Microsemi
POWER PRODUCTS GROUP

APT70GR120J

1200V, 70A, $V_{ce(on)}$ = 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**
- **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	112	A
I_{C2}	Continuous Collector Current @ T_C = 86°C	70	
I_{CM}	Pulsed Collector Current ①	280	
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	543	W
T_J,T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150	

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 = 2.5mA, T_j = 25°C)	3.5	5.0	6.5	
$V_{CE(ON)}$	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = 70A, T_j = 25°C)		2.5	3.2	
	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = 70A, T_j = 125°C)		3.3		
	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = 140A, T_j = 25°C)		3.5		
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

APT70GR120J

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	Capacitance		7260		pF
C_{oes}	Output Capacitance	V_{GE} = 0V, V_{CE} = 25V		643		
C_{res}	Reverse Transfer Capacitance	f = 1MHz		199		
V_{GEP}	Gate to Emitter Plateau Voltage	Gate Charge		7.5		V
Q_g ③	Total Gate Charge	V_{GE} = 15V		412	544	nC
Q_{ge}	Gate-Emitter Charge	V_{CE}= 600V		48	62	
Q_{gc}	Gate- Collector Charge	I_C = 70A		204	275	
$t_{d(on)}$	Turn-On Delay Time	Inductive Switching (25°C)		33		ns
t_r	Current Rise Time	V_{CC} = 600V		48		
$t_{d(off)}$	Turn-Off Delay Time	V_{GE} = 15V		278		
t_f	Current Fall Time	I_C = 70A		64		
E_{on2} ⑤	Turn-On Switching Energy	R_G = 4.3 Ω④		3816	5720	µJ
E_{off} ⑥	Turn-Off Switching Energy	T_J = +25°C		2582	3870	
$t_{d(on)}$	Turn-On Delay Time	Inductive Switching (125°C)		33		ns
t_r	Current Rise Time	V_{CC} = 600V		48		
$t_{d(off)}$	Turn-Off Delay Time	V_{GE} = 15V		320		
t_f	Current Fall Time	I_C = 70A		74		
E_{on2} ⑤	Turn-On Switching Energy	R_G = 4.3 Ω④		5651	8475	µJ
E_{off} ⑥	Turn-Off Switching Energy	T_J = +125°C		3323	4980	

THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction to Case	-	-	0.23	°C/W
W_T	Package Weight	-	1.03	-	oz
Torque	Terminals and Mounting Screws.	-	-	10	in·lbf
		-	-	1.1	N·m
$V_{Isolation}$	RMS Voltage (50-60Hz Sinusoidal Waveform from Terminals to Mounting Base for 1 Min.)	2500	-	-	Volts

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

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

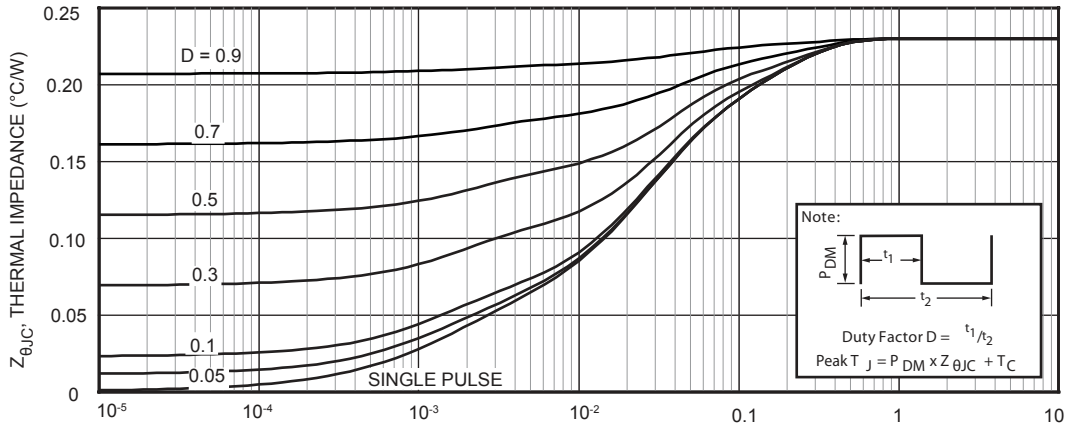
3 See Mil-Std-750 Method 3471.

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.

Microsemi reserves the right to change, without notice, the specifications and information contained herein.



RECTANGULAR PULSE DURATION (SECONDS)

Figure 1, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

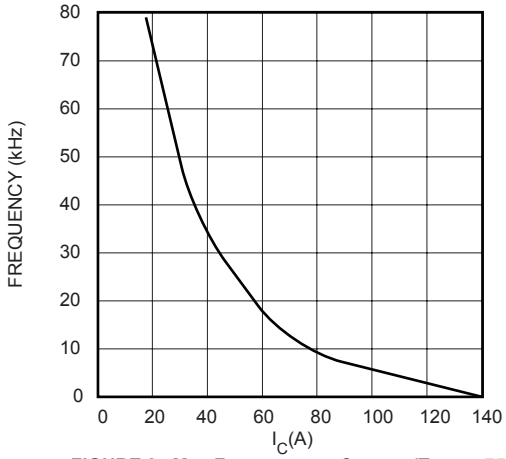


FIGURE 2, Max Frequency vs Current (T_{case} = 75°C)

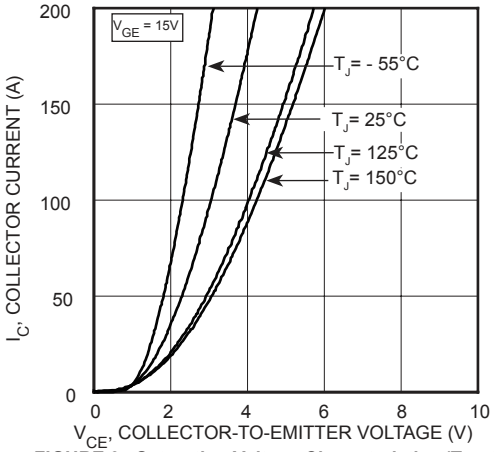


FIGURE 3, Saturation Voltage Characteristics (T_J = 25°C)

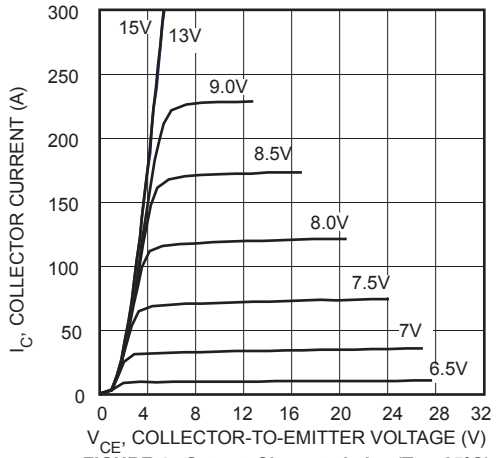


FIGURE 4, Output Characteristics (T_J = 25°C)

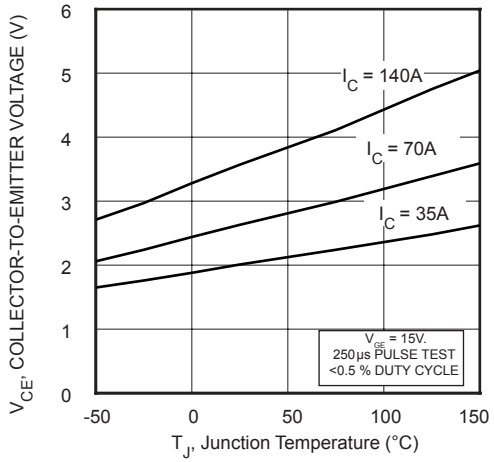


FIGURE 5, On State Voltage vs Junction Temperature

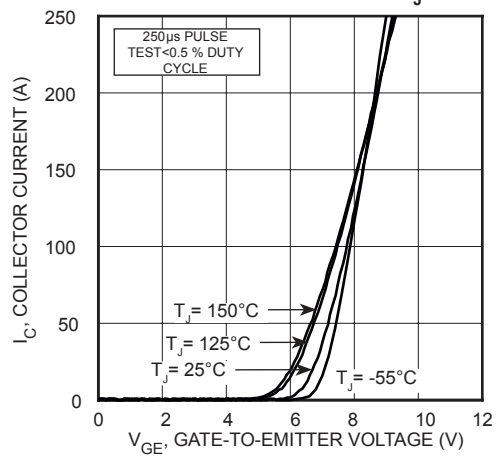


FIGURE 6, Transfer Characteristics

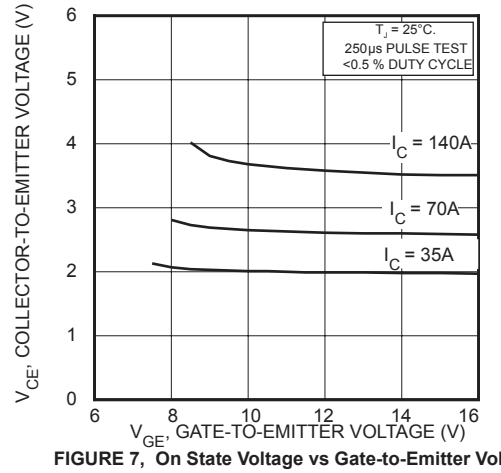


FIGURE 7, On State Voltage vs Gate-to-Emitter Voltage

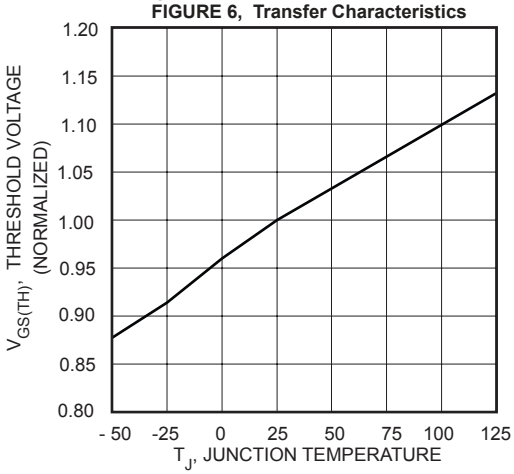


FIGURE 8, Threshold Voltage vs Junction Temperature

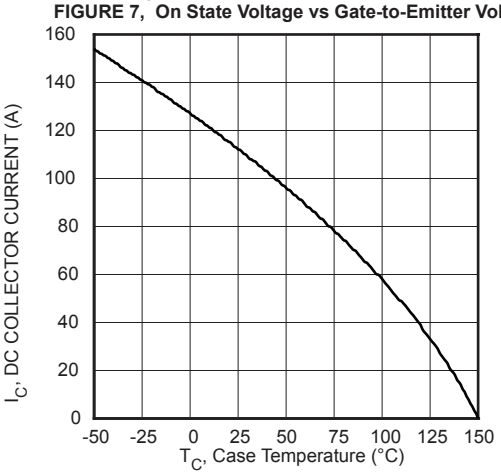


FIGURE 9, DC Collector Current vs Case Temperature

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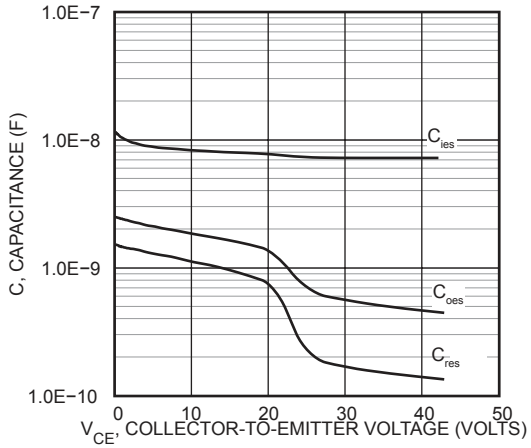


FIGURE 10, Capacitance vs Collector-To-Emitter Voltage

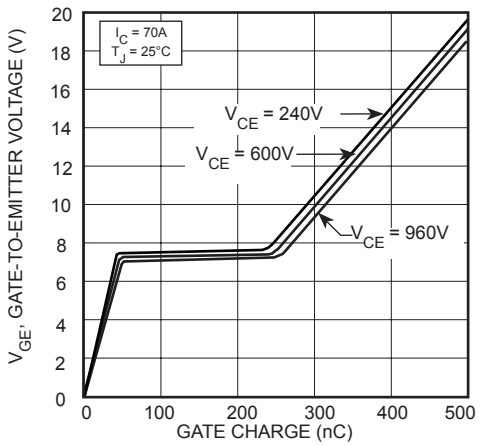


FIGURE 11, Gate charge

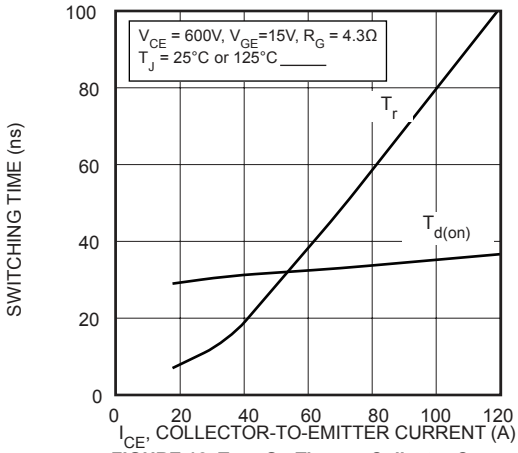


FIGURE 12, Turn-On Time vs Collector Current

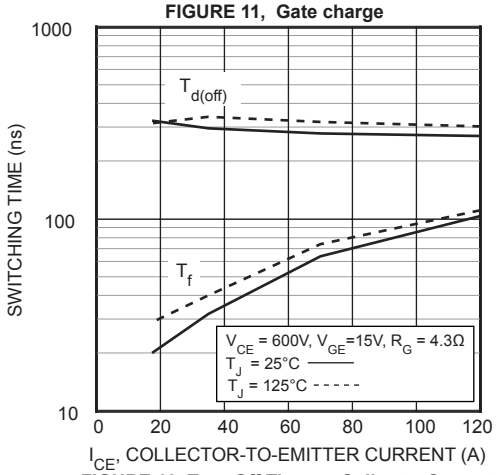


FIGURE 13, Turn-Off Time vs Collector Current

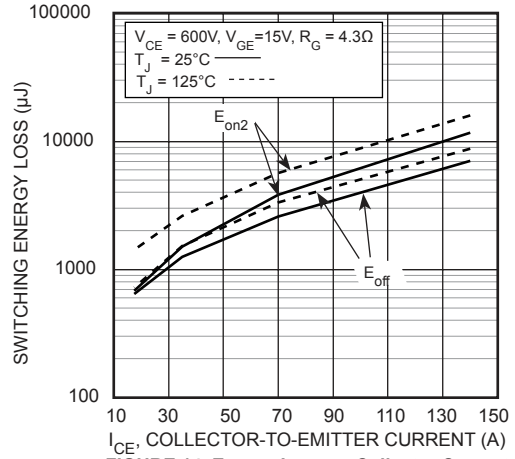


FIGURE 14, Energy Loss vs Collector Current

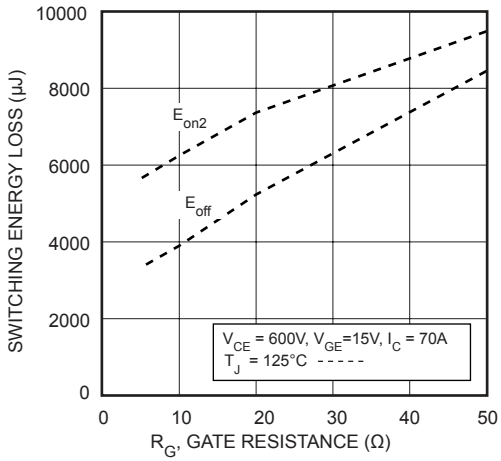


FIGURE 15, Energy Loss vs Gate Resistance

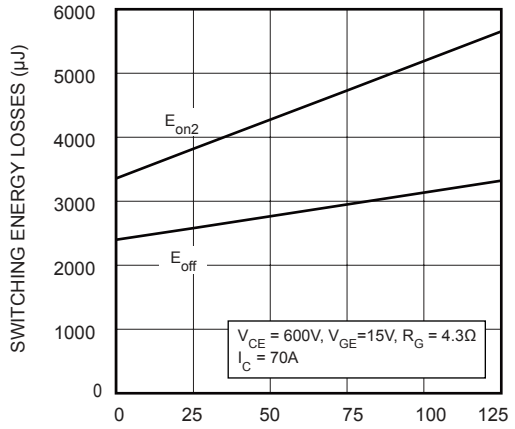


FIGURE 16, Swiitching Energy vs Junction Temperature

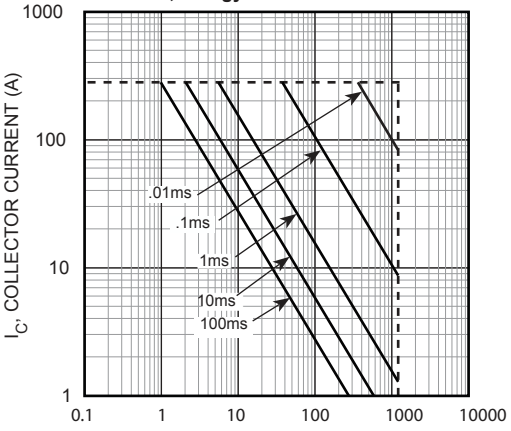
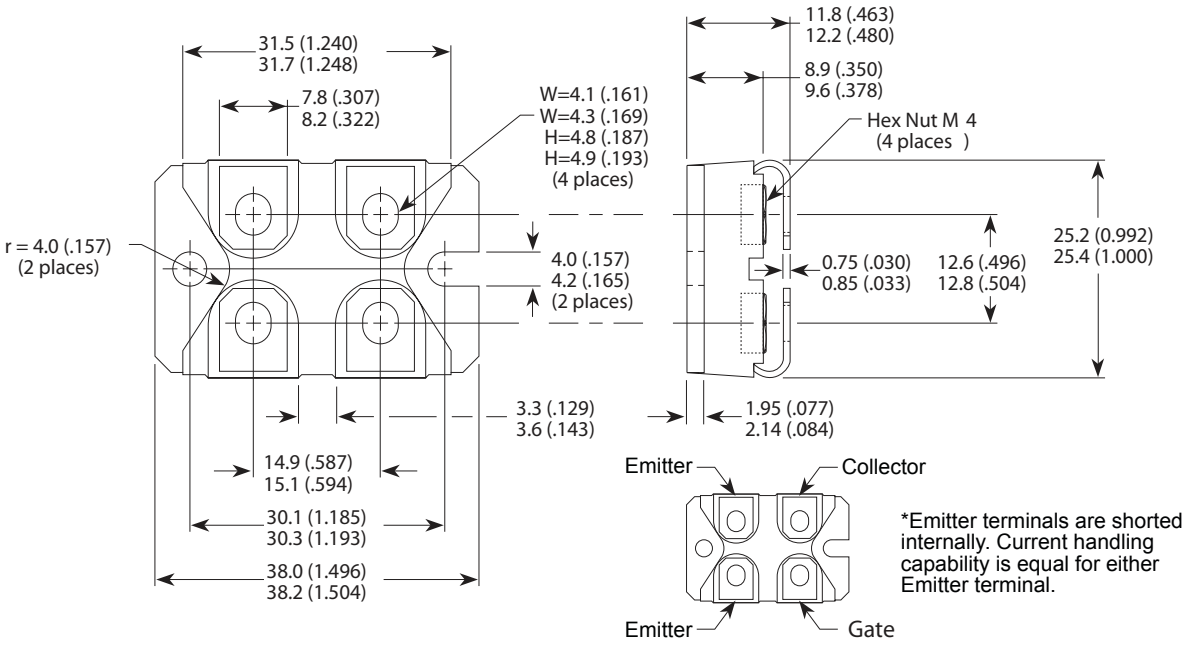


FIGURE 17, Minimum Switching Safe Operating Area

SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters and (Inches)

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