

DYNAMIC CHARACTERISTICS

APT65GP60B2

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{ies}	Input Capacitance	Capacitance $V_{GE} = 0V, V_{CE} = 25V$ $f = 1 \text{ MHz}$		7400		pF
C_{oes}	Output Capacitance			580		
C_{res}	Reverse Transfer Capacitance			35		
V_{GEP}	Gate-to-Emitter Plateau Voltage	Gate Charge $V_{GE} = 15V$ $V_{CE} = 300V$ $I_C = 65A$		7.5		V
Q_g	Total Gate Charge ^③			210		nC
Q_{ge}	Gate-Emitter Charge			50		
Q_{gc}	Gate-Collector ("Miller") Charge			65		
SSOA	Safe Operating Area	$T_J = 150^\circ C, R_G = 5\Omega, V_{GE} = 15V, L = 100\mu H, V_{CE} = 600V$	250			A
$t_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{CC} = 400V$ $V_{GE} = 15V$ $I_C = 65A$ $R_G = 5\Omega$ $T_J = +25^\circ C$		30		ns
t_r	Current Rise Time			54		
$t_{d(off)}$	Turn-off Delay Time			91		
t_f	Current Fall Time			65		
E_{on1}	Turn-on Switching Energy ^④			605		μJ
E_{on2}	Turn-on Switching Energy (Diode) ^⑤			1408		
E_{off}	Turn-off Switching Energy ^⑥			896		
$t_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C) $V_{CC} = 400V$ $V_{GE} = 15V$ $I_C = 65A$ $R_G = 5\Omega$ $T_J = +125^\circ C$		30		ns
t_r	Current Rise Time			54		
$t_{d(off)}$	Turn-off Delay Time			128		
t_f	Current Fall Time			91		
E_{on1}	Turn-on Switching Energy ^④			605		μJ
E_{on2}	Turn-on Switching Energy (Diode) ^⑤			1925		
E_{off}	Turn-off Switching Energy ^⑥			1470		

THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case (IGBT)			.15	°C/W
$R_{\theta JC}$	Junction to Case (DIODE)			N/A	
W_T	Package Weight			6.10	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. (See Figure 24.)

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. A Combi device is used for the clamping diode as shown in the E_{on2} test circuit. (See Figures 21, 22.)

⑥ E_{off} is the clamped inductive turn-off energy measured in accordance with JEDEC standard JEDS24-1. (See Figures 21, 23.)

⑦ Continuous current limited by package lead temperature.

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

TYPICAL PERFORMANCE CURVES

APT65GP60B2

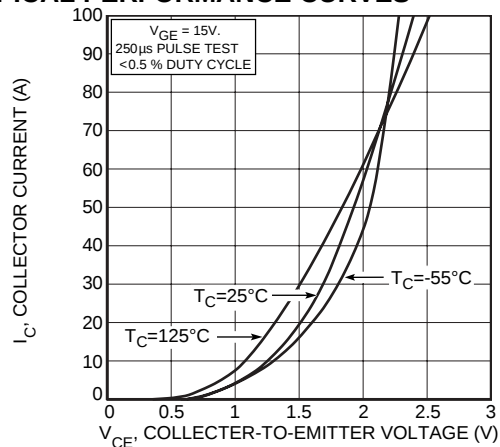


FIGURE 1, Output Characteristics ($V_{GE} = 15V$)

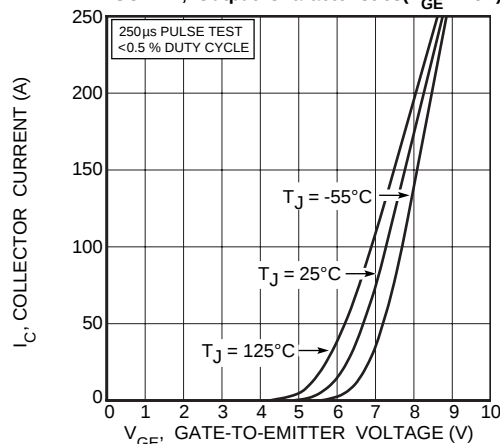


FIGURE 3, Transfer Characteristics

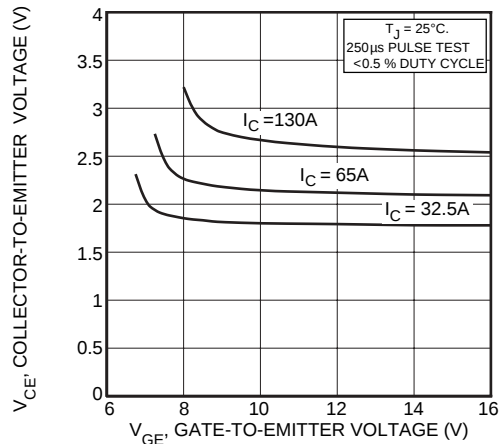


FIGURE 5, On State Voltage vs Gate-to-Emitter Voltage

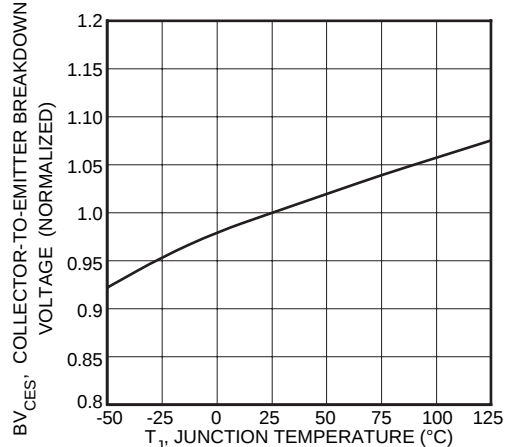


FIGURE 7, Breakdown Voltage vs. Junction Temperature

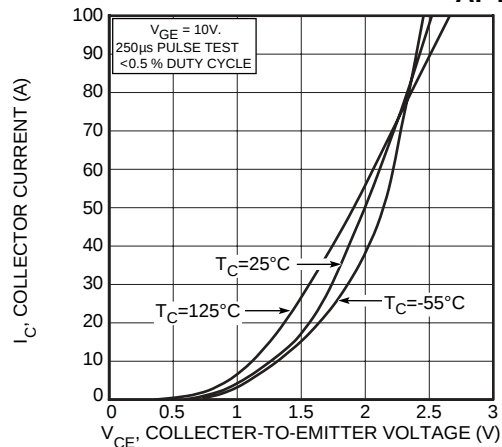


FIGURE 2, Output Characteristics ($V_{GE} = 10V$)

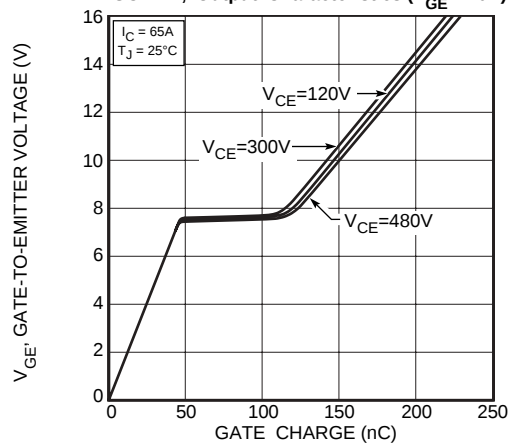


FIGURE 4, Gate Charge

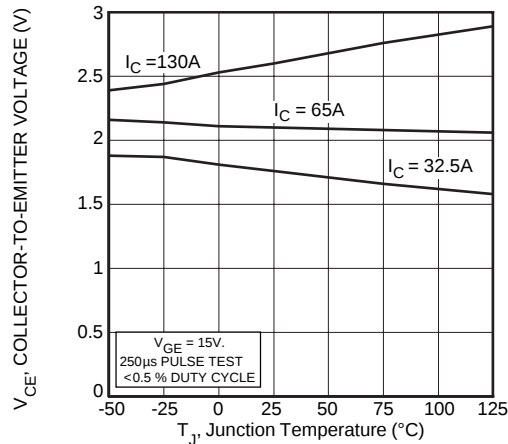


FIGURE 6, On State Voltage vs Junction Temperature

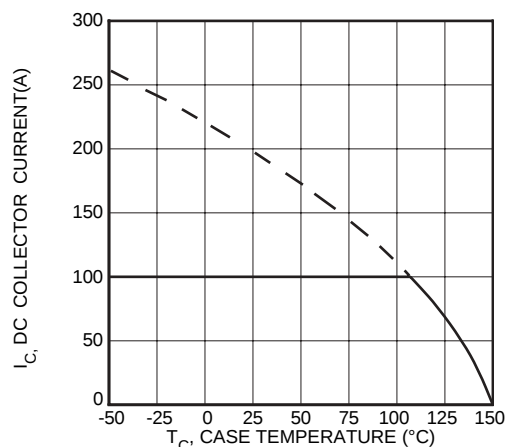


FIGURE 8, DC Collector Current vs Case Temperature

TYPICAL PERFORMANCE CURVES

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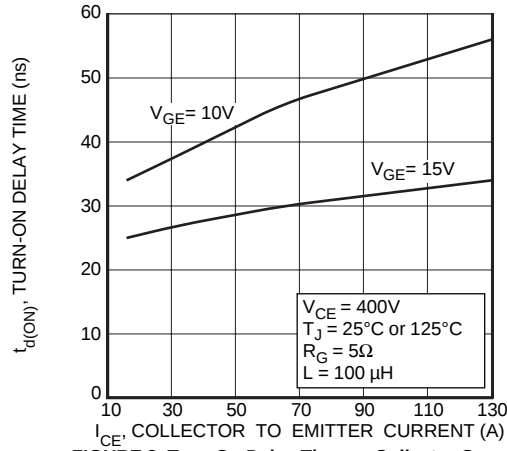


FIGURE 9, Turn-On Delay Time vs Collector Current

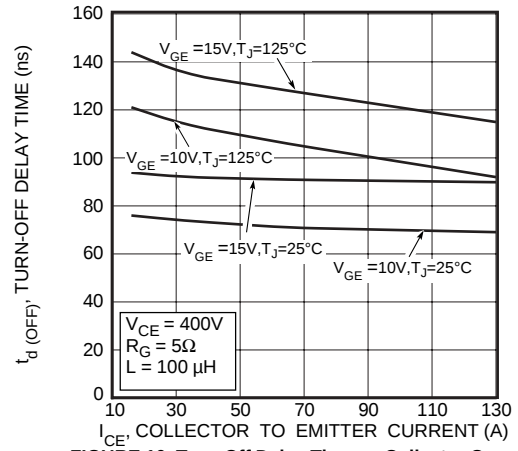


FIGURE 10, Turn-Off Delay Time vs Collector Current

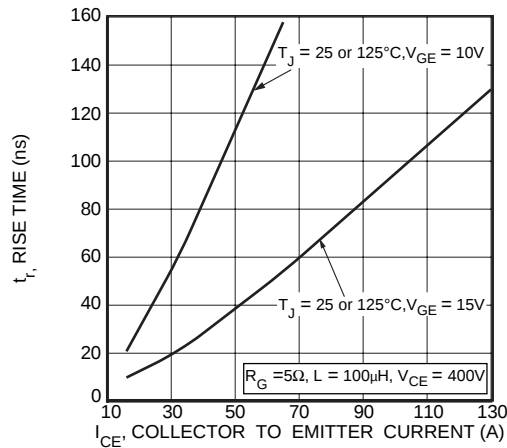


FIGURE 11, Current Rise Time vs Collector Current

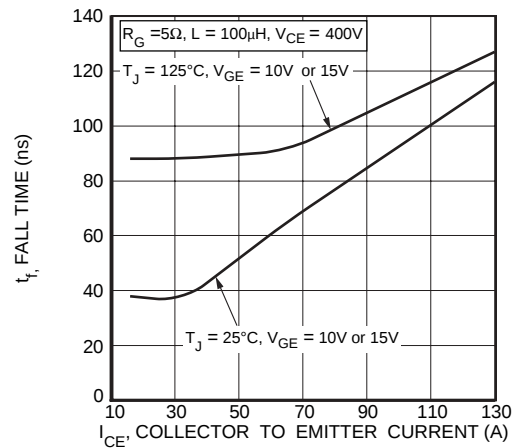


FIGURE 12, Current Fall Time vs Collector Current

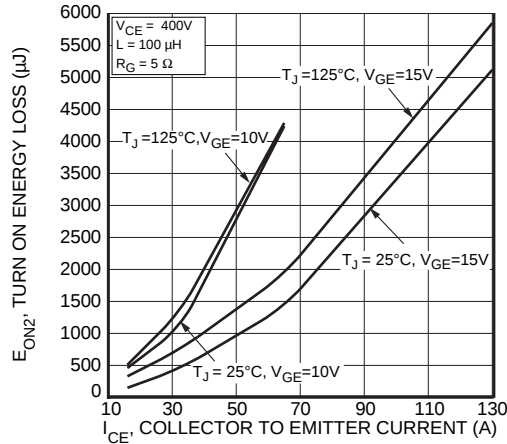


FIGURE 13, Turn-On Energy Loss vs Collector Current

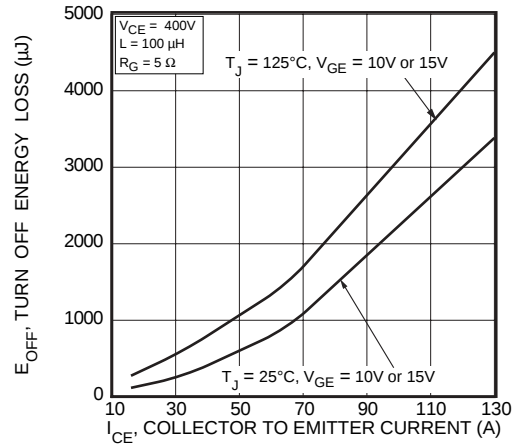


FIGURE 14, Turn Off Energy Loss vs Collector Current

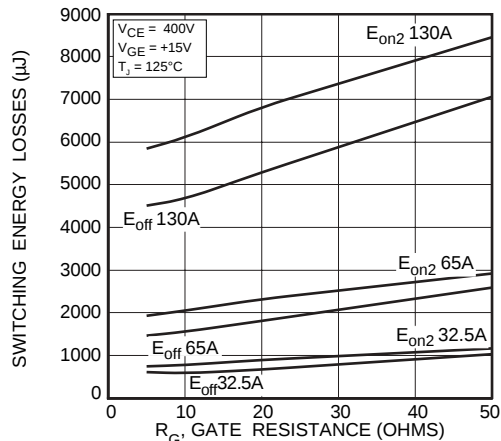


FIGURE 15, Switching Energy Losses vs. Gate Resistance

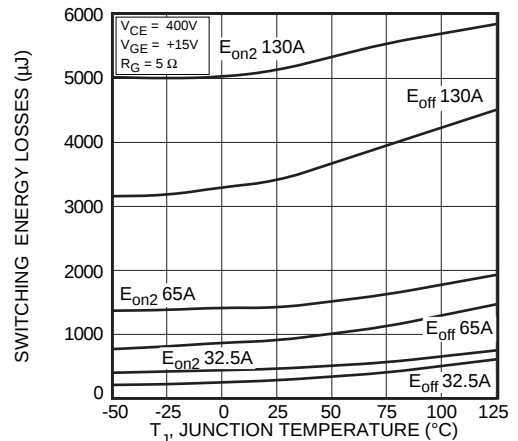


FIGURE 16, Switching Energy Losses vs Junction Temperature

TYPICAL PERFORMANCE CURVES

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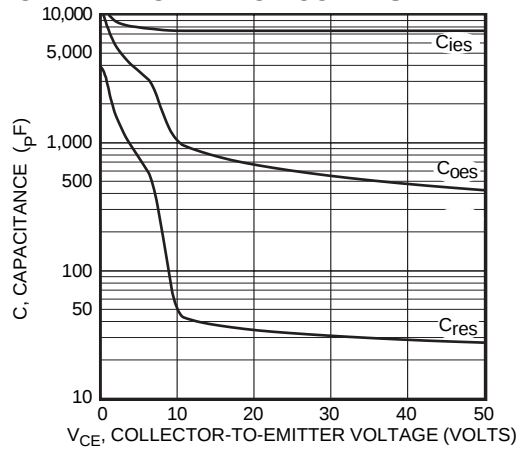


Figure 17, Capacitance vs Collector-To-Emitter Voltage

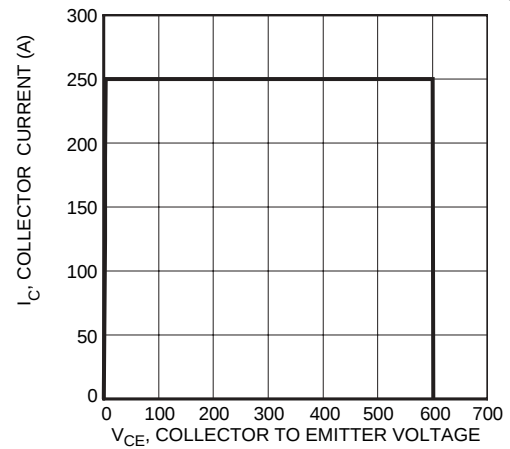


Figure 18, Minimum Switching Safe Operating Area

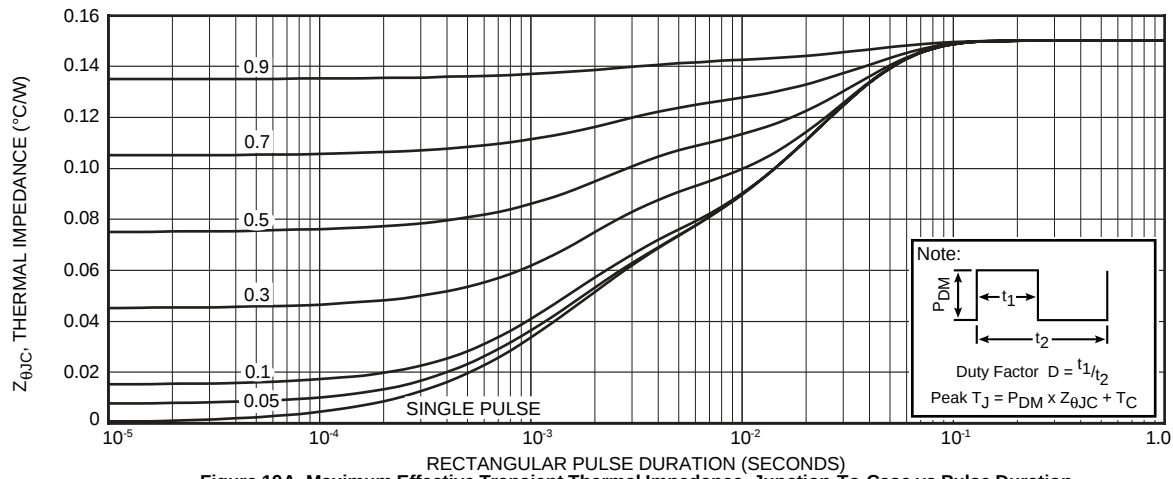


Figure 19A, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

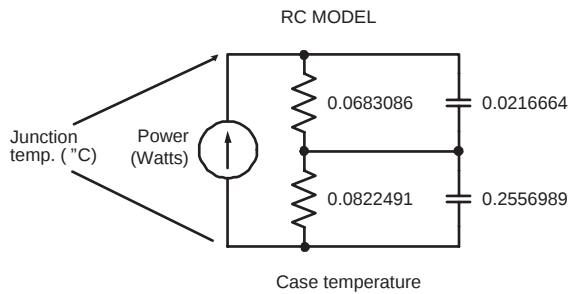


FIGURE 19B, TRANSIENT THERMAL IMPEDANCE MODEL

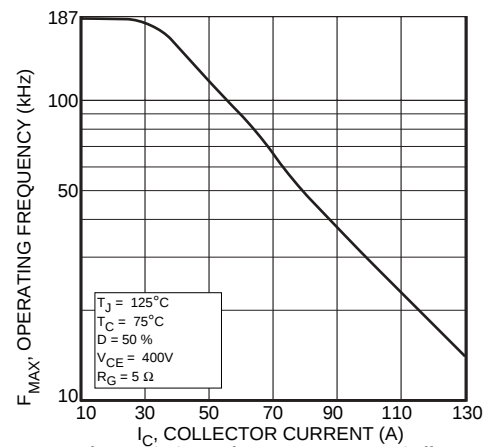


Figure 20, Operating Frequency vs Collector Current

$$F_{\max} = \min(f_{\max 1}, f_{\max 2})$$

$$f_{\max 1} = \frac{0.05}{t_{d(on)} + t_r + t_{d(off)} + t_f}$$

$$f_{\max 2} = \frac{P_{diss} - P_{cond}}{E_{on2} + E_{off}}$$

$$P_{diss} = \frac{T_J - T_C}{R_{\theta JC}}$$

TYPICAL PERFORMANCE CURVES

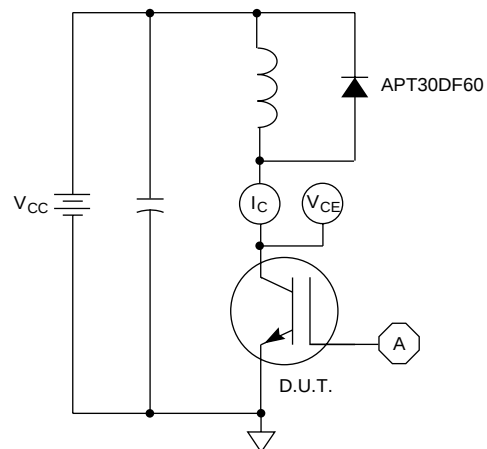


Figure 21, Inductive Switching Test Circuit

APT65GP60B2

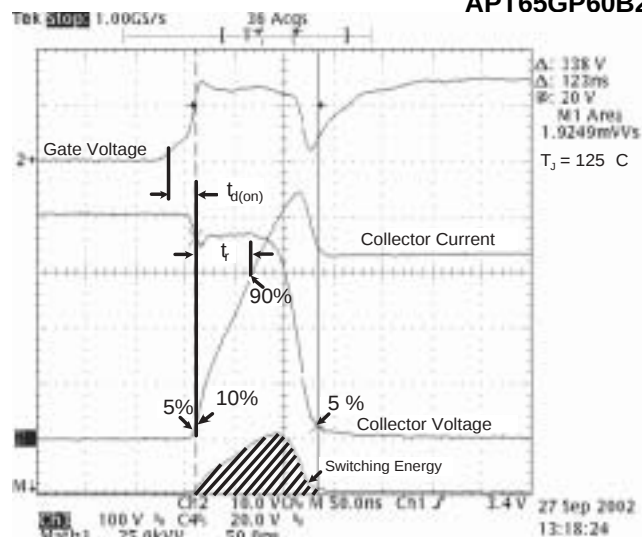


Figure 22, Turn-on Switching Waveforms and Definitions

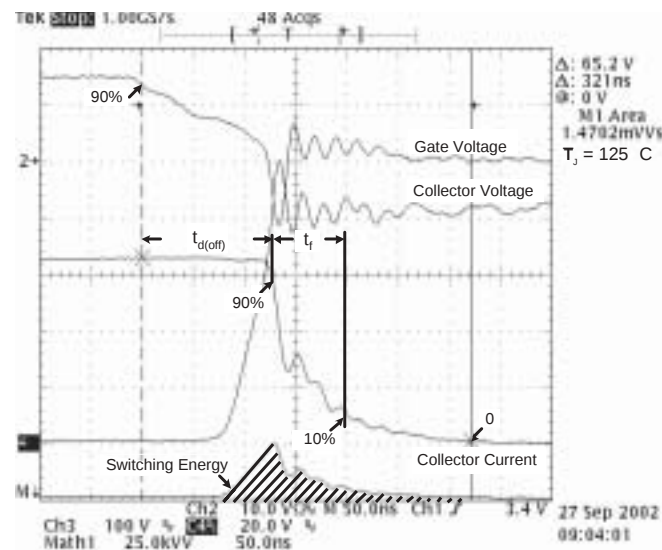


Figure 23, Turn-off Switching Waveforms and Definitions

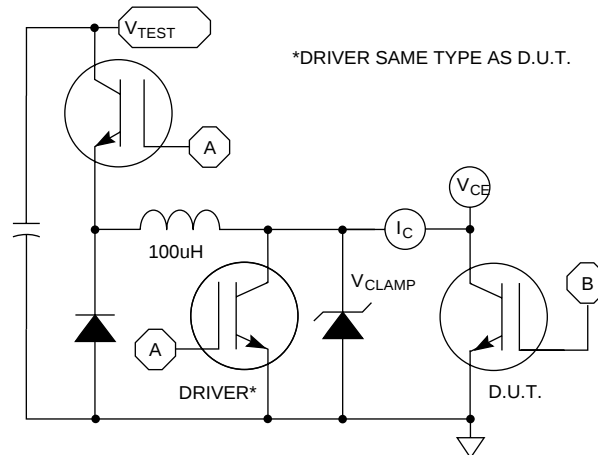
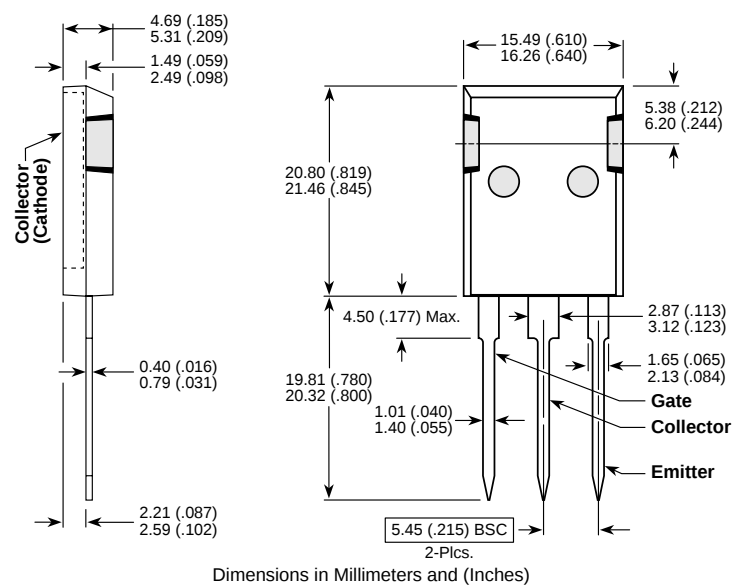


Figure 24, E_{ON1} Test Circuit

T-MAX[®] (B2) Package Outline



Dimensions in Millimeters and (Inches)