

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: $T_C = 25^\circ\text{C}$ 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 @ $T_C = 25^\circ\text{C}$	118	A
I_{C2}	Continuous Collector Current @ $T_C = 75^\circ\text{C}$	85	
I_{CM}	Pulsed Collector Current ^①	340	
SCWT	Short Circuit Withstand Time: $V_{CE} = 600\text{V}$, $V_{GE} = 15\text{V}$, $T_C = 125^\circ\text{C}$	10	μs
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	595	W
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	Parameter	Min	Typ	Max	Unit
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage ($V_{GE} = 0\text{V}$, $I_C = 1.0\text{mA}$)	1200			Volts
$V_{GE(TH)}$	Gate Threshold Voltage ($V_{CE} = V_{GE}$, $I_C = 2.5\text{mA}$, $T_J = 25^\circ\text{C}$)	3.5	5.0	6.5	
$V_{CE(ON)}$	Collector-Emitter On Voltage ($V_{GE} = 15\text{V}$, $I_C = 85\text{A}$, $T_J = 25^\circ\text{C}$)		2.5	3.2	
	Collector-Emitter On Voltage ($V_{GE} = 15\text{V}$, $I_C = 85\text{A}$, $T_J = 125^\circ\text{C}$)		3.3		
	Collector-Emitter On Voltage ($V_{GE} = 15\text{V}$, $I_C = 170\text{A}$, $T_J = 25^\circ\text{C}$)		3.5		
I_{CES}	Collector Cut-off Current ($V_{CE} = 1200\text{V}$, $V_{GE} = 0\text{V}$, $T_J = 25^\circ\text{C}$) ^②		10	1000	μA
	Collector Cut-off Current ($V_{CE} = 1200\text{V}$, $V_{GE} = 0\text{V}$, $T_J = 125^\circ\text{C}$) ^②		100		
I_{GES}	Gate-Emitter Leakage Current ($V_{GE} = \pm 20\text{V}$)			± 250	nA


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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	Capacitance $V_{GE} = 0V, V_{CE} = 25V$ $f = 1MHz$		8400		pF
C_{oes}	Output Capacitance			725		
C_{res}	Reverse Transfer Capacitance			190		
V_{GEP}	Gate to Emitter Plateau Voltage	Gate Charge $V_{GE} = 15V$ $V_{CE} = 600V$ $I_C = 85A$		7.5		V
$Q_g^{(3)}$	Total Gate Charge			490	660	
Q_{ge}	Gate-Emitter Charge			60	85	
Q_{gc}	Gate- Collector Charge			230	320	
$t_{d(on)}$	Turn-On Delay Time	Inductive Switching (25°C) $V_{CC} = 600V$ $V_{GE} = 15V$ $I_C = 85A$ $R_G = 4.3 \Omega^{(4)}$ $T_J = +25^\circ C$		43		ns
t_r	Current Rise Time			70		
$t_{d(off)}$	Turn-Off Delay Time			300		
t_f	Current Fall Time			85		
$E_{on2}^{(5)}$	Turn-On Switching Energy	Inductive Switching (25°C) $V_{CC} = 600V$ $V_{GE} = 15V$ $I_C = 85A$ $R_G = 4.3 \Omega^{(4)}$ $T_J = +25^\circ C$		6000	9000	μJ
$E_{off}^{(6)}$	Turn-Off Switching Energy			3800	5700	
$t_{d(on)}$	Turn-On Delay Time	Inductive Switching (125°C) $V_{CC} = 600V$ $V_{GE} = 15V$ $I_C = 85A$ $R_G = 4.3 \Omega^{(4)}$ $T_J = +125^\circ C$		43		ns
t_r	Current Rise Time			70		
$t_{d(off)}$	Turn-Off Delay Time			350		
t_f	Current Fall Time			95		
$E_{on2}^{(5)}$	Turn-On Switching Energy	Inductive Switching (125°C) $V_{CC} = 600V$ $V_{GE} = 15V$ $I_C = 85A$ $R_G = 4.3 \Omega^{(4)}$ $T_J = +125^\circ C$		7800	11,700	μJ
$E_{off}^{(6)}$	Turn-Off Switching Energy			4900	7350	

THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction to Case	-	-	0.21	°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 energy loss at turn-on and includes the charge stored in the freewheeling 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.

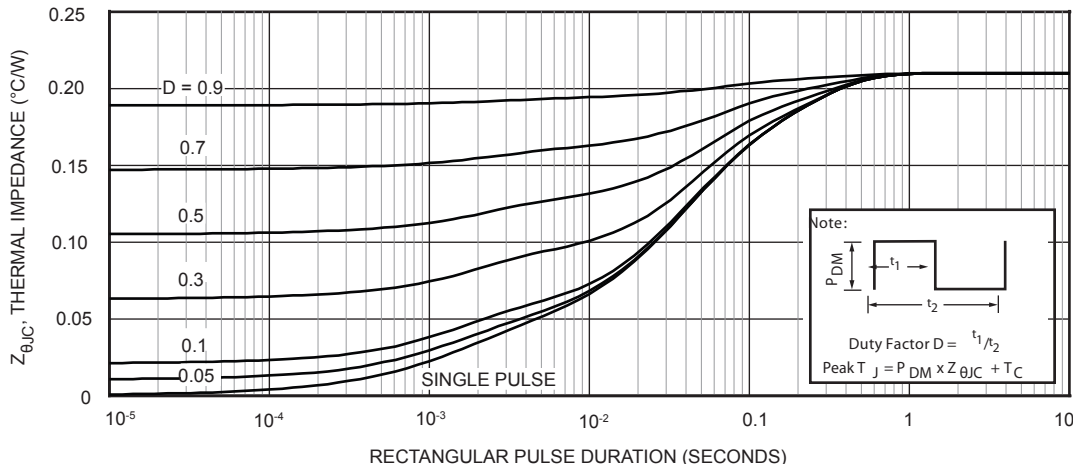


Figure 1, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

TYPICAL PERFORMANCE CURVES

APT85GR120J

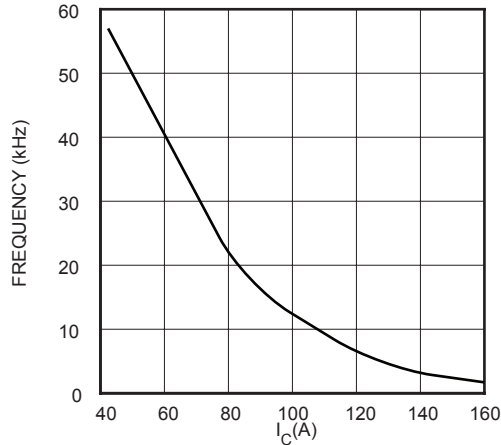


FIGURE 2, Max Frequency vs Current ($T_{case} = 75^{\circ}C$)

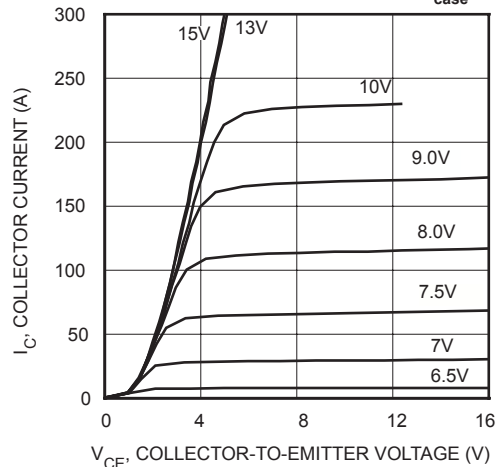


FIGURE 4, Output Characteristics ($T_J = 25^{\circ}C$)

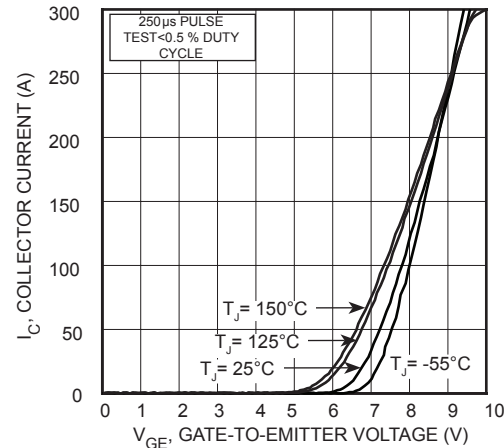


FIGURE 6, Transfer Characteristics

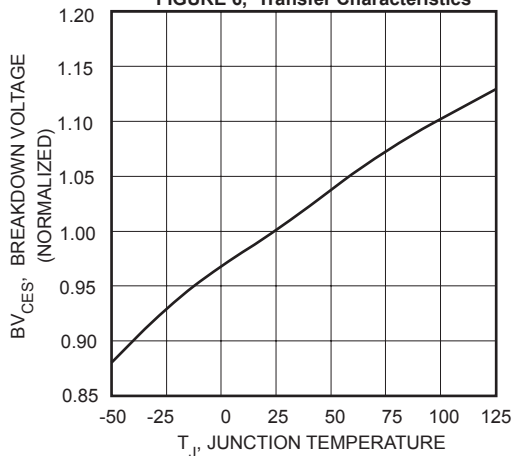


FIGURE 8, Breakdown Voltage vs Junction Temperature

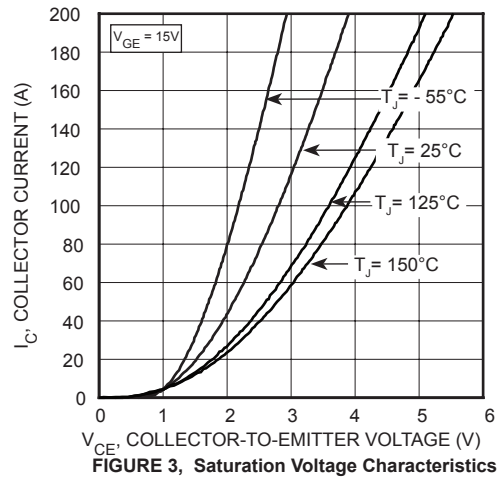


FIGURE 3, Saturation Voltage Characteristics

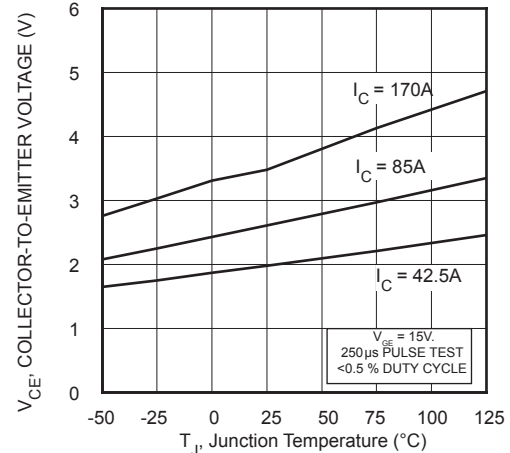


FIGURE 5, On State Voltage vs Junction Temperature

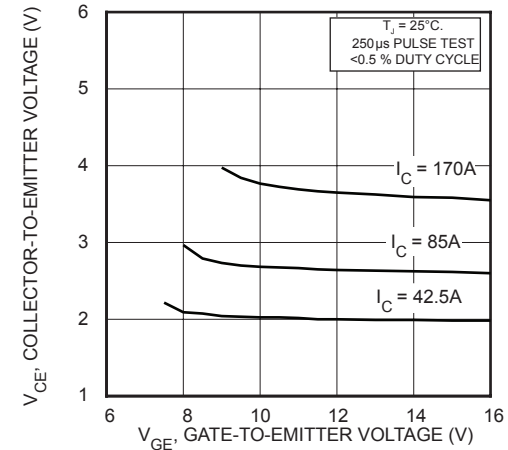


FIGURE 7, On State Voltage vs Gate-to-Emitter Voltage

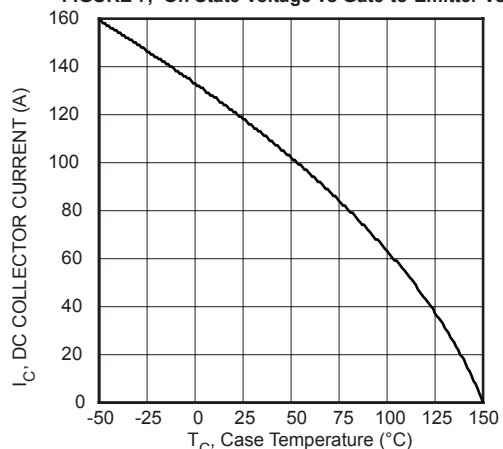


FIGURE 9, DC Collector Current vs Case Temperature

TYPICAL PERFORMANCE CURVES

APT85GR120J

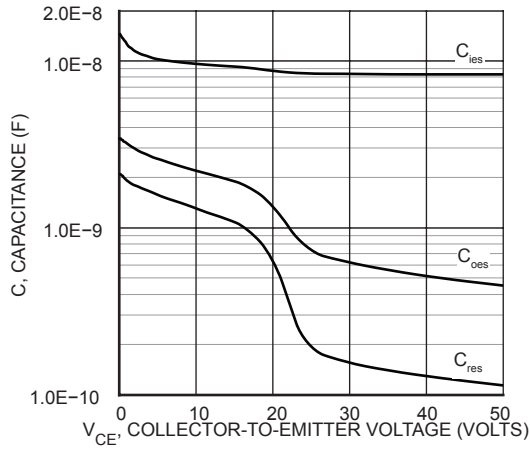


FIGURE 10, Capacitance vs Collector-To-Emitter Voltage

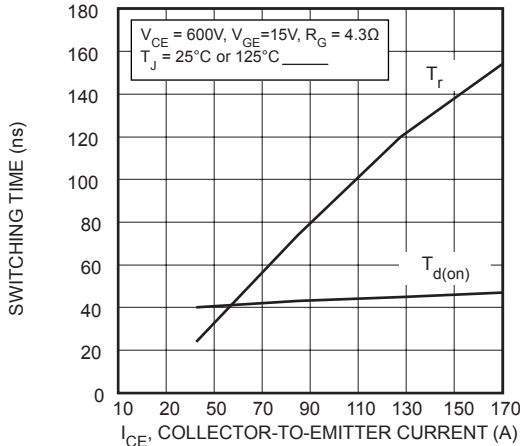


FIGURE 12, Turn-On Time vs Collector Current

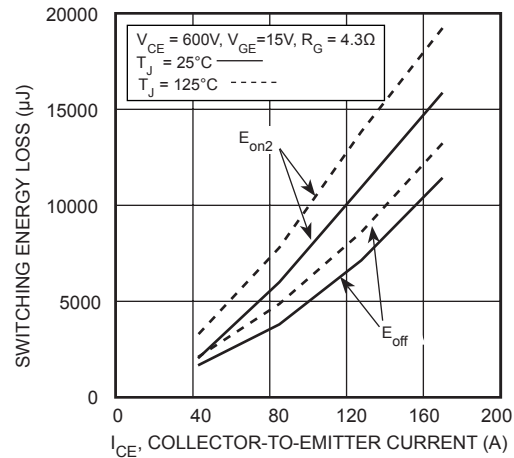


FIGURE 14, Energy Loss vs Collector Current

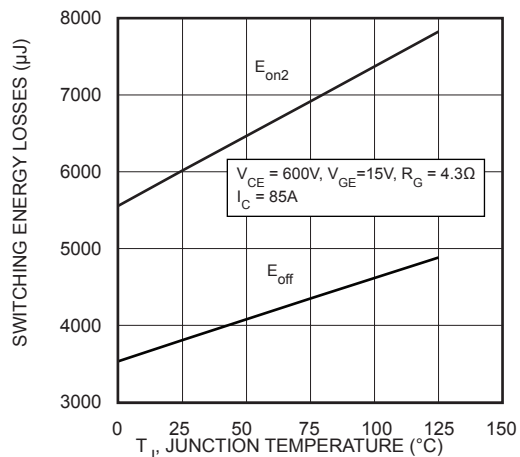


FIGURE 16, Switching Energy vs Junction Temperature

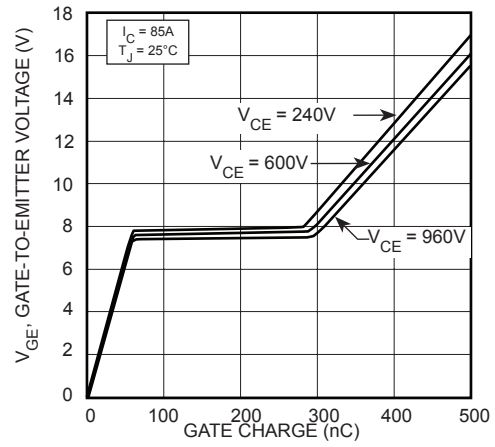


FIGURE 11, Gate charge

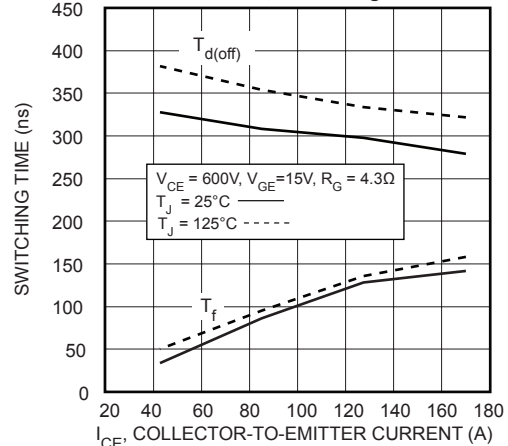


FIGURE 13, Turn-Off Time vs Collector Current

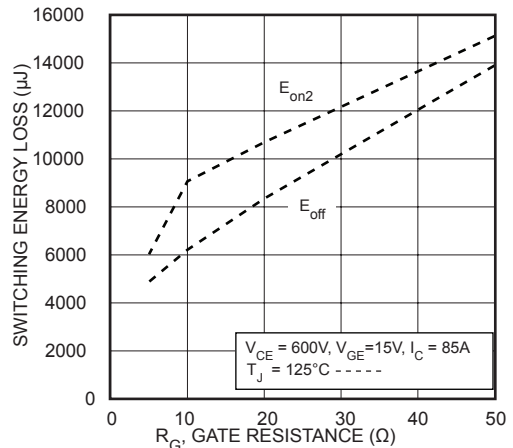


FIGURE 15, Energy Loss vs Gate Resistance

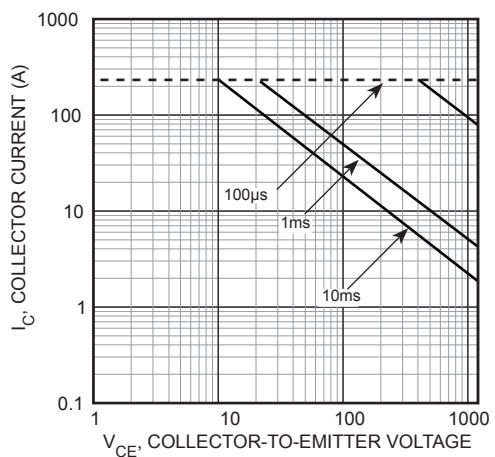
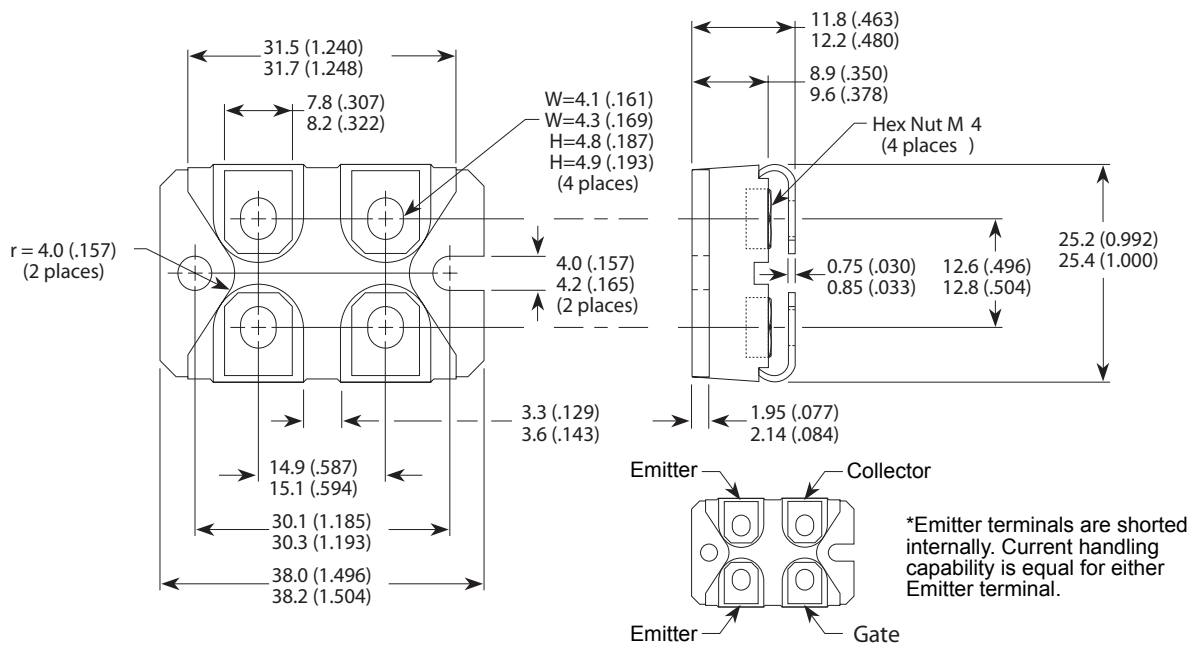


FIGURE 17, Minimum Switching Safe Operating Area

SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters and (Inches)

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