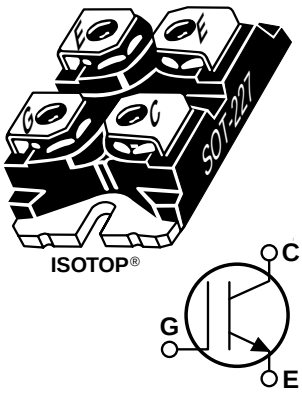
APT35GP120J

1200V

Mos 7™ Ultra Fast IGBT



The Mos 7™ Ultra Fast IGBT is a new generation of high voltage power IGBTs. Using Punch Through Technology this IGBT is ideal for many high frequency, high voltage switching applications and has been optimized for high frequency switchmode power supplies.

- **Low Conduction Loss**
- **Low Gate Charge**
- **Ultrafast Tail Current shutoff**
- **50 kHz operation @ 800V, 18A**
- **20 kHz operation @ 800V, 29A**
- **RBSOA rated**

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

Symbol	Parameter	APT35GP120J	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	64	Amps
I_{C2}	Continuous Collector Current @ T_C = 110°C	29	
I_{CM}	Pulsed Collector Current ① @ T_C = 25°C	140	
RBSOA	Reverse Bias Safe Operating Area @ T_J = 150°C	140A @ 960V	
P_D	Total Power Dissipation	284	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 = 35A, T_j = 25°C)		2.9	3.9	
	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = 35A, T_j = 125°C)		2.8		
I_{CES}	Collector Cut-off Current (V_{CE} = V_{CES}, V_{GE} = 0V, T_j = 25°C) ②			250	µA
	Collector Cut-off Current (V_{CE} = V_{CES}, 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

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DYNAMIC CHARACTERISTICS

APT35GP120J

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{ies}	Input Capacitance	**Capacitance**		3423		pF
C_{oes}	Output Capacitance	V_{GE} = 0V, V_{CE} = 25V		252		
C_{res}	Reverse Transfer Capacitance	f = 1 MHz		30		
V_{GEP}	Gate-to-Emitter Plateau Voltage	**Gate Charge**		7		V
Q_g	Total Gate Charge ③	V_{GE} = 15V		150		nC
Q_{ge}	Gate-Emitter Charge	V_{CE} = 600V		21		
Q_{gc}	Gate-Collector ("Miller") Charge	I_C = 35A		62		
RBSOA	Reverse Bias Safe Operating Area	T_J = 150°C, R_G = 5Ω, V_{GE} = 15V, L = 100µH, V_{CE} = 960V	140			A
$t_{d(on)}$	Turn-on Delay Time	**Inductive Switching (25°C)**		14		ns
t_r	Current Rise Time	V_{CLAMP}(Peak) = 800V		29		
$t_{d(off)}$	Turn-off Delay Time	V_{GE} = 15V		147		
t_f	Current Fall Time	I_C = 35A		90		
E_{on1}	Turn-on Switching Energy ④	R_G = 5Ω		1190		µJ
E_{on2}	Turn-on Switching Energy (Diode) ⑤	T_J = +25°C		2438		
E_{off}	Turn-off Switching Energy ⑥			1484		
$t_{d(on)}$	Turn-on Delay Time	**Inductive Switching (125°C)**		13		ns
t_r	Current Rise Time	V_{CLAMP}(Peak) = 800V		27		
$t_{d(off)}$	Turn-off Delay Time	V_{GE} = 15V		187		
t_f	Current Fall Time	I_C = 35A		178		
E_{on1}	Turn-on Switching Energy ④	R_G = 5Ω		1190		µJ
E_{on2}	Turn-on Switching Energy (Diode) ⑤	T_J = +125°C		3811		
E_{off}	Turn-off Switching Energy ⑥			4637		

THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\Theta JC}$	Junction to Case (IGBT)			.44	°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 Figures 21, 22)

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. If the divice is a Combi, the same device type is used for the clamping diode as shown in the E_{on2} test circuit in Figure 23. If the device is not a Combi, a diode of similar current rating as the IGBT is used for the clamping diode. (See Figures 23, 24).

⑥ E_{off} is the clamped inductive turn-off energy. (See Figures 21, 22).

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TYPICAL PREFORMANCE CURVES

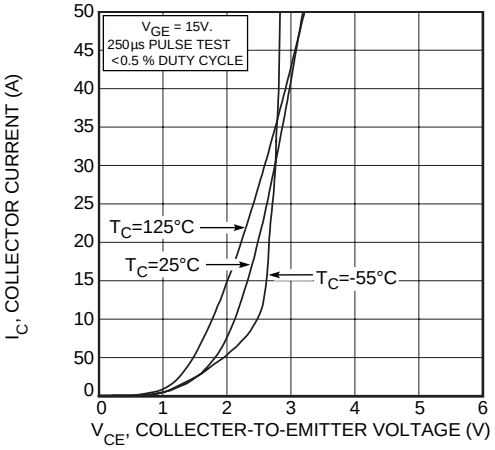


FIGURE 1, Output Characteristics(V_{GE} = 15V)

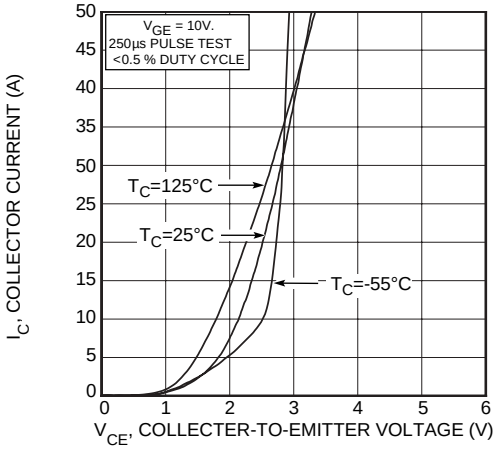


FIGURE 2, Output Characteristics (V_{GE} = 10V)

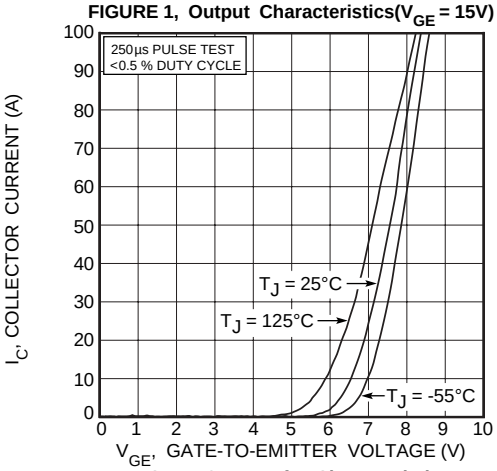


FIGURE 3, Transfer Characteristics

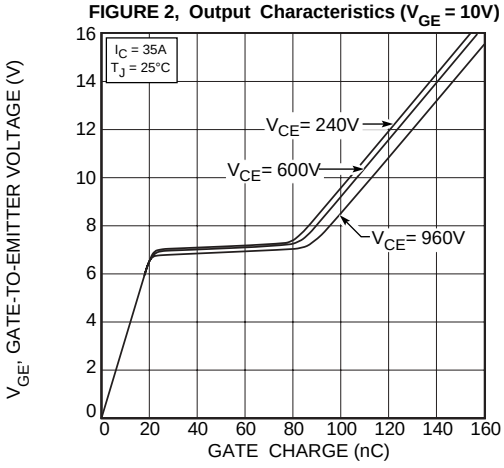


FIGURE 4, Gate Charge

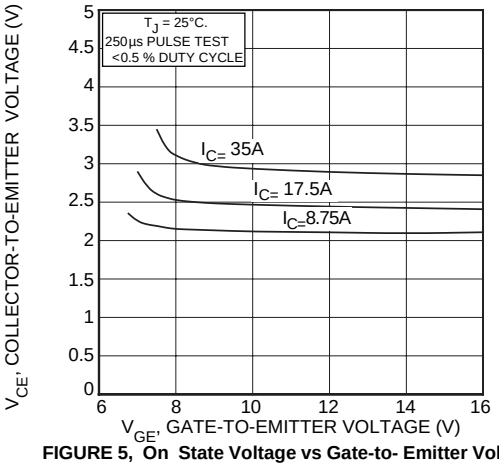


FIGURE 5, On State Voltage vs Gate-to- Emitter Voltage

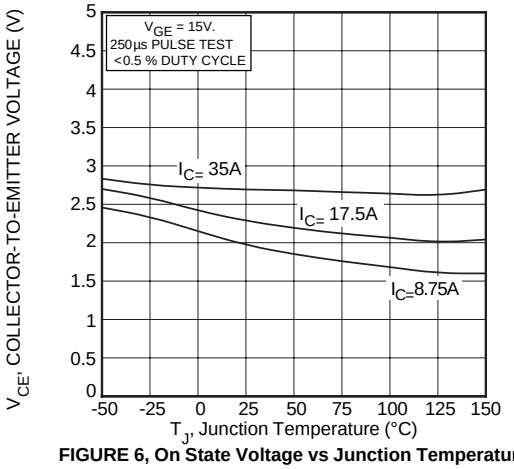


FIGURE 6, On State Voltage vs Junction Temperature

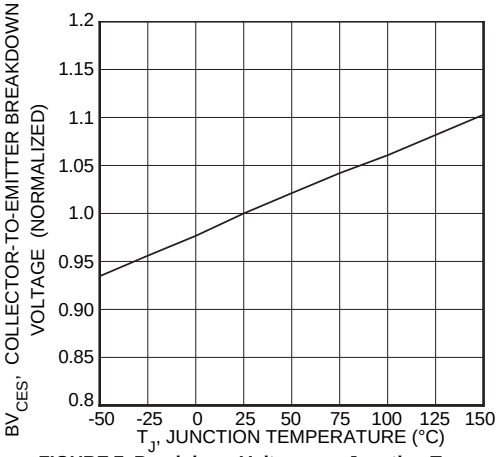


FIGURE 7, Breakdown Voltage vs. Junction Temperature

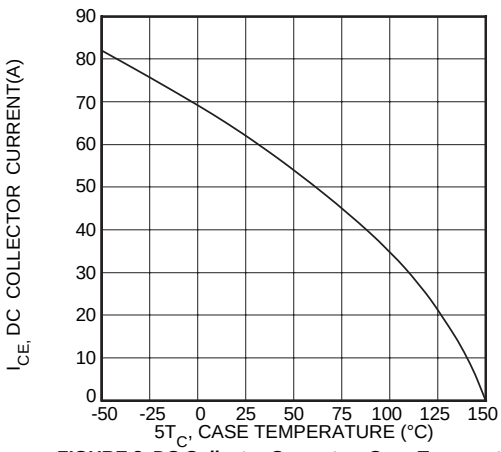


FIGURE 8, DC Collector Current vs Case Temperature

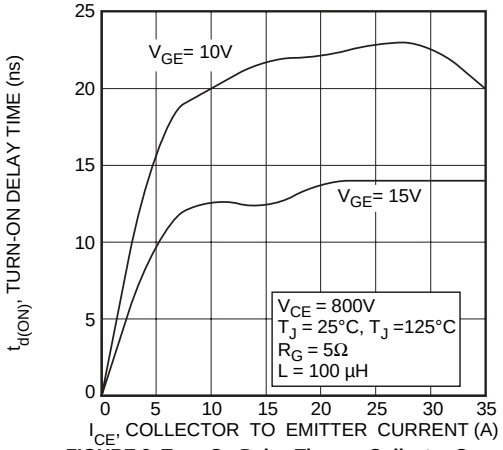


FIGURE 9, Turn-On Delay Time vs Collector Current

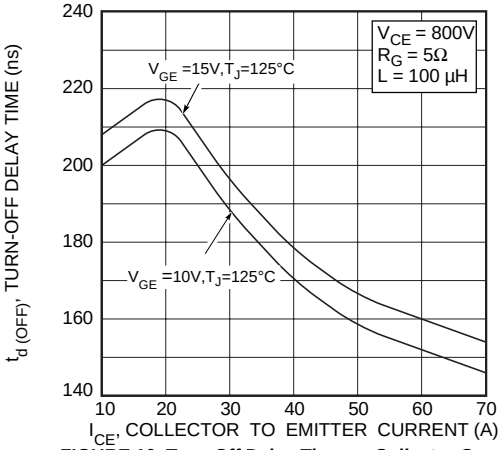


FIGURE 10, Turn-Off Delay Time vs Collector Current

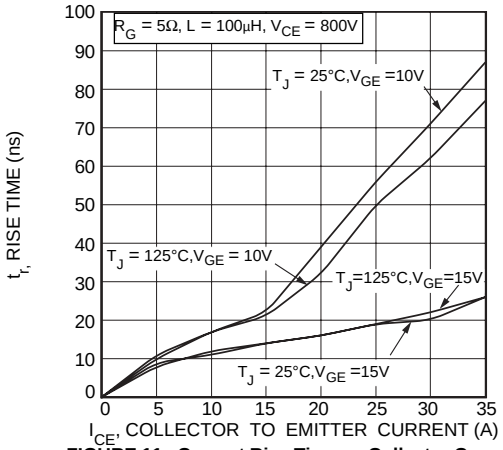


FIGURE 11, Current Rise Time vs Collector Current

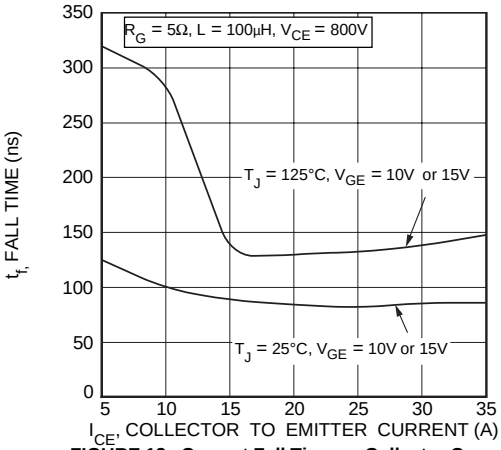


FIGURE 12, Current Fall Time vs Collector Current

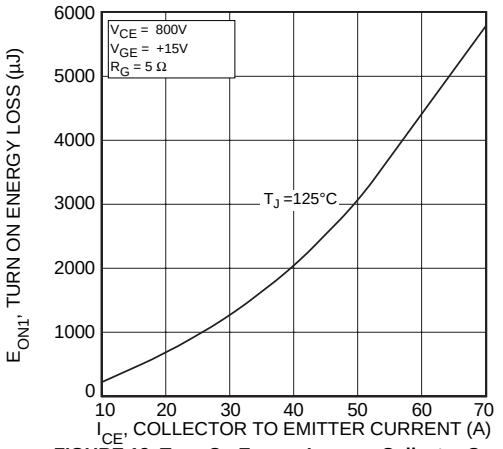


FIGURE 13, Turn-On Energy Loss vs Collector Current

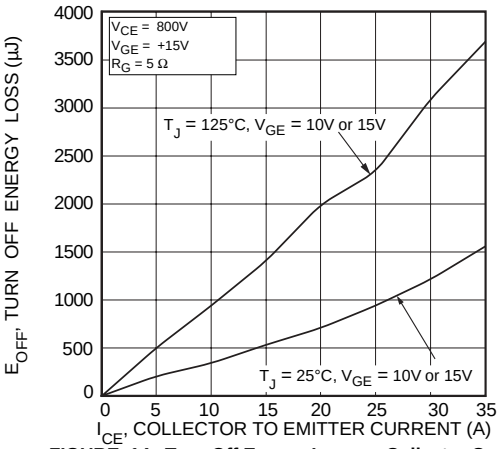


FIGURE 14, Turn Off Energy Loss vs Collector Current

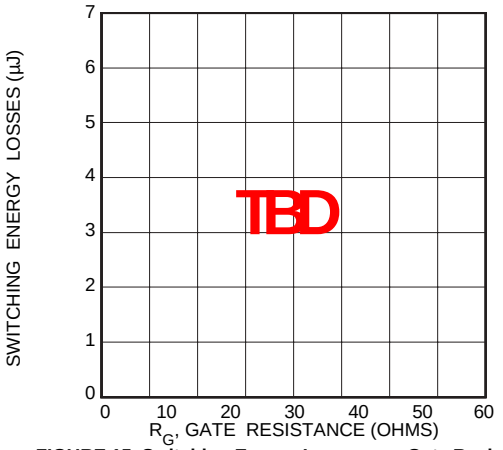


FIGURE 15, Switching Energy Losses vs. Gate Resistance

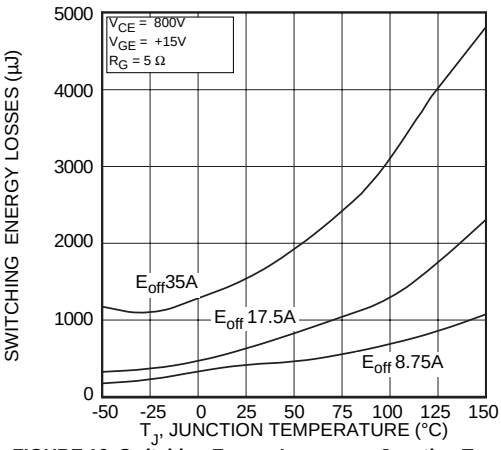


FIGURE 16, Switching Energy Losses vs Junction Temperature

TYPICAL PREFORMANCE CURVES

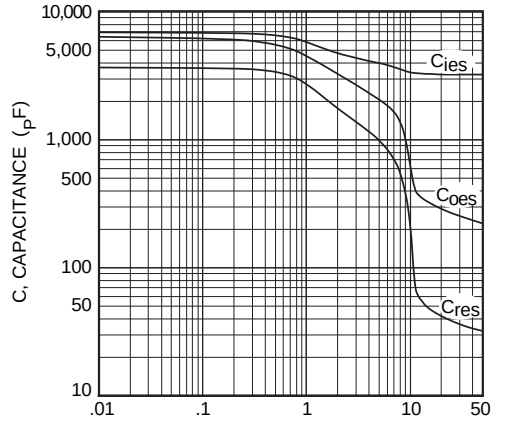


Figure 17, Capacitance vs Collector-To-Emitter Voltage

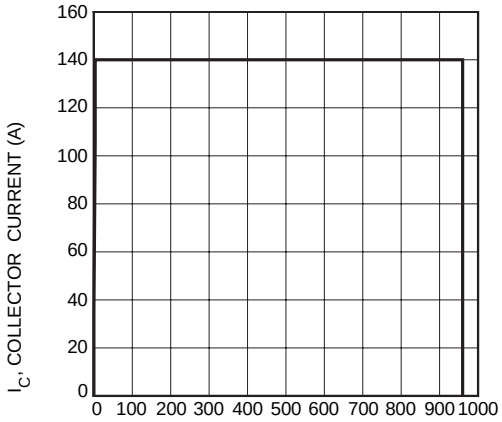


Figure 18, Reverse Bias Safe Operating Area

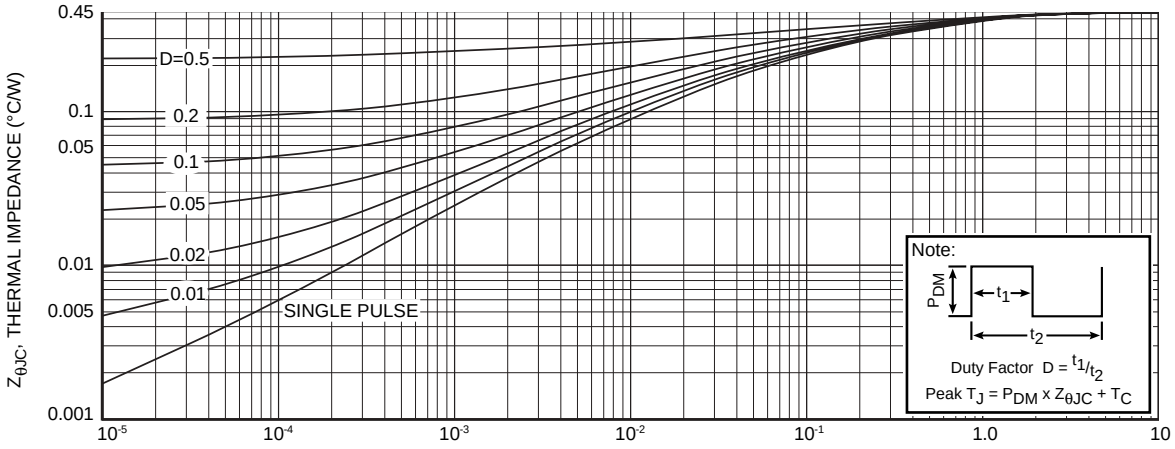


Figure 19, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

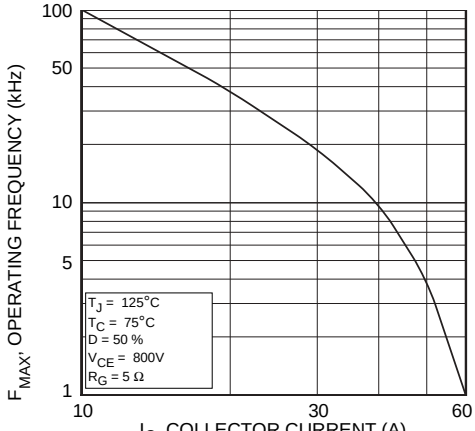


Figure 20, Operating Frequency vs Collector Current

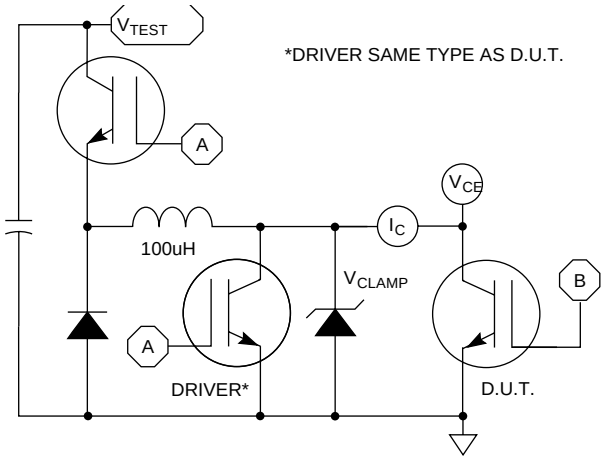


Figure 21, Switching Loss Test Circuit

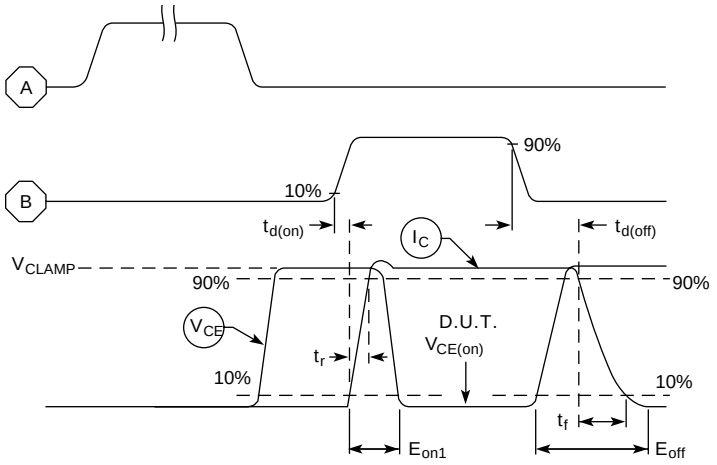


Figure 22, Switching Wave Form and Definitions

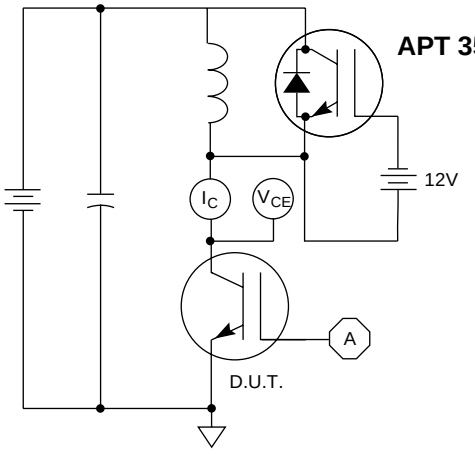


Figure 23, E_{ON2} Test Circuit

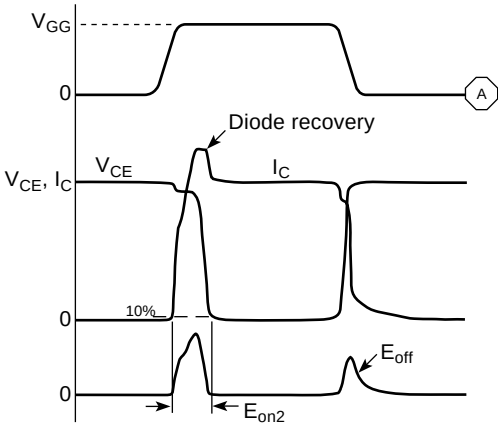
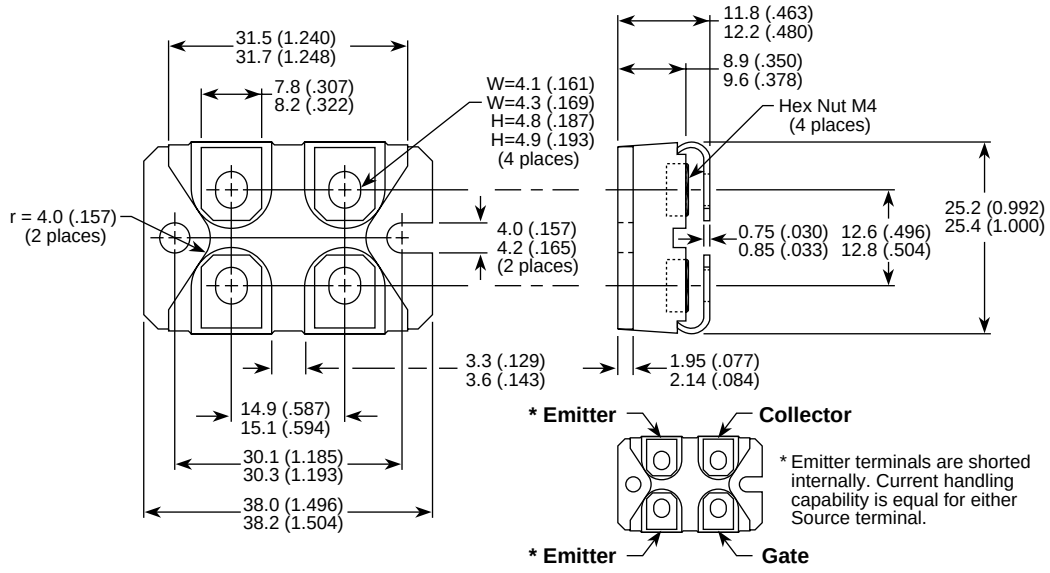


Figure 24, E_{ON2} Wave Form and Definitions

SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters and (Inches)