Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

Is Now Part of

ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at
www.onsemi.com

April 2015

FGA6540WDF
650 V, 40 A Field Stop Trench IGBT

Features

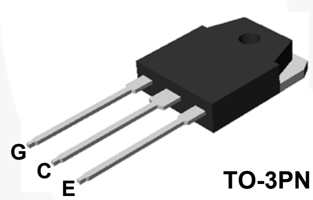
- Maximum Junction Temperature : T_J =175^{o}C
- Positive Temperaure Co-efficient for Easy Parallel Operating
- High Current Capability
- Low Saturation Voltage: $V_{CE(sat)}$ =1.8 V(Typ.) @ I_C = 40 A
- 100% of the Parts Tested for I_{LM}(1)
- High Input Impedance
- Fast Switching
- Tighten Parameter Distribution
- RoHS Compliant

General Description

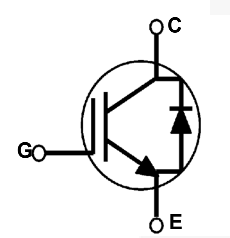
Using novel field stop IGBT technology, Fairchild's new series of field stop 3rd generation IGBTs offer the optimum performance for welder and industrial application where low conduction and switching losses are essential.

Applications

- Welder and Industrial Application
- Power Factor Correction



TO-3PN



Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Description		FGA6540WDF	Unit
V_{CES}	Collector to Emitter Voltage		650	V
V_{GES}	Gate to Emitter Voltage		± 20	V
	Transient Gate to Emitter Voltage		± 30	V
I_C	Collector Current	@ T_C = 25^{o}C	80	A
	Collector Current	@ T_C = 100^{o}C	40	A
$I_{LM (1)}$	Pulsed Collector Current	@ T_C = 25^{o}C	120	A
$I_{CM (2)}$	Pulsed Collector Current		120	A
I_F	Diode Forward Current	@ T_C = 25^{o}C	40	A
	Diode Forward Current	@ T_C = 100^{o}C	20	A
$I_{FM (2)}$	Pulsed Diode Maximum Forward Current		120	A
P_D	Maximum Power Dissipation	@ T_C = 25^{o}C	238	W
	Maximum Power Dissipation	@ T_C = 100^{o}C	119	W
T_J	Operating Junction Temperature		-55 to +175	^{o}C
T_{stg}	Storage Temperature Range		-55 to +175	^{o}C
T_L	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds		300	^{o}C

Notes:
1. V_{CC} = 400 V, V_{GE} = 15 V, I_C =120 A, R_G = 60 Ω, Inductive Load
2. Repetitive rating: Pulse width limited by max. junction temperature

Thermal Characteristics

Symbol	Parameter	FGA6540WDF	Unit
$R_{\theta JC}$(IGBT)	Thermal Resistance, Junction to Case, Max.	0.63	$^oC/W$
$R_{\theta JC}$(Diode)	Thermal Resistance, Junction to Case, Max.	1.75	$^oC/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	$^oC/W$

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Qty per Tube
FGA6540WDF	FGA6540WDF	TO-3PN	Tube	-	-	30

Electrical Characteristics of the IGBT

T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{CES}	Collector to Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 1 mA	650	-	-	V
ΔBV_{CES} / ΔT_J	Temperature Coefficient of Breakdown Voltage	I_C = 1 mA, Reference to 25^oC	-	0.6	-	V/^oC
I_{CES}	Collector Cut-Off Current	V_{CE} = V_{CES}, V_{GE} = 0 V	-	-	250	μA
I_{GES}	G-E Leakage Current	V_{GE} = V_{GES}, V_{CE} = 0 V	-	-	±400	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	I_C = 40 mA, V_{CE} = V_{GE}	4.1	5.6	7.6	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 40 A, V_{GE} = 15 V	-	1.8	2.3	V
		I_C = 40 A, V_{GE} = 15 V, T_C = 175^oC	-	2.31	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30 V, V_{GE} = 0 V, f = 1MHz	-	1525	-	pF
C_{oes}	Output Capacitance		-	60	-	pF
C_{res}	Reverse Transfer Capacitance		-	20	-	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 400 V, I_C = 40 A, R_G = 6 Ω, V_{GE} = 15 V, Inductive Load, T_C = 25^oC	-	16.8	-	ns
t_r	Rise Time		-	34.4	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	54.4	-	ns
t_f	Fall Time		-	10	-	ns
E_{on}	Turn-On Switching Loss		-	1.37	-	mJ
E_{off}	Turn-Off Switching Loss		-	0.25	-	mJ
E_{ts}	Total Switching Loss		-	1.62	-	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 400 V, I_C = 40 A, R_G = 6 Ω, V_{GE} = 15 V, Inductive Load, T_C = 175^oC	-	16	-	ns
t_r	Rise Time		-	35.2	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	57.6	-	ns
t_f	Fall Time		-	12.8	-	ns
E_{on}	Turn-On Switching Loss		-	1.89	-	mJ
E_{off}	Turn-Off Switching Loss		-	0.47	-	mJ
E_{ts}	Total Switching Loss		-	2.36	-	mJ

Electrical Characteristics of the IGBT (Continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max	Unit
Q_g	Total Gate Charge	V_{CE} = 400 V, I_C = 40 A, V_{GE} = 15 V	-	55.5	-	nC
Q_{ge}	Gate to Emitter Charge		-	9.8	-	nC
Q_{gc}	Gate to Collector Charge		-	21	-	nC

Electrical Characteristics of the Diode T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max	Unit
V_{FM}	Diode Forward Voltage	I_F = 20 A	T_C = 25°C	-	1.5	1.95	V
			T_C = 175°C	-	1.37	-	
E_{rec}	Reverse Recovery Energy	I_F =20 A, dI_F/dt = 200 A/μs	T_C = 175°C	-	153	-	uJ
t_{rr}	Diode Reverse Recovery Time		T_C = 25°C	-	101	-	ns
			T_C = 175°C	-	238	-	
Q_{rr}	Diode Reverse Recovery Charge		T_C = 25°C	-	343	-	nC
			T_C = 175°C	-	1493	-	

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

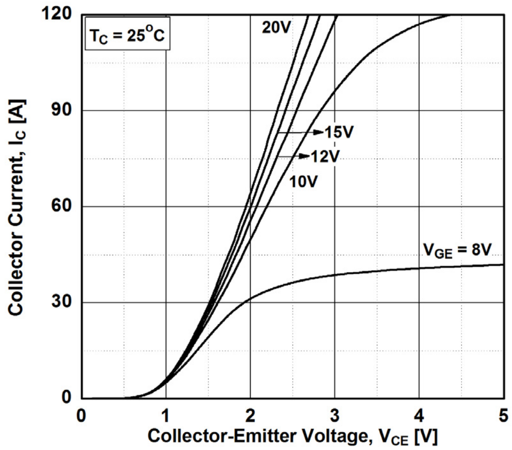


Figure 2. Typical Output Characteristics

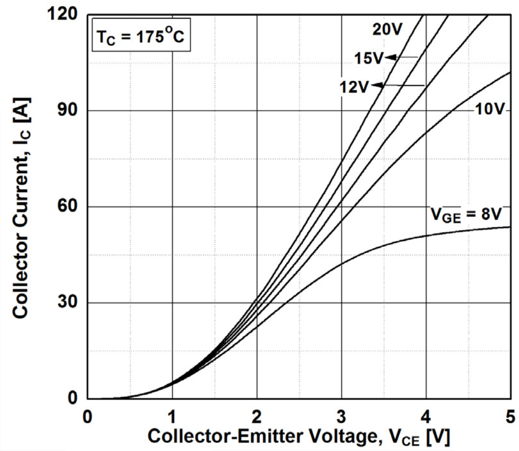


Figure 3. Typical Saturation Voltage Characteristics

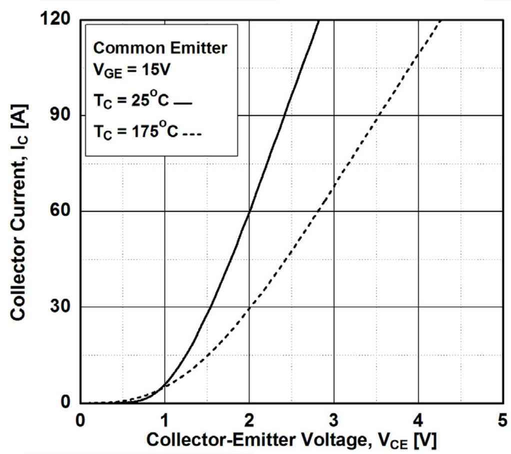


Figure 4. Saturation Voltage vs. Case Temperature at Variant Current Level

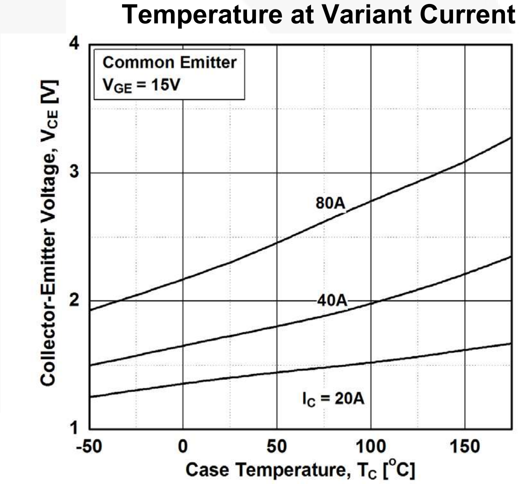


Figure 5. Saturation Voltage vs. V_{GE}

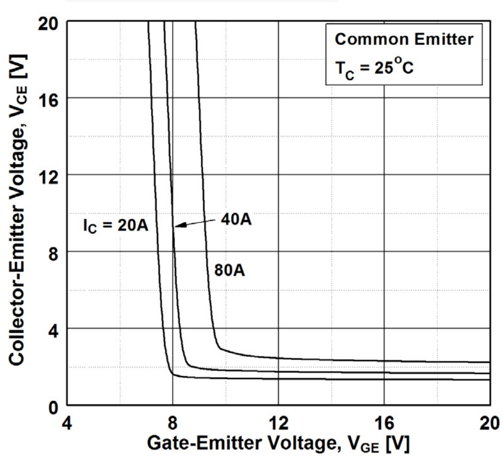
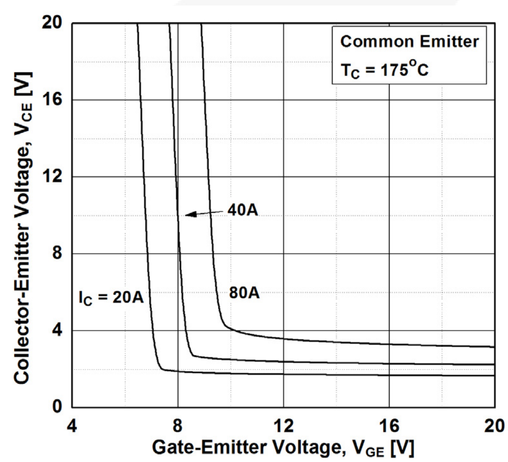


Figure 6. Saturation Voltage vs. V_{GE}



Typical Performance Characteristics

Figure 7. Capacitance Characteristics

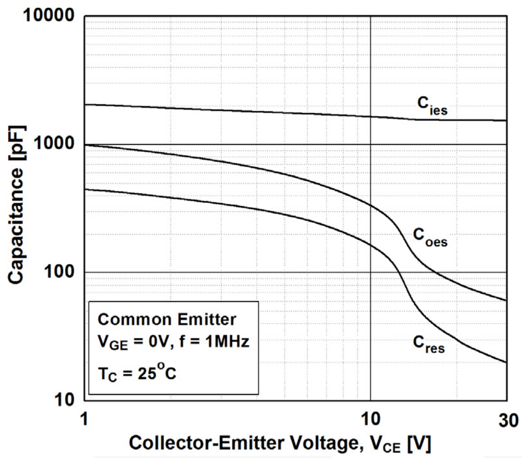


Figure 8. Gate charge Characteristics

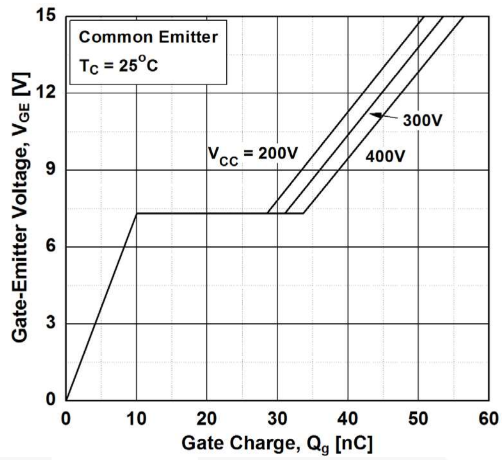


Figure 9. Turn-on Characteristics vs. Gate Resistance

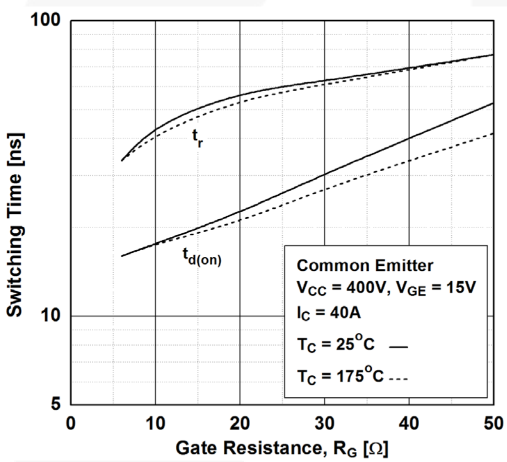


Figure 10. Turn-off Characteristics vs. Gate Resistance

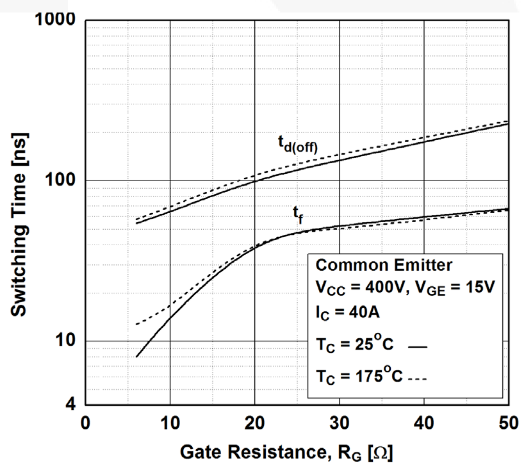


Figure 11. Switching Loss vs. Gate Resistance

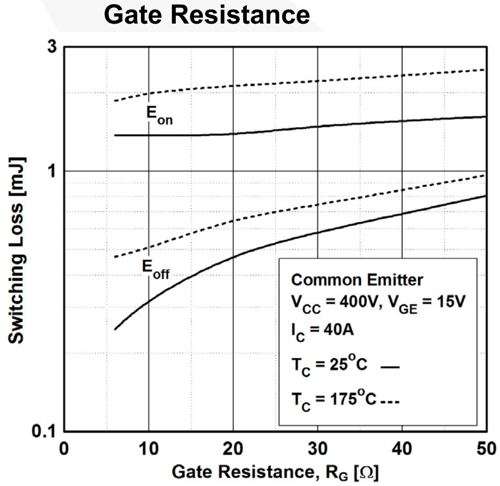
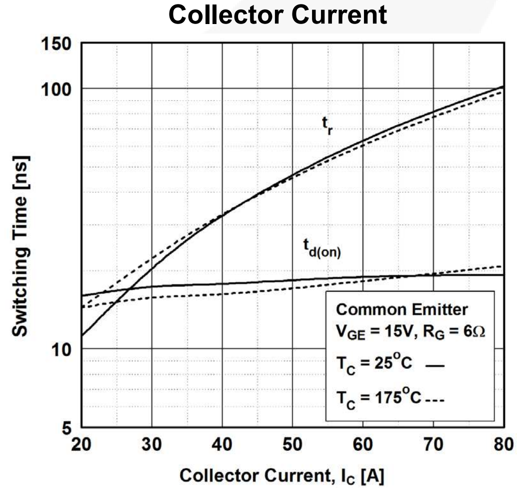


Figure 12. Turn-on Characteristics vs. Collector Current



Typical Performance Characteristics

Figure 13. Turn-off Characteristics vs. Collector Current

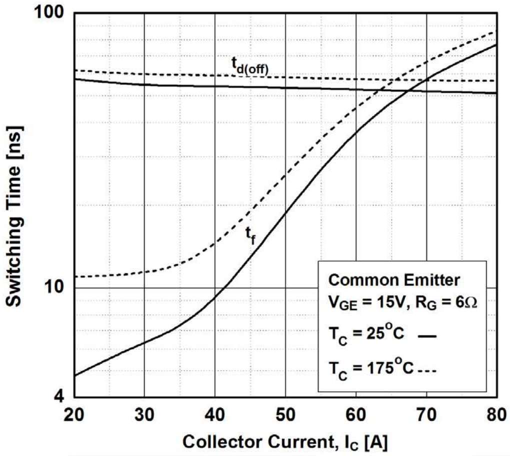


Figure 14. Switching Loss vs. Collector Current

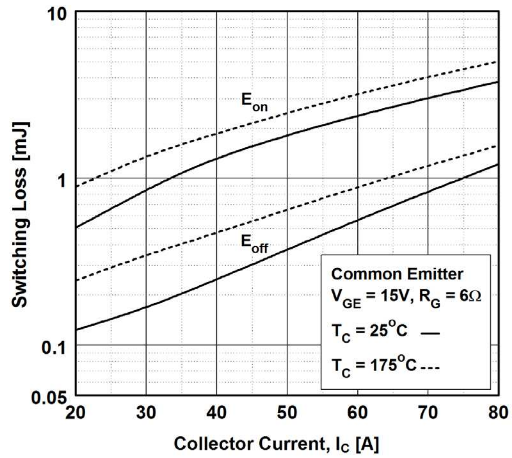


Figure 15. Load Current Vs. Frequency

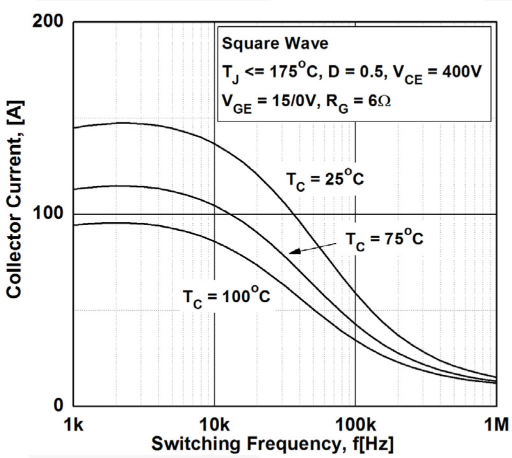


Figure 16. SOA Characteristics

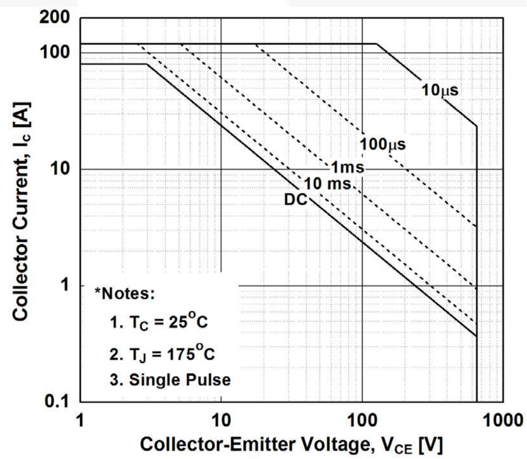


Figure 17. Forward Characteristics

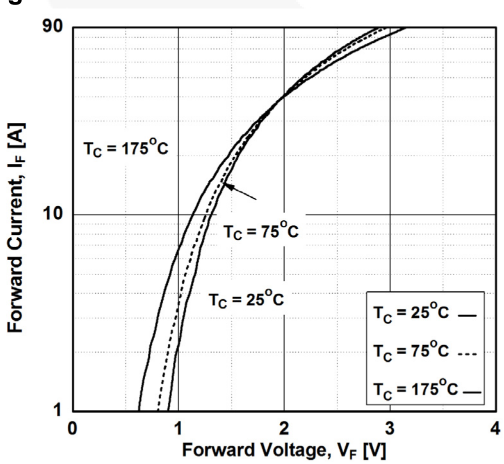
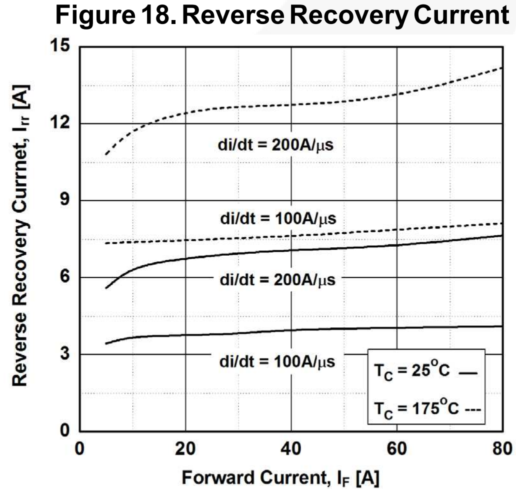


Figure 18. Reverse Recovery Current



Typical Performance Characteristics

Figure 19. Reverse Recovery Time

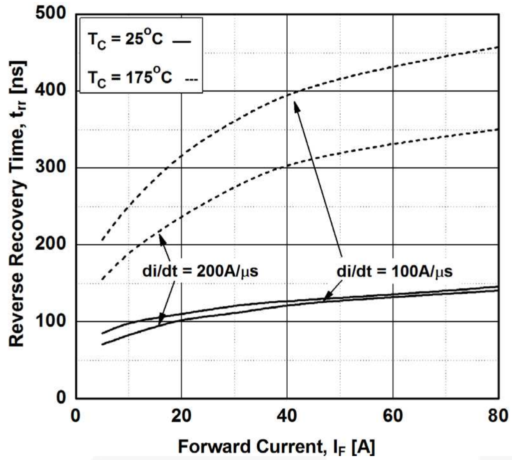


Figure 20. Stored Charge

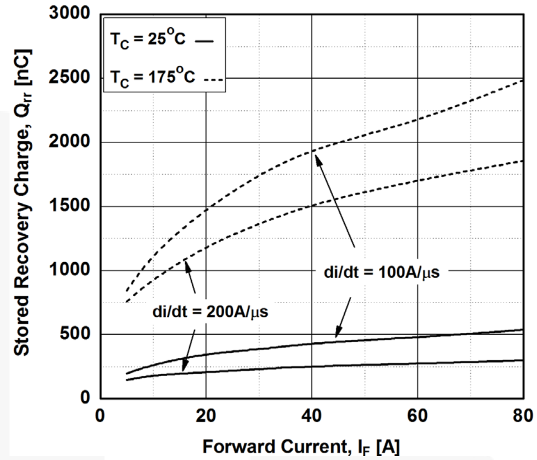


Figure 21.Transient Thermal Impedance of IGBT

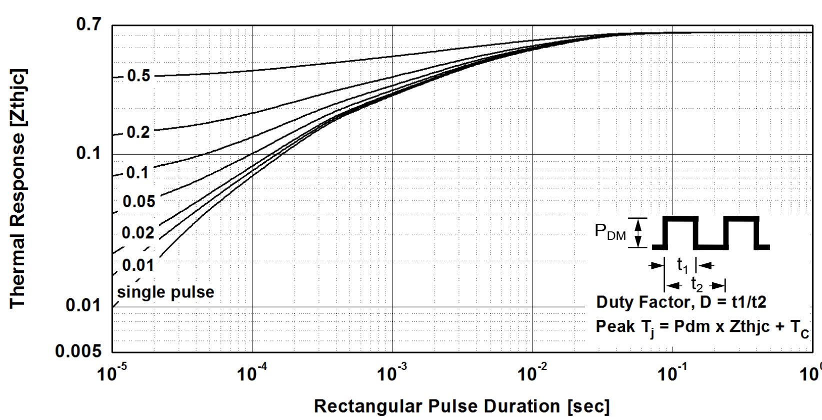
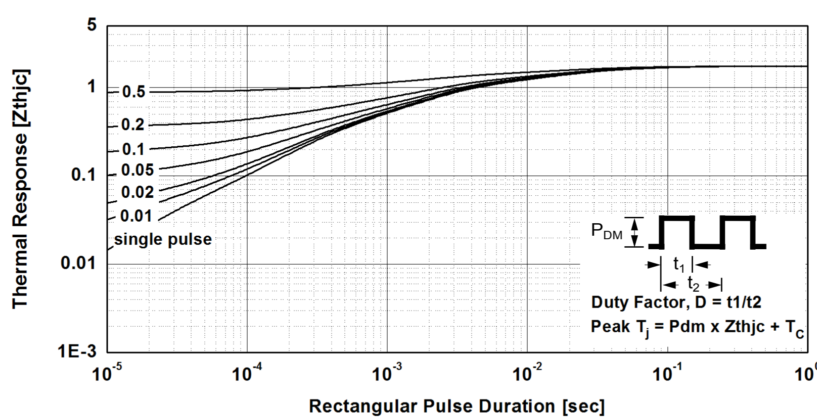
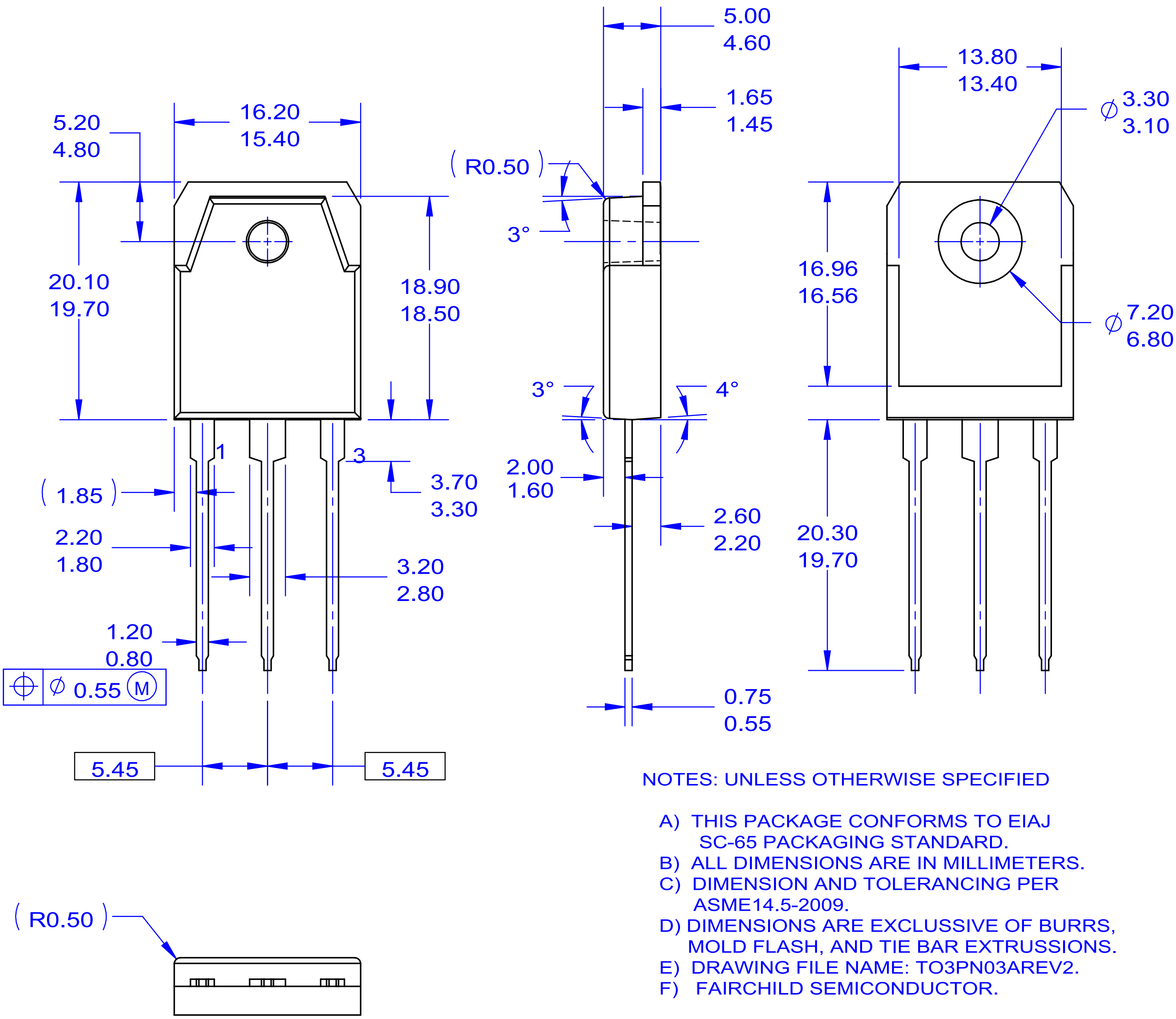


Figure 22.Transient Thermal Impedance of Diode





NOTES: UNLESS OTHERWISE SPECIFIED

A) THIS PACKAGE CONFORMS TO EIAJ SC-65 PACKAGING STANDARD.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSION AND TOLERANCING PER ASME14.5-2009.
D) DIMENSIONS ARE EXCLUSSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSSIONS.
E) DRAWING FILE NAME: TO3PN03AREV2.
F) FAIRCHILD SEMICONDUCTOR.

FAIRCHILD ™

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative