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# FGH30N60LSD

## 600 V, 30 A PT IGBT

### Features

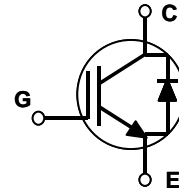
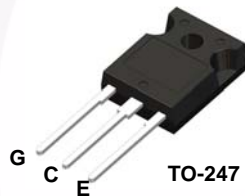
- Low Saturation Voltage:  $V_{CE(sat)} = 1.1 \text{ V @ } I_C = 30 \text{ A}$
- High Input Impedance
- Low Conduction Loss

### Applications

- Solar Inverter, UPS

### General Description

Using Fairchild's advanced PT technology, the FGA30N60LSD IGBT offers superior conduction performances, which offer the optimum performance for medium switching application such as solar inverter, UPS applications where low conduction losses are the most important factor.



### Absolute Maximum Ratings

Symbol	Description	Ratings	Unit
$V_{CES}$	Collector-Emitter Voltage	600	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V
$I_C$	Collector Current @ $T_C = 25^\circ\text{C}$	60	A
	Collector Current @ $T_C = 100^\circ\text{C}$	30	A
$I_{CM(1)}$	Pulsed Collector Current	90	A
$I_{FSM}$	Non-repetitive Peak Surge Current 60Hz Single Half-Sine Wave	150	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	480	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	192	W
$T_J$	Operating Junction Temperature	-55 to +150	$^\circ\text{C}$
$T_{stg}$	Storage Temperature Range	-55 to +150	$^\circ\text{C}$
$T_L$	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

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}(\text{IGBT})$	Thermal Resistance, Junction-to-Case	--	0.26	$^\circ\text{C/W}$
$R_{\theta JC}(\text{Diode})$	Thermal Resistance, Junction-to-Case	--	0.92	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	40	$^\circ\text{C/W}$

**Package Marking and Ordering Information**

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FGH30N60LSDTU	FGH30N60LSD	TO-247	Tube	N/A	N/A	30

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
$BV_{CES}$	Collector-Emitter Breakdown Voltage	$V_{GE} = 0\text{ V}, I_C = 250\text{ }\mu\text{A}$	600	--	--	V
$\frac{\Delta BV_{CES}}{\Delta T_J}$	Temperature Coefficient of Breakdown Voltage	$V_{GE} = 0\text{ V}, I_C = 250\text{ }\mu\text{A}$	--	0.6	--	V/ $^\circ\text{C}$
$I_{CES}$	Collector Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0\text{ V}$	--	--	250	$\mu\text{A}$
$I_{GES}$	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0\text{ V}$	--	--	$\pm 250$	nA
<b>On Characteristics</b>						
$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 250\text{ }\mu\text{A}, V_{CE} = V_{GE}$	4.0	5.5	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 30\text{ A}, V_{GE} = 15\text{ V}$	--	1.1	1.4	V
		$I_C = 30\text{ A}, V_{GE} = 15\text{ V}, T_C = 125^\circ\text{C}$	--	1.0	--	V
		$I_C = 60\text{ A}, V_{GE} = 15\text{ V}$	--	1.3	--	V
<b>Dynamic Characteristics</b>						
$C_{ies}$	Input Capacitance	$V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	--	3550	--	pF
$C_{oes}$	Output Capacitance		--	245	--	pF
$C_{res}$	Reverse Transfer Capacitance		--	90	--	pF
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 400\text{ V}, I_C = 30\text{ A}, R_G = 6.8\text{ }\Omega, V_{GE} = 15\text{ V}, \text{Inductive Load}, T_C = 25^\circ\text{C}$	--	18	--	ns
$t_r$	Rise Time		--	46	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	250	--	ns
$t_f$	Fall Time		--	1.3	2.0	us
$E_{on}$	Turn-On Switching Loss		--	1.1	--	mJ
$E_{off}$	Turn-Off Switching Loss		--	21	--	mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 400\text{ V}, I_C = 30\text{ A}, R_G = 6.8\text{ }\Omega, V_{GE} = 15\text{ V}, \text{Inductive Load}, T_C = 125^\circ\text{C}$	--	17	--	ns
$t_r$	Rise Time		--	45	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	270	--	ns
$t_f$	Fall Time		--	2.6	--	us
$E_{on}$	Turn-On Switching Loss		--	1.1	--	mJ
$E_{off}$	Turn-Off Switching Loss		--	36	--	mJ
$Q_g$	Total Gate Charge	$V_{CE} = 600\text{ V}, I_C = 30\text{ A}, V_{GE} = 15\text{ V}$	--	225	--	nC
$Q_{ge}$	Gate-Emitter Charge		--	30	--	nC
$Q_{gc}$	Gate-Collector Charge		--	105	--	nC
$L_e$	Internal Emitter Inductance		Measured 5mm from PKG	--	7	--

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

Parameter	Conditions	Min.	Typ.	Max	Unit	
$V_{FM}$	$I_F = 15\text{ A}$	-	1.8	2.2	V	
	$I_F = 15\text{ A}$	-	1.6	-	V	
$I_{RM}$	$V_R = 600\text{ V}$	-	-	100	$\mu\text{A}$	
$t_{rr}$	$I_F = 1\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	-	35	ns	
	$I_F = 15\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 390\text{ V}$	-	-	40	ns	
$t_a$	$I_F = 15\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 390\text{ V}$	$T_C = 25^\circ\text{C}$	-	18	-	ns
		$T_C = 25^\circ\text{C}$	-	13	-	ns
$Q_{rr}$	$I_F = 15\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 390\text{ V}$	-	27.5	-	nC	



## Typical Performance Characteristics

Figure 1. Typical Output Characteristics

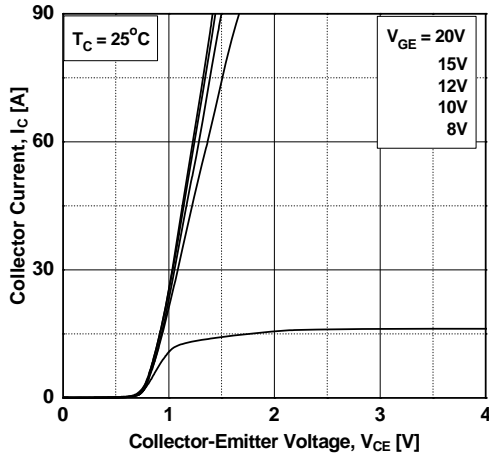


Figure 3. Typical Saturation Voltage Characteristics

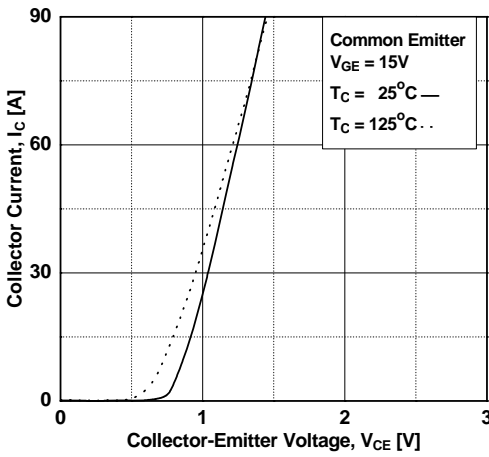


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

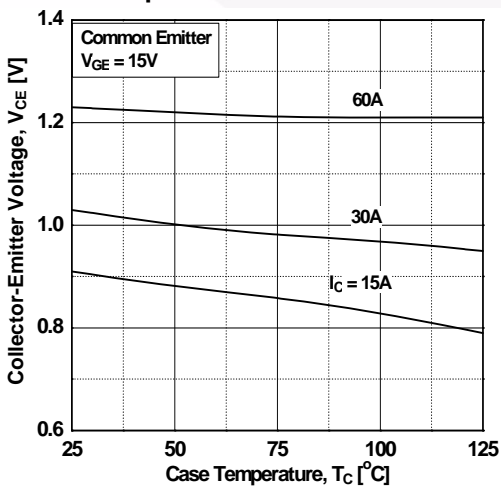


Figure 2. Typical Saturation Voltage Characteristics

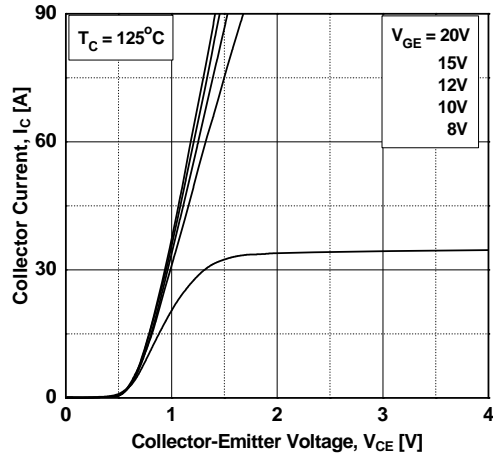


Figure 4. Transfer characteristics

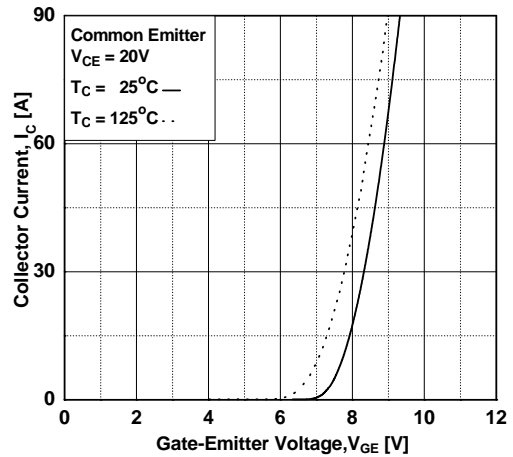
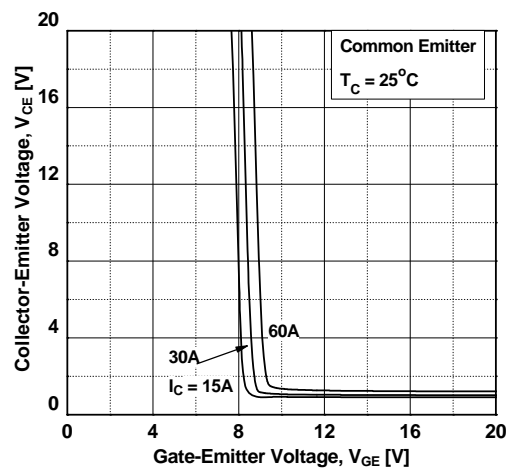
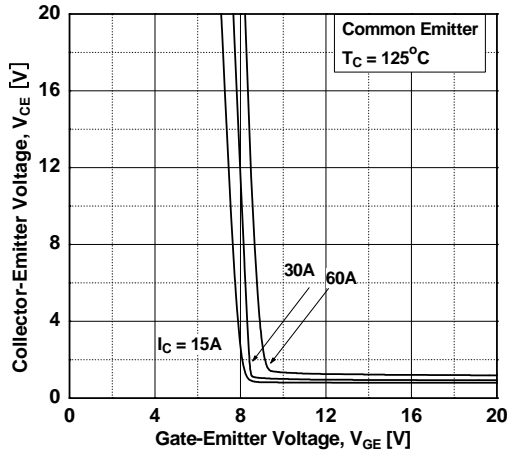


Figure 6. Saturation Voltage vs. Vge

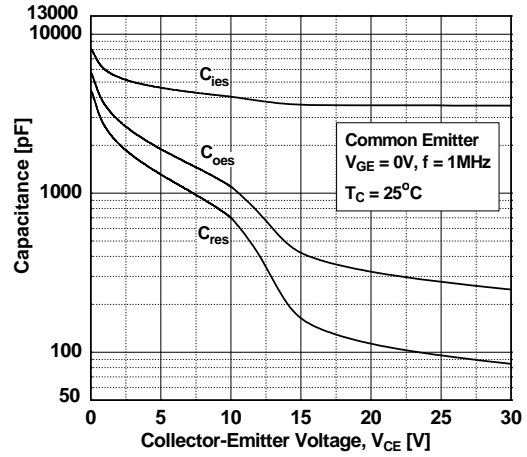


**Typical Performance Characteristics** (Continued)

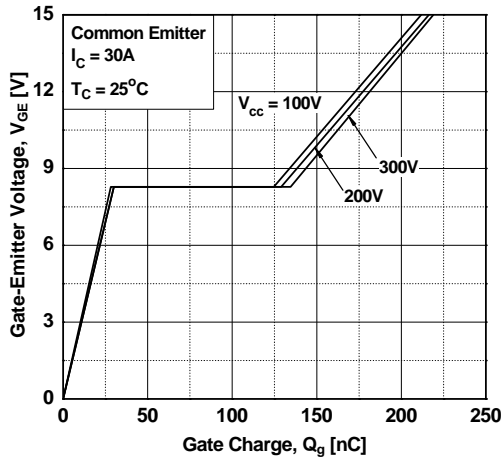
**Figure 7. Saturation Voltage vs. V<sub>GE</sub>**



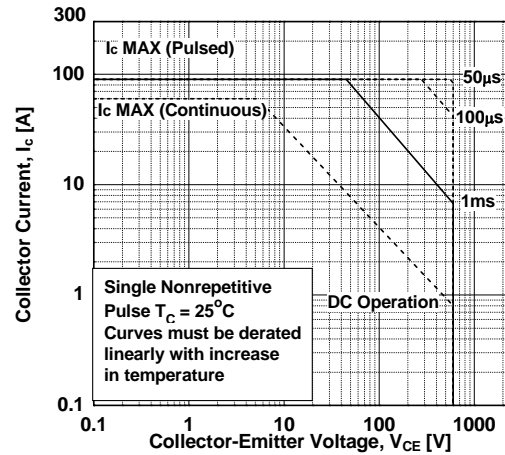
**Figure 8. Capacitance characteristics**



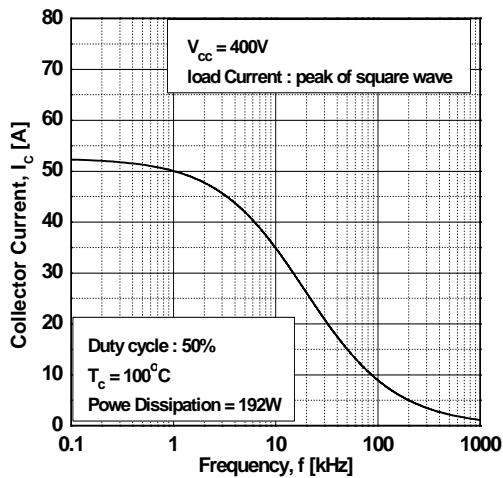
**Figure 9. Gate Charge Characteristics**



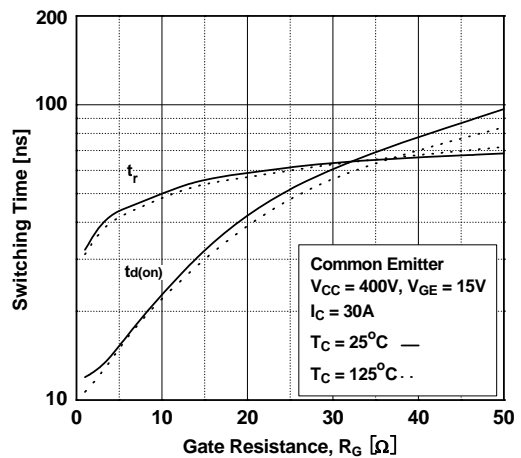
**Figure 10. SOA Characteristics**



**Figure 11. Load Current vs. Frequency**

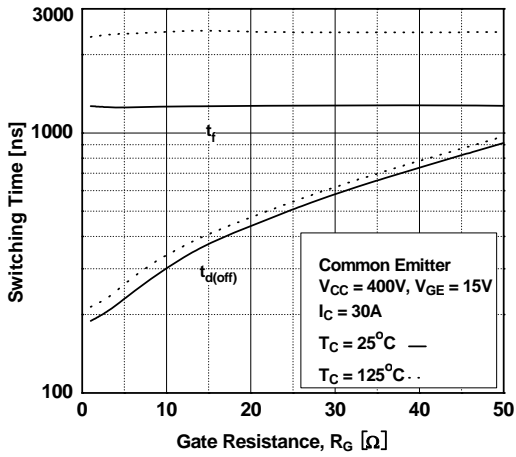


**Figure 12. Turn-On Characteristics vs. Gate Resistance**

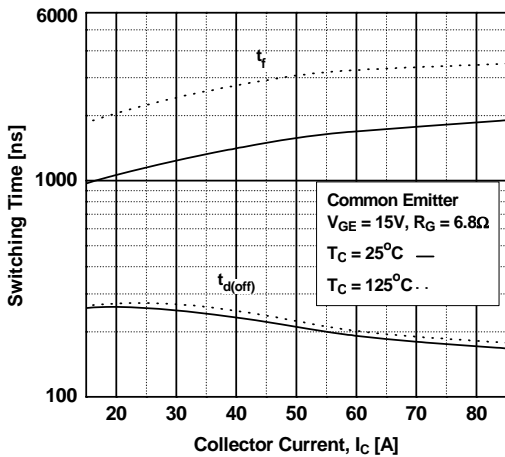


**Typical Performance Characteristics** (Continued)

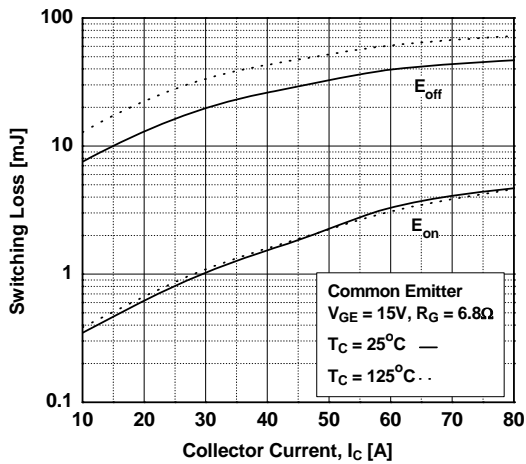
**Figure 13. Turn-Off Characteristics vs. Gate Resistance**



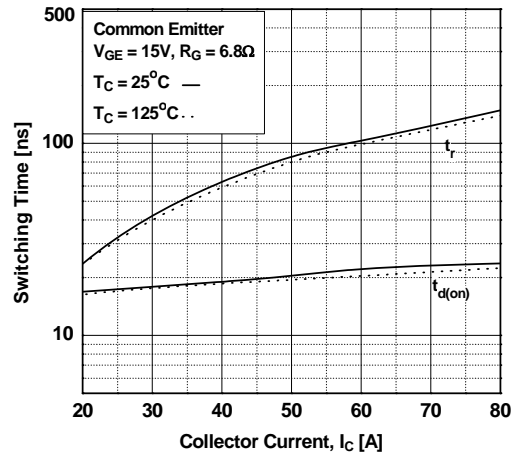
**Figure 15. Turn-Off Characteristics vs. Collector Current**



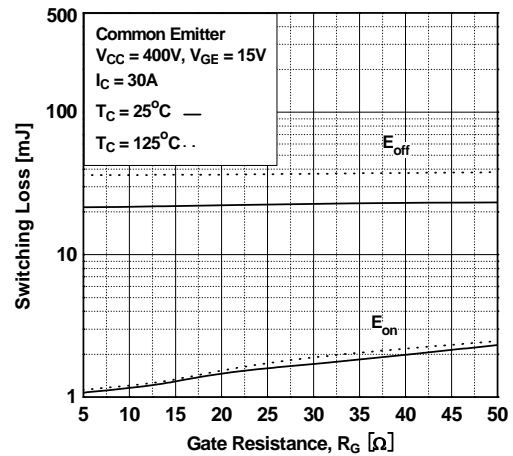
**Figure 17. Switching Loss vs Collector Current**



**Figure 14. Turn-On Characteristics vs. Collector Current**



**Figure 16. Switching Loss vs Gate Resistance**



**Figure 18. Turn-Off Switching SOA Characteristics**

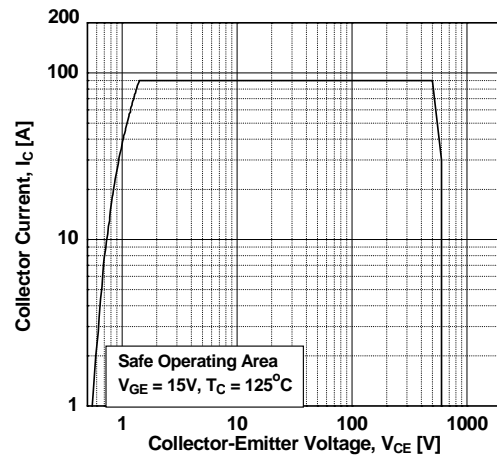


Figure 19. Transient Thermal Impedance of IGBT

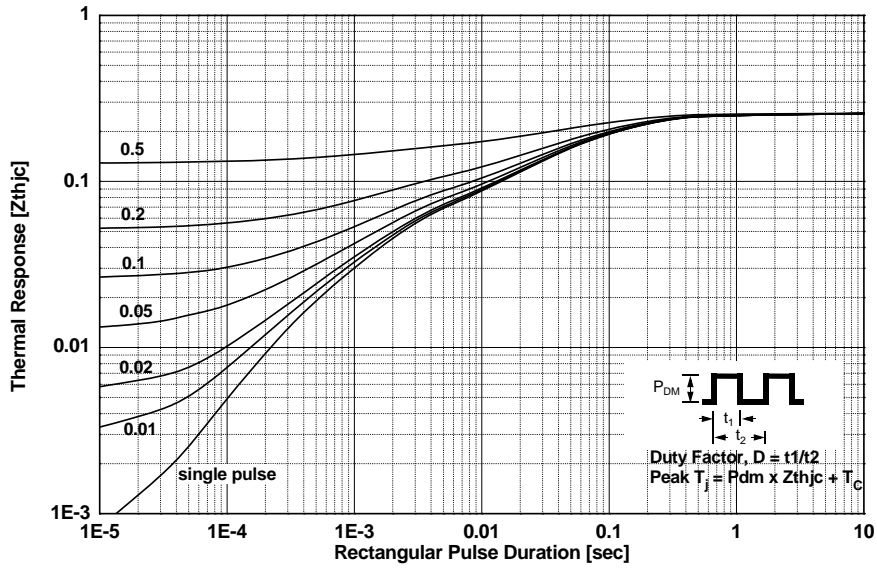


Figure 20. Forward Characteristics

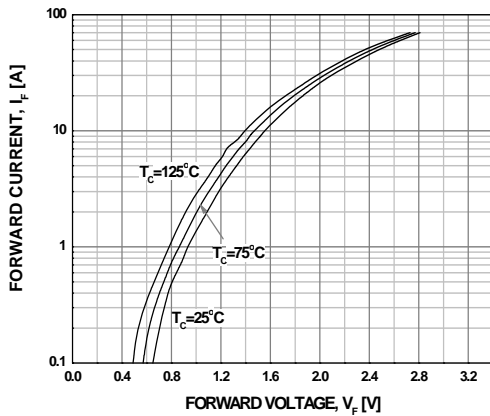


Figure 21. Reverse Current

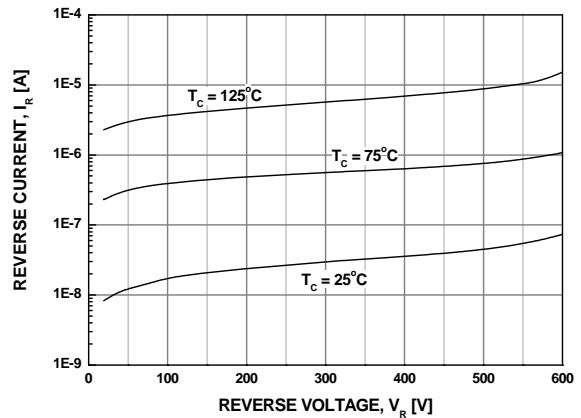
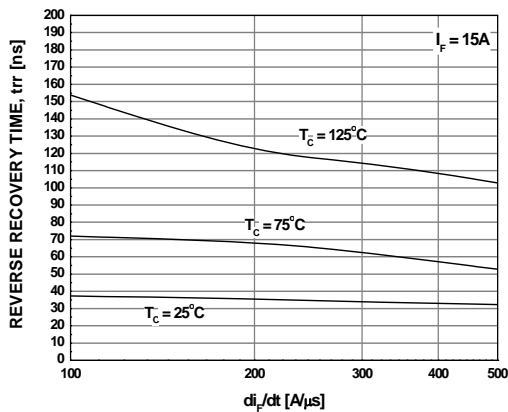
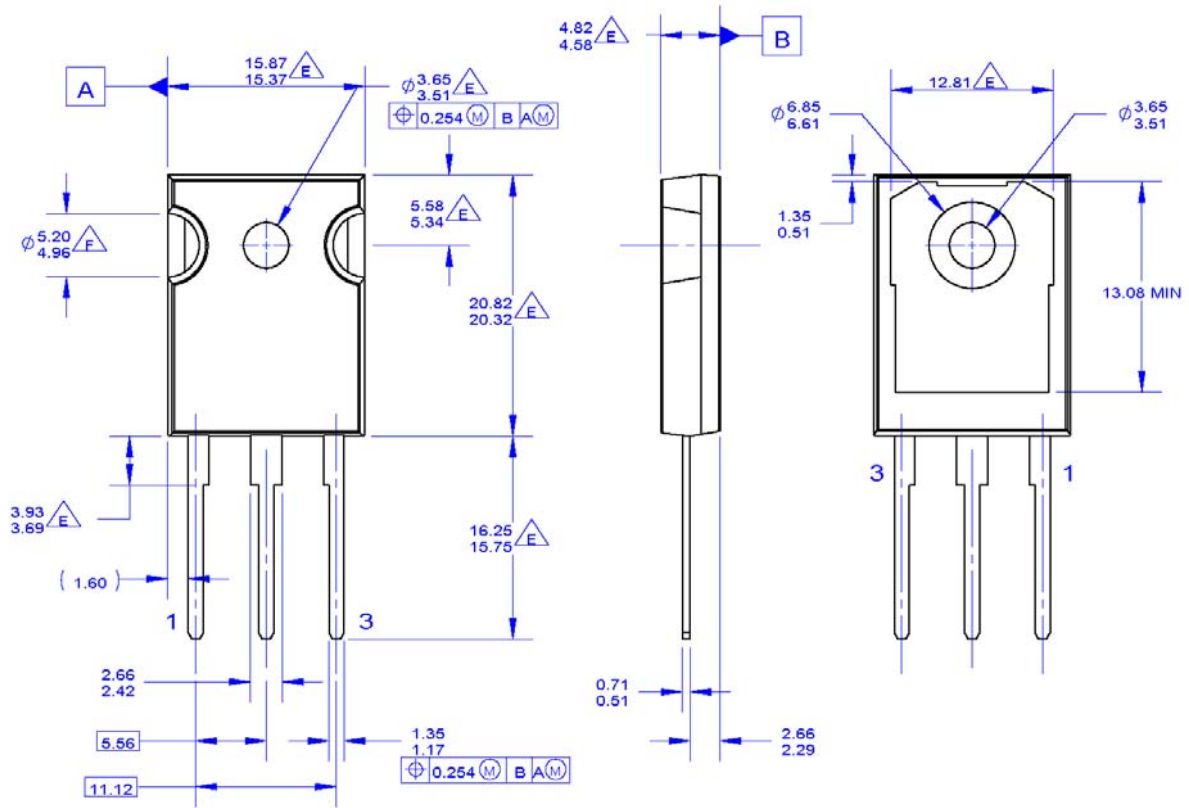


Figure 22. Reverse Recovery Time





## Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED.

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- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DRAWING CONFORMS TO ASME Y14.5 - 1994

- DOES NOT COMPLY JEDEC STANDARD VALUE
- NOTCH MAY BE SQUARE
- G. DRAWING FILENAME: MKT-TO247A03\_REV03

**Figure 23. TO-247 3L - TO-247,MOLDED,3 LEAD,JEDEC VARIATION AB**

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| AX-CAP®*   | FRFET®  | PowerXS™  |  SYSTEM®* |
| BitSiC™  | Global Power Resource <sup>SM</sup>             | Programmable Active Droop™  | TinyBoost®   |
| Build it Now™  | GreenBridge™                                    | QFET®   | TinyBuck™  |
| CorePLUS™  | Green FPS™                                      | QS™   | TinyCalc™  |
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