FAIRCHILD SEMICONDUCTOR®

September 2013

FGH25T120SMD

1200 V, 25 A Field Stop Trench IGBT

Features

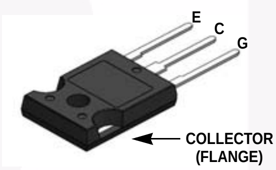
- FS Trench Technology, Positive Temperature Coefficient
- High Speed Switching
- Low Saturation Voltage: $V_{CE(sat)}$ =1.8 V @ I_C = 25 A
- 100% of The Parts Tested for I_{LM}(1)
- High Input Impedance
- RoHS Compliant

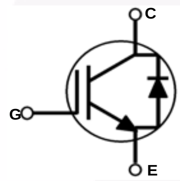
Applications

- Solar Inverter, Welder, UPS & PFC Applications.

General Description

Using innovative field stop trench IGBT technology, Fairchild's new series of field stop trench IGBTs offer the optimum performance for hard switching application such as solar inverter, UPS, welder and PFC applications.





Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Description		Ratings	Unit
V_{CES}	Collector to Emitter Voltage		1200	V
V_{GES}	Gate to Emitter Voltage		±25	V
	Transient Gate to Emitter Voltage		±30	V
I_C	Collector Current	@ T_C = 25^{o}C	50	A
	Collector Current	@ T_C = 100^{o}C	25	A
I_{LM} (1)	Clamped Inductive Load Current	@ T_C = 25^{o}C	100	A
I_{CM} (2)	Pulsed Collector Current		100	A
I_F	Diode Continuous Forward Current	@ T_C = 25^{o}C	50	A
	Diode Continuous Forward Current	@ T_C = 100^{o}C	25	A
I_{FM}	Diode Maximum Forward Current		200	A
P_D	Maximum Power Dissipation	@ T_C = 25^{o}C	428	W
	Maximum Power Dissipation	@ T_C = 100^{o}C	214	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

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}$(IGBT)	Thermal Resistance, Junction to Case	--	0.35	^{o}C/W
$R_{\theta JC}$(Diode)	Thermal Resistance, Junction to Case	--	1.4	^{o}C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	--	40	^{o}C/W

Notes:
1. Vcc = 600 V, V_{GE} = 15 V, I_C = 100 A, R_G = 23 Ω , Inductive Load
2. Limited by Tjmax

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGH25T120SMD	FGH25T120SMD_F155	TO-247G03	-	-	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 = 250 uA	1200	-	-	V
I_{CES}	Collector Cut-Off Current	$V_{CE} = V_{CES}$, V_{GE} = 0 V	-	-	250	uA
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 = 25 mA, $V_{CE} = V_{GE}$	4.9	6.2	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 25 A, V_{GE} = 15 V T_C = 25^{o}C	-	1.8	2.4	V
		I_C = 25 A, V_{GE} = 15 V, T_C = 175^{o}C	-	1.9	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30 V, V_{GE} = 0 V, f = 1MHz	-	2800	-	pF
C_{oes}	Output Capacitance		-	105	-	pF
C_{res}	Reverse Transfer Capacitance		-	60	-	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600 V, I_C = 25 A, R_G = 23 Ω, V_{GE} = 15 V, Inductive Load, T_C = 25^{o}C	-	40	-	ns
t_r	Rise Time		-	45	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	490	-	ns
t_f	Fall Time		-	12	-	ns
E_{on}	Turn-On Switching Loss		-	1.74	-	mJ
E_{off}	Turn-Off Switching Loss		-	0.56	-	mJ
E_{ts}	Total Switching Loss		-	2.30	-	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600 V, I_C = 25 A, R_G = 23 Ω, V_{GE} = 15 V, Inductive Load, T_C = 175^{o}C	-	40	-	ns
t_r	Rise Time		-	48	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	520	-	ns
t_f	Fall Time		-	64	-	ns
E_{on}	Turn-On Switching Loss		-	2.94	-	mJ
E_{off}	Turn-Off Switching Loss		-	1.09	-	mJ
E_{ts}	Total Switching Loss		-	4.03	-	mJ
Q_g	Total Gate Charge	V_{CE} = 600 V, I_C = 25 A, V_{GE} = 15 V	-	225	-	nC
Q_{ge}	Gate to Emitter Charge		-	20	-	nC
Q_{gc}	Gate to Collector Charge		-	128	-	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 = 25 A, T_C = 25^{o}C	-	2.8	3.7	V
		I_F = 25 A, T_C = 175^{o}C	-	2.1	-	V
t_{rr}	Diode Reverse Recovery Time	V_R = 600 V, I_F = 25 A, di_F/dt = 200 A/us, T_C = 25^{o}C	-	60	-	ns
I_{rr}	Diode Peak Reverse Recovery Current		-	6.6	-	A
Q_{rr}	Diode Reverse Recovery Charge		-	197	-	nC
E_{rec}	Reverse Recovery Energy	V_R = 600 V, I_F = 25 A, di_F/dt = 200 A/us, T_C = 175^{o}C	-	330	-	uJ
t_{rr}	Diode Reverse Recovery Time		-	325	-	ns
I_{rr}	Diode Peak Reverse Recovery Current		-	13	-	A
Q_{rr}	Diode Reverse Recovery Charge		-	2113	-	nC

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

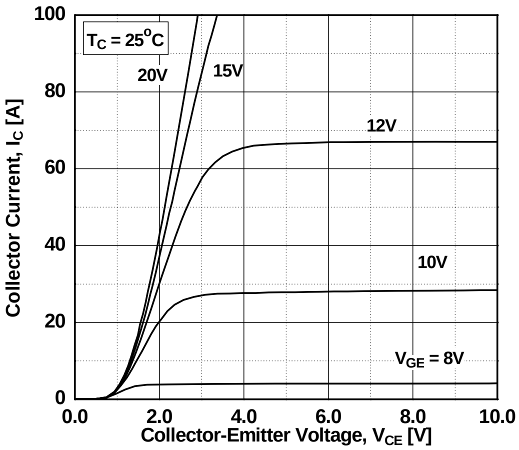


Figure 2. Typical Output Characteristics

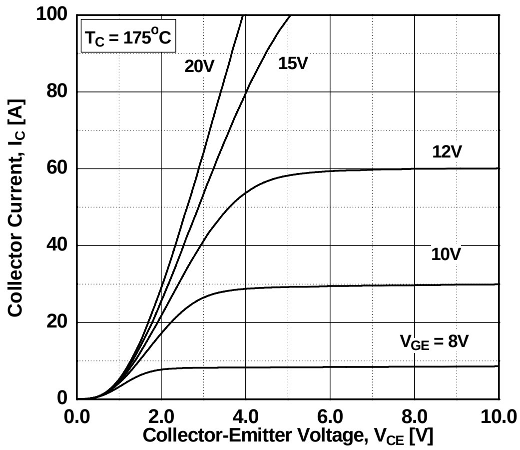


Figure 3. Typical Saturation Voltage Characteristics

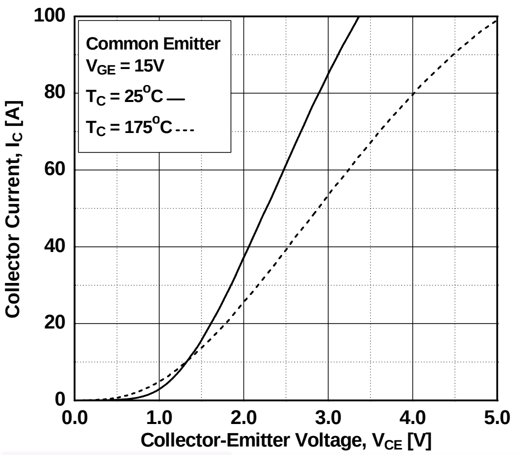


Figure 4. Saturation Voltage vs. Case Temperature at Variant Current Level

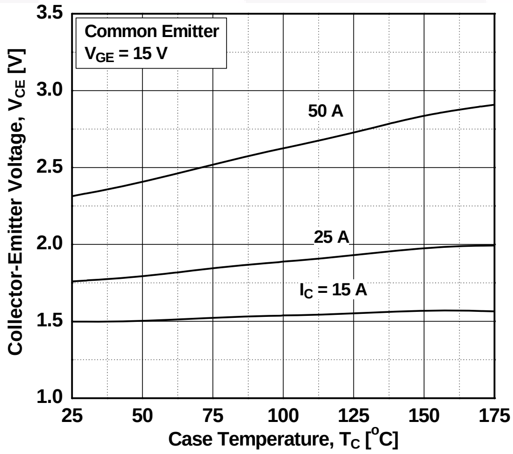


Figure 5. Saturation Voltage vs. V_{GE}

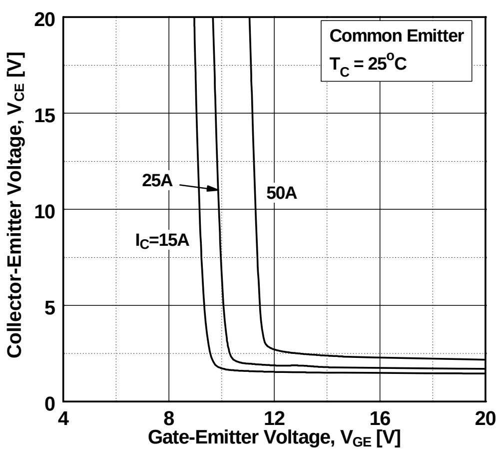
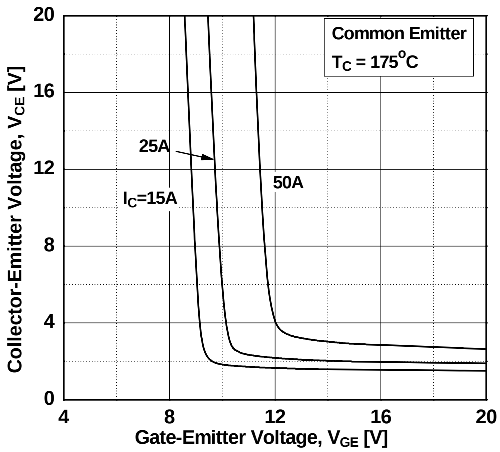


Figure 6. Saturation Voltage vs. V_{GE}



Typical Performance Characteristics

Figure 7. Capacitance Characteristics

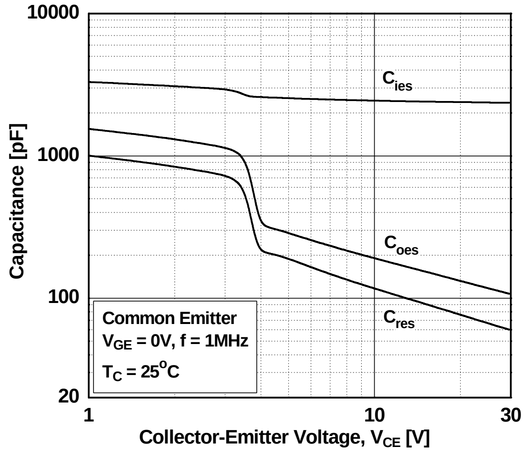


Figure 8. Gate Charge Characteristics

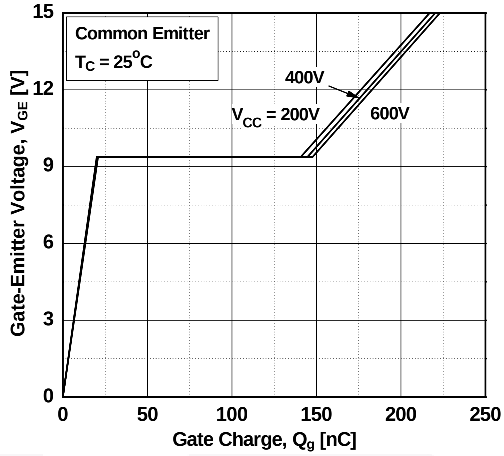


Figure 9. Turn-on Characteristics vs. Gate Resistance

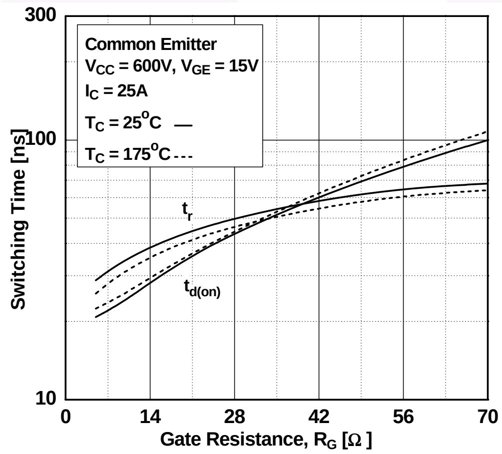


Figure 10. Turn-off Characteristics vs. Gate Resistance

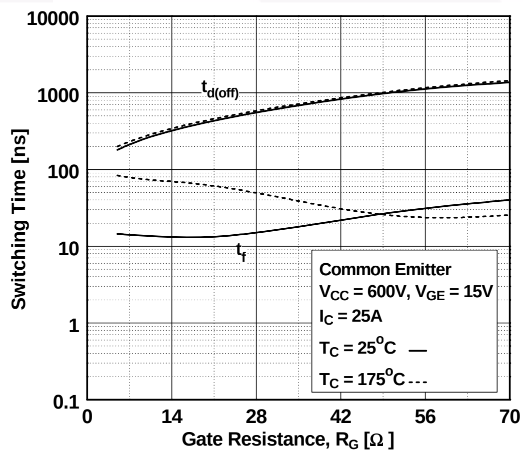


Figure 11. Swithcing Loss vs. Gate Resistance

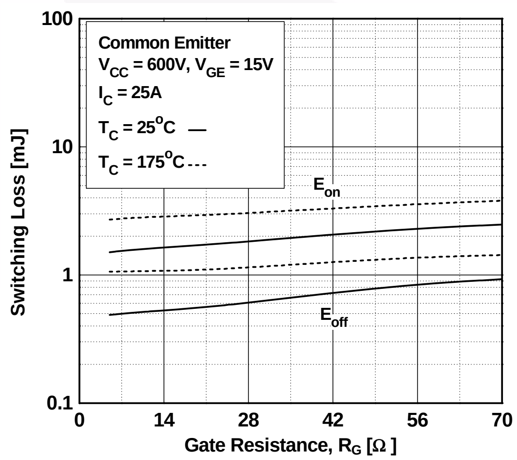
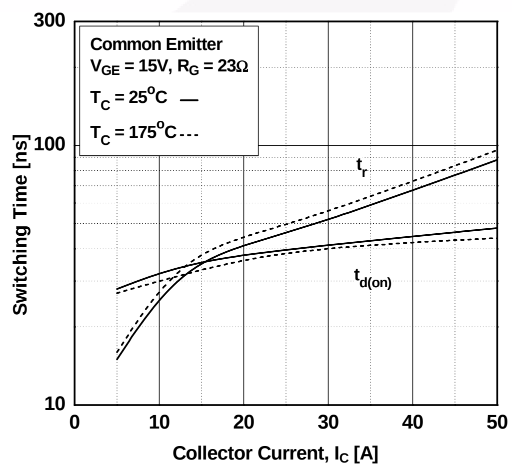


Figure 12. Turn-on Characteristics vs. Collector Current



Typical Performance Characteristics

Figure 13. Turn-off Characteristics vs. Collector Current

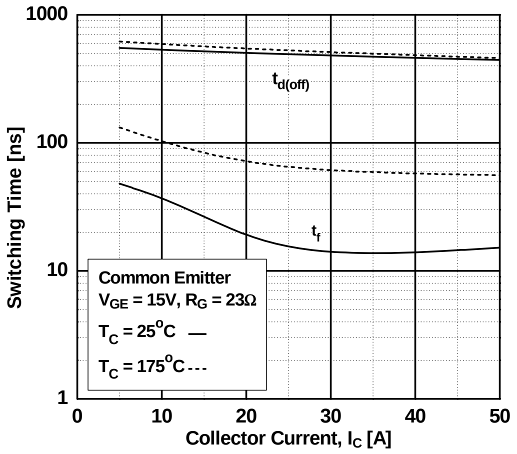


Figure 14. Swithcing Loss vs. Collector Current

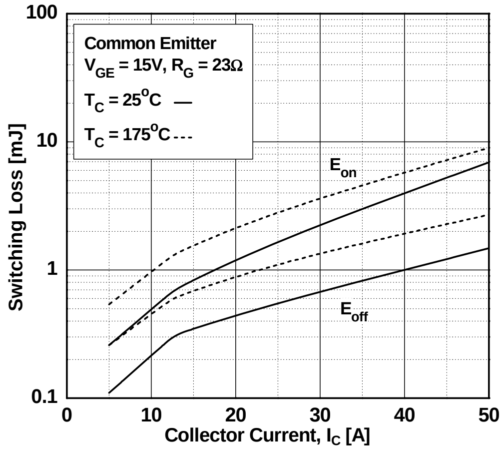


Figure 15. Load Current vs. Frequency

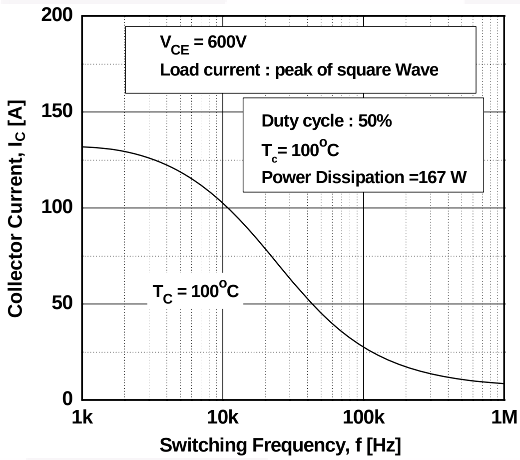


Figure 16. SOA Characteristics

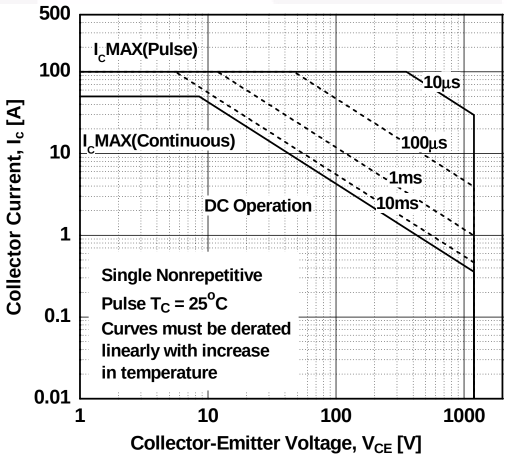


Figure 17. Forward Characteristics

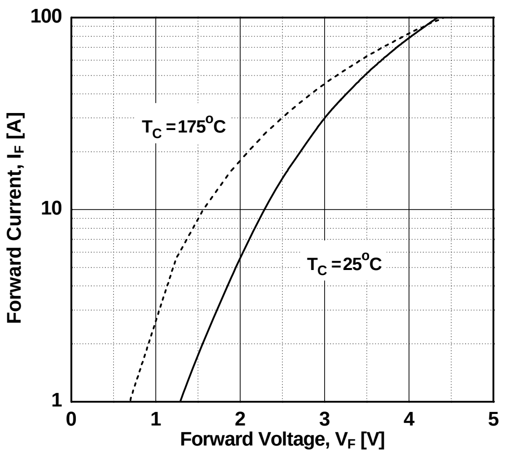
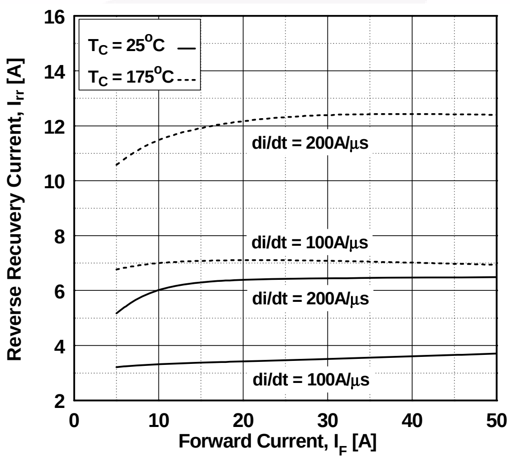


Figure 18. Reverse Recovery Current



Typical Performance Characteristics

Figure 19. Reverse Recovery Time

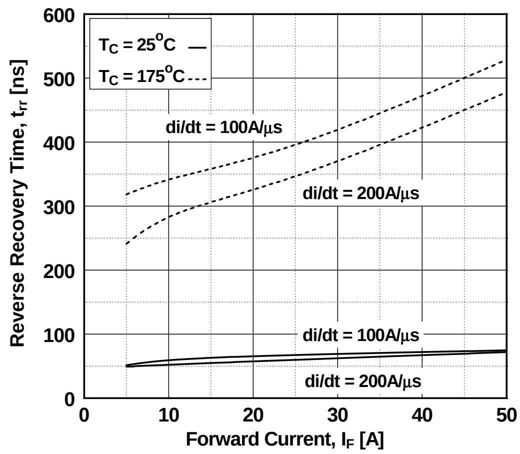


Figure 20. Stored Charge

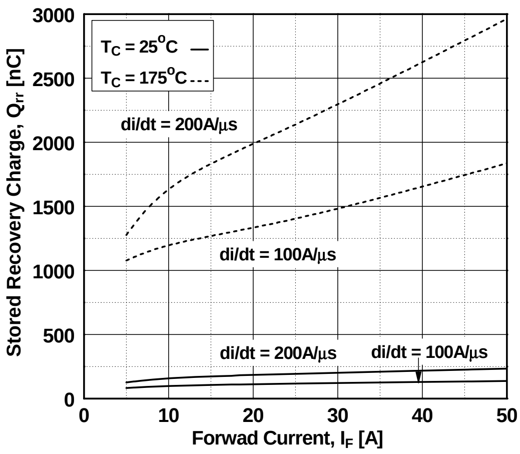


Figure 21. Transient Thermal Impedance of IGBT

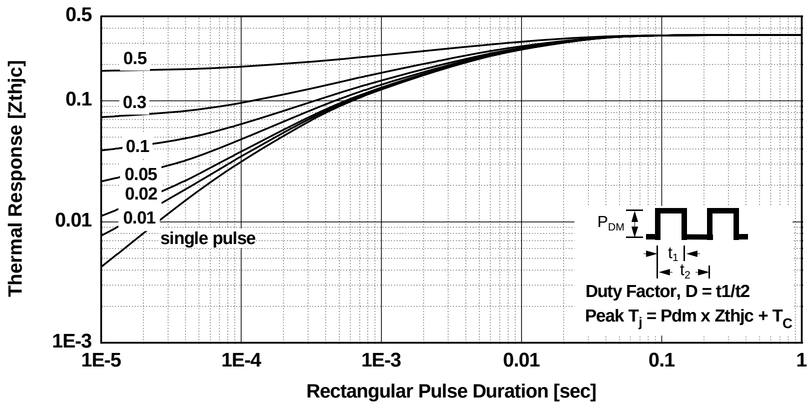
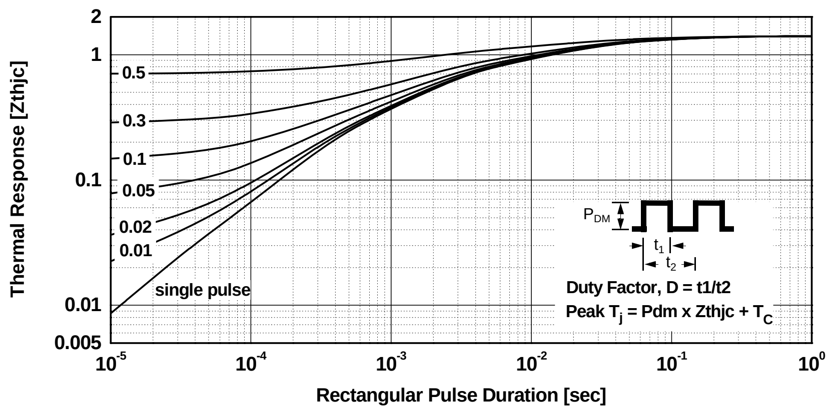
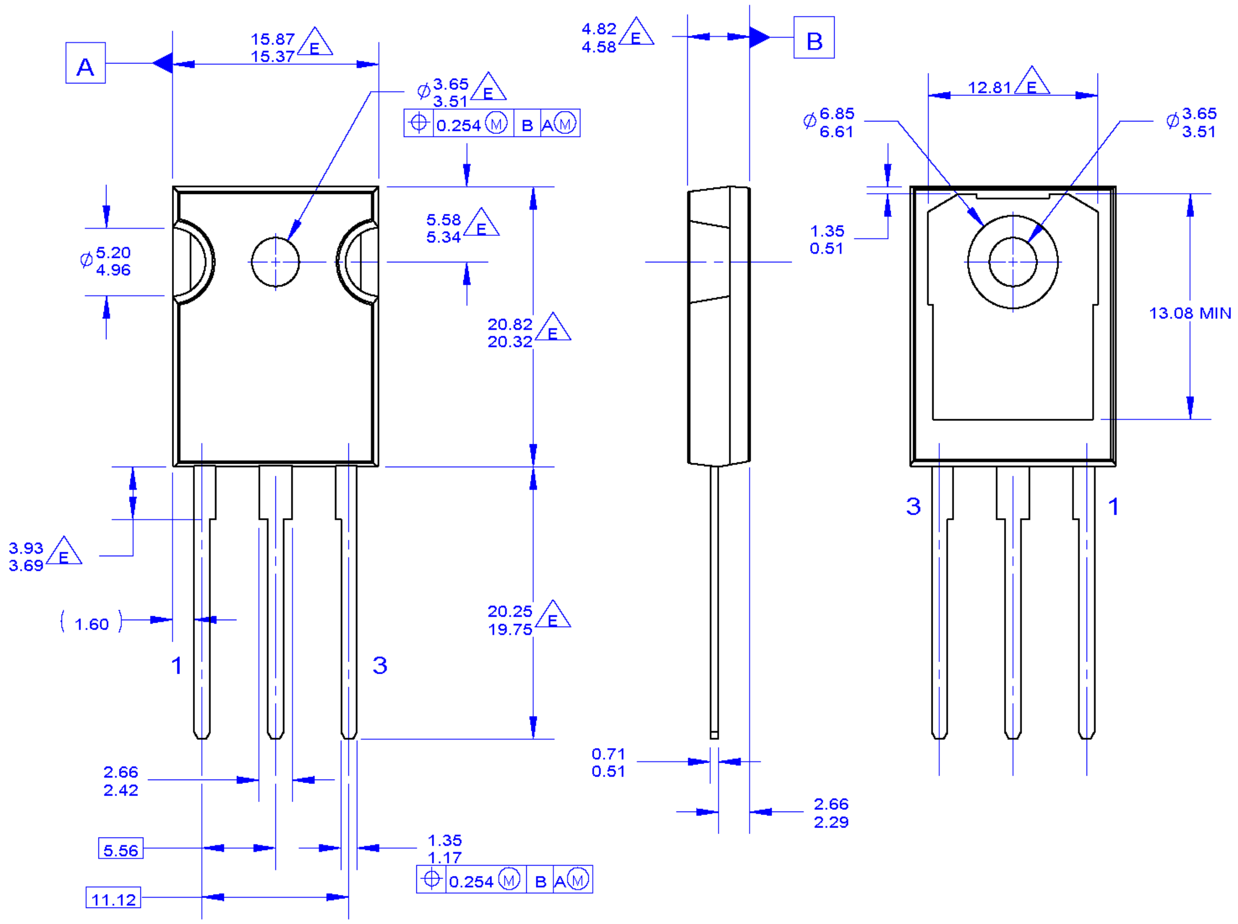


Figure 22. Transient Thermal Impedance of Diode



Mechanical Dimensions



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

E DOES NOT COMPLY JEDEC STANDARD VALUE
F. DRAWING FILENAME: MKT-TO247G03_REV01

Figure 23. TO-247,MOLDED,3 LEAD,JEDEC AB LONG LEADS (Active)

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Dimensions in Millimeters

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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.
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