

# FGH75T65UPD

## 650V, 75A Field Stop Trench IGBT



### Features

- Maximum Junction Temperature :  $T_J = 175^{\circ}\text{C}$
- Positive Temperature Co-efficient for easy parallel operating
- High current capability
- Low saturation voltage:  $V_{CE(sat)} = 1.65\text{V(Typ.)} @ I_C = 75\text{A}$
- High input impedance
- Tightened Parameter Distribution
- RoHS compliant
- Short Circuit Ruggedness  $> 5\mu\text{s} @ 25^{\circ}\text{C}$

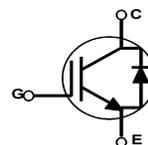
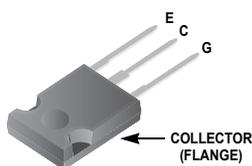


### General Description

Using Novel Field Stop Trench IGBT Technology, Fairchild's new series of Field Stop Trench IGBTs offer the optimum performance for Solar Inverter, UPS and Digital Power Generator where low conduction and switching losses are essential.

### Applications

- Solar Inverter, UPS, Digital Power Generator



### Absolute Maximum Ratings

Symbol	Description	Ratings	Units
$V_{CES}$	Collector to Emitter Voltage	650	V
$V_{GES}$	Gate to Emitter Voltage	$\pm 20$	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	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 @ $T_C = 25^{\circ}\text{C}$	375	W
	Maximum Power Dissipation @ $T_C = 100^{\circ}\text{C}$	187	W
SCWT	Short Circuit Withstand Time @ $T_C = 25^{\circ}\text{C}$	5	us
$T_J$	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

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}(\text{IGBT})$	Thermal Resistance, Junction to Case	-	0.40	$^{\circ}\text{C/W}$
$R_{\theta JC}(\text{Diode})$	Thermal Resistance, Junction to Case	-	0.86	$^{\circ}\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	-	40	$^{\circ}\text{C/W}$

## Package Marking and Ordering Information

Device Marking	Device	Package	Eco Status	Pacing Type	Qty per Tube
FGH75T65UPD	FGH75T65UPD	TO-247	-	-	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> = 1mA	650	-	-	V
$\frac{\Delta BV_{CES}}{\Delta T_J}$	Temperature Coefficient of Breakdown Voltage	V <sub>GE</sub> = 0V, I <sub>C</sub> = 1mA	-	0.65	-	V/°C
I <sub>CES</sub>	Collector Cut-Off Current	V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0V	-	-	250	μA
I <sub>GES</sub>	G-E Leakage Current	V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0V	-	-	±400	nA
<b>On Characteristics</b>						
V <sub>GE(th)</sub>	G-E Threshold Voltage	I <sub>C</sub> = 75mA, V <sub>CE</sub> = V <sub>GE</sub>	4.0	6.0	7.5	V
V <sub>CE(sat)</sub>	Collector to Emitter Saturation Voltage	I <sub>C</sub> = 75A, V <sub>GE</sub> = 15V	-	1.65	2.3	V
		I <sub>C</sub> = 75A, V <sub>GE</sub> = 15V, T <sub>C</sub> = 175°C	-	2.05	-	V
<b>Dynamic Characteristics</b>						
C <sub>ies</sub>	Input Capacitance	V <sub>CE</sub> = 30V, V <sub>GE</sub> = 0V, f = 1MHz	-	5665	-	pF
C <sub>oes</sub>	Output Capacitance		-	205	-	pF
C <sub>res</sub>	Reverse Transfer Capacitance		-	100	-	pF
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>CC</sub> = 400V, I <sub>C</sub> = 75A, R <sub>G</sub> = 3Ω, V <sub>GE</sub> = 15V, Inductive Load, T <sub>C</sub> = 25°C	-	32	42	ns
t <sub>r</sub>	Rise Time		-	43	56	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	166	216	ns
t <sub>f</sub>	Fall Time		-	24	33	ns
E <sub>on</sub>	Turn-On Switching Loss		-	2.85	3.68	mJ
E <sub>off</sub>	Turn-Off Switching Loss		-	1.20	1.60	mJ
E <sub>ts</sub>	Total Switching Loss		-	4.05	5.3	mJ
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>CC</sub> = 400V, I <sub>C</sub> = 75A, R <sub>G</sub> = 3Ω, V <sub>GE</sub> = 15V, Inductive Load, T <sub>C</sub> = 175°C	-	30	-	ns
t <sub>r</sub>	Rise Time		-	57	-	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	176	-	ns
t <sub>f</sub>	Fall Time		-	21	-	ns
E <sub>on</sub>	Turn-On Switching Loss		-	4.45	-	mJ
E <sub>off</sub>	Turn-Off Switching Loss		-	1.60	-	mJ
E <sub>ts</sub>	Total Switching Loss		-	6.05	-	mJ
T <sub>sc</sub>	Short Circuit Withstand Time	V <sub>GE</sub> = 15V, V <sub>CC</sub> ≤ 400V, R <sub>G</sub> = 10 Ω	5	-	-	us

**Electrical Characteristics of the IGBT** (Continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max	Units
$Q_g$	Total Gate Charge	$V_{CE} = 400V, I_C = 75A,$ $V_{GE} = 15V$	-	385	578	nC
$Q_{ge}$	Gate to Emitter Charge		-	45	68	nC
$Q_{gc}$	Gate to Collector Charge		-	210	315	nC

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max	Units	
$V_{FM}$	Diode Forward Voltage	$I_F = 50A$	$T_C = 25^\circ C$	-	2.1	2.6	V
			$T_C = 175^\circ C$	-	1.7	-	
$E_{rec}$	Reverse Recovery Energy	$I_F = 50A, di_F/dt = 200A/\mu s$	$T_C = 175^\circ C$	-	40	-	uJ
$t_{rr}$	Diode Reverse Recovery Time		$T_C = 25^\circ C$	-	65	85	ns
			$T_C = 175^\circ C$	-	127	-	
$Q_{rr}$	Diode Reverse Recovery Charge		$T_C = 25^\circ C$	-	120	170	nC
		$T_C = 175^\circ C$	-	550	-		

## Typical Performance Characteristics

Figure 1. Typical Output Characteristics

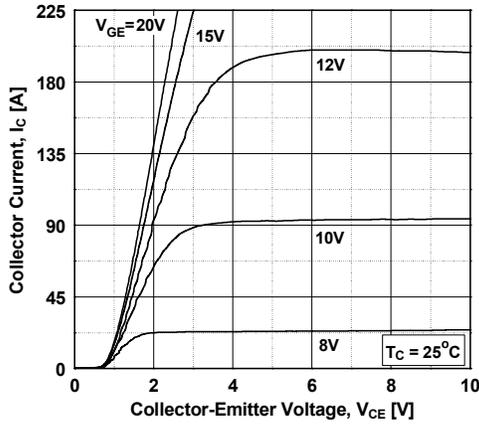


Figure 2. Typical Output Characteristics

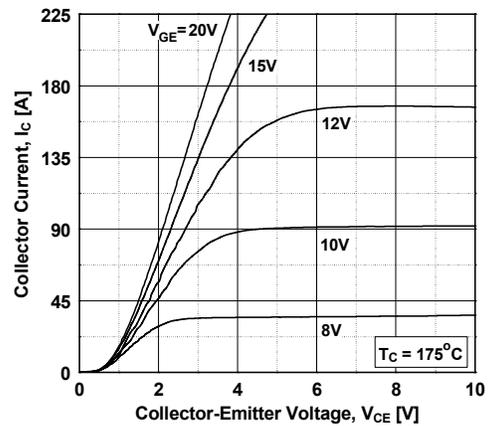


Figure 3. Typical Saturation Voltage Characteristics

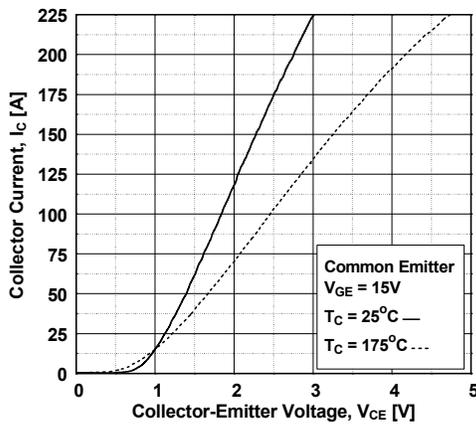


Figure 4. Transfer Characteristics

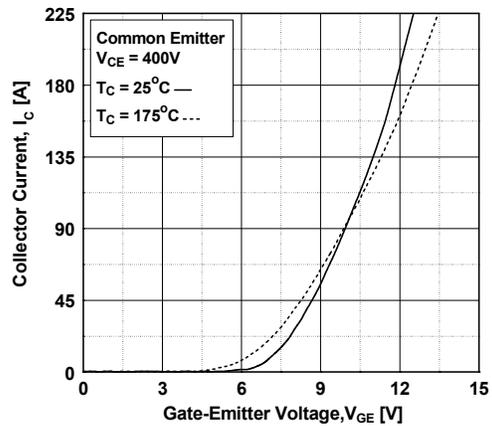


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

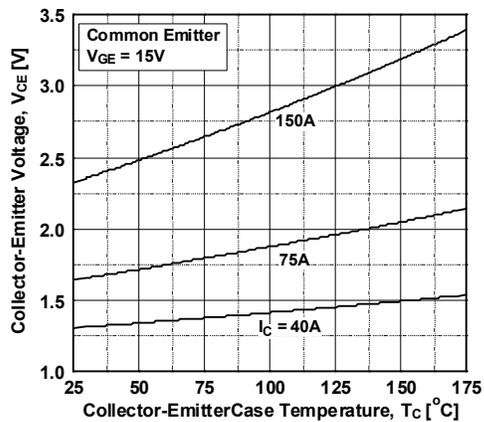
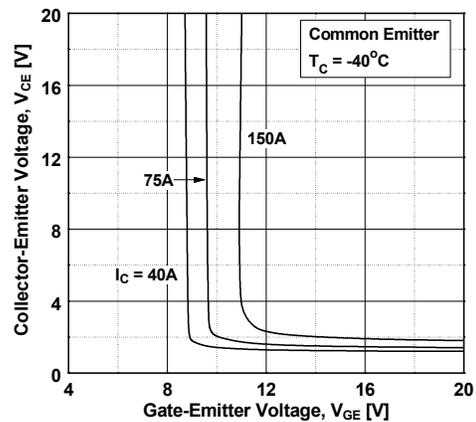


Figure 6. Saturation Voltage vs. Vge



## Typical Performance Characteristics

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

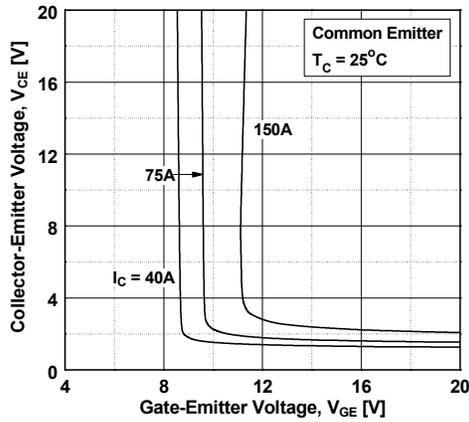


Figure 8. Saturation Voltage vs.  $V_{GE}$

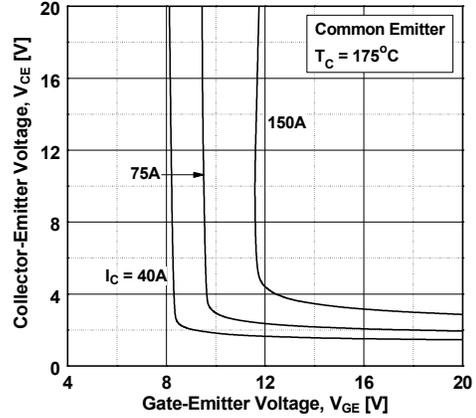


Figure 9. Capacitance Characteristics

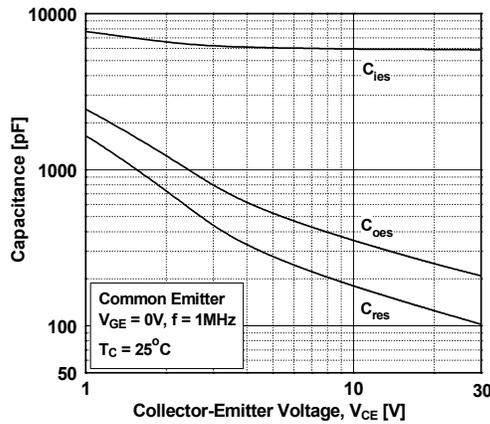


Figure 10. Gate charge Characteristics

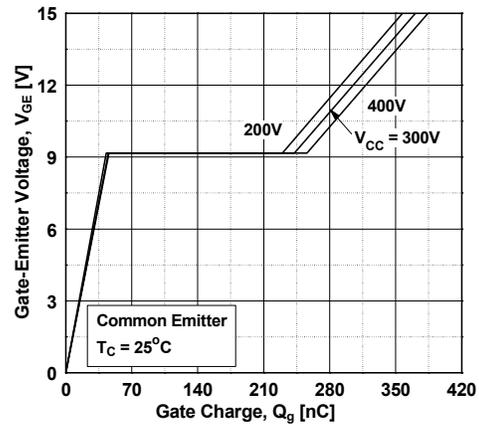


Figure 11. SOA Characteristics

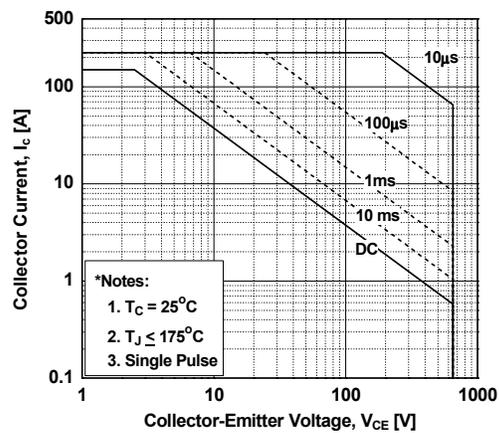
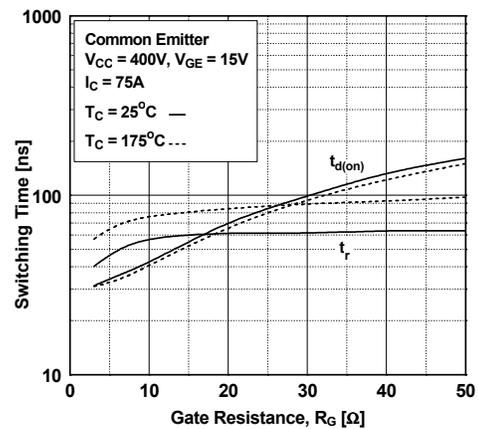
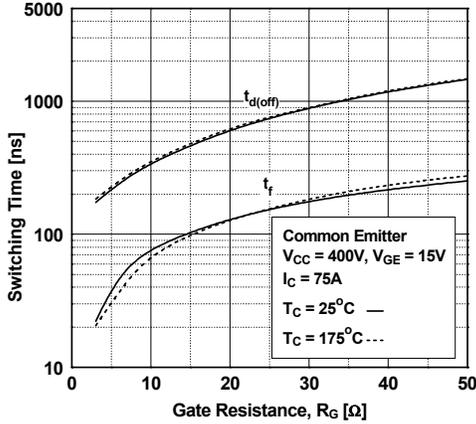


Figure 12. Turn-on Characteristics vs. Gate Resistance

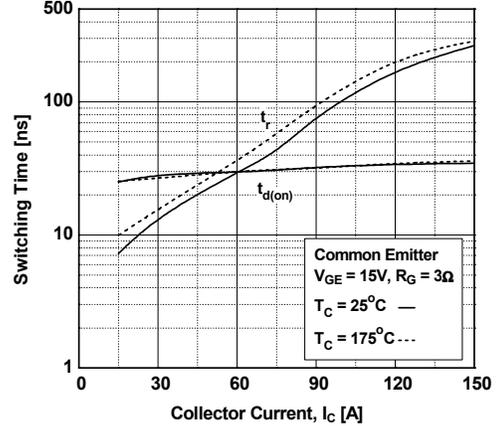


## Typical Performance Characteristics

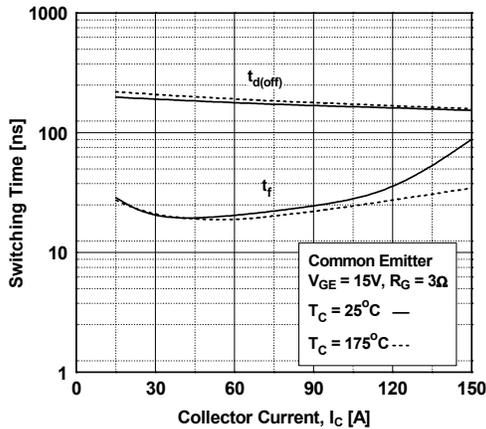
**Figure 13. Turn-off Characteristics vs. Gate Resistance**



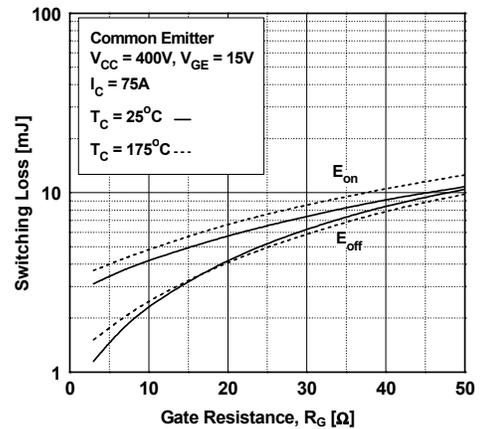
**Figure 14. Turn-on Characteristics vs. Collector Current**



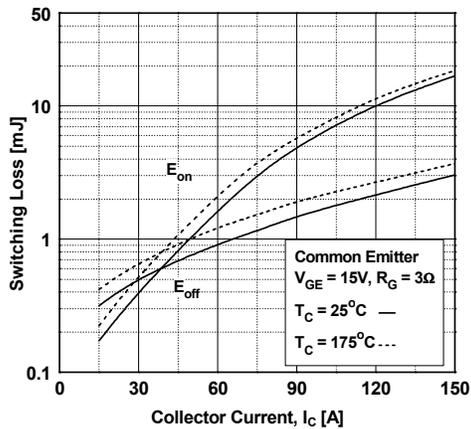
**Figure 15. Turn-off Characteristics vs. Collector Current**



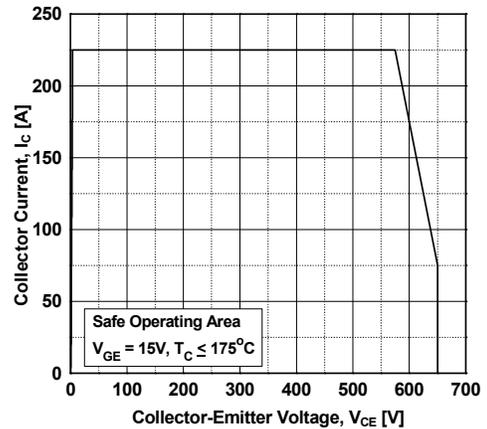
**Figure 16. Switching Loss vs. Gate Resistance**



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



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



## Typical Performance Characteristics

Figure 19. Current Derating

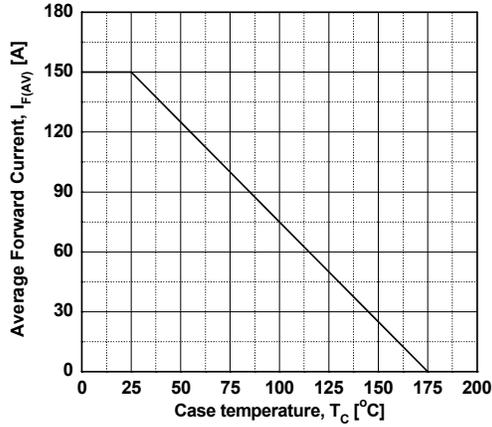


Figure 20. Load Current Vs. Frequency

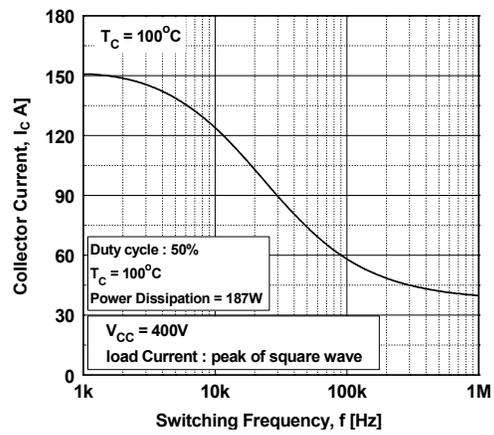


Figure 21. Forward Characteristics

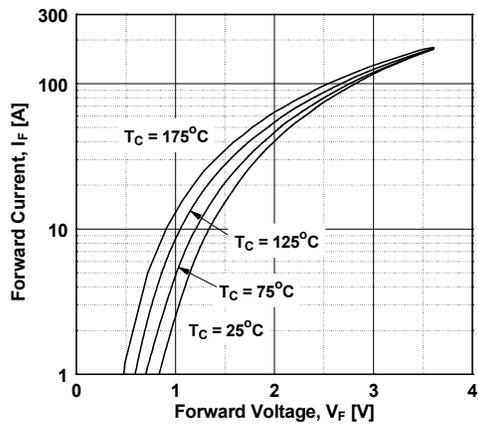


Figure 22. Reverse Recovery Current

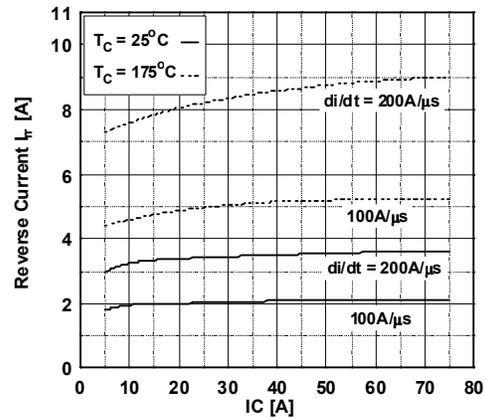


Figure 23. Stored Charge

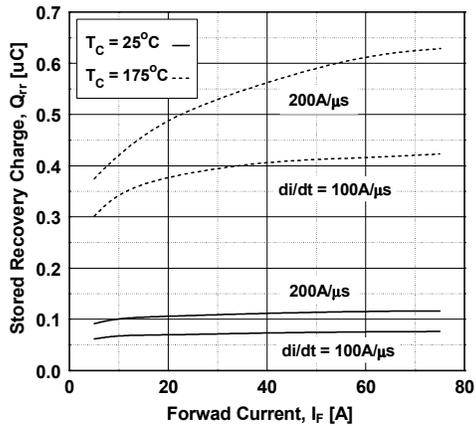
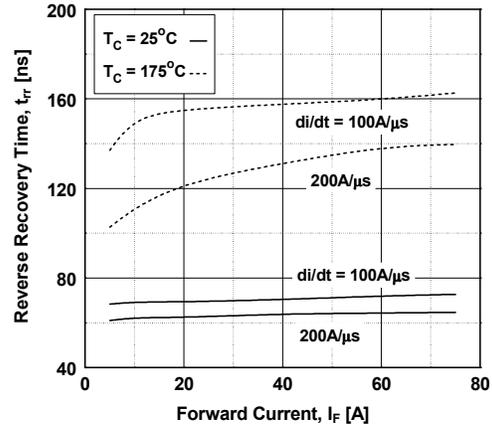


Figure 24. Reverse Recovery Time



## Typical Performance Characteristics

Figure 25. Transient Thermal Impedance of IGBT

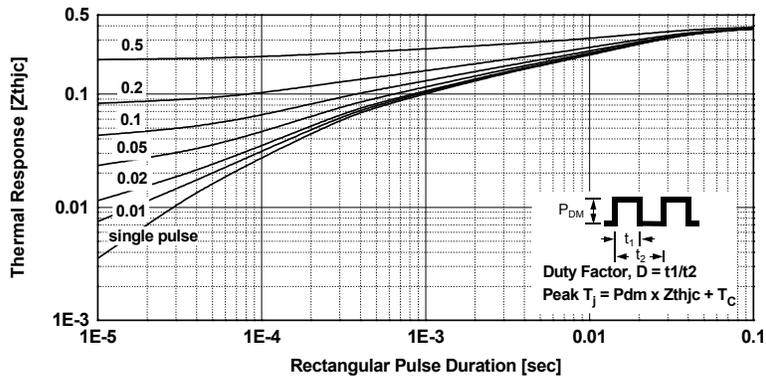
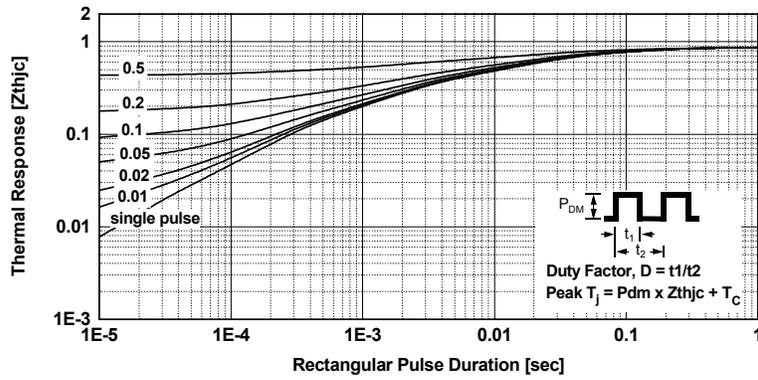
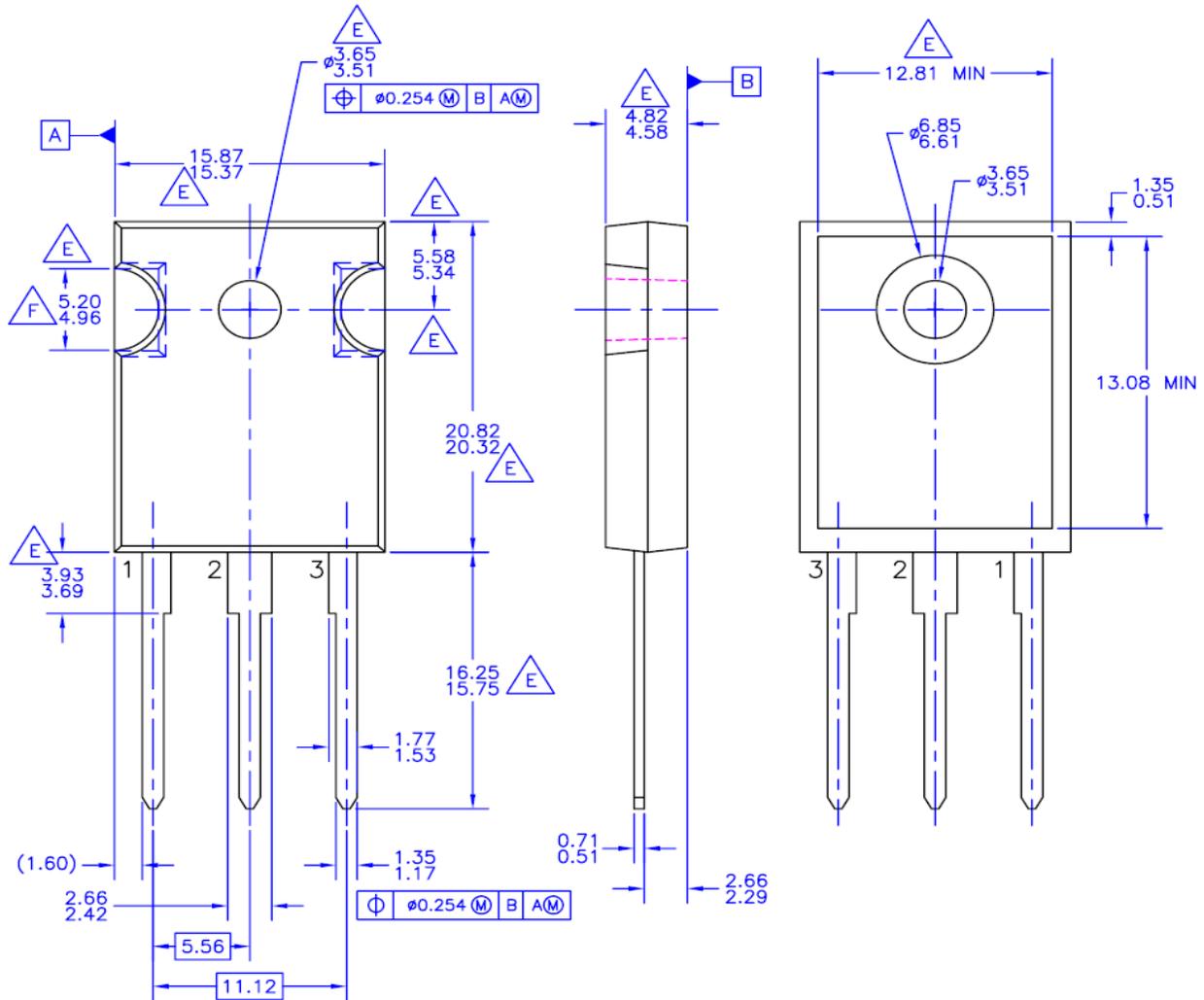


Figure 26. Transient Thermal Impedance of Diode



### Mechanical Dimensions

## TO - 247AB (FKS PKG CODE 001)



**NOTES: UNLESS OTHERWISE SPECIFIED**

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- C. ALL DIMENSIONS ARE IN MILLIMETERS.
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No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
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Rev. 161