

# NPT Trench IGBT

1200 V, 25 A

## FGA25N120ANTDTU

### Description

Using onsemi's proprietary trench design and advanced NPT Technology, the 1200 V NPT IGBT offers superior conduction and switching performances, high avalanche ruggedness and easy parallel operation. This device is well suited for the resonant or soft switching application such as induction heating, microwave oven.

### Features

- NPT Trench Technology, Positive Temperature Coefficient
- Low Saturation Voltage:  $V_{CE(sat)}$ , typ = 2.0 V @  $I_C = 25$  A and  $T_C = 25^\circ\text{C}$
- Low Switching Loss:  $E_{CE\ off}$ , typ = 0.96 mJ @  $I_C = 25$  A and  $T_C = 25^\circ\text{C}$
- Extremely Enhanced Avalanche Capability
- This Device is Pb-Free Halide, Free and RoHS Compliant

### Applications

- Induction Heating, Microwave Oven

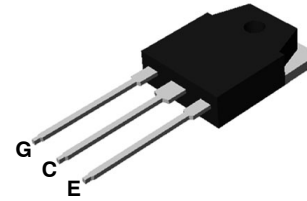
### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-Emitter Voltage	1200	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	
$I_C$	Collector Current (@ $T_C = 25^\circ\text{C}$ )	50	A
	Collector Current (@ $T_C = 100^\circ\text{C}$ )	25	
$I_{CM}$	Pulsed Collector Current (Note 1)	90	A
$I_F$	Diode Continuous Forward Current (@ $T_C = 25^\circ\text{C}$ )	50	A
	Diode Continuous Forward Current (@ $T_C = 100^\circ\text{C}$ )	25	A
$I_{FM}$	Diode Maximum Forward Current	150	A
$P_D$	Maximum Power Dissipation (@ $T_C = 25^\circ\text{C}$ )	312	W
	Maximum Power Dissipation (@ $T_C = 100^\circ\text{C}$ )	125	W
$T_J$	Operating Temperature Range	-55 to +150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-55 to +150	$^\circ\text{C}$
$T_L$	Maximum Lead Temp for Soldering Purpose, 1/8" from Case for 5 s	300	$^\circ\text{C}$

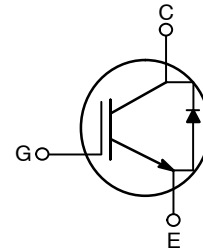
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### NOTES:

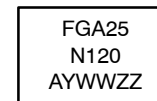
1. Repetitive Rating: Pulse-width limited by maximum junction temperature.



TO-3P-3  
CASE 340BZ



### MARKING DIAGRAM



FGA25N120 = Specific Device Code  
A = Assembly Location  
YWW = Date Code (Year and Week)  
ZZ = Assembly Lot Code

### ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

# FGA25N120ANTDTU

## THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$ (IGBT)	Thermal Resistance, Junction to Case	0.4	°C/W
$R_{\theta JC}$ (DIODE)	Thermal Resistance, Junction to Case	2.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	40	°C/W

## ORDERING INFORMATION

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FGA25N120ANTDTU-F109	FGA25N120ANTD	TO-3PN	Tube	N/A	N/A	30

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

## ELECTRICAL CHARACTERISTICS OF THE IGBT ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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### Off Characteristics

$I_{CES}$	Collector Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0\text{ V}$	-	-	3	mA
$I_{GES}$	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0\text{ V}$	-	-	±250	nA

### On Characteristics

$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 25\text{ mA}, V_{CE} = V_{GE}$	3.5	5.5	7.5	V
$V_{CE(Sat)}$	Collector to Emitter Saturation Voltage	$I_C = 25\text{ A}, V_{GE} = 15\text{ V}$	-	2.0	-	V
		$I_C = 25\text{ A}, V_{GE} = 15\text{ V}, T_C = 125^\circ\text{C}$	-	2.15	-	V
		$I_C = 50\text{ A}, V_{GE} = 15\text{ V}$	-	2.65	-	V

### Dynamic Characteristics

$C_{ies}$	Input Capacitance	$V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	-	3700	-	pF
$C_{oes}$	Output Capacitance		-	130	-	pF
$C_{res}$	Reverse Transfer Capacitance		-	80	-	pF

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 600\text{ V}, I_C = 25\text{ A}, R_G = 10\ \Omega, V_{GE} = 15\text{ V},$ Inductive Load, $T_C = 125^\circ\text{C}$	-	50	-	ns
$t_r$	Rise Time		-	60	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	190	-	ns
$t_f$	Fall Time		-	100	-	ns
$E_{on}$	Turn-On Switching Loss		-	4.1	-	mJ
$E_{off}$	Turn-Off Switching Loss		-	0.96	-	mJ
$E_{ts}$	Total Switching Loss		-	5.06	-	mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 600\text{ V}, I_C = 25\text{ A}, R_G = 10\ \Omega, V_{GE} = 15\text{ V},$ Inductive Load, $T_C = 125^\circ\text{C}$	-	50	-	ns
$t_r$	Rise Time		-	60	-	ns
$t_{d(off)}$	Turn-Off Fall Time		-	200	-	ns
$t_f$	Fall Time		-	154	-	ns
$E_{on}$	Turn-On Switching Loss		-	4.3	-	mJ
$E_{off}$	Turn-Off Switching Loss		-	1.5	-	mJ
$E_{ts}$	Total Switching Loss		-	5.8	-	mJ
$Q_g$	Total Gate Charge	$V_{CE} = 600\text{ V}, I_C = 25\text{ A}, V_{GE} = 15\text{ V}$	-	200	-	nC
$Q_{ge}$	Gate-Emitter Charge		-	15	-	nC
$Q_{gc}$	Gate-Collector Charge		-	100	-	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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## ELECTRICAL CHARACTERISTICS OF DIODE ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
$V_{FM}$	Diode Forward Voltage	$I_F = 25\text{ A}$	$T_C = 25^\circ\text{C}$	-	2.0	3.0	V
			$T_C = 125^\circ\text{C}$	-	2.1	-	
$t_{rr}$	Diode Reverse Recovery Time	$I_F = 25\text{ A},$ $di_F/dt = 100\text{ A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$	-	235	350	ns
			$T_C = 125^\circ\text{C}$	-	300	-	
$I_{rr}$	Diode Peak Reverse Recovery Current	$I_F = 25\text{ A},$ $di_F/dt = 100\text{ A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$	-	27	40	A
			$T_C = 125^\circ\text{C}$	-	31	-	
$Q_{rr}$	Diode Reverse Recovery Charge	$I_F = 25\text{ A},$ $di_F/dt = 100\text{ A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$	-	3130	4700	nC
			$T_C = 125^\circ\text{C}$	-	4650	-	

TYPICAL PERFORMANCE CHARACTERISTICS

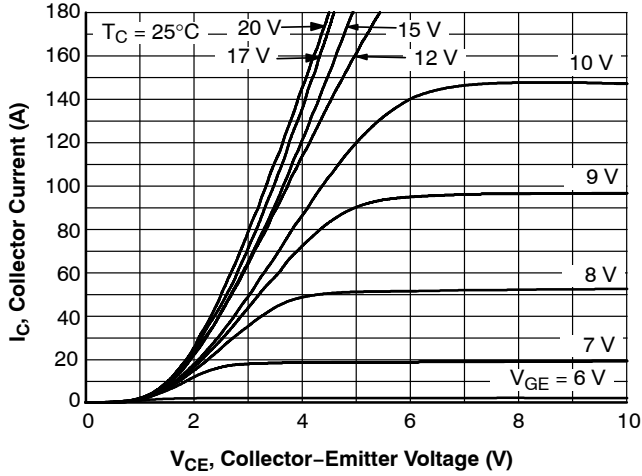


Figure 1. Typical Output Characteristics

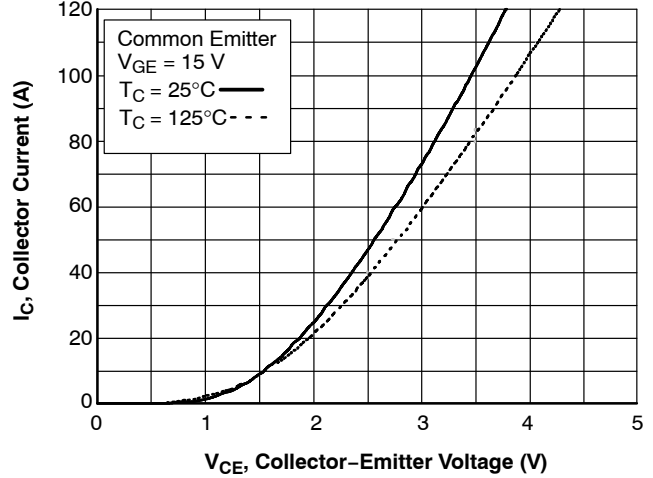


Figure 2. Typical Saturation Voltage Characteristics

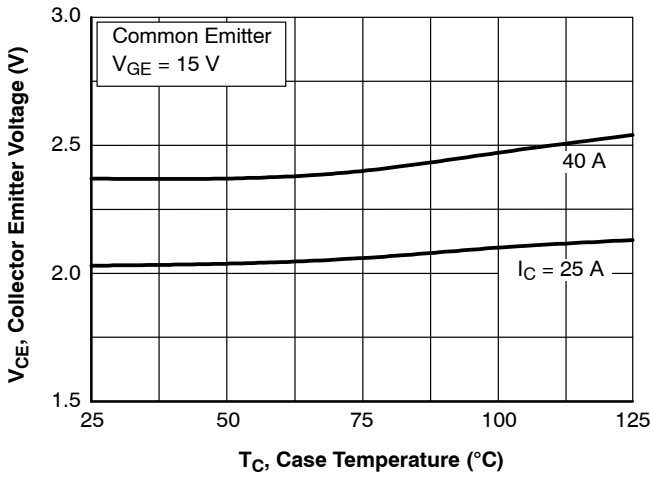


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

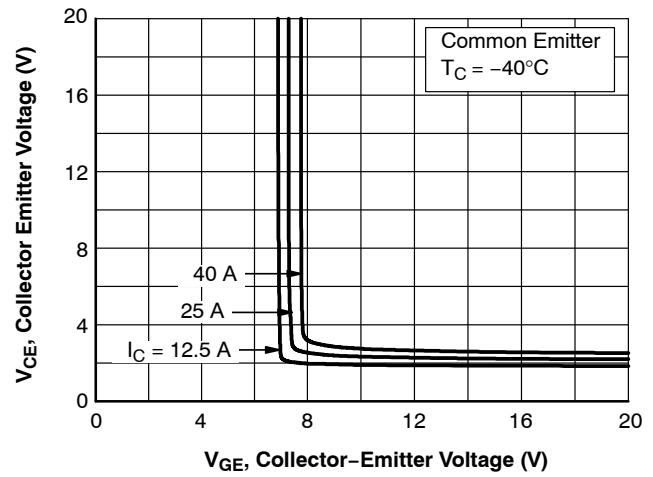


Figure 4.  $V_{GE}$  vs Saturation Voltage

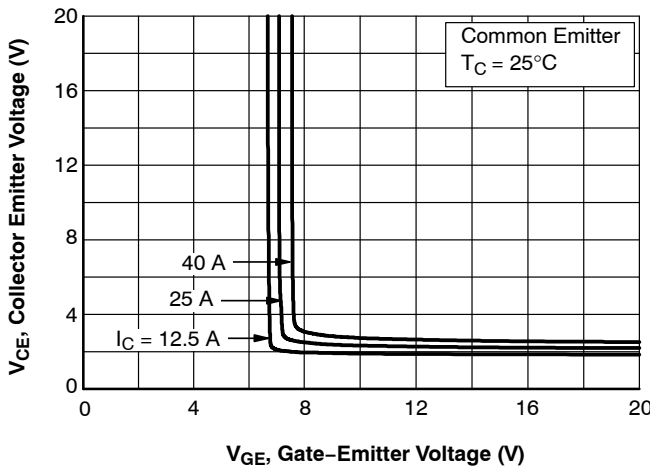


Figure 5.  $V_{GE}$  vs. Saturation Voltage

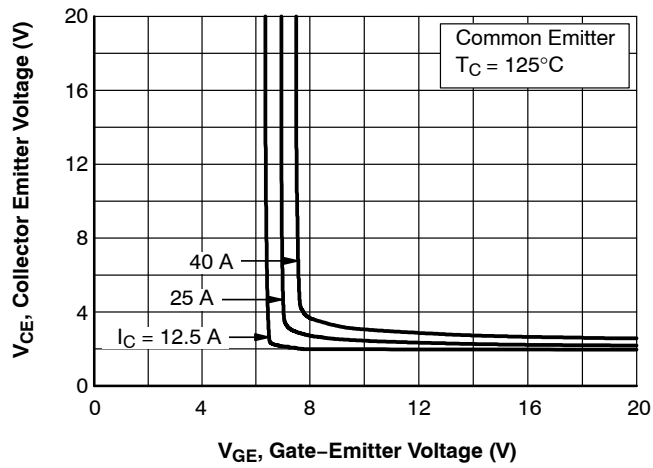


Figure 6.  $V_{GE}$  vs. Saturation Voltage

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## TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

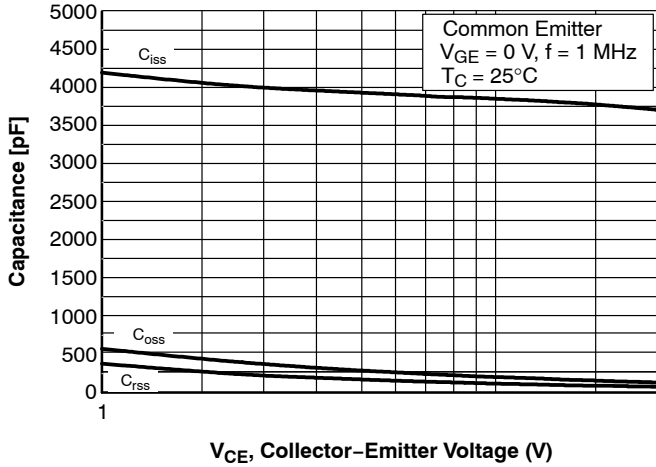


Figure 7. Capacitance Characteristics

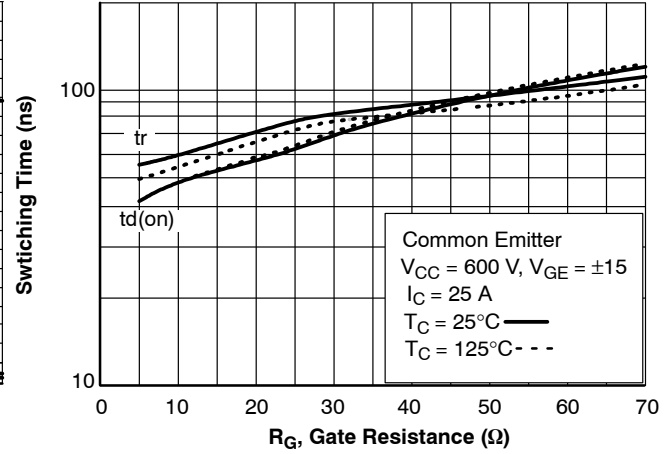


Figure 8. Turn On-Characteristics vs. Gate Resistance

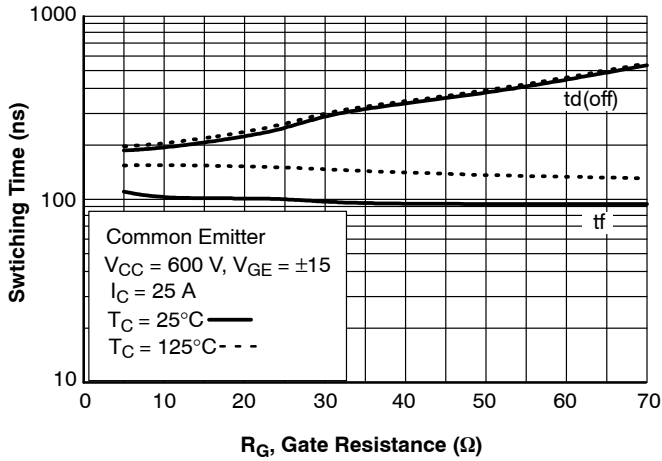


Figure 9. Turn Off-Characteristics vs. Gate Resistance

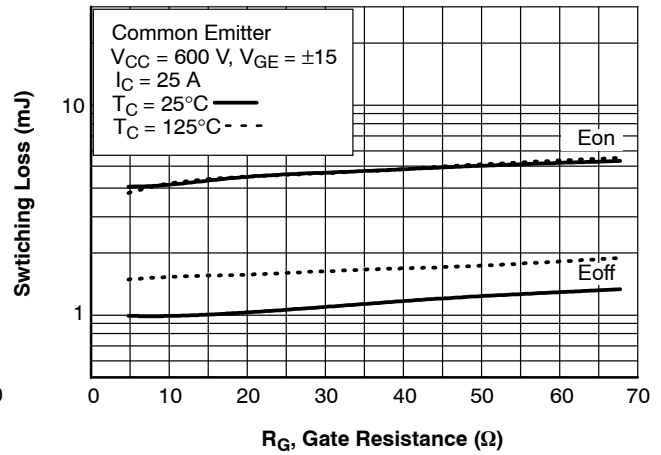


Figure 10. Switching Loss vs. Gate Resistance

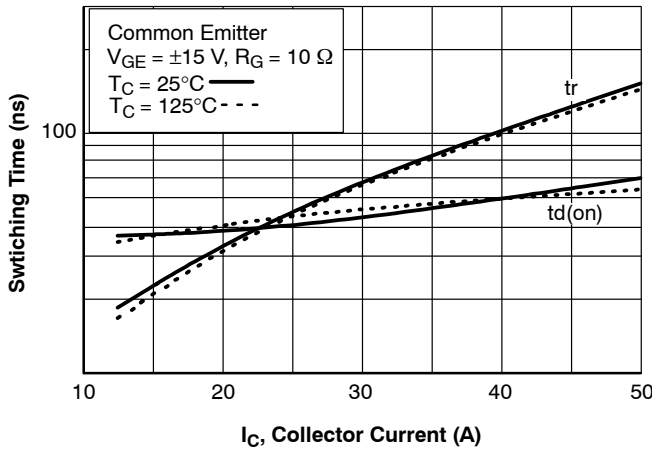


Figure 11. Turn-On Characteristics vs. Collector Current

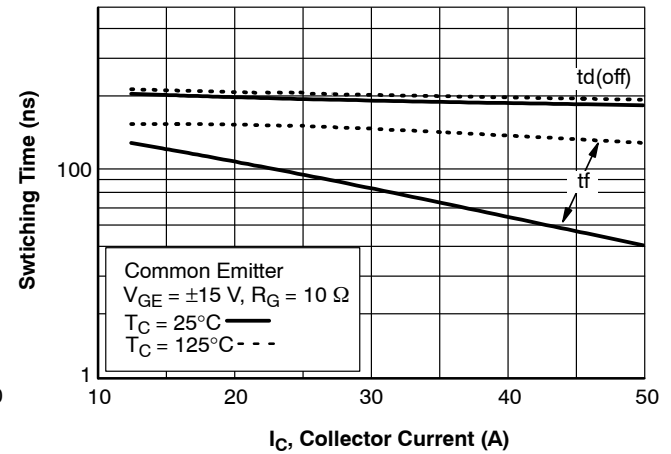


Figure 12. Turn-Off Characteristics vs. Collector Current

# FGA25N120ANTDTU

## TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

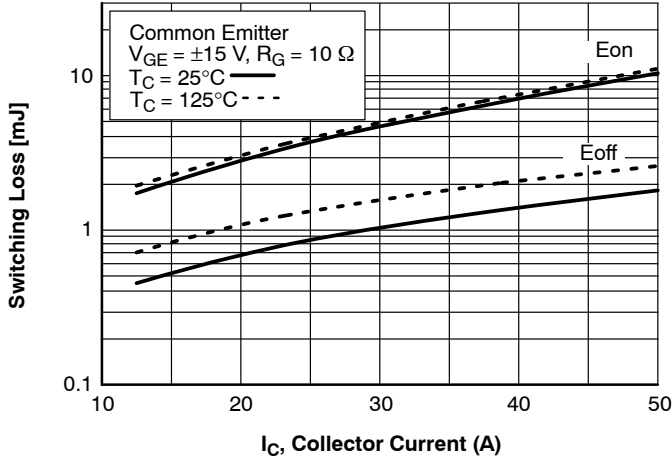


Figure 13. Switching Loss vs Collector Current

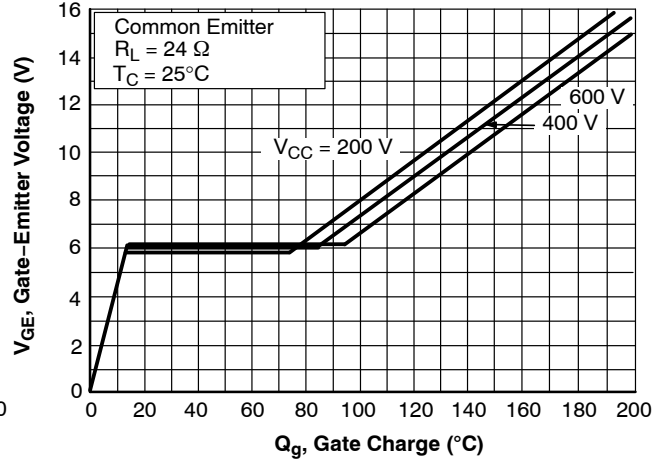


Figure 14. Gate Charge Characteristics

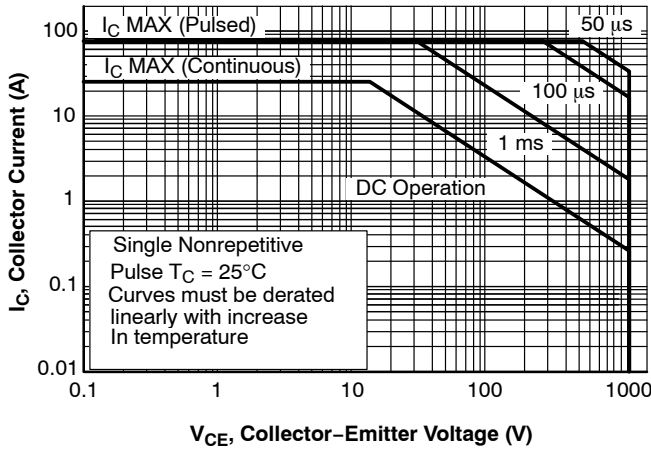


Figure 15. SOA Characteristics

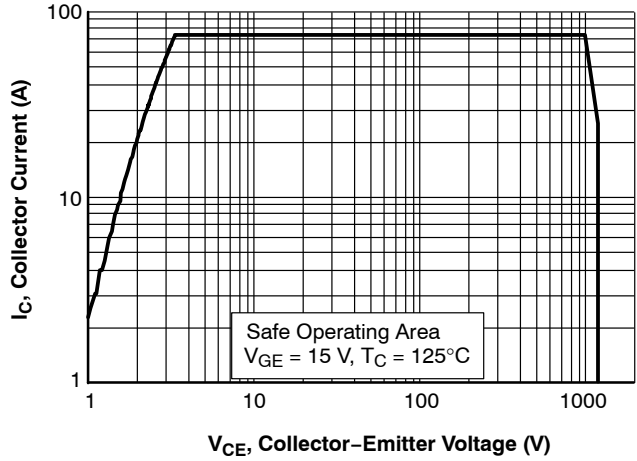


Figure 16. Turn-Off SOA

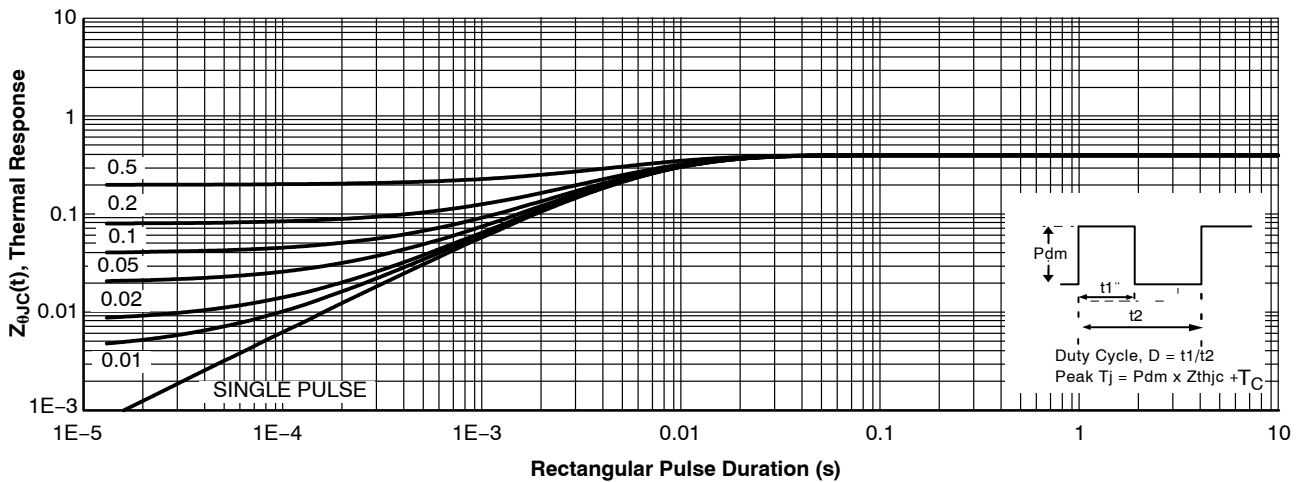


Figure 17. Transient Thermal Impedance of IGBT

TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

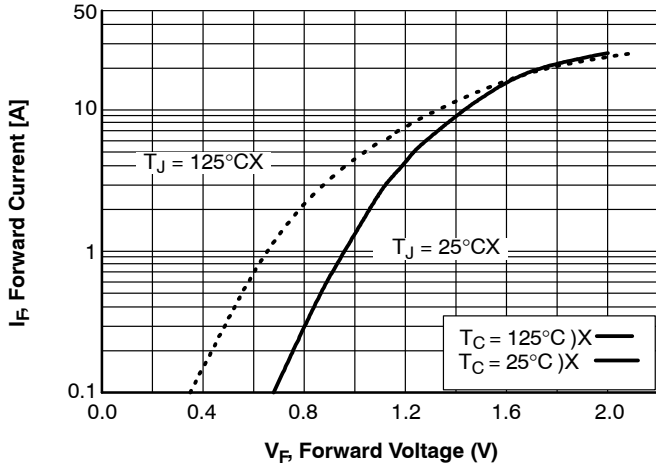


Figure 18. Forward Characteristics

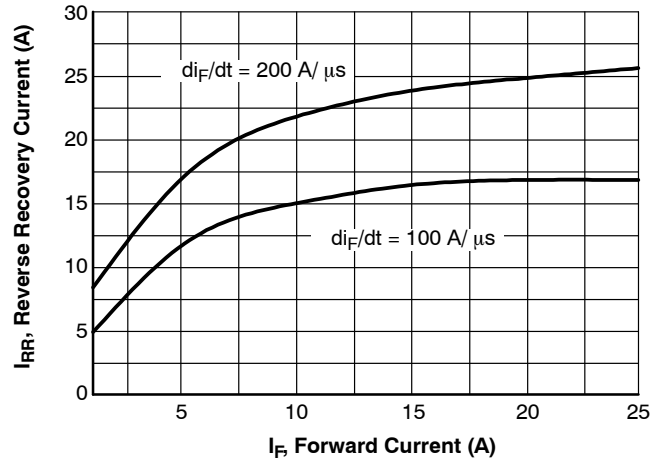


Figure 19. Reverse Recovery Current

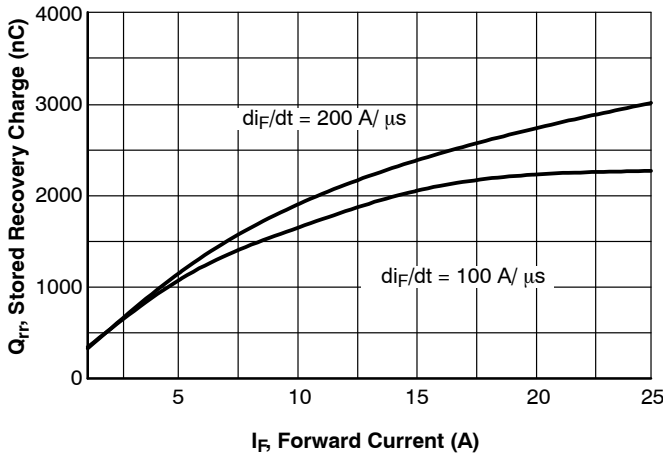


Figure 20. Stored Charge

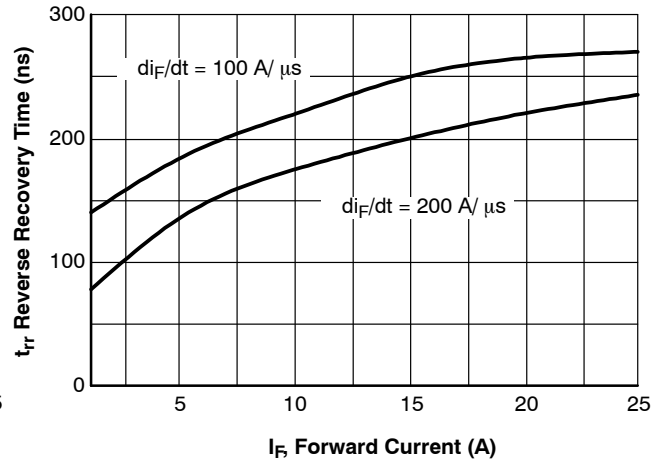
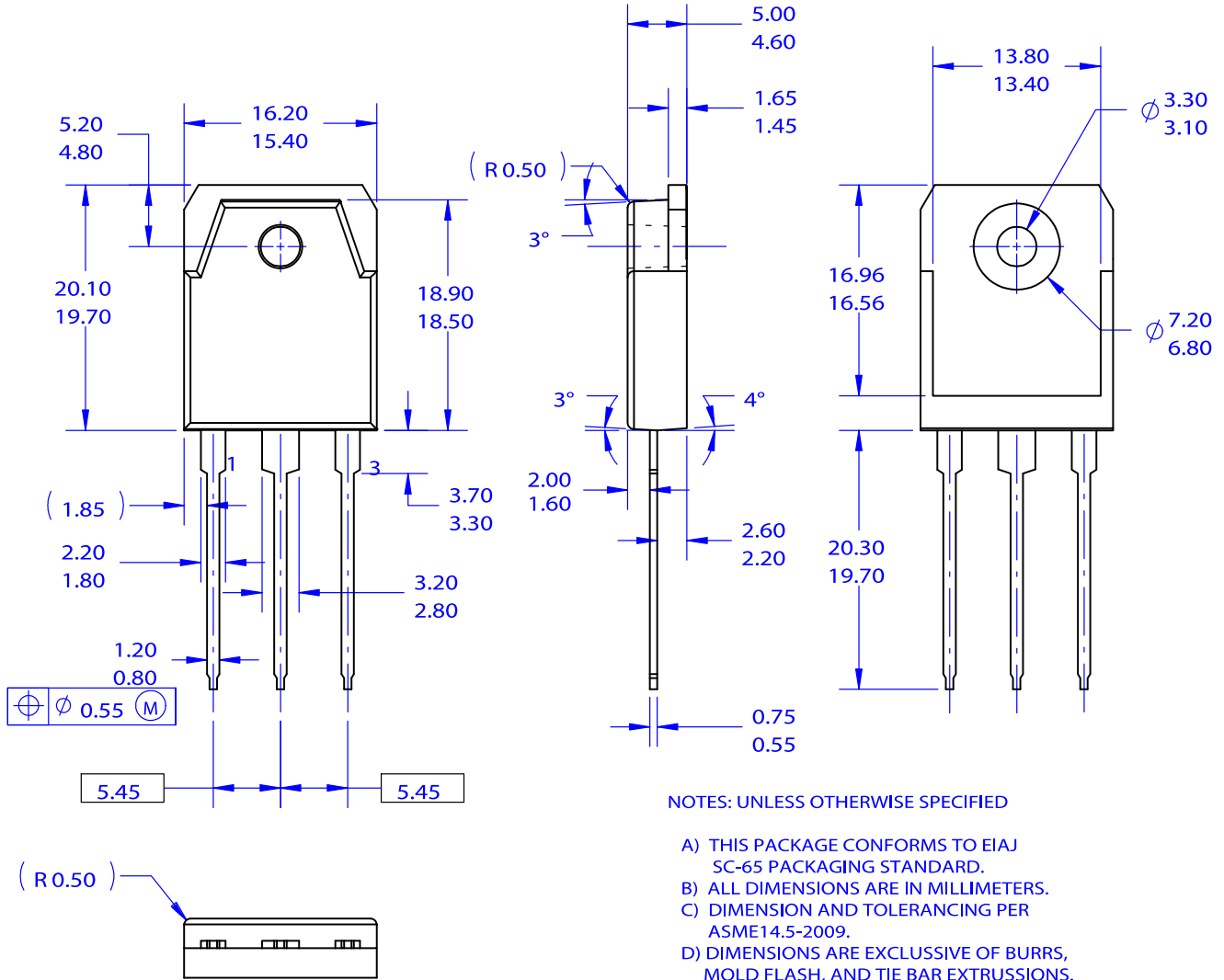


Figure 21. Reverse Recovery Time

**TO-3P-3LD / EIAJ SC-65, ISOLATED**  
**CASE 340BZ**  
**ISSUE O**

DATE 31 OCT 2016



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