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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

FAIRCHILD SEMICONDUCTOR®

November 2013

FGA50N100BNTD2
1000 V NPT Trench IGBT

Features

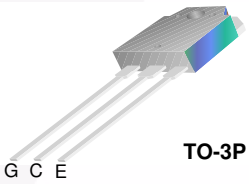
- High Speed Switching
- Low Saturation Voltage : $V_{CE(sat)}$ = 2.5 V @ I_C = 60 A
- High Input Impedance
- Built-in Fast Recovery Diode
- RoHS Compliant

Applications

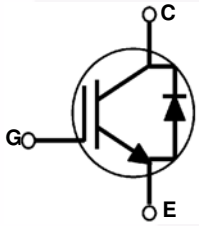
- UPS, Welder

General Description

Using Fairchild's proprietary trench design and advanced NPT technology, the 1000V NPT IGBT offers superior conduction and switching performances, high avalanche ruggedness and easy parallel operation. This device offers the optimum performance for hard switching application such as UPS, welder applications.



TO-3P



Absolute Maximum Ratings

Symbol	Description		Ratings	Unit
V_{CES}	Collector to Emitter Voltage		1000	V
V_{GES}	Gate to Emitter Voltage		± 25	V
I_C	Collector Current	@ T_C = 25°C	50	A
	Collector Current	@ T_C = 100°C	35	A
$I_{CM\ (1)}$	Pulsed Collector Current		200	A
I_F	Diode Continuous Forward Current	@ T_C = 25°C	30	A
	Diode Continuous Forward Current	@ T_C = 100°C	15	A
I_{FM}	Diode Maximum Forward Current		150	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	156	W
	Maximum Power Dissipation	@ T_C = 100°C	63	W
T_J	Operating Junction Temperature		-55 to +150	°C
T_{stg}	Storage Temperature Range		-55 to +150	°C
T_L	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds		300	°C

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

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}$(IGBT)	Thermal Resistance, Junction to Case	-	0.8	°C/W
$R_{\theta JC}$(DIODE)	Thermal Resistance, Junction to Case	-	1.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	-	40.0	°C/W

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FGA50N100BNTD2	FGA50N100BNTD2	TO-3P	Tube	N/A	N/A	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} = 0 V, I_C = 1 mA	1000	-	-	V
I_{CES}	Collector Cut-Off Current	V_{CE} = 1000 V, V_{GE} = 0 V	-	-	1.0	mA
I_{GES}	G-E Leakage Current	V_{GE} = ±25 V, V_{CE} = 0 V	-	-	±500	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	I_C = 60 mA, V_{CE} = V_{GE}	4.0	5.5	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 10 A, V_{GE} = 15 V	-	1.5	1.8	V
		I_C = 60 A, V_{GE} = 15 V		2.5	2.9	V
		I_C = 60 A, V_{GE} = 15 V, T_C = 125°C	-	3.3	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 10 V, V_{GE} = 0 V, f = 1 MHz	-	6000	-	pF
C_{oes}	Output Capacitance		-	260	-	pF
C_{res}	Reverse Transfer Capacitance		-	200	-	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600 V, I_C = 60 A, R_G = 10 Ω, V_{GE} = 15 V, Inductive Load, T_C = 25°C	-	34	-	ns
t_r	Rise Time		-	68	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	243	-	ns
t_f	Fall Time		-	65	100	ns
Q_g	Total Gate Charge	V_{CE} = 600 V, I_C = 60 A, V_{GE} = 15 V, T_C = 25°C	-	257	350	nC
Q_{ge}	Gate to Emitter Charge		-	45	-	nC
Q_{gc}	Gate to Collector Charge		-	95	-	nC

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

V_{FM}	Diode Forward Voltage	I_F = 15 A	-	2.9	3.2	V
		I_F = 60 A	-	4.0	4.7	V
t_{rr}	Diode Reverse Recovery Time	I_F = 60 A, di_F/dt = 100 A/us	-	60	75	ns
I_R	Instantaneous Reverse Current	V_{RRM} = 1000 V	-	-	2	μA

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

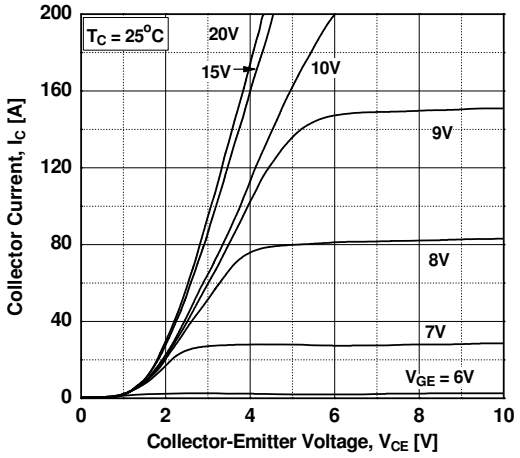


Figure 2. Typical Output Characteristics

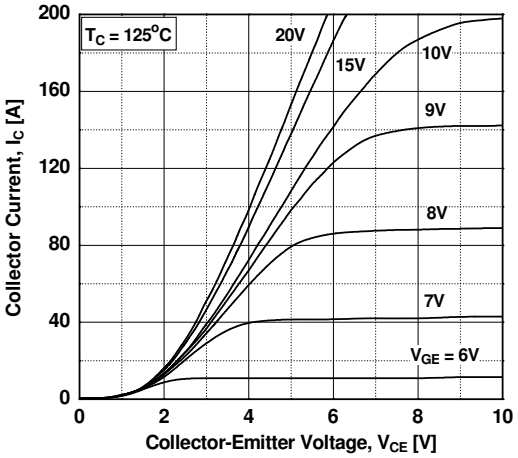


Figure 3. Typical Saturation Voltage Characteristics

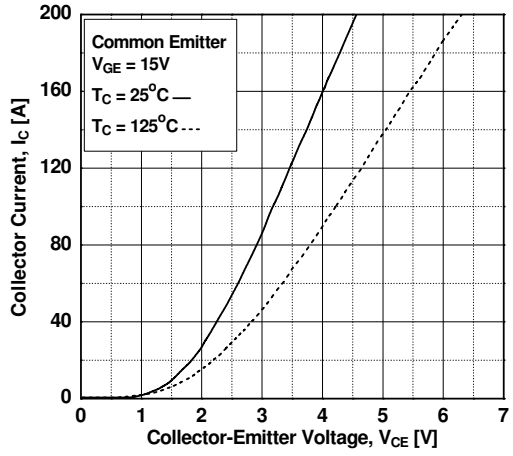


Figure 4. Transfer Characteristics

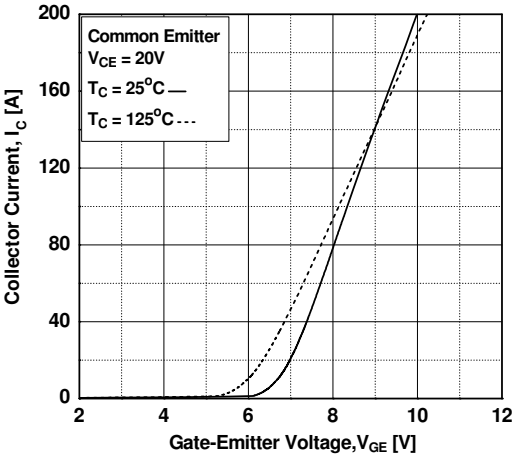


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

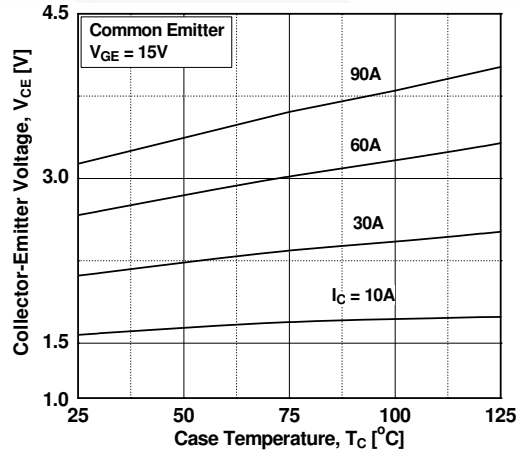
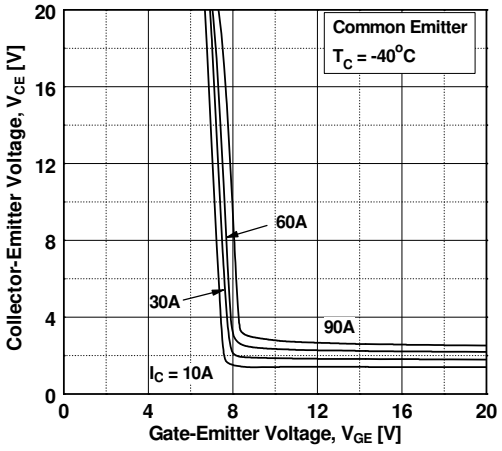


Figure 6. Saturation Voltage vs. V_{GE}



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. V_{GE}

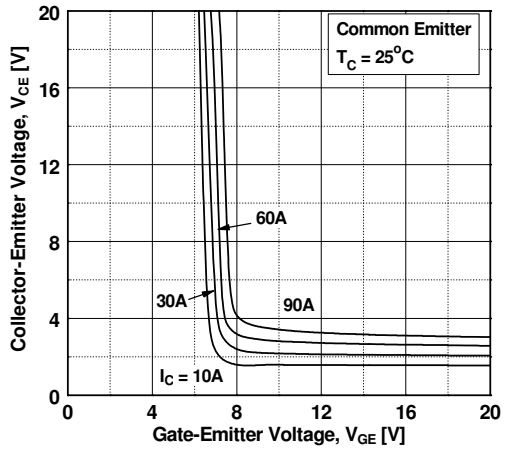


Figure 8. Saturation Voltage vs. V_{GE}

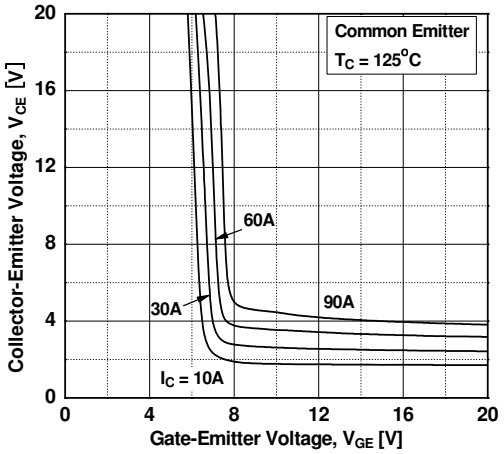


Figure 9. Capacitance Characteristics

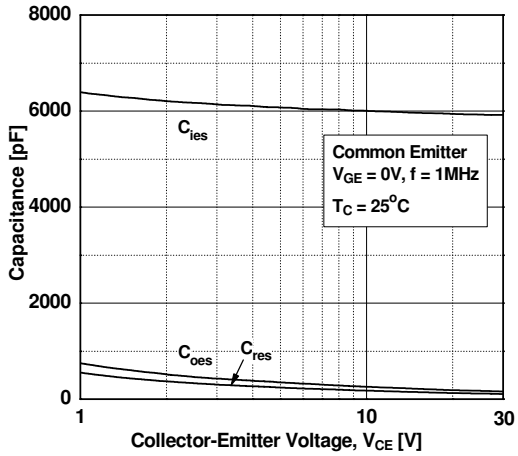


Figure 10. Gate charge Characteristics

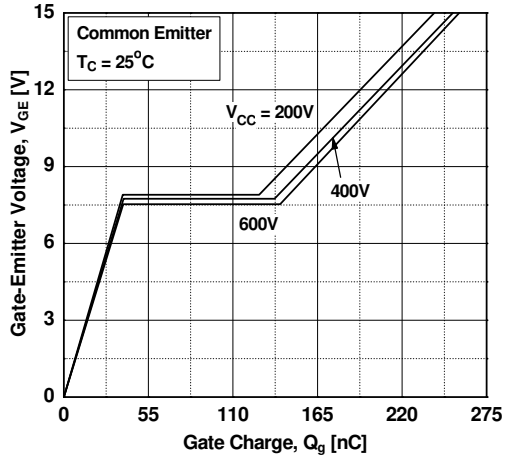


Figure 11. SOA Characteristics

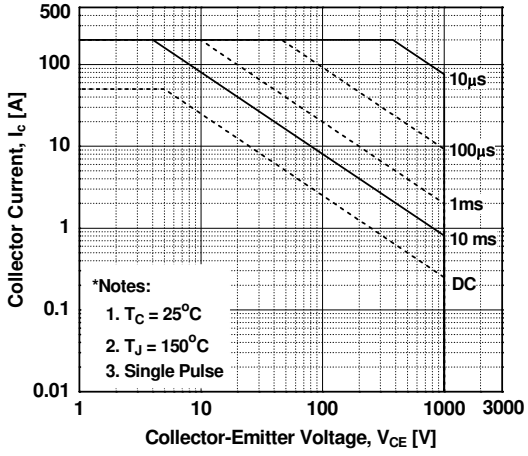
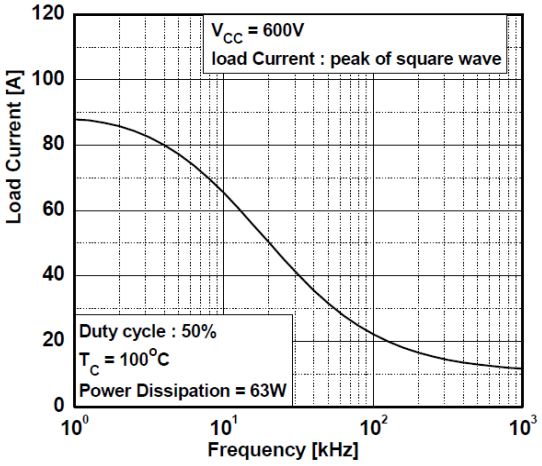


Figure 12. Load Current vs. Frequency



Typical Performance Characteristics

Figure 13. Turn-on Characteristics vs. Gate Resistance

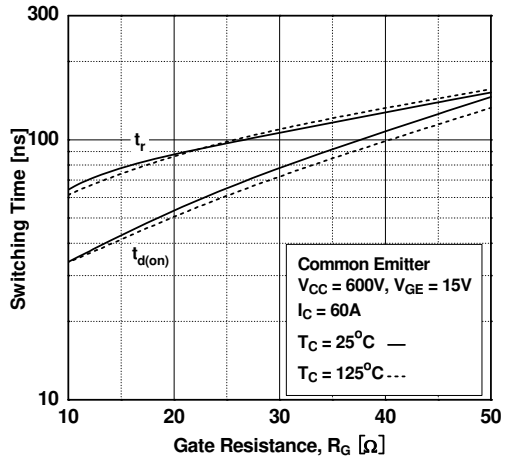


Figure 14. Turn-off Characteristics vs. Gate Resistance

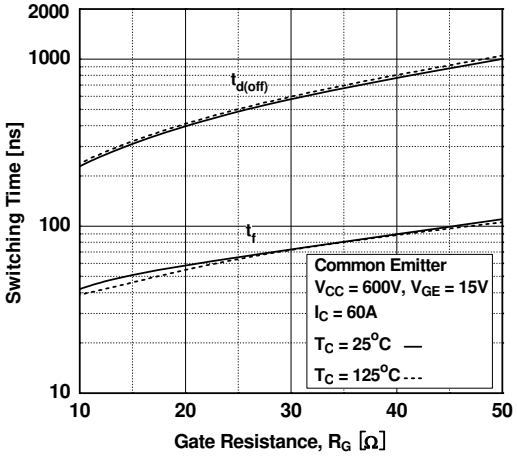


Figure 15. Turn-on Characteristics vs. Collector Current

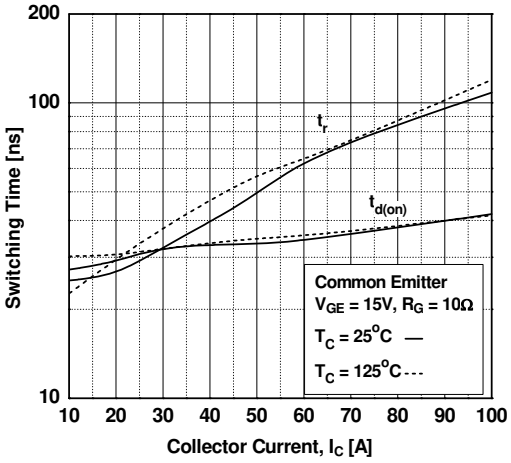


Figure 16. Turn-off Characteristics vs. Collector Current

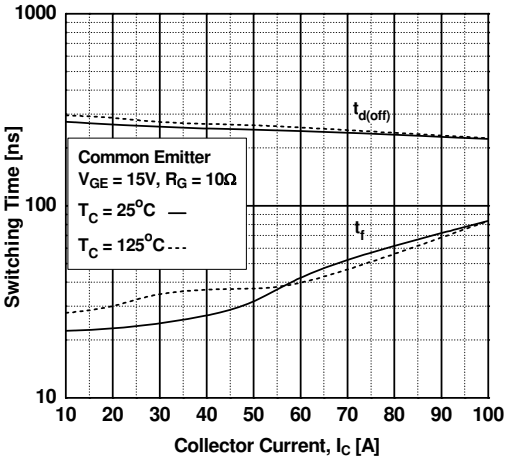


Figure 17. Switching Loss vs. Gate Resistance

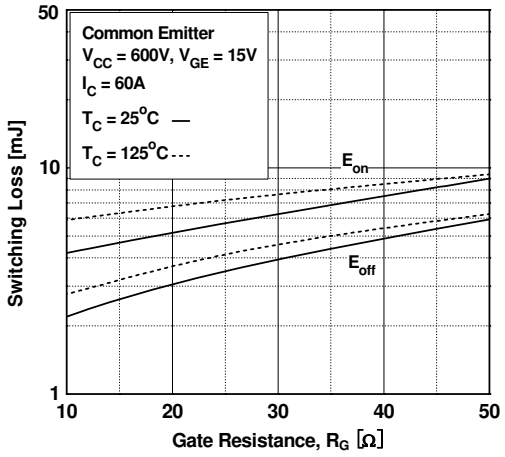
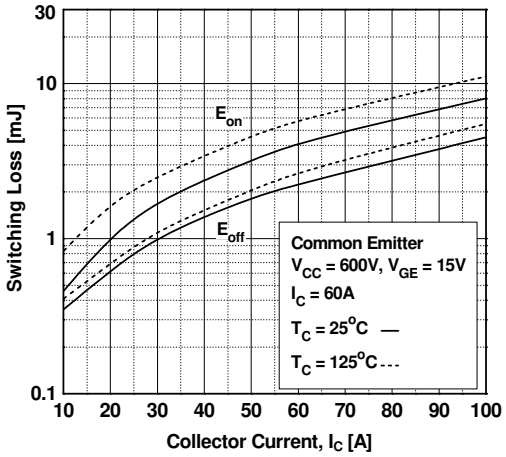


Fig 18. Switching Loss vs. Collector Current



Typical Performance Characteristics

Figure 19. Turn off Switching SOA Characterisics

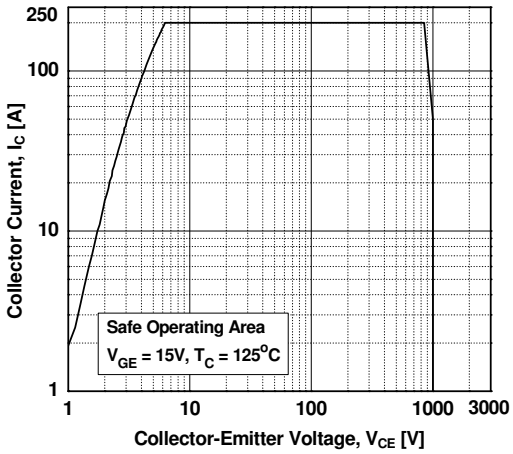


Figure 20. Forward Characteristics

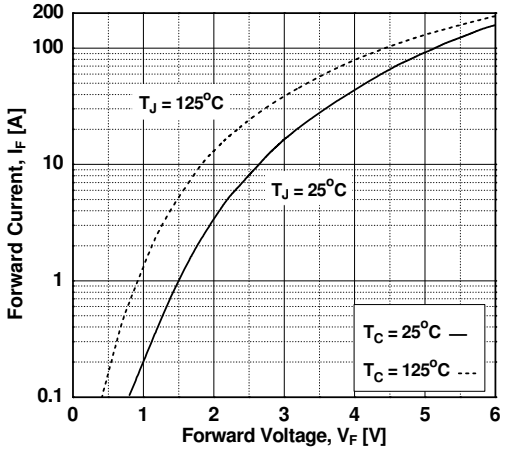


Figure 21. Reverse Current

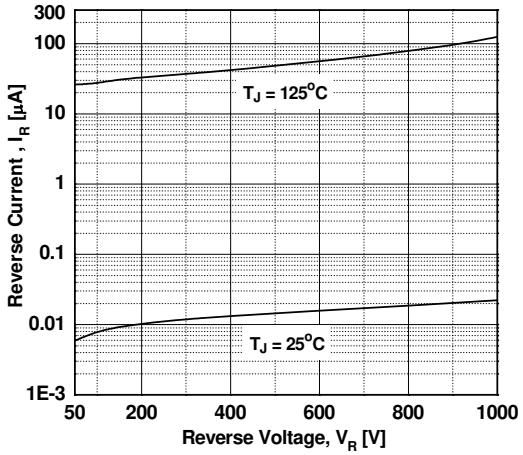


Figure 22. Reverse Recovery Characteristics vs. di_F/dt

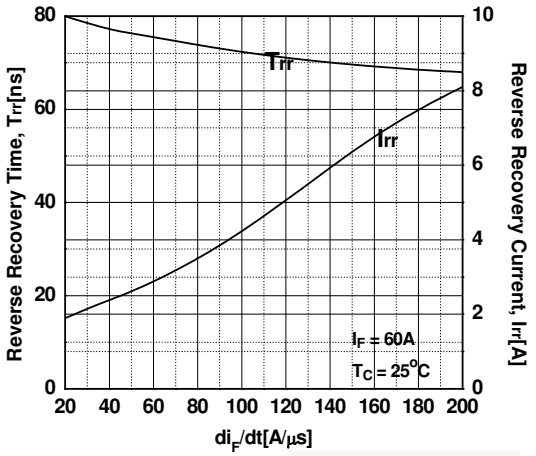
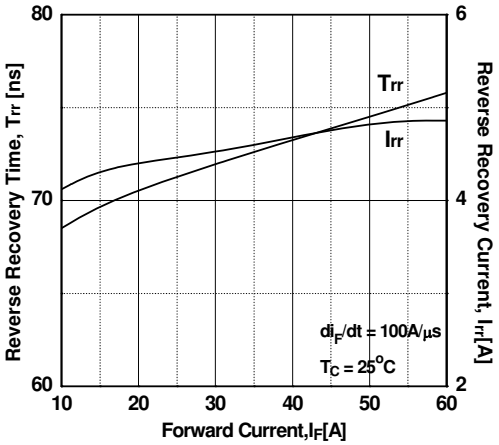
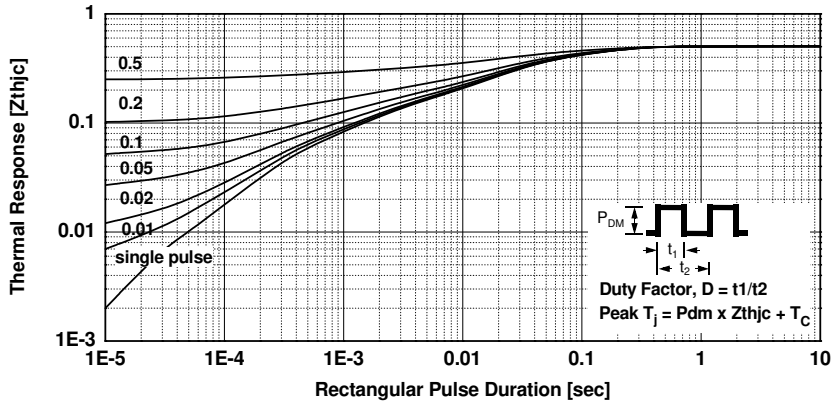


Figure 23. Reverse Recovery Characteristics vs. Forward Current



Typical Performance Characteristics

Figure 24.Transient Thermal Impedance of IGBT



Mechanical Dimensions

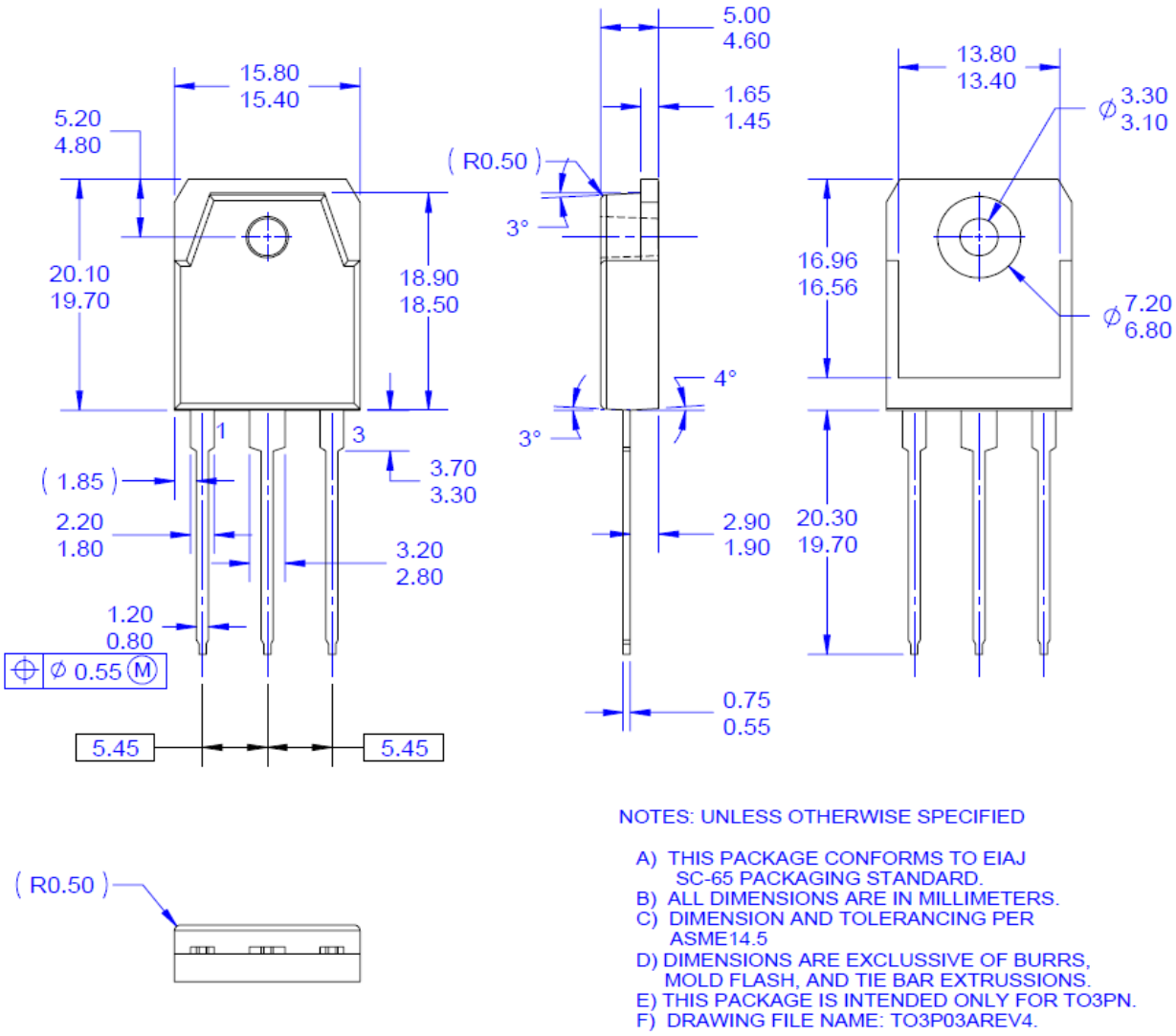


Figure 25. TO-3P 3L - 3LD, T03, PLASTIC, EIAJ SC-65

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2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
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.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I66

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