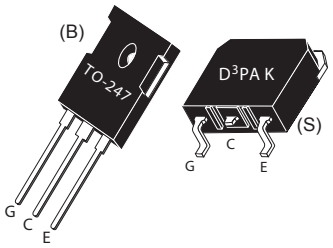
APT40GR120B
APT40GR120S

1200V, 40A, $V_{CE(on)}$= 2.5V Typical

Ultra Fast NPT - IGBT®



The Ultra Fast NPT - IGBT® is a new generation of high voltage power IGBTs. Using Non-Punch-Through Technology, the Ultra Fast NPT-IGBT® offers superior ruggedness and ultrafast switching speed.

Features

- **Low Saturation Voltage**
- **Low Tail Current**
- **RoHS Compliant**
- **Short Circuit Withstand Rated**
- **High Frequency Switching to 50KHz**
- **Ultra Low Leakage Current**

Unless stated otherwise, Microsemi discrete IGBTs contain a single IGBT die. This device is recommended for applications such as induction heating (IH), motor control, general purpose inverters and uninterruptible power supplies (UPS).

MAXIMUM RATINGS

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

Symbol	Parameter	Ratings	Unit
V_{ces}	Collector Emitter Voltage	1200	V
V_{GE}	Gate-Emitter Voltage	±30	
I_{C1}	Continuous Collector Current @ T_C = 25°C	88	A
I_{C2}	Continuous Collector Current @ T_C = 100°C	40	
I_{CM}	Pulsed Collector Current ①	160	
SCWT	Short Circuit Withstand Time: V_{CE} = 600V, V_{GE} = 15V, T_C=125°C	10	µs
P_D	Total Power Dissipation @ T_C = 25°C	500	W
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	Parameter	Min	Typ	Max	Unit
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage (V_{GE} = 0V, I_C = 1.0mA)	1200			Volts
$V_{GE(TH)}$	Gate Threshold Voltage (V_{CE} = V_{GE}, I_C = 2.0mA, T_j = 25°C)	3	4.5	6.0	
$V_{CE(ON)}$	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = 40A, T_j = 25°C)		2.5	3.2	
	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = 40A, T_j = 125°C)		3.5		
	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = 88A, T_j = 25°C)		3.2		
I_{CES}	Collector Cut-off Current (V_{CE} = 1200V, V_{GE} = 0V, T_j = 25°C) ②		10	1000	µA
	Collector Cut-off Current (V_{CE} = 1200V, V_{GE} = 0V, T_j = 125°C) ②		100		
I_{GES}	Gate-Emitter Leakage Current (V_{GE} = ±20V)			±250	nA

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

DYNAMIC CHARACTERISTICS

APT40GR120B_S

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	Capacitance		3980		pF
C_{oes}	Output Capacitance	V_{GE} = 0V, V_{CE} = 25V		320		
C_{res}	Reverse Transfer Capacitance	f = 1MHz		80		
V_{GEP}	Gate to Emitter Plateau Voltage	Gate Charge		7		V
Q_g ③	Total Gate Charge	V_{GE} = 15V		210		nC
Q_{ge}	Gate-Emitter Charge	V_{CE}= 600V		25		
Q_{gc}	Gate- Collector Charge	I_C = 40A		90		
$t_{d(on)}$	Turn-On Delay Time	Inductive Switching (25°C)		22		ns
t_r	Current Rise Time	V_{CC} = 600V		25		
$t_{d(off)}$	Turn-Off Delay Time	V_{GE} = 15V		163		
t_f	Current Fall Time	I_C = 40A		40		
E_{on2} ⑤	Turn-On Switching Energy	R_G = 4.3 Ω④		1375	3000	µJ
E_{off} ⑥	Turn-Off Switching Energy	T_J = +25°C		906	1650	
$t_{d(on}$	Turn-On Delay Time	Inductive Switching (125°C)		22		ns
t_r	Current Rise Time	V_{CC} = 600V		25		
$t_{d(off)}$	Turn-Off Delay Time	V_{GE} = 15V		185		
t_f	Current Fall Time	I_C = 40A		47		
E_{on2} ⑤	Turn-On Switching Energy	R_G = 4.3 Ω④		1916	3500	µJ
E_{off} ⑥	Turn-Off Switching Energy	T_J = +125°C		1186	2500	

THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Characteristic	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction to Case Thermal Resistance			.25	°C/W
$R_{\theta JA}$	Junction to Ambient Thermal Resistance			40	
W_T	Package Weight		.22		oz
			6.2		g
Torque	Mounting Torque (TO-247 Package), 4-40 or M3 screw			10	in-lbf
				6.2	N·m

1 Repetitive Rating: Pulse width and case temperature limited by maximum junction temperature.

2 Pulse test: Pulse Width < 380μs, duty cycle < 2%.

3 See Mil-Std-750 Method 3471.

4 R_G is external gate resistance, not including internal gate resistance or gate driver impedance. (MIC4452)

5 E_{on2} is the clamped inductive turn on energy that includes a commutating diode reverse recovery current in the IGBT turn on energy loss. A combi device is used for the clamping diode.

6 E_{off} is the clamped inductive turn-off energy measured in accordance with JEDEC standard JESD24-1.

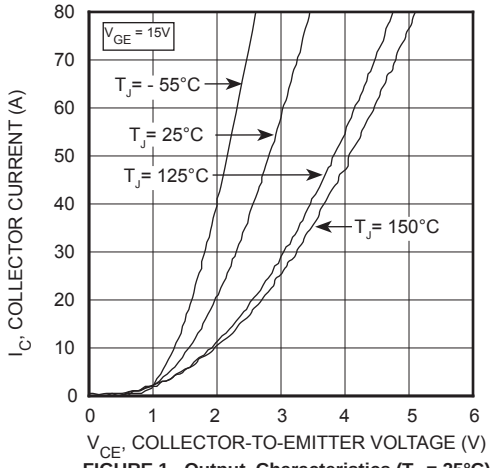


FIGURE 1, Output Characteristics (T_J = 25°C)

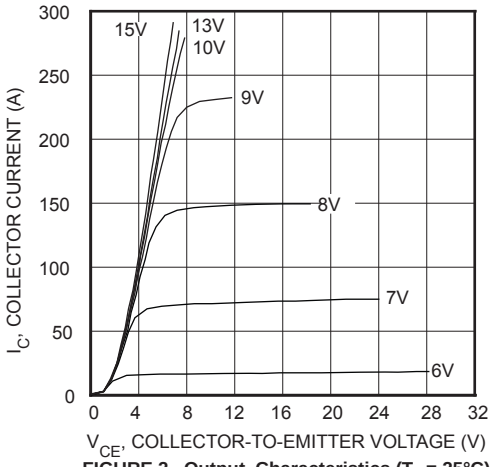


FIGURE 2, Output Characteristics (T_J = 25°C)

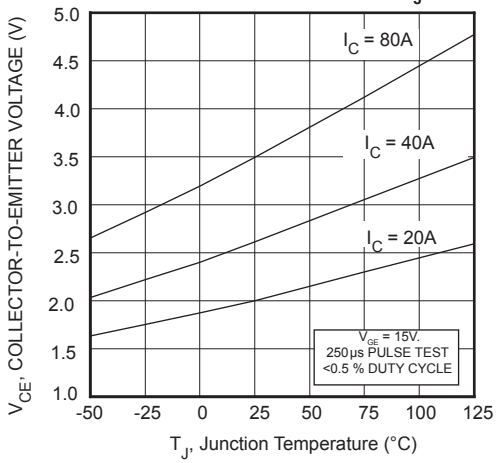


FIGURE 3, On State Voltage vs Junction Temperature

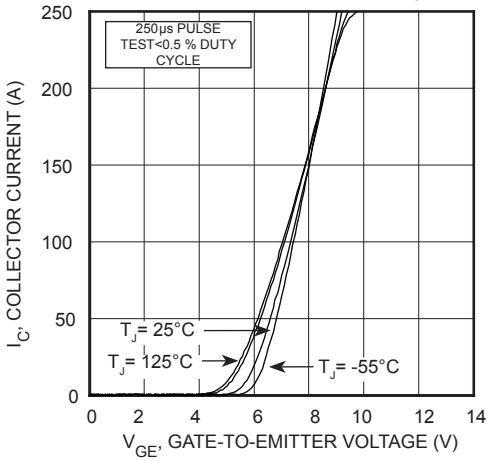


FIGURE 4, Transfer Characteristics

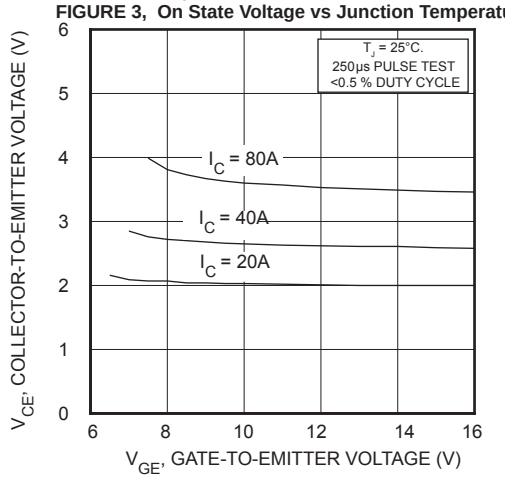


FIGURE 5, On State Voltage vs Gate-to-Emitter Voltage

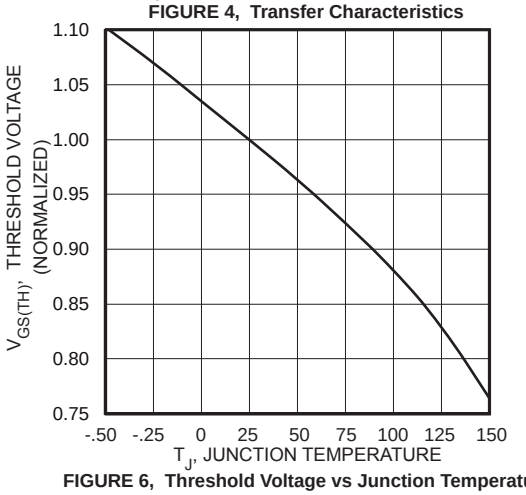


FIGURE 6, Threshold Voltage vs Junction Temperature

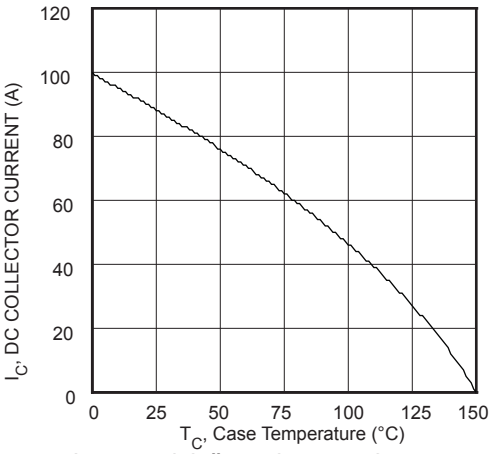


FIGURE 7, DC Collector Current vs Case Temperature

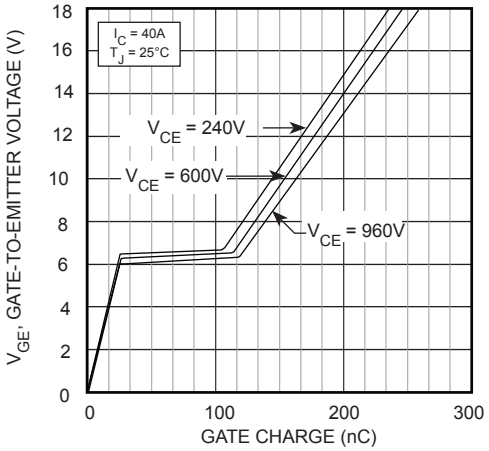


FIGURE 8, Gate charge

TYPICAL PERFORMANCE CURVES

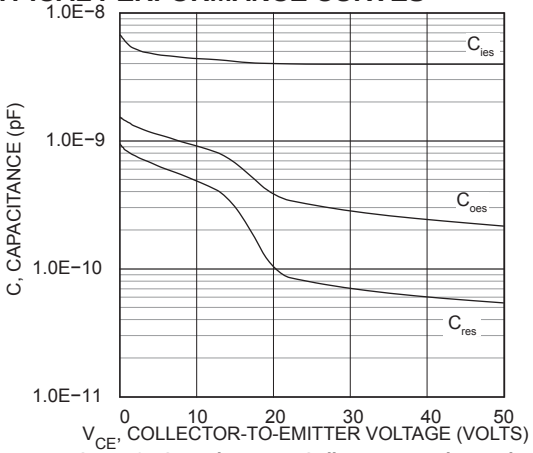


FIGURE 9, Capacitance vs Collector-To-Emitter Voltage

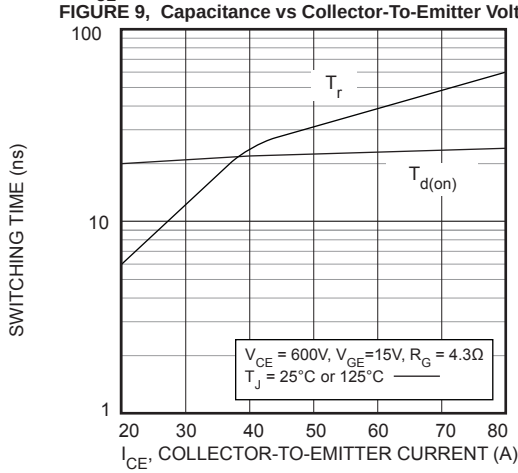


FIGURE 11, Turn-On Time vs Collector Current

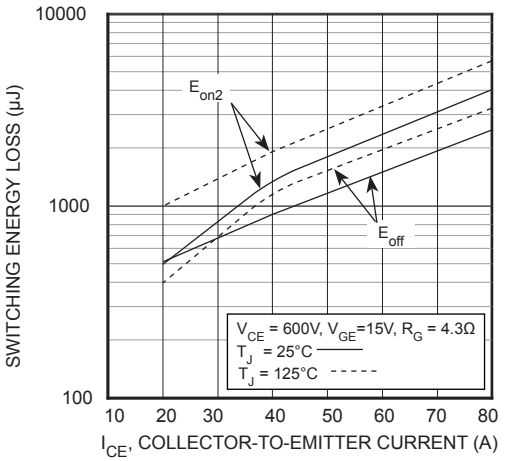


FIGURE 13, Energy Loss vs Collector Current

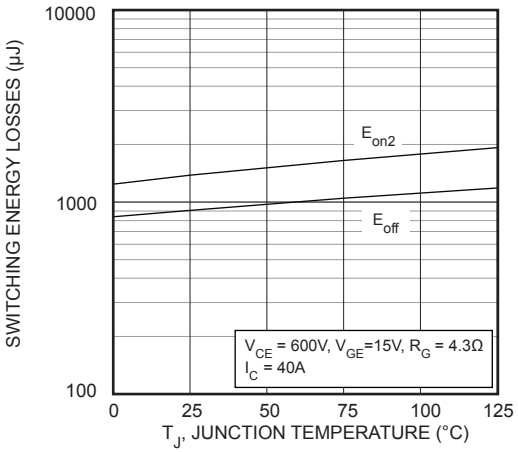


FIGURE 15, Energy Losses vs Junction Temperature

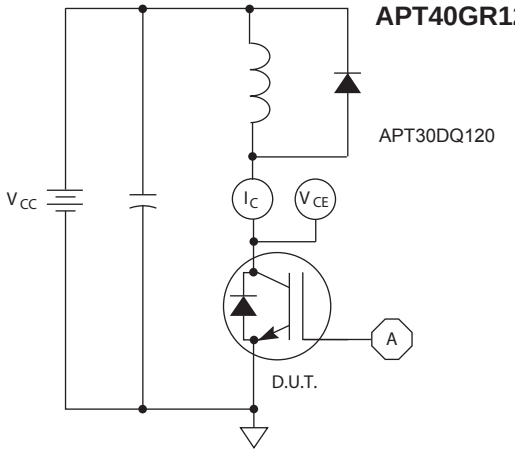


FIGURE 10, Inductive Switching Test Circuit

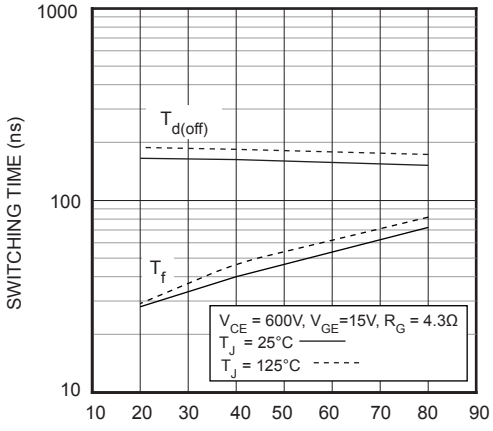


FIGURE 12, Turn-Off Time vs Collector Current

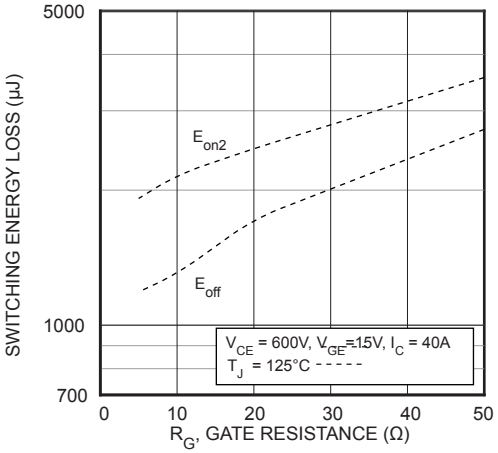


FIGURE 14, Energy Loss vs Gate Resistance

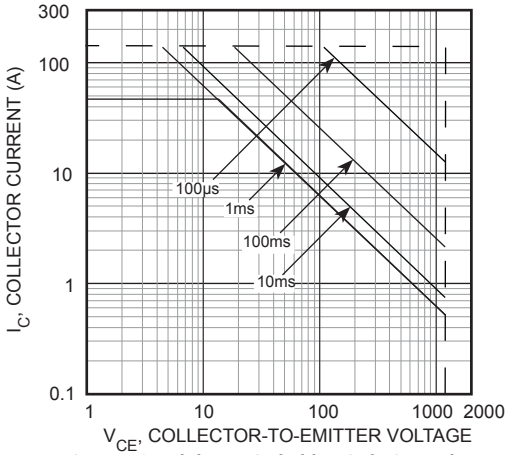


FIGURE 16, Minimum Switching Safe Operating Area

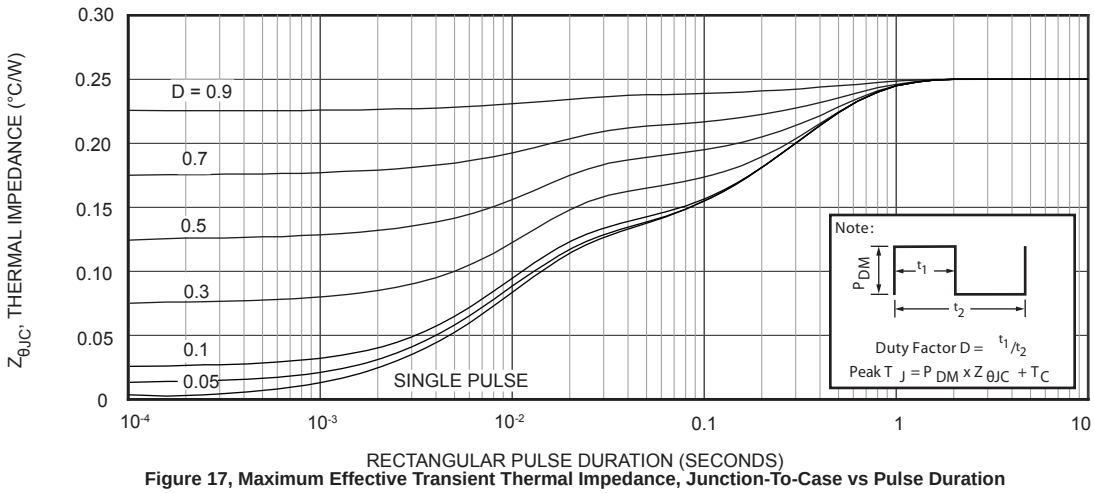
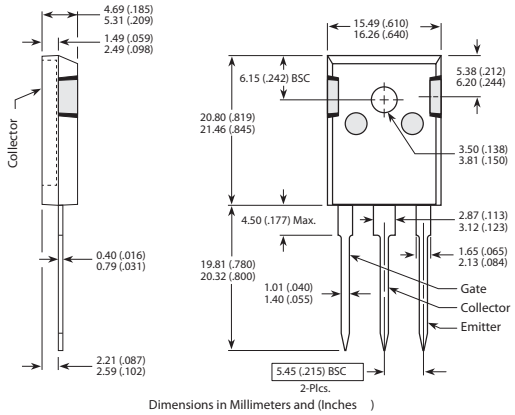


Figure 17, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

TO-247 Package Outline

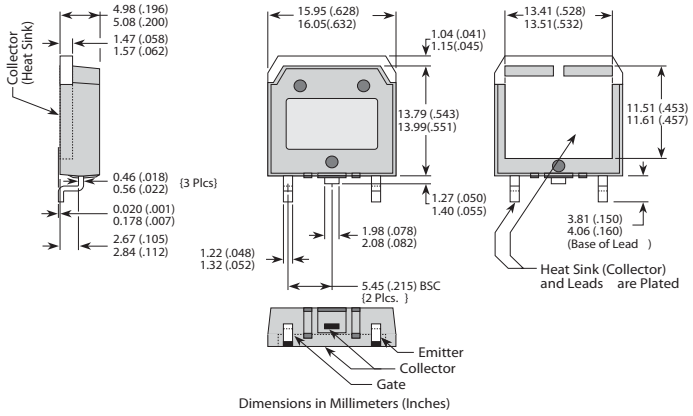
e3 SAC: 100% Sn Plating



Dimensions in Millimeters and (Inches)

D³PAK Package Outline

e3 SAC: 100% Sn Plating



Dimensions in Millimeters (Inches)