

DYNAMIC CHARACTERISTICS

APT45GP120B

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{ies}	Input Capacitance	Capacitance $V_{GE} = 0V, V_{CE} = 25V$ $f = 1 \text{ MHz}$		3935		pF
C_{oes}	Output Capacitance			300		
C_{res}	Reverse Transfer Capacitance			55		
V_{GEP}	Gate-to-Emitter Plateau Voltage	Gate Charge $V_{GE} = 15V$ $V_{CE} = 600V$ $I_C = 45A$		7.5		V
Q_g	Total Gate Charge ^③			185		nC
Q_{ge}	Gate-Emitter Charge			25		
Q_{gc}	Gate-Collector ("Miller") Charge			80		
RBSOA	Safe Operating Area	$T_J = 150^\circ C, R_G = 5\Omega, V_{GE} = 15V, L = 100\mu H, V_{CE} = 960V$	170			A
$t_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{CC} = 600V$ $V_{GE} = 15V$ $I_C = 45A$ $R_G = 5\Omega$ $T_J = +25^\circ C$		18		ns
t_r	Current Rise Time			29		
$t_{d(off)}$	Turn-off Delay Time			102		
t_f	Current Fall Time			38		
E_{on1}	Turn-on Switching Energy ^④			900		μJ
E_{on2}	Turn-on Switching Energy (Diode) ^⑤			1869		
E_{off}	Turn-off Switching Energy ^⑥			904		
$t_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C) $V_{CC} = 600V$ $V_{GE} = 15V$ $I_C = 45A$ $R_G = 5\Omega$ $T_J = +125^\circ C$		18		ns
t_r	Current Rise Time			29		
$t_{d(off)}$	Turn-off Delay Time			151		
t_f	Current Fall Time			79		
E_{on1}	Turn-on Switching Energy ^④			900		μJ
E_{on2}	Turn-on Switching Energy (Diode) ^⑤			3078		
E_{off}	Turn-off Switching Energy ^⑥			2254		

THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case (IGBT)			.20	$^\circ C/W$
$R_{\theta JC}$	Junction to Case (DIODE)			N/A	
W_T	Package Weight			5.9	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. (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 Continuous current limited by package lead temperature.

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

TYPICAL PERFORMANCE CURVES

APT45GP120B

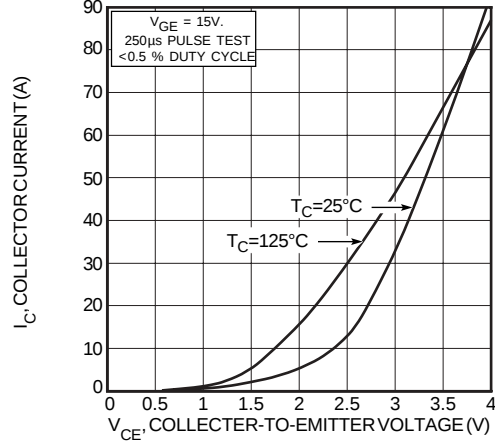


FIGURE 1, Output Characteristics ($V_{GE} = 15V$)

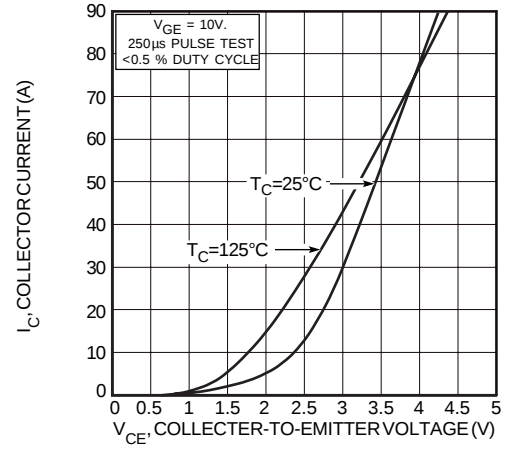


FIGURE 2, Output Characteristics ($V_{GE} = 10V$)

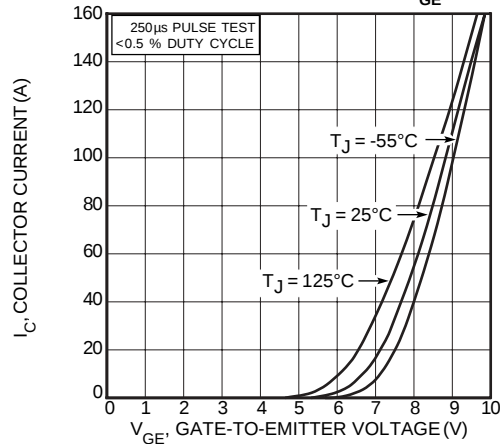


FIGURE 3, Transfer Characteristics

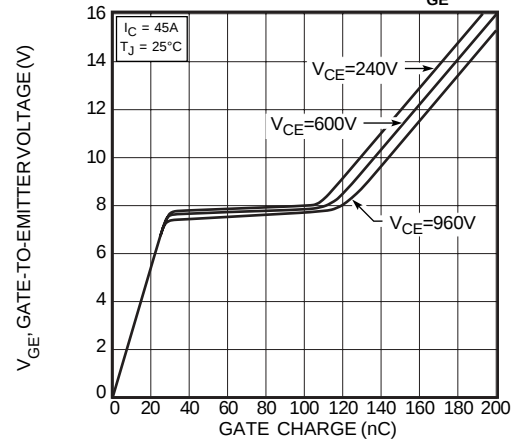


FIGURE 4, Gate Charge

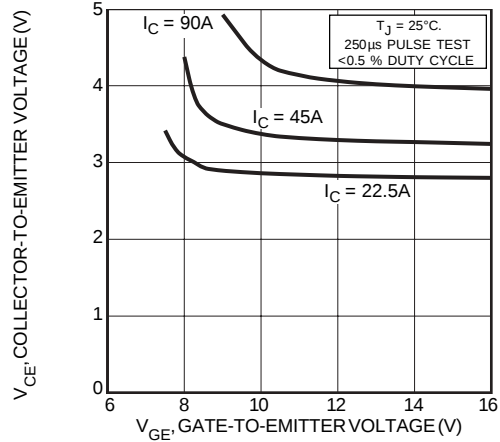


FIGURE 5, On State Voltage vs Gate-to-Emitter Voltage

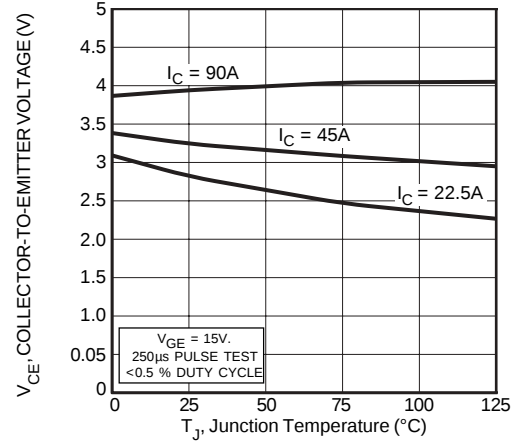


FIGURE 6, On State Voltage vs Junction Temperature

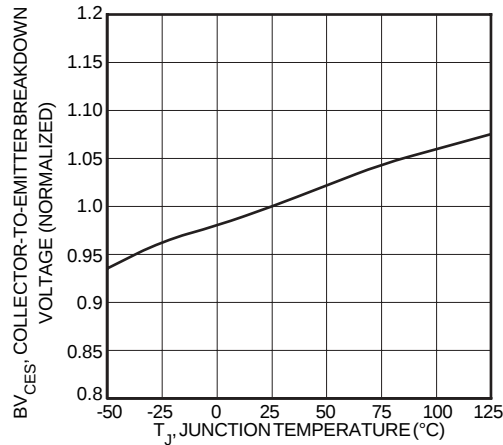


FIGURE 7, Breakdown Voltage vs. Junction Temperature

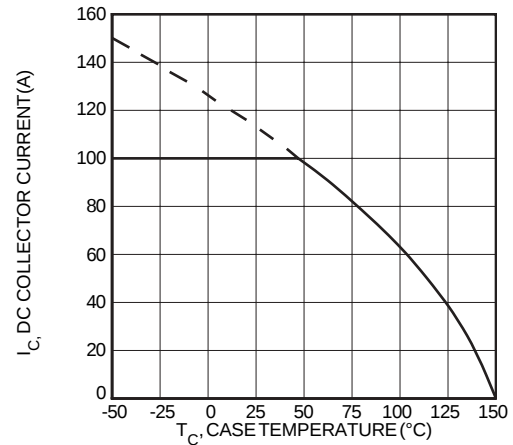


FIGURE 8, DC Collector Current vs Case Temperature

TYPICAL PERFORMANCE CURVES

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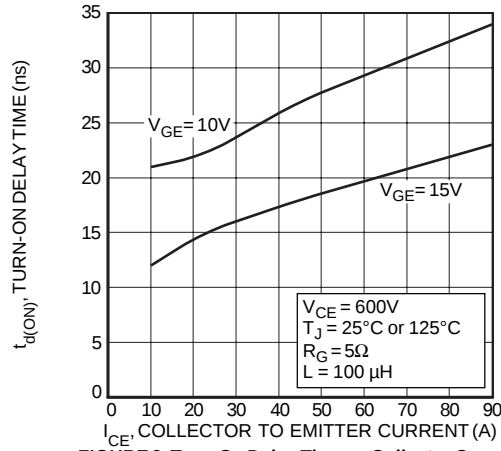


FIGURE 9, Turn-On Delay Time vs Collector Current

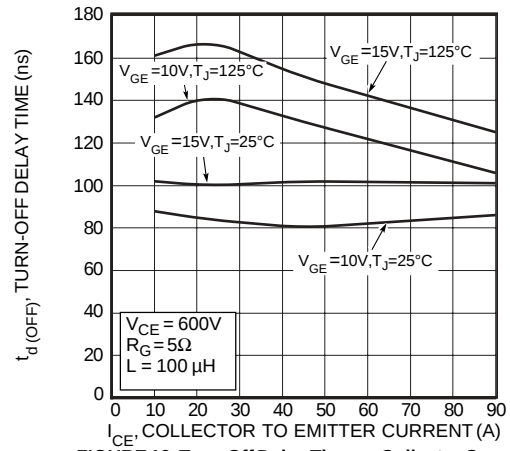


FIGURE 10, Turn-Off Delay Time vs Collector Current

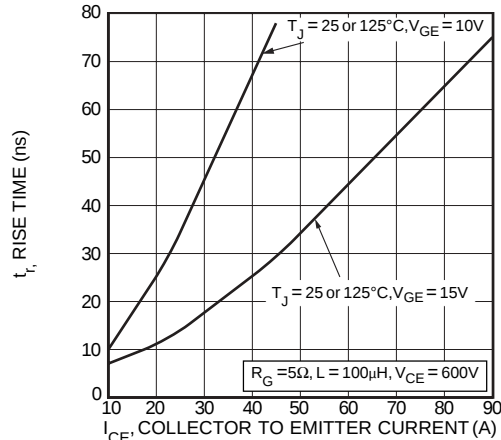


FIGURE 11, Current Rise Time vs Collector Current

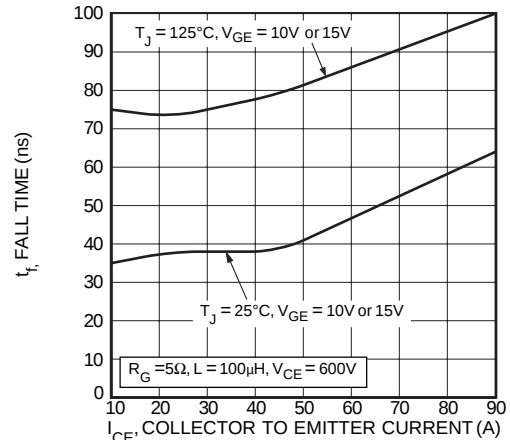


FIGURE 12, Current Fall Time vs Collector Current

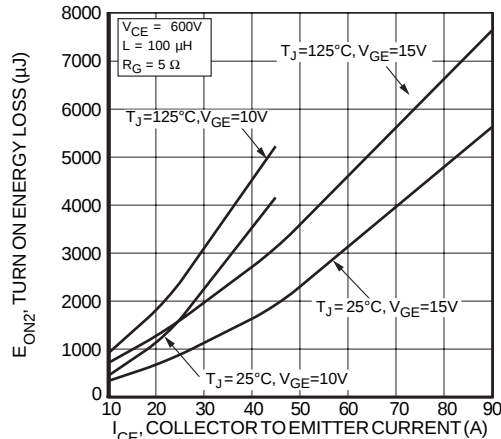


FIGURE 13, Turn-On Energy Loss vs Collector Current

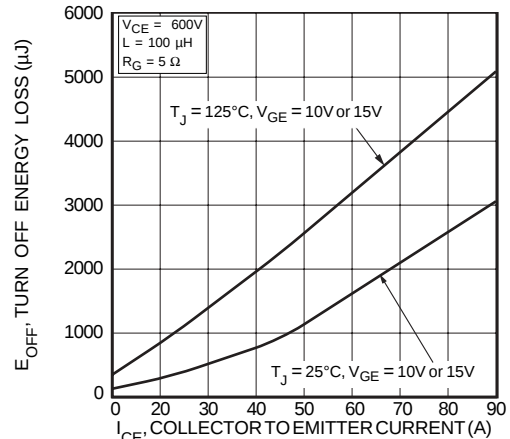


FIGURE 14, Turn Off Energy Loss vs Collector Current

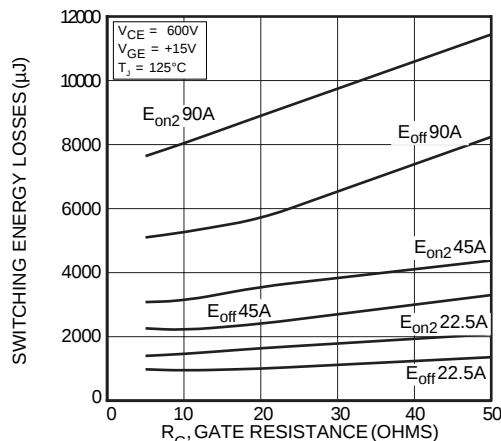


FIGURE 15, Switching Energy Losses vs. Gate Resistance

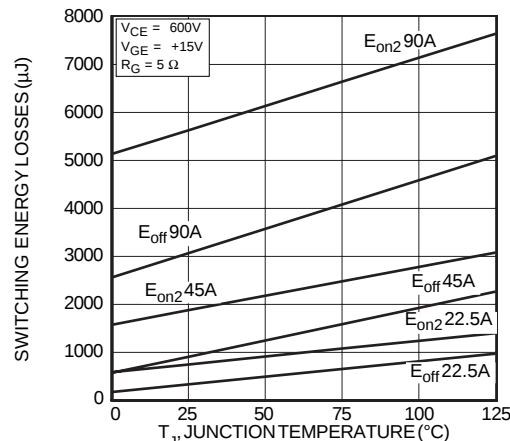
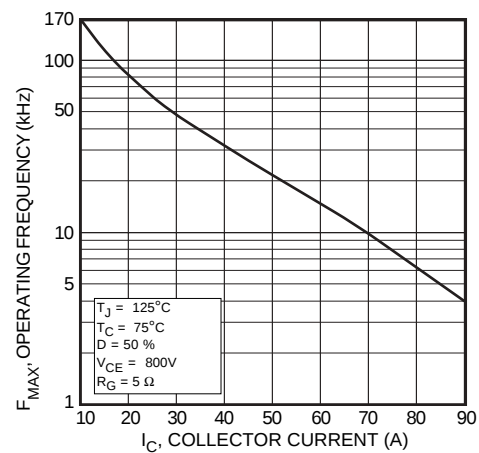
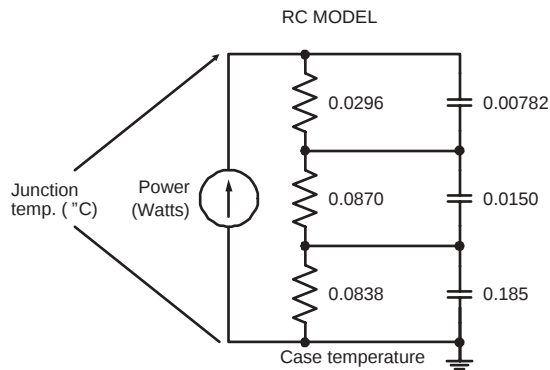
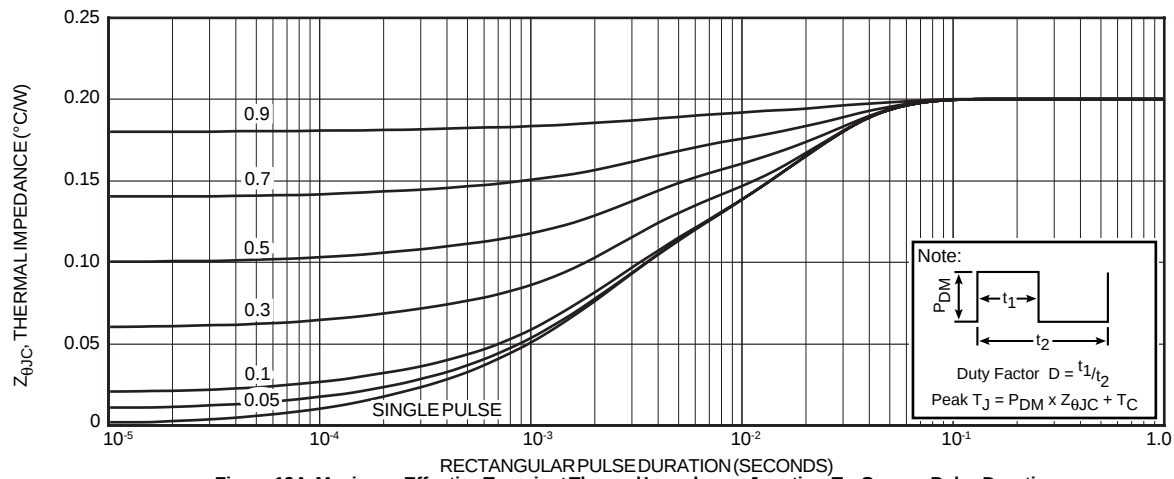
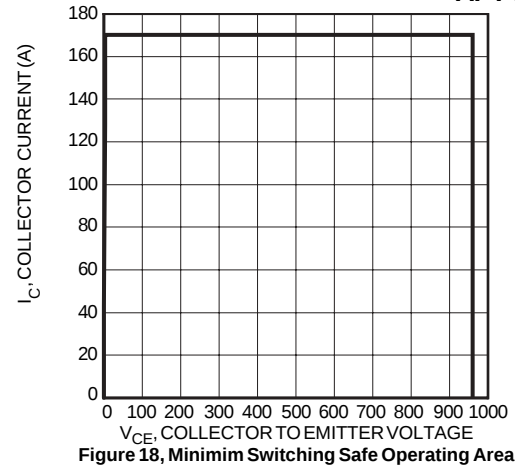
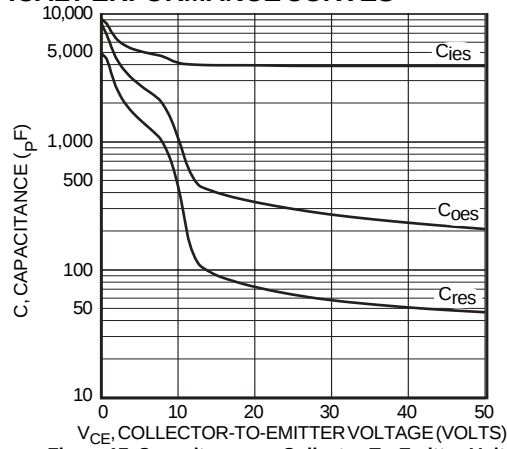


FIGURE 16, Switching Energy Losses vs Junction Temperature

TYPICAL PERFORMANCE CURVES

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

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

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

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

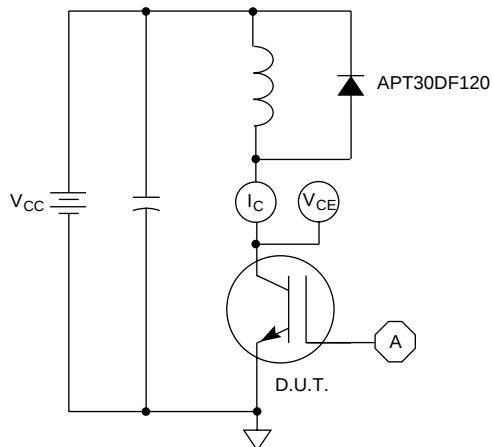


Figure 21, Inductive Switching Test Circuit

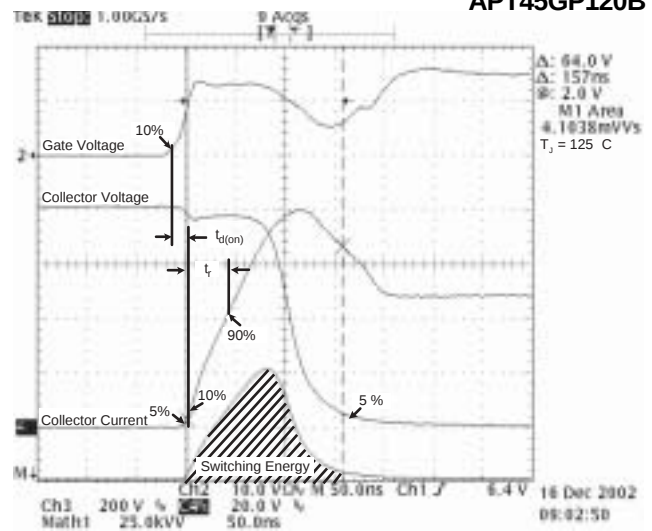


Figure 22, Turn-on Switching Waveforms and Definitions

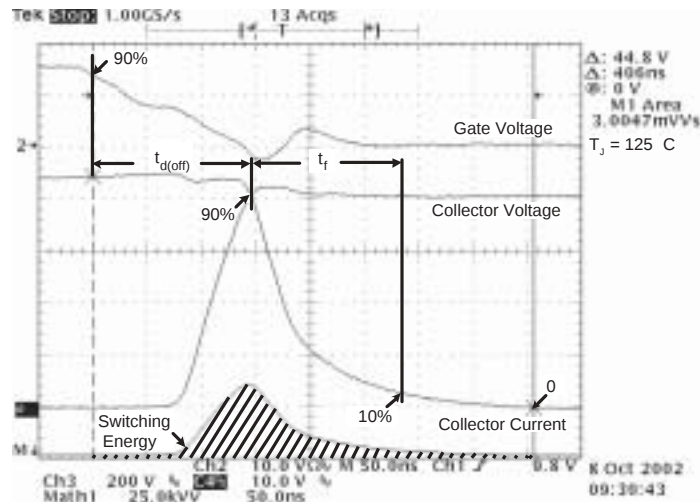
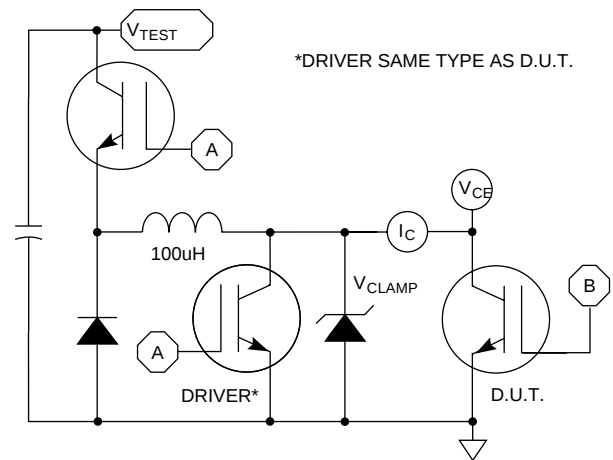
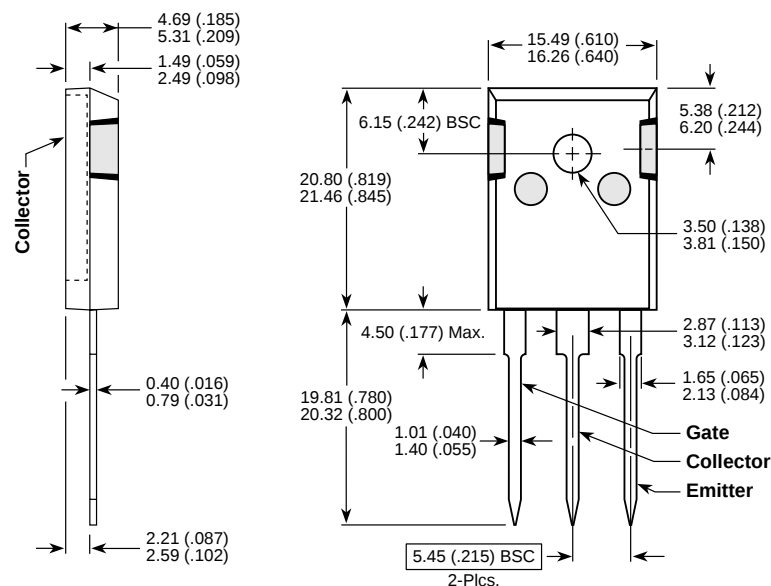


Figure 23, Turn-off Switching Waveforms and Definitions

Figure 24, E_{ON1} Test Circuit

T0-247 Package Outline



Dimensions in Millimeters and (Inches)

APT'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 and foreign patents. US and Foreign patents pending. All Rights Reserved.