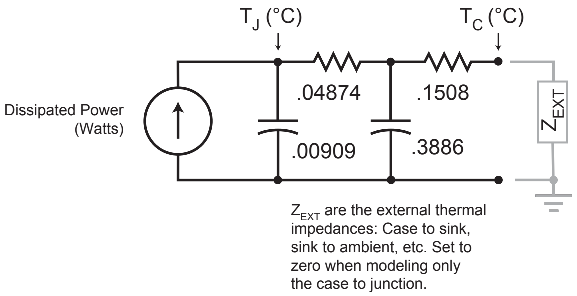


Figure 19a, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration



Z_{EXT} are the external thermal impedances: Case to sink, sink to ambient, etc. Set to zero when modeling only the case to junction.

FIGURE 19b, TRANSIENT THERMAL IMPEDANCE MODEL

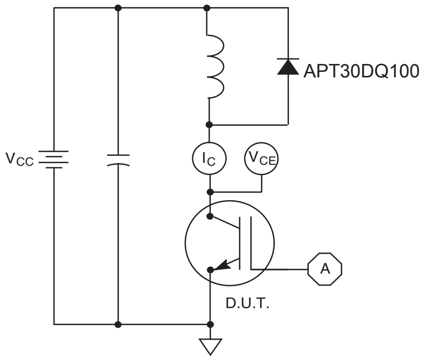


Figure 20, Inductive Switching Test Circuit

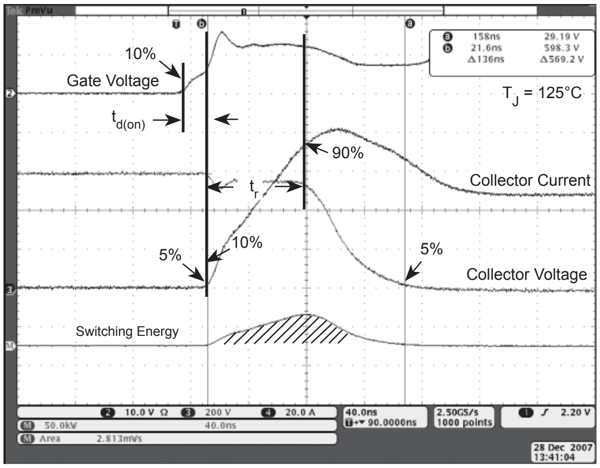


Figure 21, Turn-on Switching Waveforms and Definitions

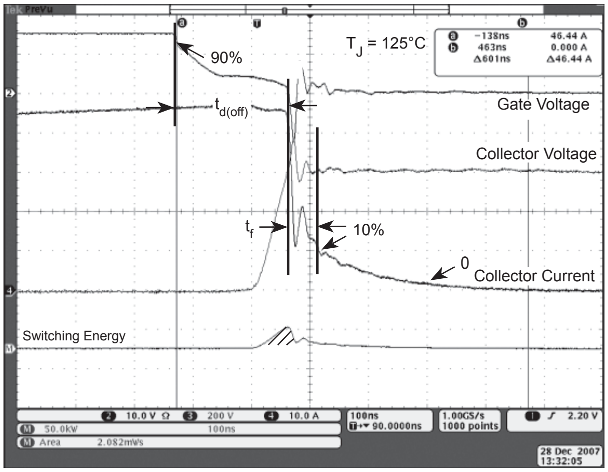
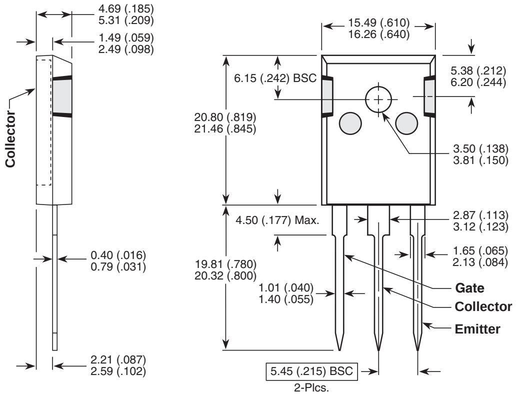


Figure 22, Turn-off Switching Waveforms and Definitions

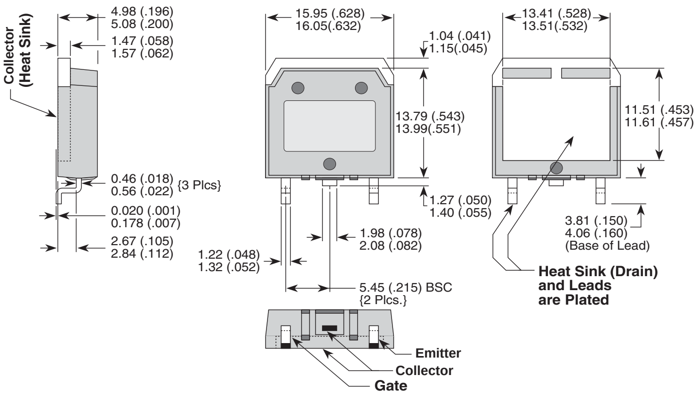
TO-247 (B) Package Outline

D³PAK Package Outline

e3 100% Sn Plated



Dimensions in Millimeters and (Inches)



Dimensions in Millimeters (Inches)

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