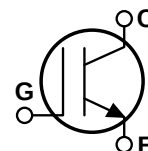
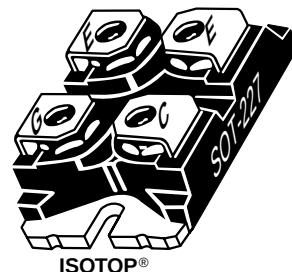


POWER MOS 7® IGBT

The POWER MOS 7® 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, 16A
- 20 kHz operation @ 800V, 30A
- RBSOA rated



MAXIMUM RATINGS

All Ratings: $T_C = 25^\circ\text{C}$ unless otherwise specified.

Symbol	Parameter	APT45GP120J	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 @ $T_C = 25^\circ\text{C}$	75	Amps
I_{C2}	Continuous Collector Current @ $T_C = 110^\circ\text{C}$	34	
I_{CM}	Pulsed Collector Current ^① @ $T_C = 25^\circ\text{C}$	170	
RBSOA	Reverse Bias Safe Operating Area @ $T_J = 150^\circ\text{C}$	170A @ 960V	
P_D	Total Power Dissipation	329	Watts
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150	$^\circ\text{C}$
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 ($V_{GE} = 0V, I_C = 500\mu A$)	1200			Volts
$V_{GE(TH)}$	Gate Threshold Voltage ($V_{CE} = V_{GE}, I_C = 1mA, T_J = 25^\circ\text{C}$)	3	4.5	6	
$V_{CE(ON)}$	Collector-Emitter On Voltage ($V_{GE} = 15V, I_C = 45A, T_J = 25^\circ\text{C}$)		3.3	3.9	
	Collector-Emitter On Voltage ($V_{GE} = 15V, I_C = 45A, T_J = 125^\circ\text{C}$)		3.0		
I_{CES}	Collector Cut-off Current ($V_{CE} = 1200V, V_{GE} = 0V, T_J = 25^\circ\text{C}$) ^②			500	μA
	Collector Cut-off Current ($V_{CE} = 1200V, V_{GE} = 0V, T_J = 125^\circ\text{C}$) ^②			2500	
I_{GES}	Gate-Emitter Leakage Current ($V_{GE} = \pm 20V$)			± 100	nA



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

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

DYNAMIC CHARACTERISTICS

APT45GP120J

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)			.38	$^\circ C/W$
$R_{\theta JC}$	Junction to Case (DIODE)			N/A	
W_T	Package Weight			29.2	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.)

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

TYPICAL PERFORMANCE CURVES

APT45GP120J

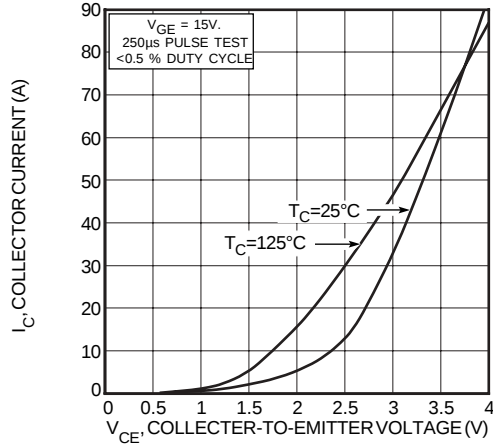


FIGURE 1, Output Characteristics ($V_{GE} = 15V$)

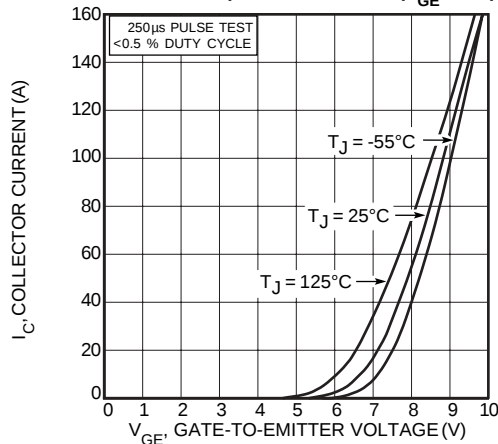


FIGURE 3, Transfer Characteristics

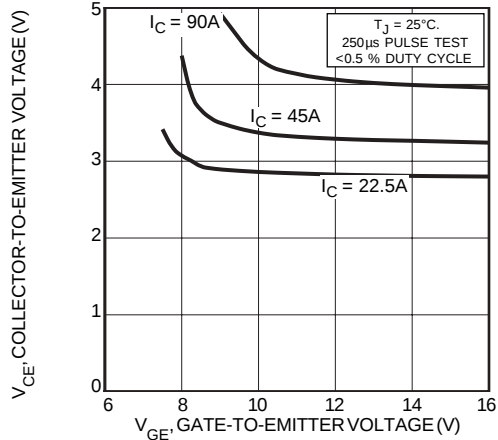


FIGURE 5, On State Voltage vs Gate-to-Emitter Voltage

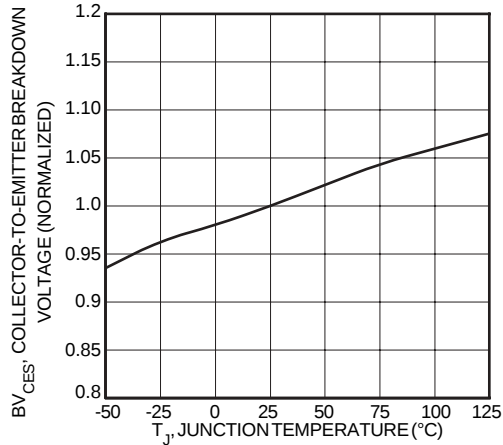


FIGURE 7, Breakdown Voltage vs. Junction Temperature

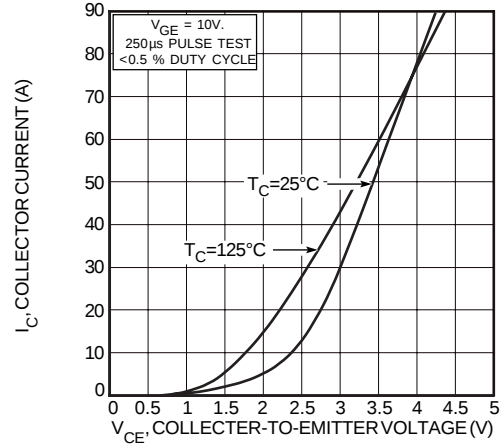


FIGURE 2, Output Characteristics ($V_{GE} = 10V$)

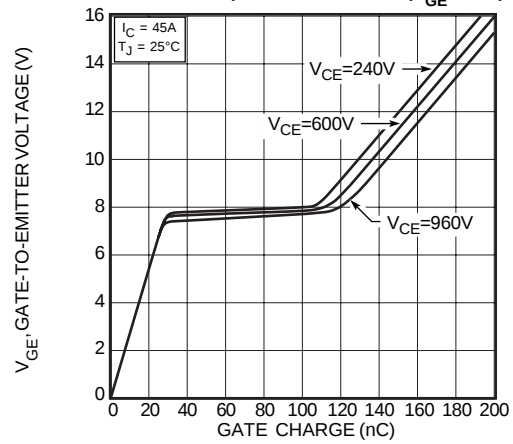


FIGURE 4, Gate Charge

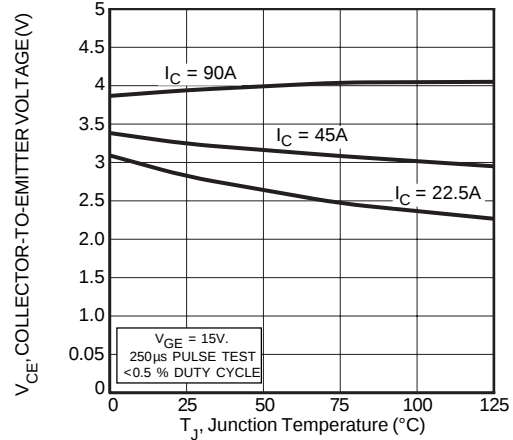


FIGURE 6, On State Voltage vs Junction Temperature

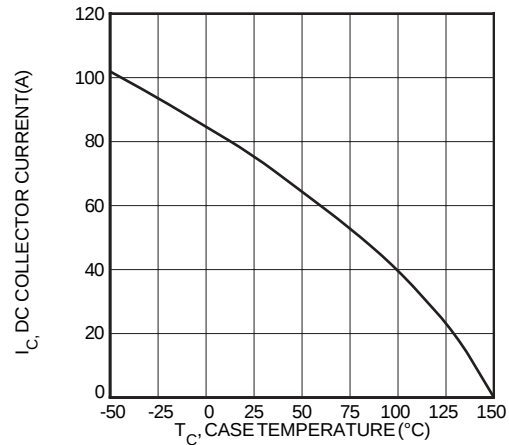


FIGURE 8, DC Collector Current vs Case Temperature

TYPICAL PERFORMANCE CURVES

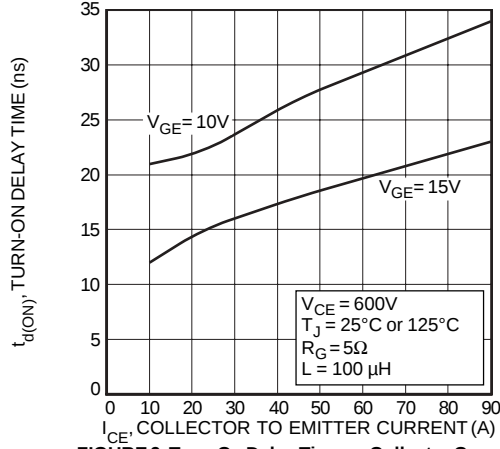


FIGURE 9, Turn-On Delay Time vs Collector Current

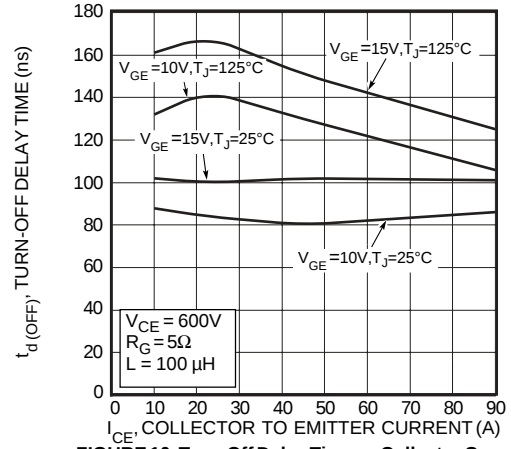


FIGURE 10, Turn-Off Delay Time vs Collector Current

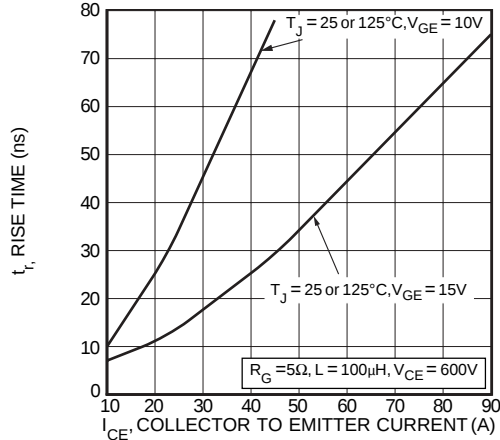


FIGURE 11, Current Rise Time vs Collector Current

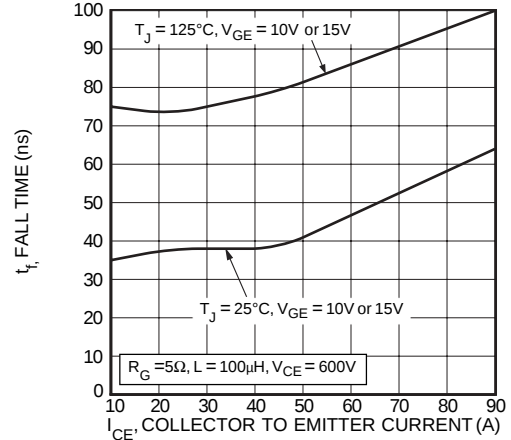


FIGURE 12, Current Fall Time vs Collector Current

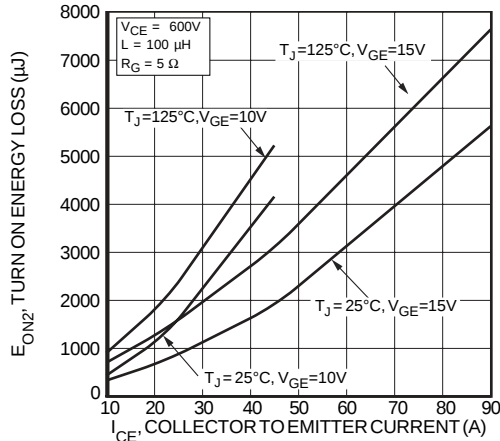


FIGURE 13, Turn-On Energy Loss vs Collector Current

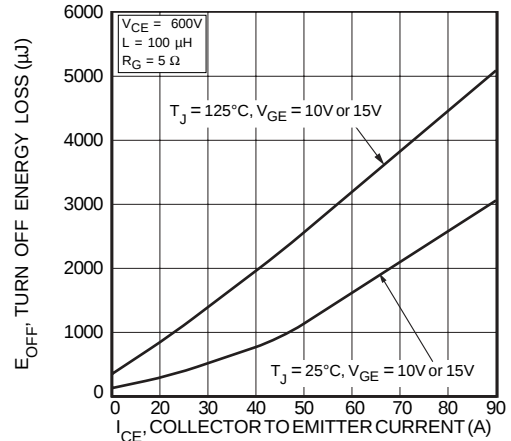


FIGURE 14, Turn Off Energy Loss vs Collector Current

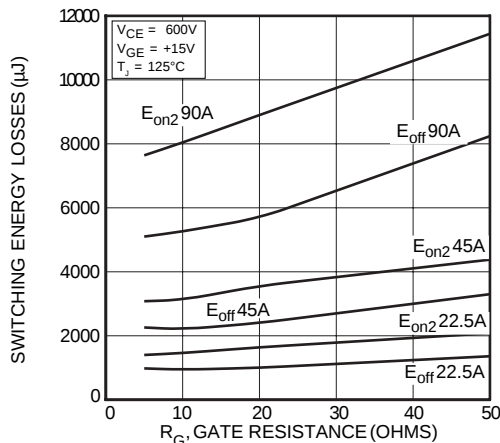


FIGURE 15, Switching Energy Losses vs. Gate Resistance

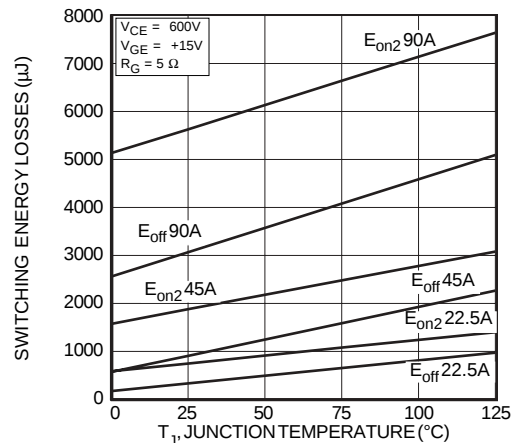


FIGURE 16, Switching Energy Losses vs Junction Temperature

TYPICAL PERFORMANCE CURVES

APT45GP120J

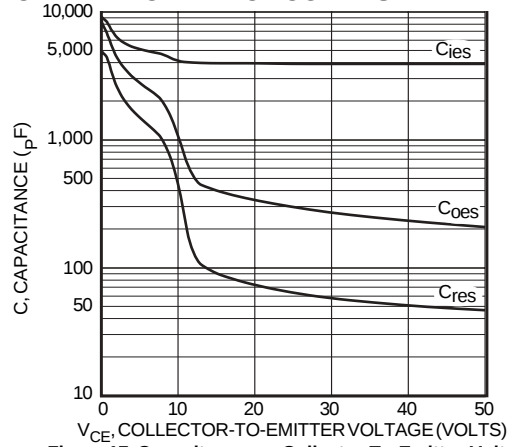


Figure 17, Capacitance vs Collector-To-Emitter Voltage

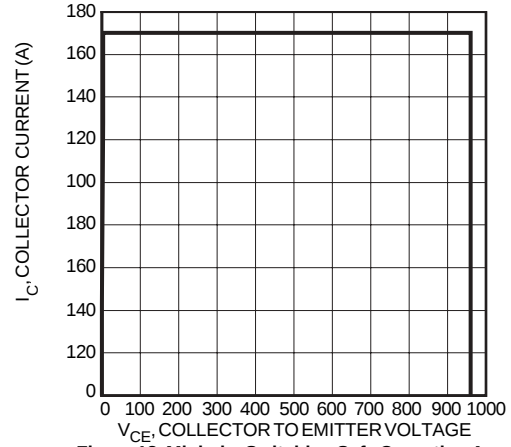


Figure 18, Minimum Switching Safe Operating Area

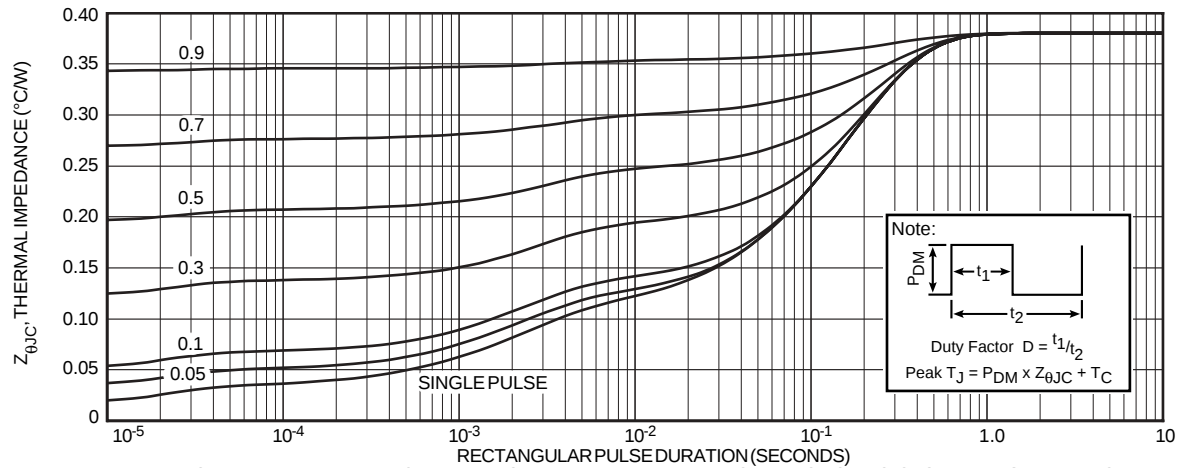


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

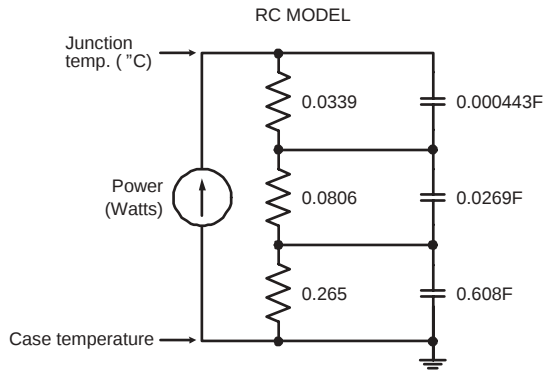


FIGURE 19B, TRANSIENT THERMAL IMPEDANCE MODEL

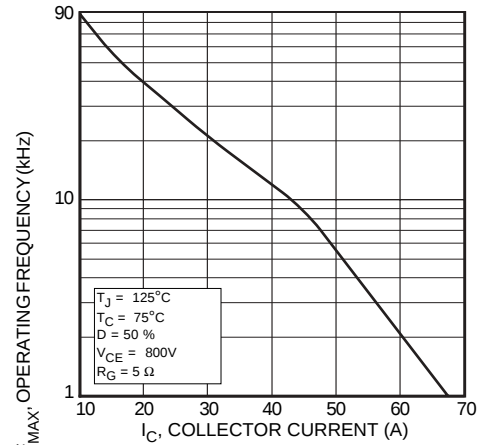


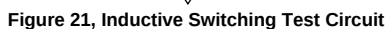
Figure 20, Operating Frequency vs Collector Current

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

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

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

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



Top View Dimensions:

- Overall width: 31.5 (1.240) / 31.7 (1.248)
- Distance between mounting holes: 7.8 (.307) / 8.2 (.322)
- Radius of mounting holes: $r = 4.0 (.157)$ (2 places)
- Distance from mounting hole to gate terminal: 4.0 (.157) / 4.2 (.165) (2 places)
- Distance from mounting hole to emitter terminal: 3.3 (.129) / 3.6 (.143)
- Distance from mounting hole to collector terminal: 14.9 (.587) / 15.1 (.594)
- Distance between gate terminals: 30.1 (1.185) / 30.3 (1.193)
- Distance between emitter terminals: 38.0 (1.496) / 38.2 (1.504)

Side View Dimensions:

- Overall height: 11.8 (.463) / 12.2 (.480)
- Distance from mounting hole to gate terminal: 8.9 (.350) / 9.6 (.378)
- Hex Nut M4 (4 places)
- Distance from mounting hole to emitter terminal: 0.75 (.030) / 0.85 (.033)
- Distance from mounting hole to collector terminal: 12.6 (.496) / 12.8 (.504)
- Overall height: 25.2 (0.992) / 25.4 (1.000)

Bottom View Dimensions:

- Distance from mounting hole to emitter terminal: 1.95 (.077) / 2.14 (.084)
- Distance from mounting hole to collector terminal: 1.95 (.077) / 2.14 (.084)

Terminal Identification:

- * Emitter** (indicated by arrows pointing to the emitter terminals)
- Collector** (indicated by an arrow pointing to the collector terminal)
- * Emitter** (indicated by an arrow pointing to the emitter terminals)
- Gate** (indicated by an arrow pointing to the gate terminal)

Notes:

- W=4.1 (.161) / W=4.3 (.169) / H=4.8 (.187) / H=4.9 (.193) (4 places)
- * Emitter terminals are shorted internally. Current handling capability is equal for either Source terminal.

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.