



# FGH25N120FTDS

## 1200V, 25A Field Stop Trench IGBT

### Features

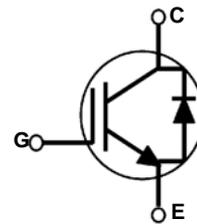
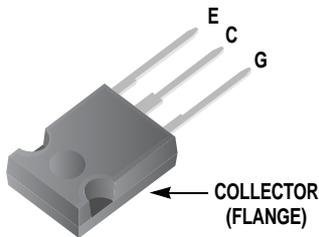
- High speed switching
- Low saturation voltage:  $V_{CE(sat)} = 1.60V @ I_C = 25A$
- High input impedance
- RoHS compliant

### Application

- UPS, Solar Inverter, Welding Machine, General Purpose Inverters

### General Description

Using advanced field stop trench technology, Fairchild's 1200V trench IGBTs offer superior conduction and switching performances, and easy parallel operation with exceptional avalanche ruggedness. This device is designed for General Inverter switching applications.



### Absolute Maximum Ratings

Symbol	Description	Ratings	Units
$V_{CES}$	Collector to Emitter Voltage	1200	V
$V_{GES}$	Gate to Emitter Voltage	$\pm 25$	V
$I_C$	Collector Current @ $T_C = 25^\circ C$	50	A
	Collector Current @ $T_C = 100^\circ C$	25	A
$I_{CM} (1)$	Pulsed Collector Current	75	A
$I_F$	Diode Continuous Forward Current @ $T_C = 100^\circ C$	25	A
$I_{FM}$	Diode Maximum Forward Current	75	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ C$	313	W
	Maximum Power Dissipation @ $T_C = 100^\circ C$	125	W
$T_J$	Operating Junction Temperature	-55 to +150	$^\circ C$
$T_{stg}$	Storage Temperature Range	-55 to +150	$^\circ C$
$T_L$	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds	300	$^\circ C$

**Notes:**

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

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}(IGBT)$	Thermal Resistance, Junction to Case	-	0.4	$^\circ C/W$
$R_{\theta JC}(Diode)$	Thermal Resistance, Junction to Case	-	1.25	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	-	40	$^\circ C/W$

## Package Marking and Ordering Information

Device Marking	Device	Package	 Eco Status	Packaging Type	Qty per Tube
FGH25N120FTDS	FGH25N120FTDS	TO-3PN	RoHS	Tube	30ea

 For Fairchild's definition of "green" Eco Status, please visit: [http://www.fairchildsemi.com/company/green/rohs\\_green.html](http://www.fairchildsemi.com/company/green/rohs_green.html).

## Electrical Characteristics of the IGBT T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
<b>Off Characteristics</b>						
BV <sub>CES</sub>	Collector to Emitter Breakdown Voltage	V <sub>GE</sub> = 0V, I <sub>C</sub> = 250μA	1200	-	-	V
I <sub>CES</sub>	Collector Cut-Off Current	V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0V	-	-	1	mA
I <sub>GES</sub>	G-E Leakage Current	V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0V	-	-	±250	nA
<b>On Characteristics</b>						
V <sub>GE(th)</sub>	G-E Threshold Voltage	I <sub>C</sub> = 25mA, V <sub>CE</sub> = V <sub>GE</sub>	3.5	6	7.5	V
V <sub>CE(sat)</sub>	Collector to Emitter Saturation Voltage	I <sub>C</sub> = 25A, V <sub>GE</sub> = 15V	-	1.6	2	V
		I <sub>C</sub> = 25A, V <sub>GE</sub> = 15V, T <sub>C</sub> = 125°C	-	1.92	-	V
<b>Dynamic Characteristics</b>						
C <sub>ies</sub>	Input Capacitance	V <sub>CE</sub> = 30V, V <sub>GE</sub> = 0V, f = 1MHz	-	4090	-	pF
C <sub>oes</sub>	Output Capacitance		-	135	-	pF
C <sub>res</sub>	Reverse Transfer Capacitance		-	75	-	pF
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>CC</sub> = 600V, I <sub>C</sub> = 25A, R <sub>G</sub> = 10Ω, V <sub>GE</sub> = 15V, Inductive Load, T <sub>C</sub> = 25°C	-	26	35	ns
t <sub>r</sub>	Rise Time		-	41	53	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	151	196	ns
t <sub>f</sub>	Fall Time		-	102	132	ns
E <sub>on</sub>	Turn-On Switching Loss		-	1.42	1.84	mJ
E <sub>off</sub>	Turn-Off Switching Loss		-	1.16	1.50	mJ
E <sub>ts</sub>	Total Switching Loss		-	2.58	3.34	mJ
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>CC</sub> = 600V, I <sub>C</sub> = 25A, R <sub>G</sub> = 10Ω, V <sub>GE</sub> = 15V, Inductive Load, T <sub>C</sub> = 125°C	-	22	-	ns
t <sub>r</sub>	Rise Time		-	41	-	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	163	-	ns
t <sub>f</sub>	Fall Time		-	136	-	ns
E <sub>on</sub>	Turn-On Switching Loss		-	2.04	-	mJ
E <sub>off</sub>	Turn-Off Switching Loss		-	1.58	-	mJ
E <sub>ts</sub>	Total Switching Loss		-	3.62	-	mJ
Q <sub>g</sub>	Total Gate Charge	V <sub>CE</sub> = 600V, I <sub>C</sub> = 25A, V <sub>GE</sub> = 15V	-	169	225	nC
Q <sub>ge</sub>	Gate to Emitter Charge		-	33	44	nC
Q <sub>gc</sub>	Gate to Collector Charge		-	78	104	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	$I_F = 25\text{A}$	$T_C = 25^\circ\text{C}$	-	2.5	3.5	V
			$T_C = 125^\circ\text{C}$	-	2.3	-	
$t_{rr}$	Diode Reverse Recovery Time	$I_{ES} = 25\text{A},$ $di/dt = 200\text{A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$	-	411	535	ns
			$T_C = 125^\circ\text{C}$	-	496	-	
$I_{rr}$	Diode Peak Reverse Recovery Current	$I_{ES} = 25\text{A},$ $di/dt = 200\text{A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$	-	5.2	6.8	A
			$T_C = 125^\circ\text{C}$	-	6.9	-	
$Q_{rr}$	Diode Reverse Recovery Charge	$I_{ES} = 25\text{A},$ $di/dt = 200\text{A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$	-	1.1	1.82	$\mu\text{C}$
			$T_C = 125^\circ\text{C}$	-	1.7	-	

## Typical Performance Characteristics

Figure 1. Typical Output Characteristics

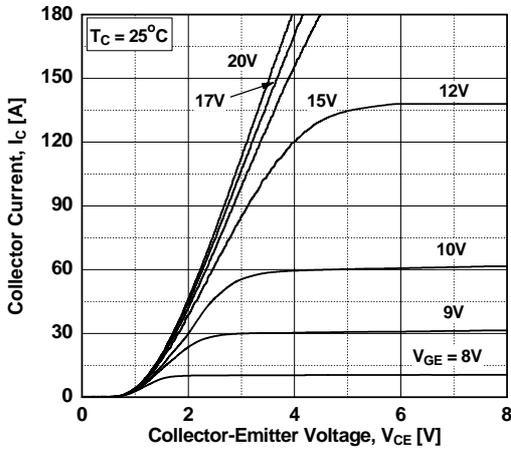


Figure 2. Typical Output Characteristics

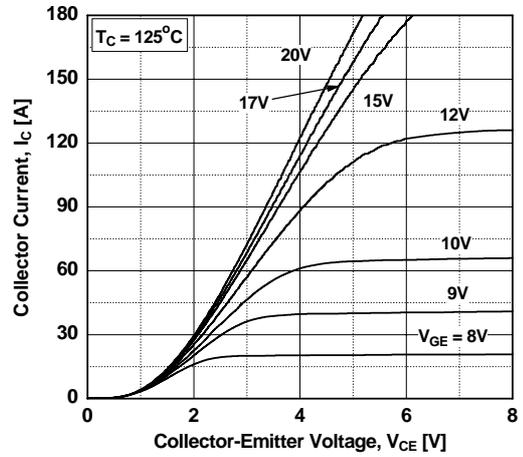


Figure 3. Typical Saturation Voltage Characteristics

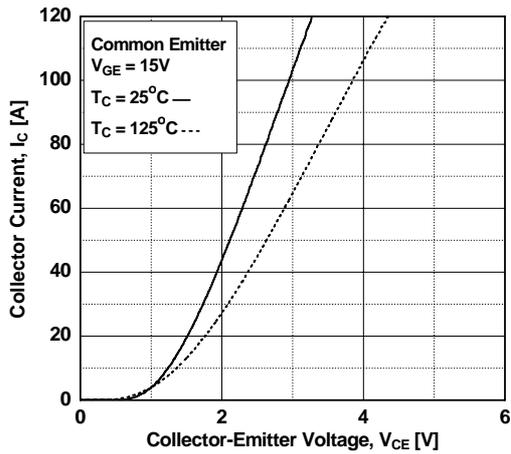


Figure 4. Transfer Characteristics

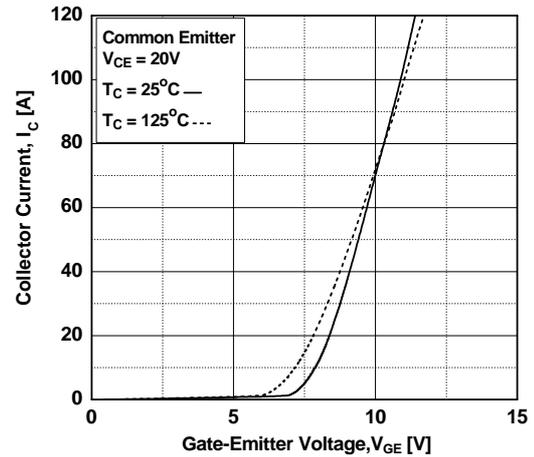


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

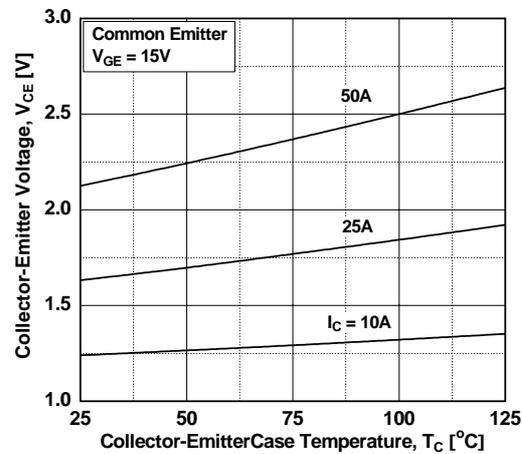
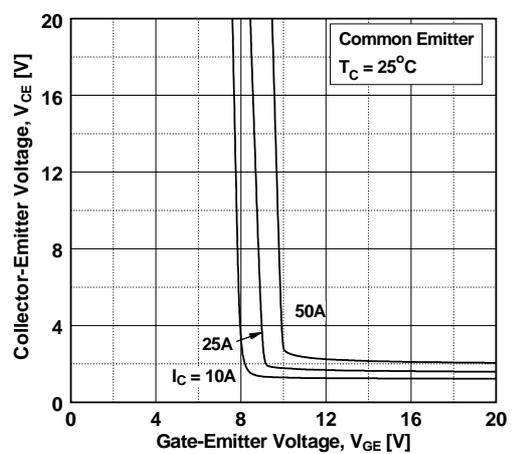


Figure 6. Saturation Voltage vs. Vge



## Typical Performance Characteristics

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

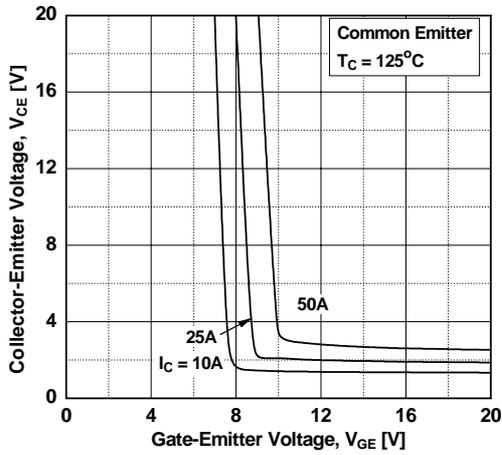


Figure 8. Load Current vs. Frequency

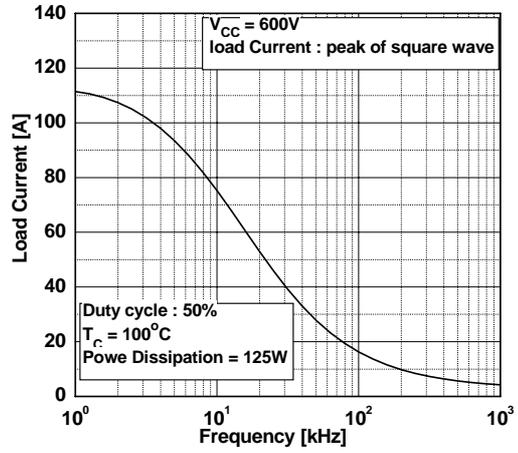


Figure 9. Capacitance Characteristics

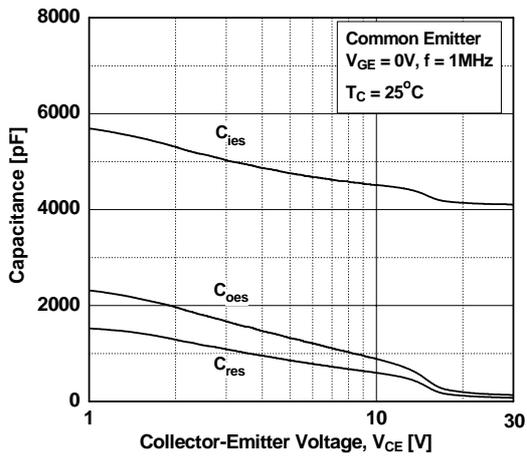


Figure 10. Gate Charge Characteristics

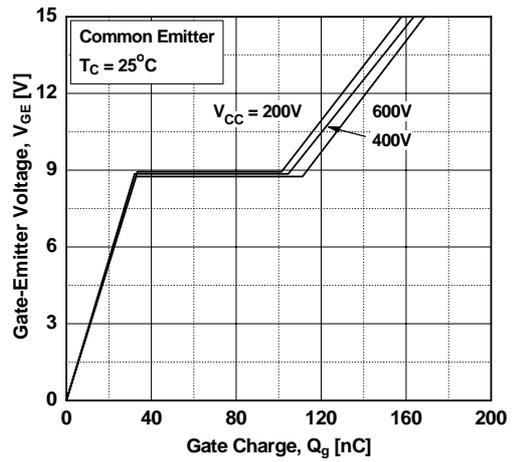


Figure 11. SOA Characteristics Gate Resistance

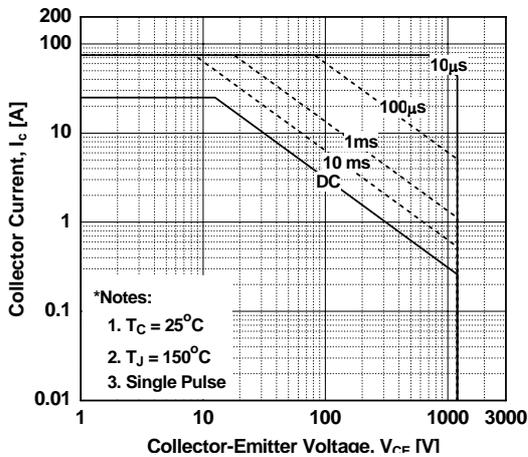
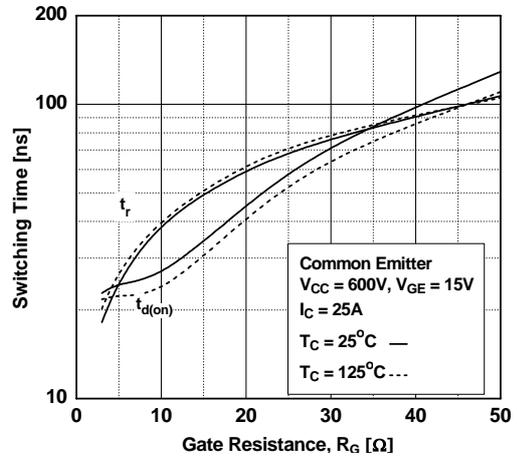
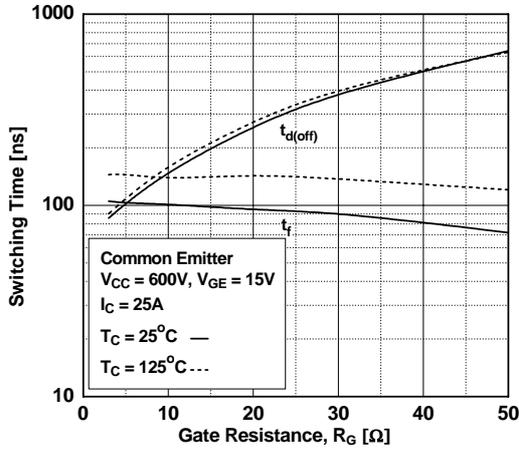


Figure 12. Turn-on Characteristics vs. Gate Resistance

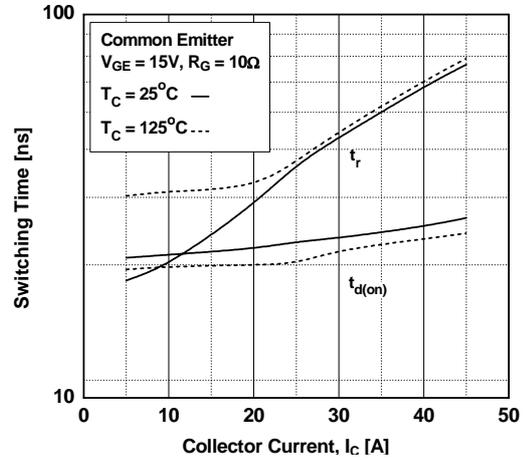


### Typical Performance Characteristics

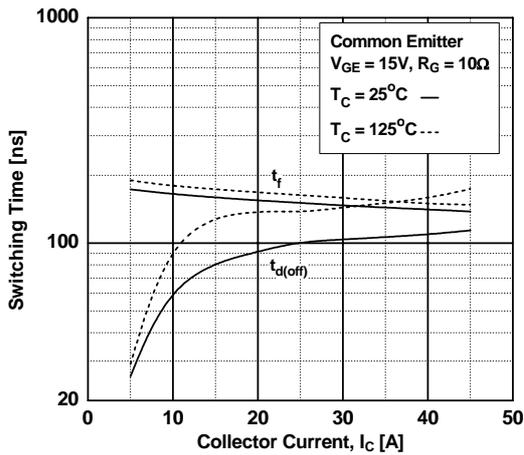
**Figure 13. Turn-off Characteristics vs. Gate Resistance**



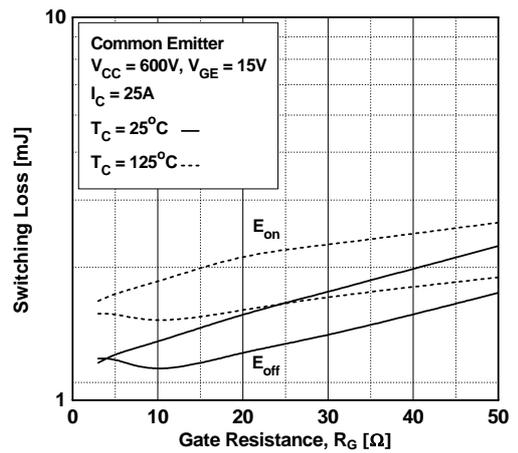
**Figure 14. Turn-on Characteristics vs. Collector Current**



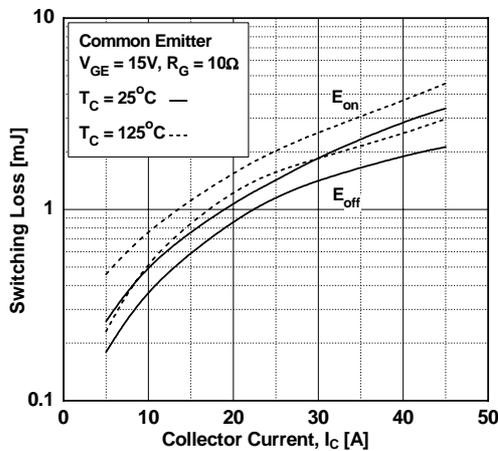
**Figure 15. Turn-off Characteristics vs. Collector Current**



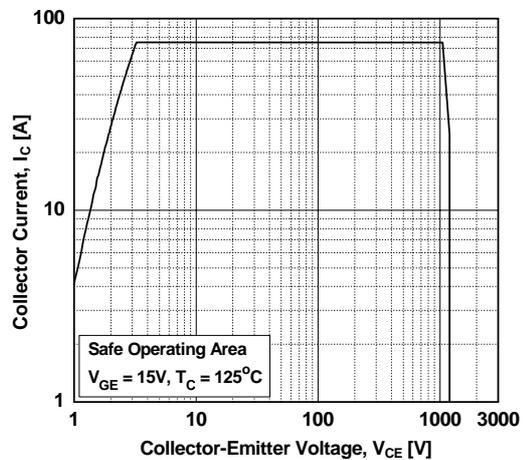
**Figure 16. Switching Loss vs. Gate Resistance**



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

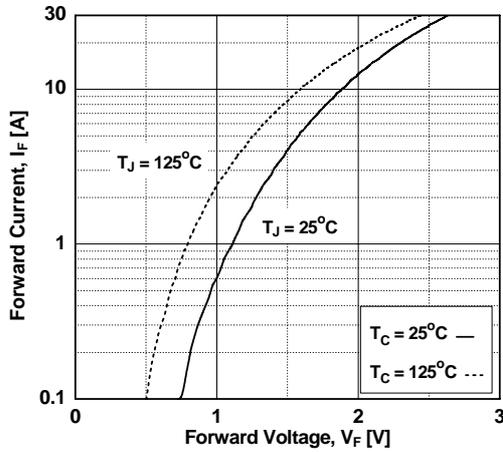


**Figure 18. Turn off Switing SOA Characteristics**

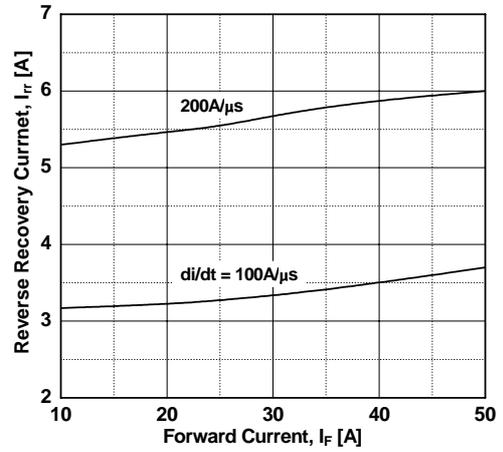


### Typical Performance Characteristics

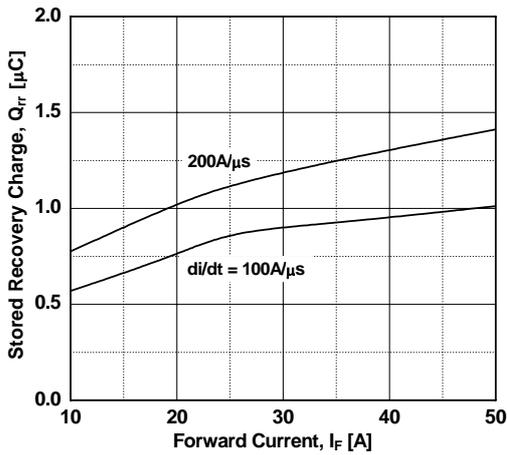
**Figure 19. Forward Characteristics**



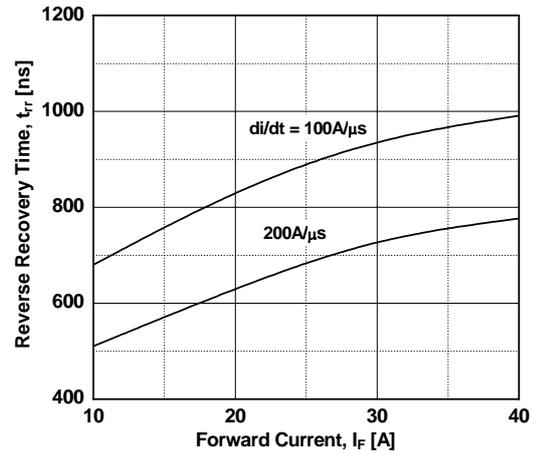
**Figure 20. Reverse Recovery Current**



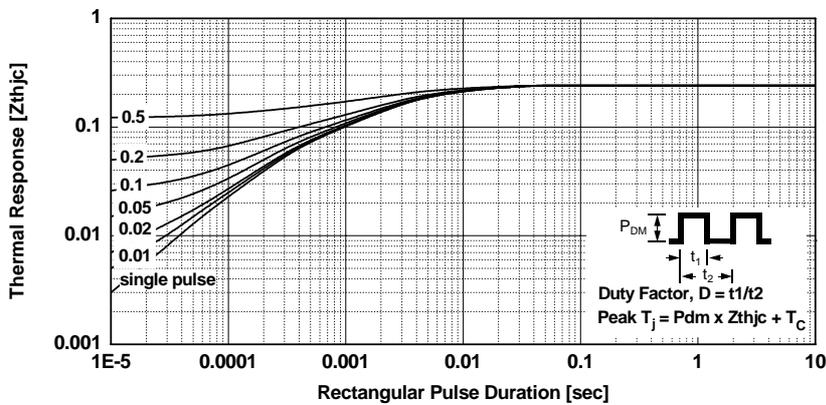
**Figure 21. Stored Charge**



**Figure 22. Reverse Recovery Time**

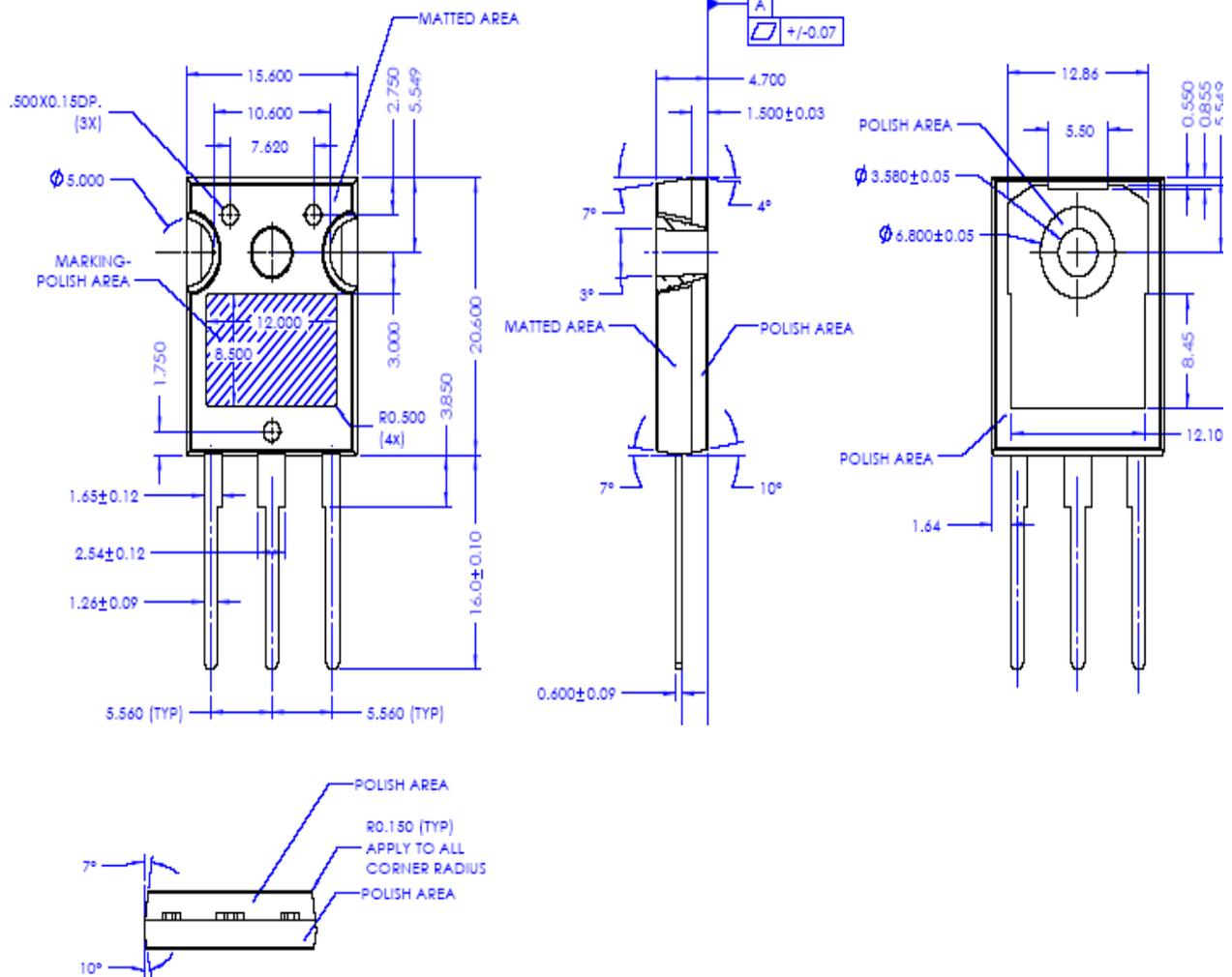


**Figure 23. Transient Thermal Impedance of IGBT**



Mechanical Dimensions

TO-247AB (FKS PKG CODE 001)

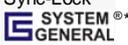


Dimensions in Millimeters



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