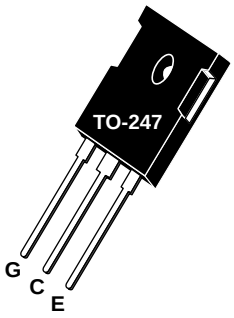
APT25GP120B

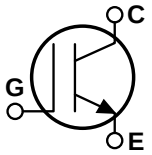
1200V

POWER MOS 7® IGBT



A new generation of high voltage power IGBTs. Using punch-through technology and a proprietary metal gate, this IGBT has been optimized for very fast switching, making it ideal for high frequency, high voltage switch-mode power supplies and tail current sensitive applications. In many cases, the POWER MOS 7® IGBT provides a lower cost alternative to a Power MOSFET.

- **Low Conduction Loss**
- **Low Gate Charge**
- **Ultrafast Tail Current shutoff**
- **100 kHz operation @ 800V,11A**
- **50 kHz operation @ 800V, 19A**
- **RBSOA Rated**



MAXIMUM RATINGS All Ratings: T_C = 25°C unless otherwise specified.

Symbol	Parameter	APT25GP120B	UNIT
V_{CES}	Collector-Emitter Voltage	1200	Volts
V_{GE}	Gate-Emitter Voltage	±20	
V_{GEM}	Gate-Emitter Voltage Transient	±30	
I_{C1}	Continuous Collector Current @ T_C = 25°C	69	Amps
I_{C2}	Continuous Collector Current @ T_C = 110°C	33	
I_{CM}	Pulsed Collector Current ① @ T_C = 25°C	90	
RBSOA	Reverse Bias Safe Operating Area @ T_J = 150°C	90A @ 960V	
P_D	Total Power Dissipation	417	Watts
T_J,T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150	°C
T_L	Max. Lead Temp. for Soldering: 0.063" from Case for 10 Sec.	300	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
BV_{CES}	Collector-Emitter Breakdown Voltage (V_{GE} = 0V, I_C = 250µA)	1200			Volts
$V_{GE(TH)}$	Gate Threshold Voltage (V_{CE} = V_{GE}, I_C = 1mA, T_j = 25°C)	3	4.5	6	
$V_{CE(ON)}$	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = 25A, T_j = 25°C)		3.3	3.9	
	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = 25A, T_j = 125°C)		3.0		
I_{CES}	Collector Cut-off Current (V_{CE} = 1200V, V_{GE} = 0V, T_j = 25°C) ②			250	µA
	Collector Cut-off Current (V_{CE} = 1200V, V_{GE} = 0V, T_j = 125°C) ②			2500	
I_{GES}	Gate-Emitter Leakage Current (V_{GE} = ±20V)			±100	nA

CAUTION: These Devices are Sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

APT Website - http://www.advancedpower.com

050-7411 Rev B 4-2003

DYNAMIC CHARACTERISTICS

APT25GP120B

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{ies}	IInput Capacitance	**Capacitance**		2090		pF
C_{oes}	Output Capacitance	V_{GE} = 0V, V_{CE} = 25V		200		
C_{res}	Reverse Transfer Capacitance	f = 1 MHz		40		
V_{GEP}	Gate-to-Emitter Plateau Voltage	**Gate Charge**		7.5		V
Q_g	Total Gate Charge ③	V_{GE} = 15V		110		nC
Q_{ge}	Gate-Emitter Charge	V_{CE} = 600V		15		
Q_{gc}	Gate-Collector ("Miller") Charge	I_C = 25A		50		
RBSOA	Reverse Bias Safe Operating Area	T_J = 150°C, R_G = 5Ω, V_{GE} = 15V, L = 100µH,V_{CE} = 960V	90			A
$t_{d(on)}$	Turn-on Delay Time	**Inductive Switching (25°C)**		12		ns
t_r	Current Rise Time	V_{CLAMP}(Peak) = 600V		14		
$t_{d(off)}$	Turn-off Delay Time	V_{GE} = 15V		70		
t_f	Current Fall Time	I_C = 25A		39		
E_{on1}	Turn-on Switching Energy ④	R_G = 5Ω		500		µJ
E_{on2}	Turn-on Switching Energy (Diode)⑤	T_J = +25°C		1092		
E_{off}	Turn-off Switching Energy ⑥			438		
$t_{d(on)}$	Turn-on Delay Time	**Inductive Switching (125°C)**		12		ns
t_r	Current Rise Time	V_{CLAMP}(Peak) = 600V		14		
$t_{d(off)}$	Turn-off Delay Time	V_{GE} = 15V		109		
t_f	Current Fall Time	I_C = 25A		88		
E_{on1}	Turn-on Switching Energy ④	R_G = 5Ω		500		µJ
E_{on2}	Turn-on Switching Energy (Diode)⑤	T_J = +125°C		1577		
E_{off}	Turn-off Switching Energy ⑥			1187		

THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\Theta JC}$	Junction to Case (IGBT)			.30	°C/W
$R_{\Theta JC}$	Junction to Case (DIODE)			N/A	
W_T	Package Weight			5.90	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 wtih JEDEC standard JESD24-1. (See Figures 21, 23.)

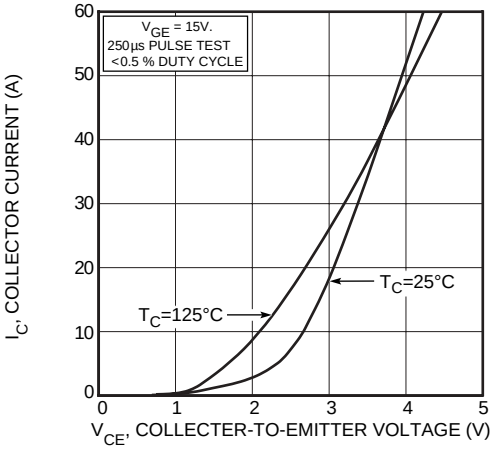


FIGURE 1, Output Characteristics(V_{GE} = 15V)

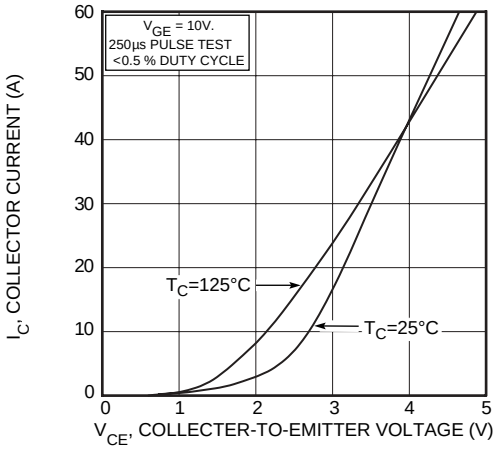


FIGURE 2, Output Characteristics (V_{GE} = 10V)

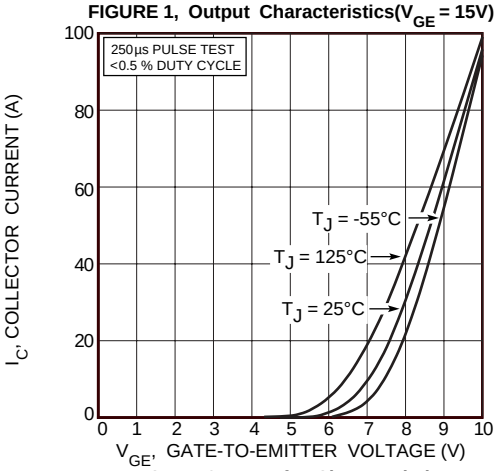


FIGURE 3, Transfer Characteristics

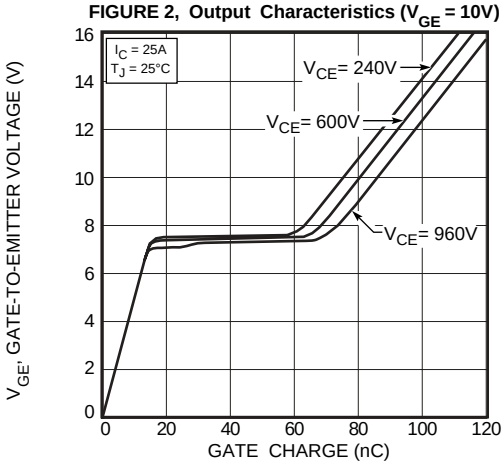


FIGURE 4, Gate Charge

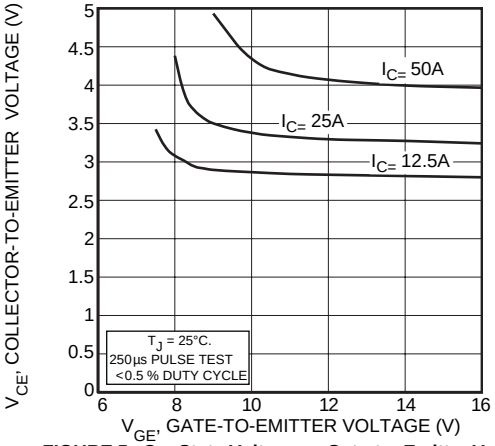


FIGURE 5, On State Voltage vs Gate-to- Emitter Voltage

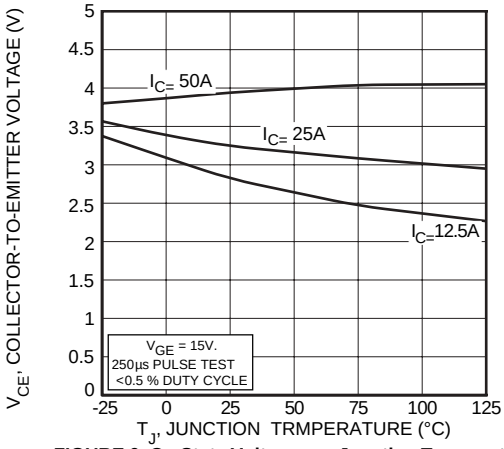


FIGURE 6, On State Voltage vs Junction Temperature

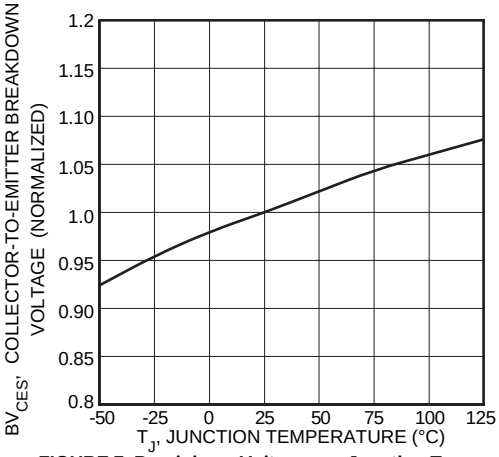


FIGURE 7, Breakdown Voltage vs. Junction Temperature

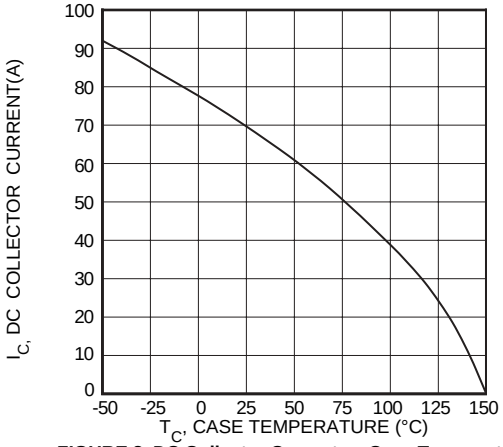


FIGURE 8, DC Collector Current vs Case Temperature

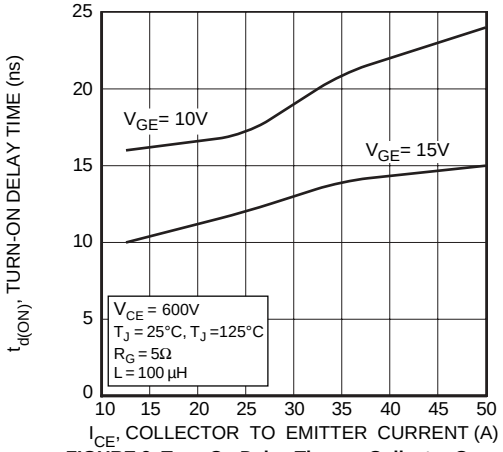


FIGURE 9, Turn-On Delay Time vs Collector Current

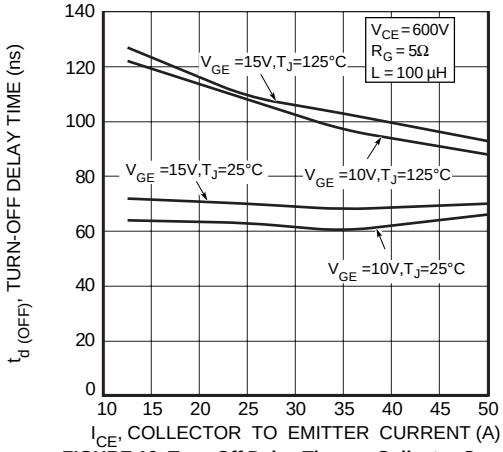


FIGURE 10, Turn-Off Delay Time vs Collector Current

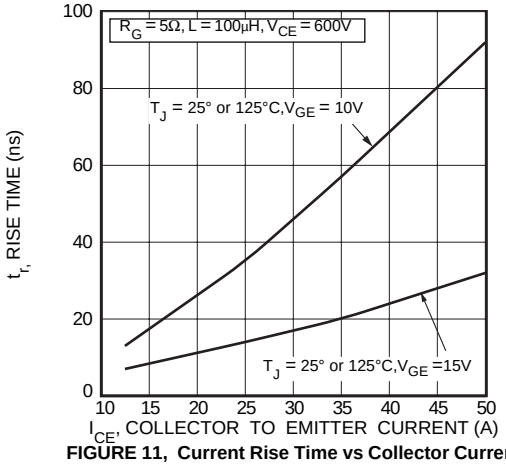


FIGURE 11, Current Rise Time vs Collector Current

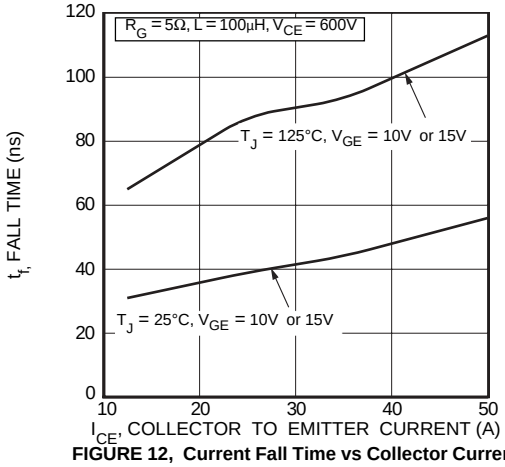


FIGURE 12, Current Fall Time vs Collector Current

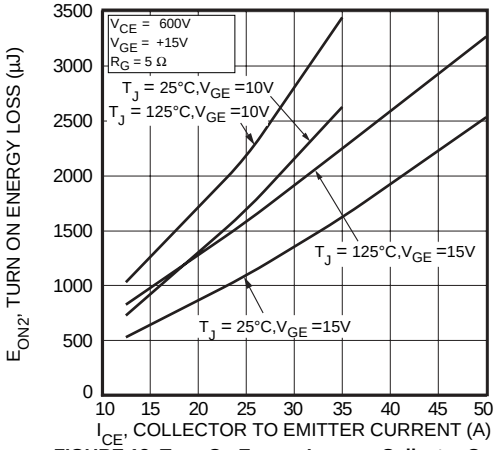


FIGURE 13, Turn-On Energy Loss vs Collector Current

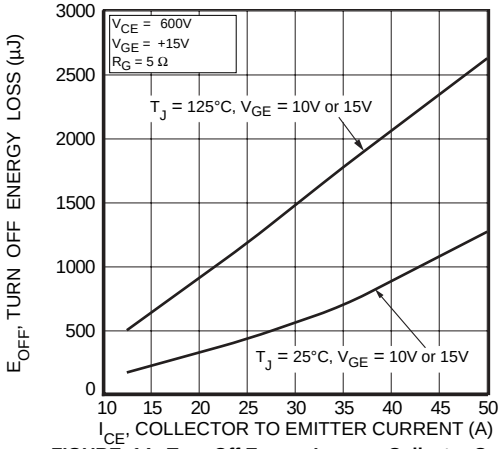


FIGURE 14, Turn Off Energy Loss vs Collector Current

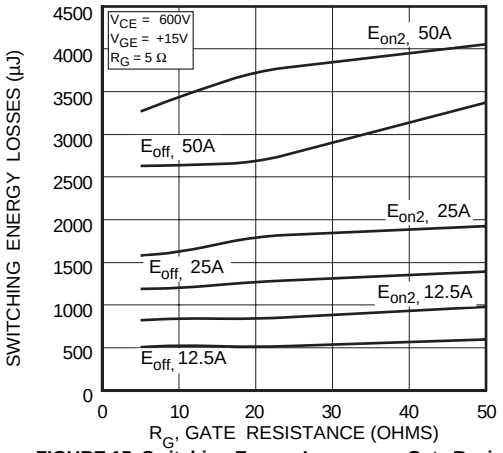


FIGURE 15, Switching Energy Losses vs. Gate Resistance

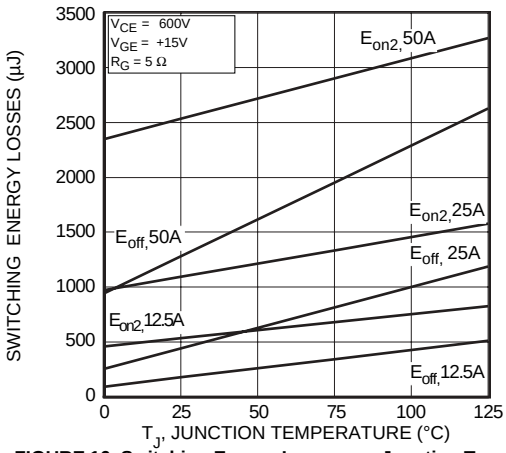


FIGURE 16, Switching Energy Losses vs Junction Temperature

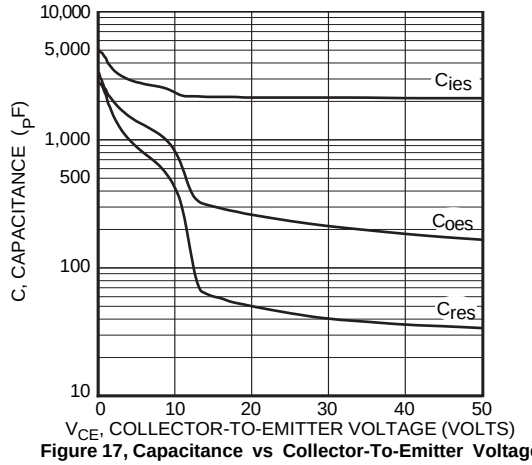


Figure 17, Capacitance vs Collector-To-Emitter Voltage

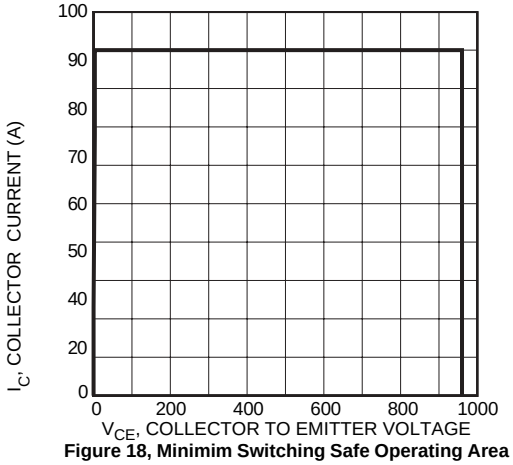


Figure 18, Minimim Switching Safe Operating Area

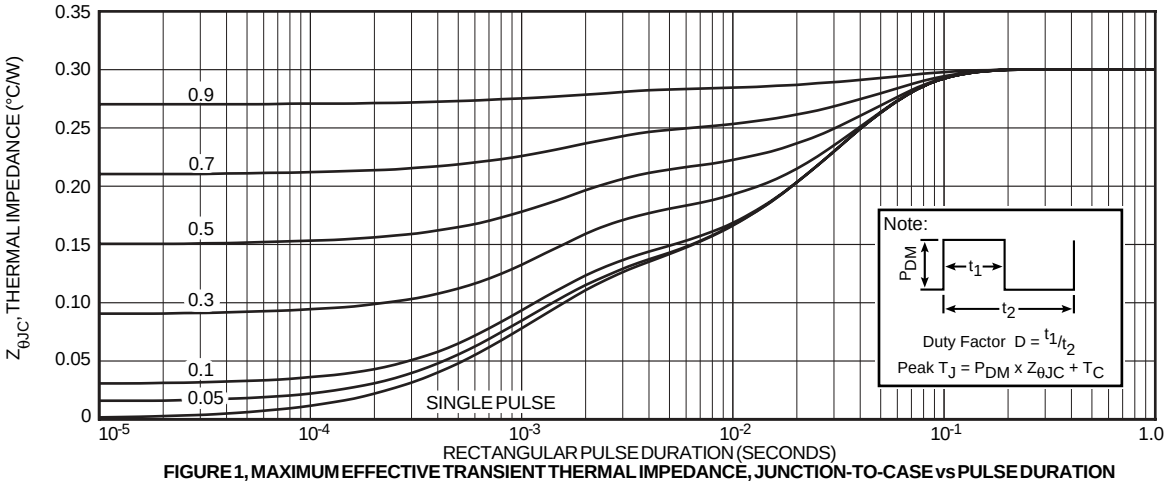


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

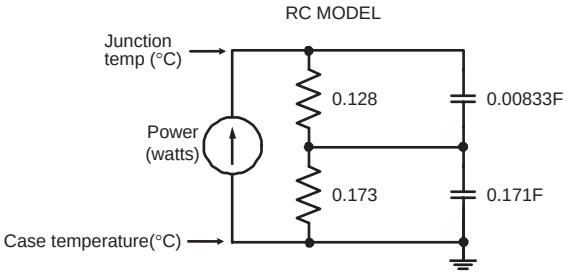


FIGURE 19B, TRANSIENT THERMAL IMPEDANCE MODEL

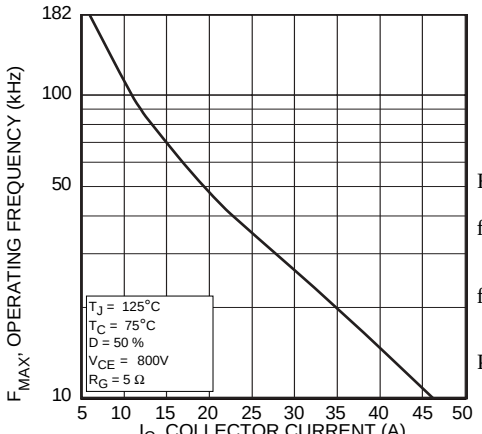


Figure 20, Operating Frequency vs Collector Current

$$F_{max} = \min(f_{max1}, f_{max2})$$

$$f_{max1} = \frac{0.05}{t_{d(on)} + t_r + t_{d(off)} + t_f}$$

$$f_{max2} = \frac{P_{diss} - P_{cond}}{E_{on2} + E_{off}}$$

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

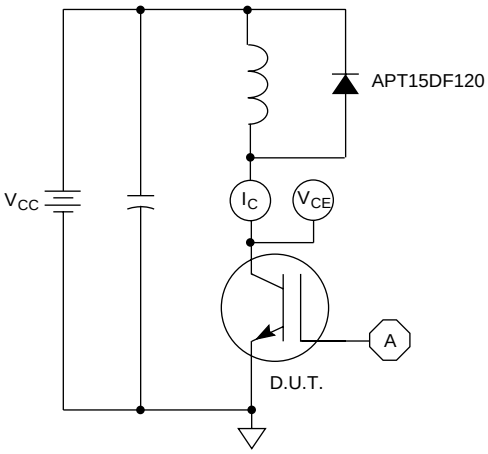


Figure 21, Inductive Switching Test Circuit

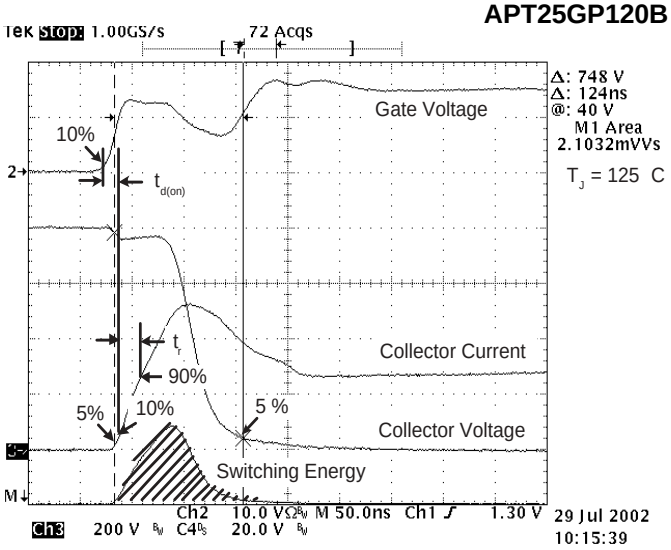


Figure 22, Turn-on Switching Waveforms and Definitions

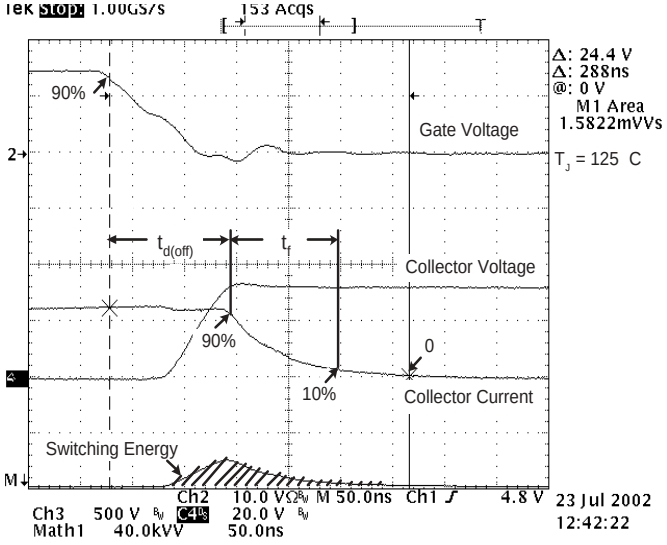


Figure 23, Turn-off Switching Waveforms and Definitions

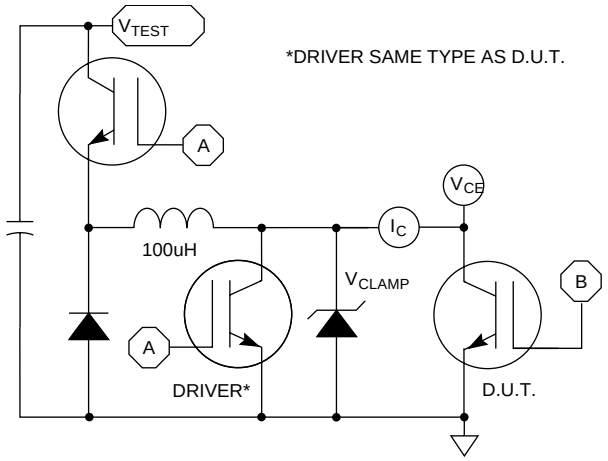
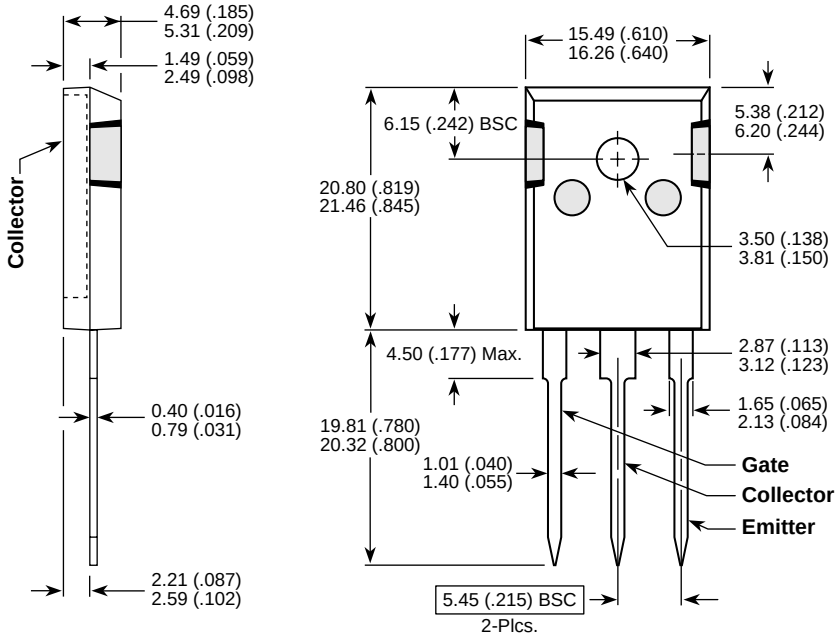


Figure 24, E_{ON1} Test Circuit

T0-247 Package Outline



Dimensions in Millimeters and (Inches)