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June 2014

# FGY75N60SMD 600 V, 75 A Field Stop IGBT

## Features

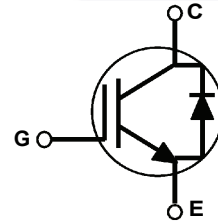
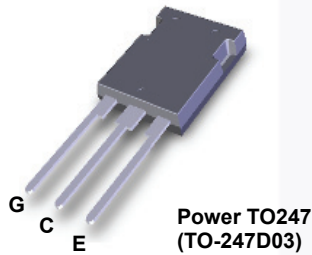
- High Current Capability
- Low Saturation Voltage:  $V_{CE(sat)} = 1.9\text{ V @ } I_C = 75\text{ A}$
- High Input Impedance
- Fast Switching :  $E_{OFF} = 10\text{ uJ/A}$
- RoHS Compliant

## General Description

Using novel field stop IGBT technology, Fairchild's new series of field stop 2<sup>nd</sup> generation IGBTs offer the optimum performance for solar inverter, UPS, welder and PFC applications where low conduction and switching losses are essential.

## Application

- Solar Inverter, UPS, Welder, SMPS, PFC



## Absolute Maximum Ratings

Symbol	Description	Ratings	Unit
$V_{CES}$	Collector to Emitter Voltage	600	V
$V_{GES}$	Gate to Emitter Voltage	$\pm 20$	V
	Transient Gate to Emitter Voltage	$\pm 30$	V
$I_C$	Collector Current @ $T_C = 25^\circ\text{C}$	150	A
	Collector Current @ $T_C = 100^\circ\text{C}$	75	A
$I_{CM(1)}$	Pulsed Collector Current @ $T_C = 25^\circ\text{C}$	225	A
$I_F$	Diode Forward Current @ $T_C = 25^\circ\text{C}$	75	A
	Diode Forward Current @ $T_C = 100^\circ\text{C}$	50	A
$I_{FM(1)}$	Pulsed Diode Maximum Forward Current	225	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	750	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	375	W
$T_J$	Operating Junction Temperature	-55 to +175	$^\circ\text{C}$
$T_{stg}$	Storage Temperature Range	-55 to +175	$^\circ\text{C}$
$T_L$	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

### Notes:

1: Repetitive rating: Pulse width limited by max. junction temperature.

FGY75N60SMD — 600 V, 75 A Field Stop IGBT

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}(IGBT)$	Thermal Resistance, Junction to Case	-	0.2	$^{\circ}C/W$
$R_{\theta JC}(Diode)$	Thermal Resistance, Junction to Case	-	0.48	$^{\circ}C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	-	40	$^{\circ}C/W$

### Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FGY75N60SMD	FGY75N60SMD	TO-247D03	Tube	N/A	N/A	30

### Electrical Characteristics of the IGBT $T_C = 25^{\circ}C$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
$BV_{CES}$	Collector to Emitter Breakdown Voltage	$V_{GE} = 0 V, I_C = 250 \mu A$	600	-	-	V
$\frac{\Delta BV_{CES}}{\Delta T_J}$	Temperature Coefficient of Breakdown Voltage	$V_{GE} = 0 V, I_C = 250 \mu A$	-	0.67	-	$V/^{\circ}C$
$I_{CES}$	Collector Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0 V$	-	-	250	$\mu A$
$I_{GES}$	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0 V$	-	-	$\pm 400$	nA
<b>On Characteristics</b>						
$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 250 \mu A, V_{CE} = V_{GE}$	3.5	5.0	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 75 A, V_{GE} = 15 V$	-	1.90	2.50	V
		$I_C = 75 A, V_{GE} = 15 V, T_C = 175^{\circ}C$	-	2.14	-	V
<b>Dynamic Characteristics</b>						
$C_{ies}$	Input Capacitance	$V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz$	-	3800	-	pF
$C_{oes}$	Output Capacitance		-	390	-	pF
$C_{res}$	Reverse Transfer Capacitance		-	105	-	pF
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 400 V, I_C = 75 A, R_G = 3 \Omega, V_{GE} = 15 V, \text{Inductive Load}, T_C = 25^{\circ}C$	-	24	32	ns
$t_r$	Rise Time		-	56	73	ns
$t_{d(off)}$	Turn-Off Delay Time		-	136	177	ns
$t_f$	Fall Time		-	22	29	ns
$E_{on}$	Turn-On Switching Loss		-	2.3	2.99	mJ
$E_{off}$	Turn-Off Switching Loss		-	0.77	1.00	mJ
$E_{ts}$	Total Switching Loss	-	3.07	3.99	mJ	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 400 V, I_C = 75 A, R_G = 3 \Omega, V_{GE} = 15 V, \text{Inductive Load}, T_C = 175^{\circ}C$	-	23	-	ns
$t_r$	Rise Time		-	53	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	146	-	ns
$t_f$	Fall Time		-	15	-	ns
$E_{on}$	Turn-On Switching Loss		-	3.60	-	mJ
$E_{off}$	Turn-Off Switching Loss		-	1.11	-	mJ
$E_{ts}$	Total Switching Loss		-	4.71	-	mJ

**Electrical Characteristics of the IGBT**  $T_C = 25^\circ\text{C}$  unless otherwise noted

$Q_g$	Total Gate Charge	$V_{CE} = 400\text{ V}, I_C = 75\text{ A},$ $V_{GE} = 15\text{ V}$	-	248	370	nC
$Q_{ge}$	Gate to Emitter Charge		-	28	42	nC
$Q_{gc}$	Gate to Collector Charge		-	129	195	nC

**Electrical Characteristics of the Diode**  $T_C = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max	Units	
$V_{FM}$	Diode Forward Voltage	$I_F = 50\text{ A}$	$T_C = 25^\circ\text{C}$	-	1.75	2.1	V
			$T_C = 175^\circ\text{C}$	-	1.35	-	
$E_{rec}$	Reverse Recovery Energy	$I_F = 50\text{ A}, di_F/dt = 200\text{ A}/\mu\text{s}$ $V_R = 400\text{ V}$	$T_C = 175^\circ\text{C}$	-	0.14	-	mJ
$t_{rr}$	Diode Reverse Recovery Time		$T_C = 25^\circ\text{C}$	-	41	55	ns
			$T_C = 175^\circ\text{C}$	-	126	-	
$Q_{rr}$	Diode Reverse Recovery Charge		$T_C = 25^\circ\text{C}$	-	81	115	nC
		$T_C = 175^\circ\text{C}$	-	736	-		



## Typical Performance Characteristics

Figure 1. Typical Output Characteristics

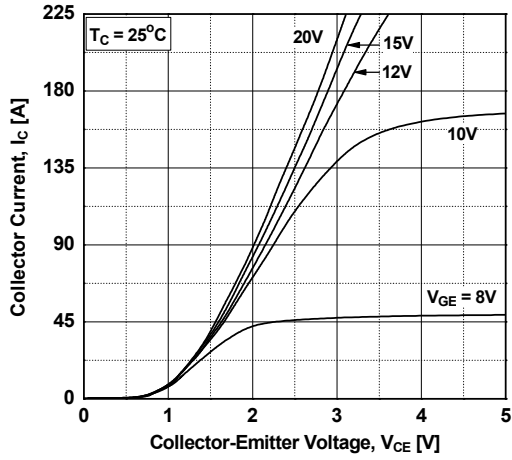


Figure 2. Typical Output Characteristics

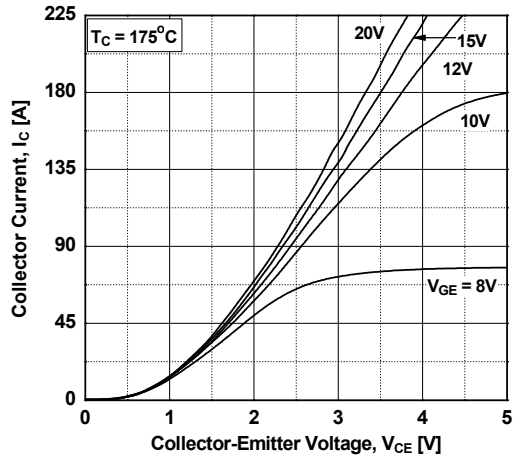


Figure 3. Typical Saturation Voltage Characteristics

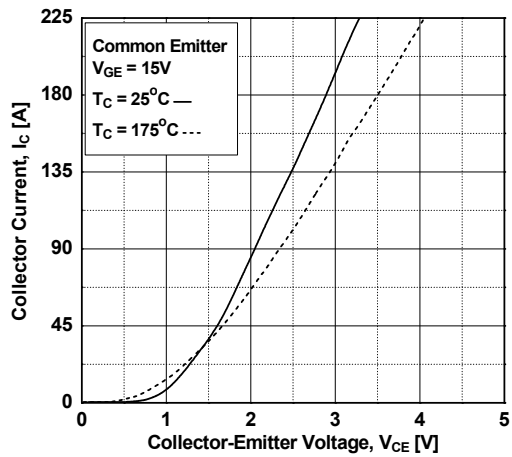


Figure 4. Transfer Characteristics

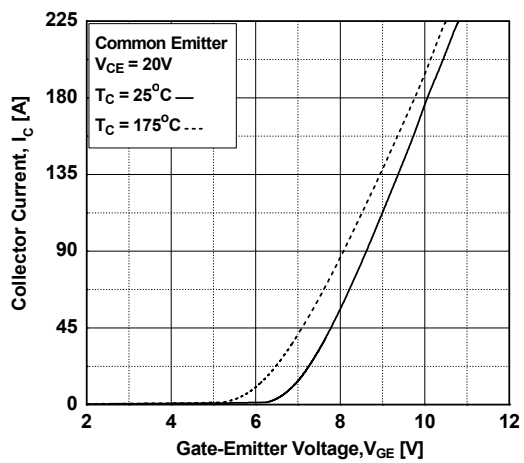


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

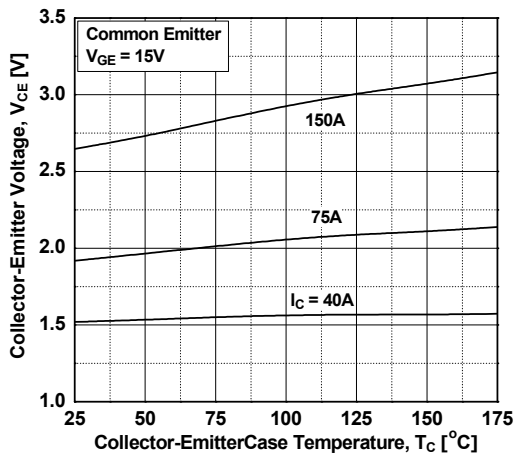
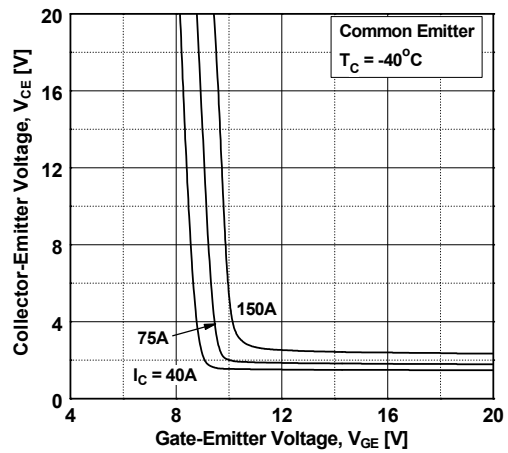


Figure 6. Saturation Voltage vs.  $V_{GE}$



## Typical Performance Characteristics

Figure 7. Saturation Voltage vs.  $V_{GE}$

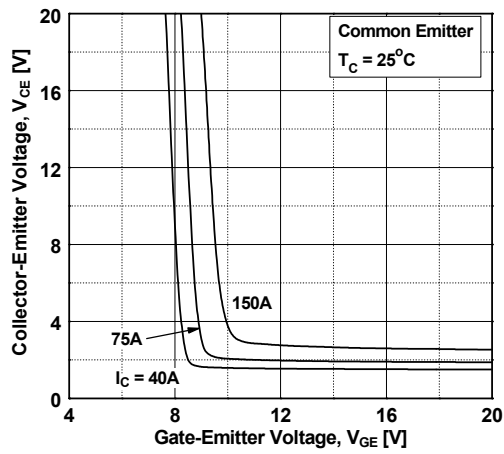


Figure 8. Saturation Voltage vs.  $V_{GE}$

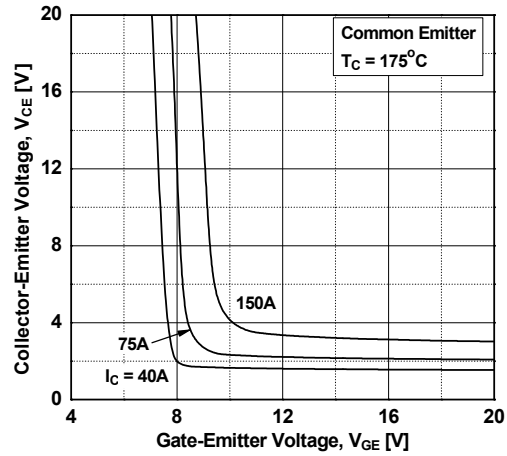


Figure 9. Capacitance Characteristics

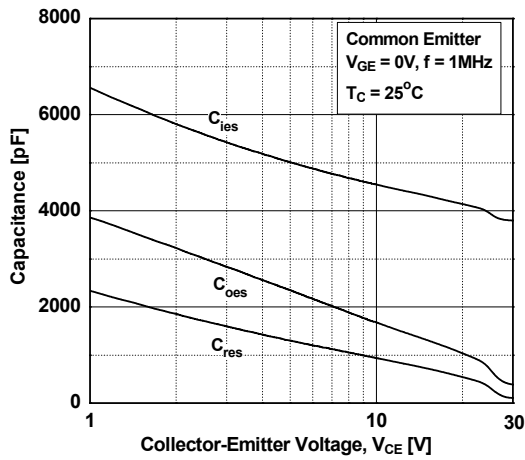


Figure 10. Gate charge Characteristics

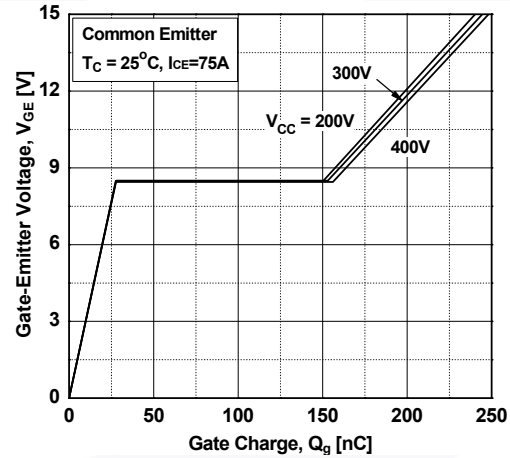


Figure 11. Turn-off Characteristics vs. Gate Resistance

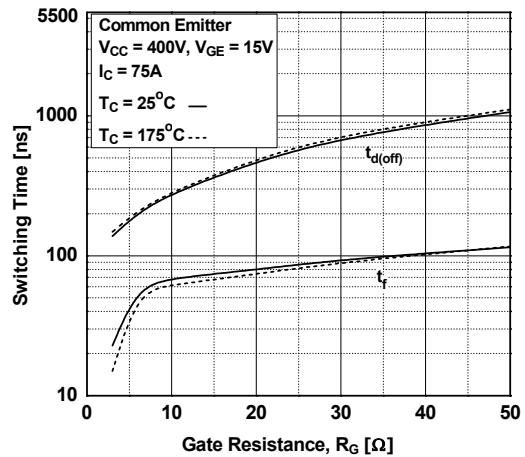
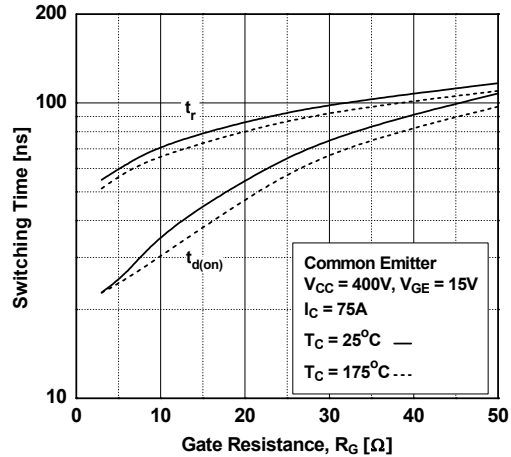


Figure 12. Turn-on Characteristics vs. Gate Resistance



## Typical Performance Characteristics

Figure 13. Turn-off Characteristics vs. Collector Current

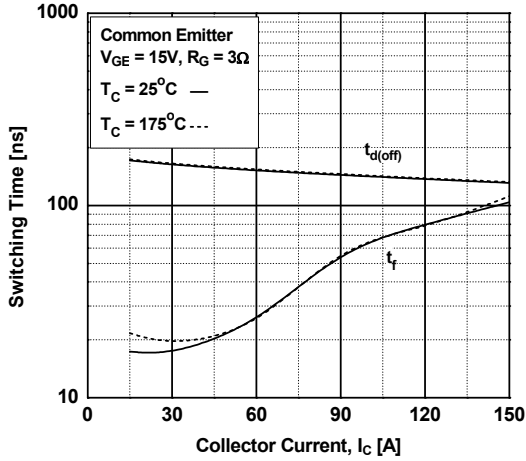


Figure 14. Turn-on Characteristics vs. Collector Current

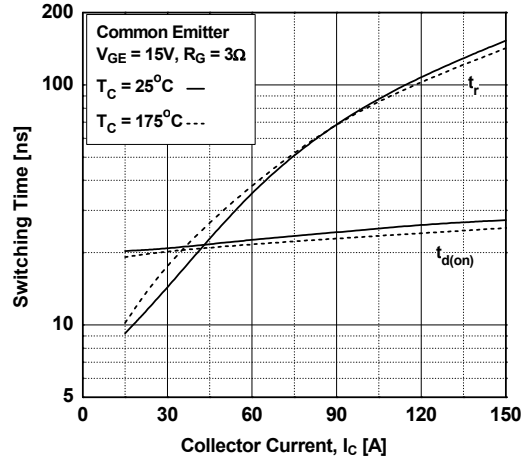


Figure 15. Switching Loss vs. Collector Current

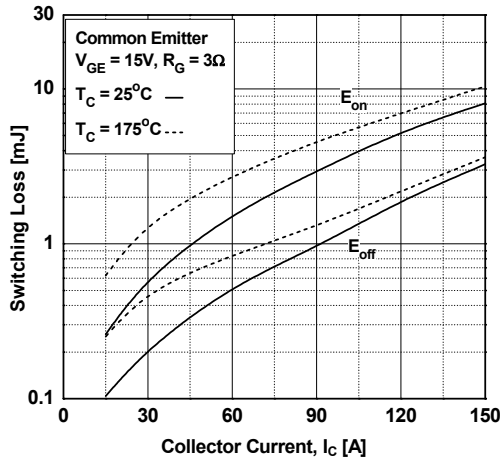


Figure 16. Switching Loss vs. Gate Resistance

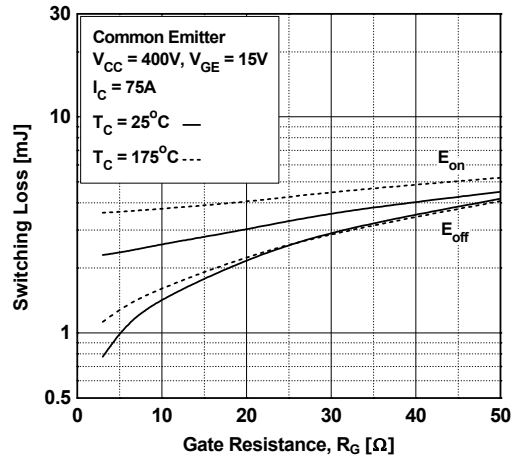


Figure 17. SOA Characteristics

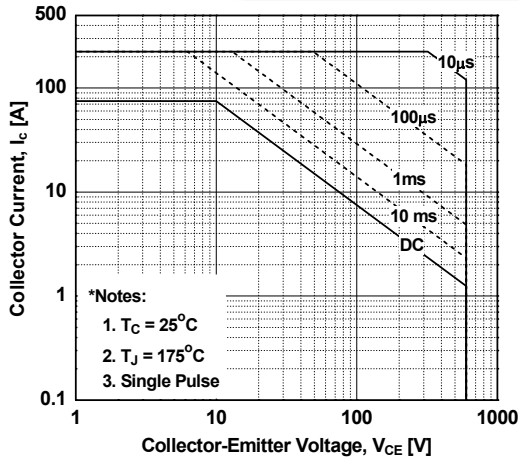
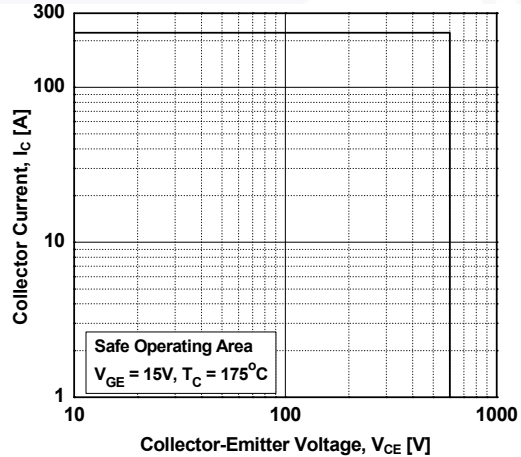


Figure 18. Turn off Switching SOA Characteristics



## Typical Performance Characteristics

Figure 19. Current Derating

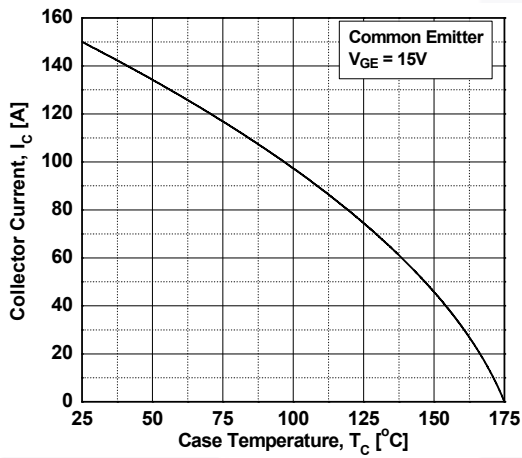


Figure 20. Load Current vs. Frequency

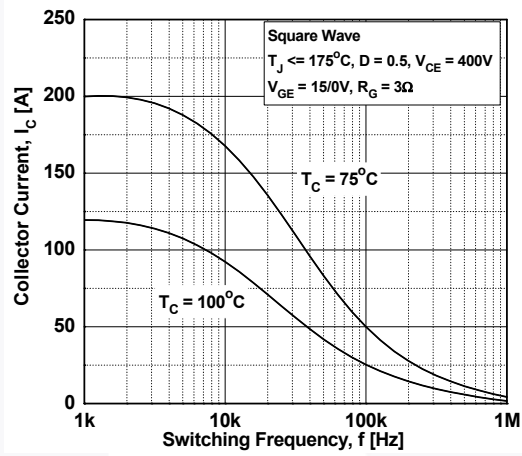


Figure 21. Forward Characteristics

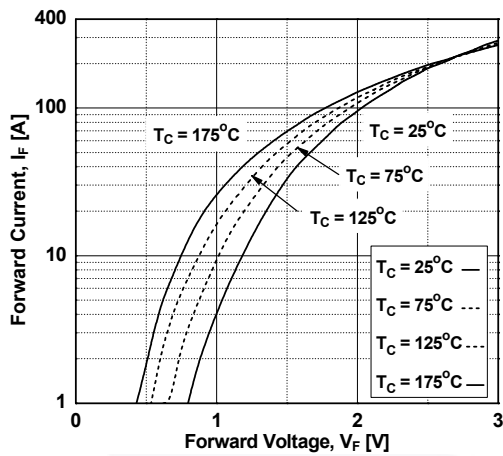


Figure 22. Reverse Current

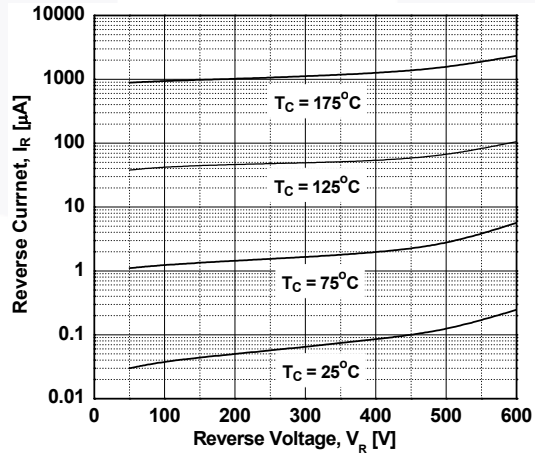


Figure 23. Stored Charge

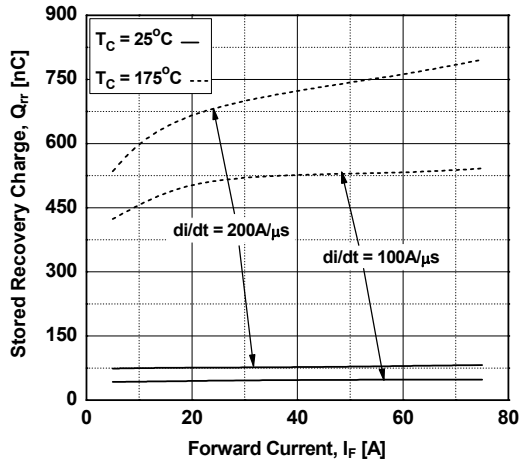
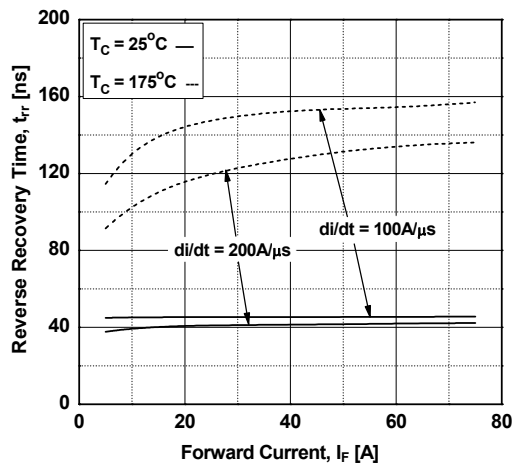


Figure 24. Reverse Recovery Current





## Typical Performance Characteristics

Figure 25. Transient Thermal Impedance of IGBT

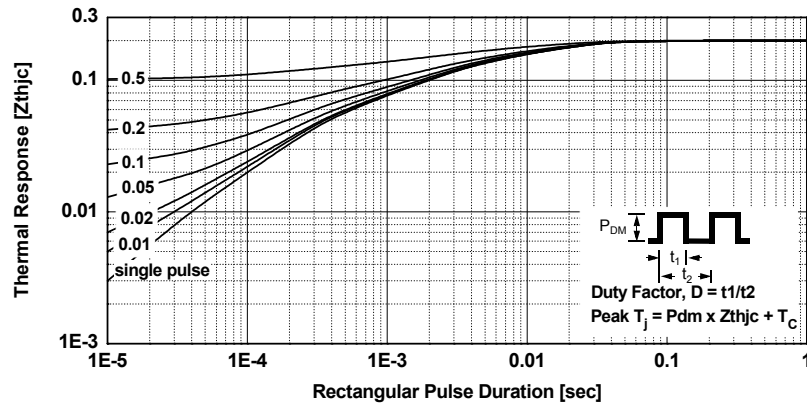
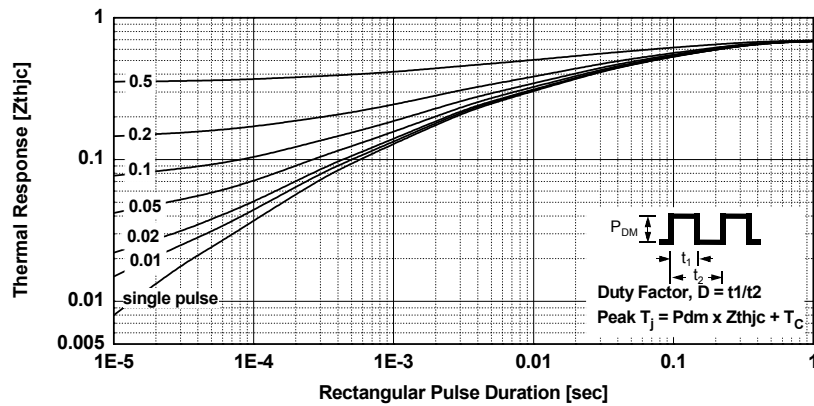
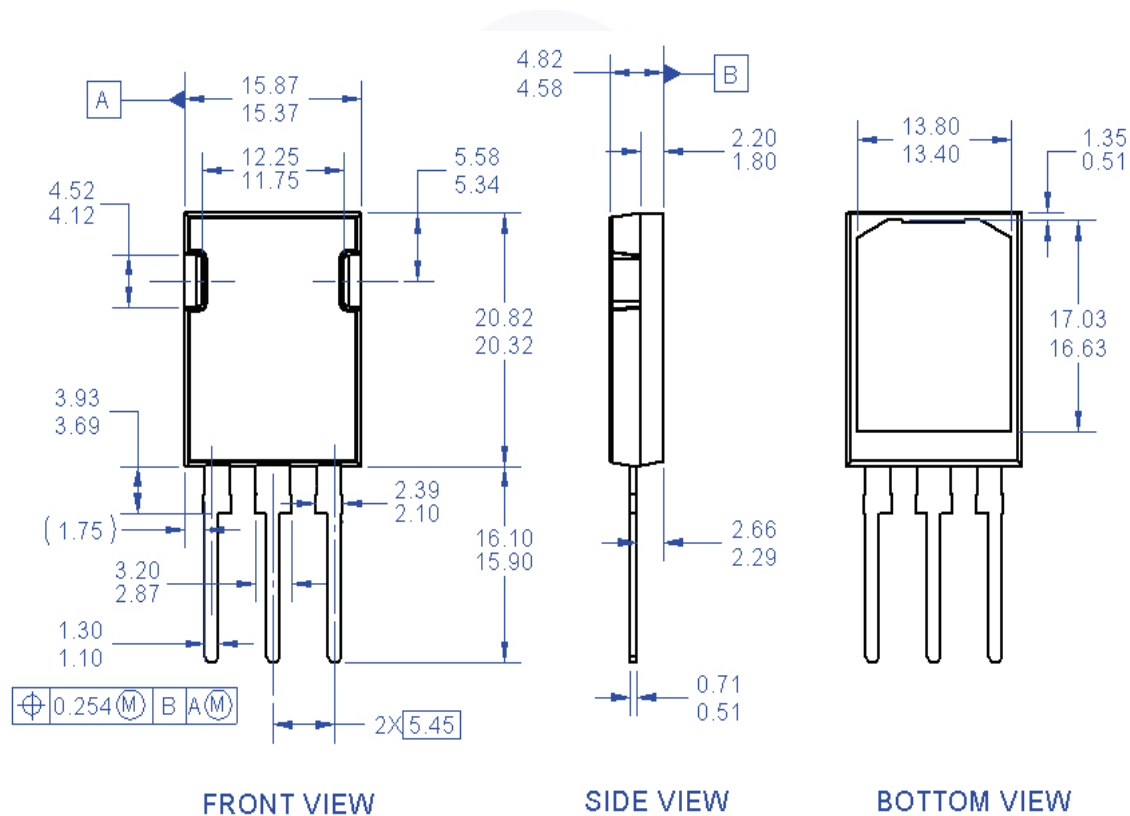


Figure 26. Transient Thermal Impedance of Diode



**Mechanical dimensions**



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- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- D. DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.
- E. DRAWING FILE NAME: TO247D03REV3



**Figure 27. TO-247 3L - 3LDS, POWER TO247, NON JEDEC**

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| AX-CAP®*                 | FRFET®                                          |  | PowerXS™                              | TinyBoost®       |
| BitSiC™                  | Global Power ResourceSM                         |  | Programmable Active Droop™            | TinyBuck®        |
| Build it Now™            | GreenBridge™                                    |  | QFET®                                 | TinyCalc™        |
| CorePLUS™                | Green FPS™                                      |  | QS™                                   | TinyLogic®       |
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