

FGH25N120FTDS

1200 V, 25 A Field Stop Trench IGBT

Features

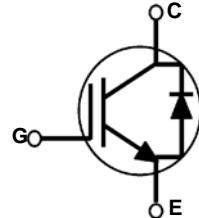
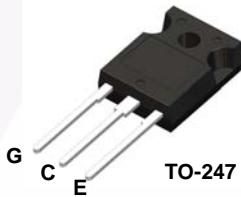
- High Speed Switching
- Low Saturation Voltage: $V_{CE(sat)} = 1.60$ V @ $I_C = 25$ A
- High Input Impedance
- RoHS Compliant

Applications

- Solar Inverter, UPS, Welder, PFC

General Description

Using advanced field stop trench technology, Fairchild's 1200V trench IGBTs offer the optimum performance for hard switching application such as solar inverter, UPS, welder and PFC applications.



Absolute Maximum Ratings

Symbol	Description	Ratings	Unit
V_{CES}	Collector to Emitter Voltage	1200	V
V_{GES}	Gate to Emitter Voltage	± 25	V
I_C	Collector Current @ $T_C = 25^\circ\text{C}$	50	A
	Collector Current @ $T_C = 100^\circ\text{C}$	25	A
$I_{CM(1)}$	Pulsed Collector Current	75	A
I_F	Diode Continuous Forward Current @ $T_C = 25^\circ\text{C}$	50	A
	Diode Continuous Forward Current @ $T_C = 100^\circ\text{C}$	25	A
I_{FM}	Diode Maximum Forward Current	75	A
P_D	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	313	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	125	W
T_J	Operating Junction Temperature	-55 to +150	$^\circ\text{C}$
T_{stg}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$
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.	Unit
$R_{\theta JC}(\text{IGBT})$	Thermal Resistance, Junction to Case	-	0.4	$^\circ\text{C}/\text{W}$
$R_{\theta JC}(\text{Diode})$	Thermal Resistance, Junction to Case	-	1.25	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	-	40	$^\circ\text{C}/\text{W}$

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FGH25N120FTDS	FGH25N120FTDS	TO-247	Tube	N/A	N/A	30

Electrical Characteristics of the IGBT $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{CES}	Collector to Emitter Breakdown Voltage	$\text{V}_{\text{GE}} = 0 \text{ V}$, $\text{I}_C = 250 \mu\text{A}$	1200	-	-	V
I_{CES}	Collector Cut-Off Current	$\text{V}_{\text{CE}} = \text{V}_{\text{CES}}$, $\text{V}_{\text{GE}} = 0 \text{ V}$	-	-	1	mA
I_{GES}	G-E Leakage Current	$\text{V}_{\text{GE}} = \text{V}_{\text{GES}}$, $\text{V}_{\text{CE}} = 0 \text{ V}$	-	-	± 250	nA
On Characteristics						
$\text{V}_{\text{GE}(\text{th})}$	G-E Threshold Voltage	$\text{I}_C = 25 \text{ mA}$, $\text{V}_{\text{CE}} = \text{V}_{\text{GE}}$	3.5	6	7.5	V
$\text{V}_{\text{CE}(\text{sat})}$	Collector to Emitter Saturation Voltage	$\text{I}_C = 25 \text{ A}$, $\text{V}_{\text{GE}} = 15 \text{ V}$	-	1.6	2	V
		$\text{I}_C = 25 \text{ A}$, $\text{V}_{\text{GE}} = 15 \text{ V}$, $T_C = 125^\circ\text{C}$	-	1.92	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	$\text{V}_{\text{CE}} = 30 \text{ V}$, $\text{V}_{\text{GE}} = 0 \text{ V}$, $f = 1 \text{ MHz}$	-	4090	-	pF
C_{oes}	Output Capacitance		-	135	-	pF
C_{res}	Reverse Transfer Capacitance		-	75	-	pF
Switching Characteristics						
$t_{\text{d}(\text{on})}$	Turn-On Delay Time	$\text{V}_{\text{CC}} = 600 \text{ V}$, $\text{I}_C = 25 \text{ A}$, $R_G = 10 \Omega$, $\text{V}_{\text{GE}} = 15 \text{ V}$, Inductive Load, $T_C = 25^\circ\text{C}$	-	26	35	ns
t_r	Rise Time		-	41	53	ns
$t_{\text{d}(\text{off})}$	Turn-Off Delay Time		-	151	196	ns
t_f	Fall Time		-	102	132	ns
E_{on}	Turn-On Switching Loss		-	1.42	1.84	mJ
E_{off}	Turn-Off Switching Loss		-	1.16	1.5	mJ
E_{ts}	Total Switching Loss		-	2.58	3.34	mJ
$t_{\text{d}(\text{on})}$	Turn-On Delay Time	$\text{V}_{\text{CC}} = 600 \text{ V}$, $\text{I}_C = 25 \text{ A}$, $R_G = 10 \Omega$, $\text{V}_{\text{GE}} = 15 \text{ V}$, Inductive Load, $T_C = 125^\circ\text{C}$	-	22	-	ns
t_r	Rise Time		-	41	-	ns
$t_{\text{d}(\text{off})}$	Turn-Off Delay Time		-	163	-	ns
t_f	Fall Time		-	136	-	ns
E_{on}	Turn-On Switching Loss		-	2.04	-	mJ
E_{off}	Turn-Off Switching Loss		-	1.58	-	mJ
E_{ts}	Total Switching Loss		-	3.62	-	mJ
Q_g	Total Gate Charge	$\text{V}_{\text{CE}} = 600 \text{ V}$, $\text{I}_C = 25 \text{ A}$, $\text{V}_{\text{GE}} = 15 \text{ V}$	-	169	225	nC
Q_{ge}	Gate to Emitter Charge		-	33	44	nC
Q_{gc}	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	Unit	
V_{FM}	Diode Forward Voltage	$I_F = 25 \text{ A}$	$T_C = 25^\circ\text{C}$	-	2.5	3.5	
			$T_C = 125^\circ\text{C}$	-	2.3	-	
t_{rr}	Diode Reverse Recovery Time	$I_F = 25 \text{ A}$, $dI_F/dt = 200 \text{ A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$	-	411	535	
			$T_C = 125^\circ\text{C}$	-	496	-	
	Diode Peak Reverse Recovery Current		$T_C = 25^\circ\text{C}$	-	5.2	6.8	
			$T_C = 125^\circ\text{C}$	-	6.9	-	
	Diode Reverse Recovery Charge		$T_C = 25^\circ\text{C}$	-	1.1	1.82	
			$T_C = 125^\circ\text{C}$	-	1.7	-	

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

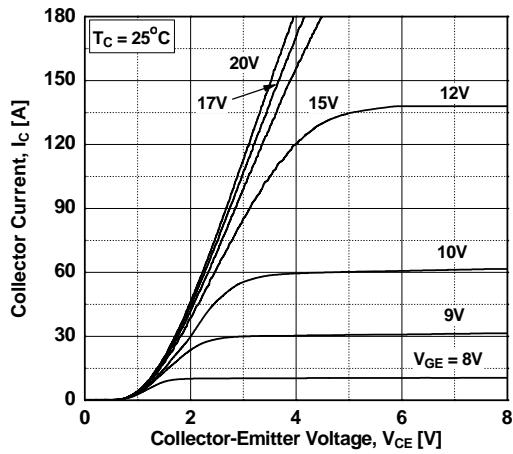


Figure 2. Typical Output Characteristics

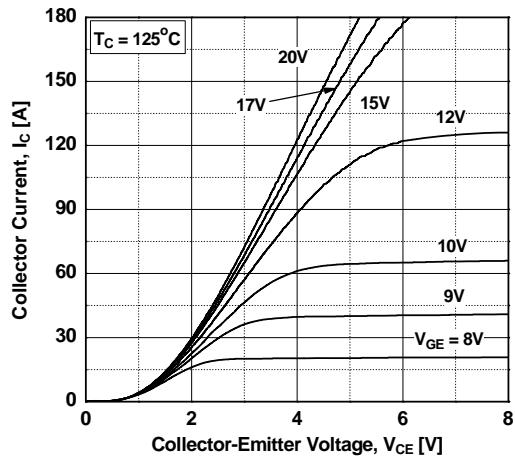


Figure 3. Typical Saturation Voltage Characteristics

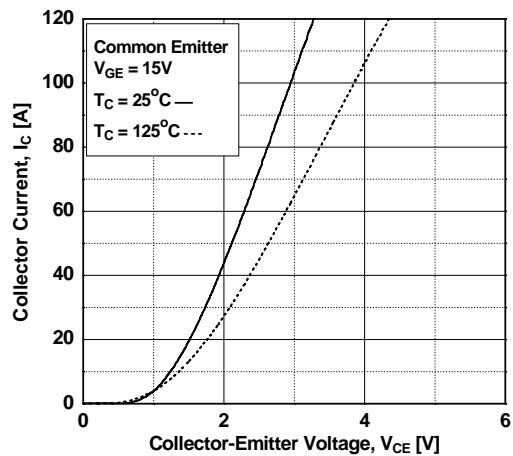


Figure 4. Transfer Characteristics

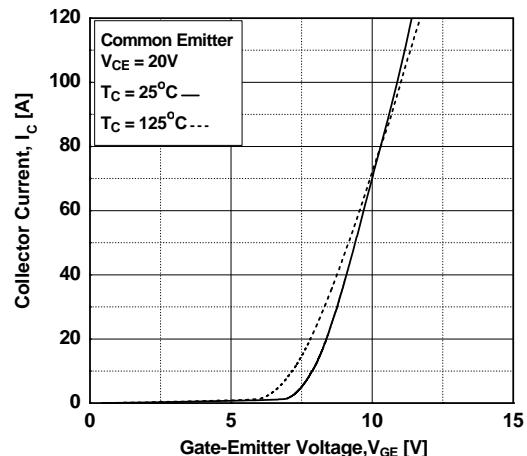


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

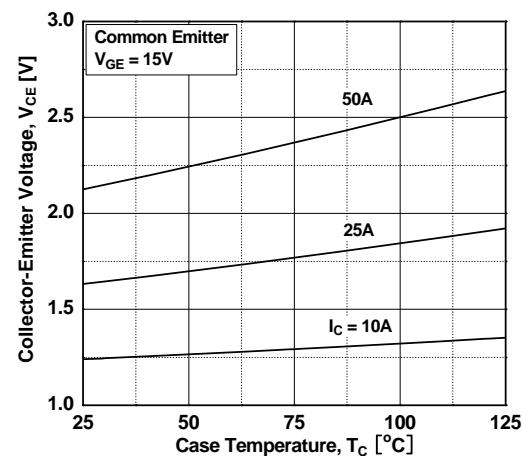
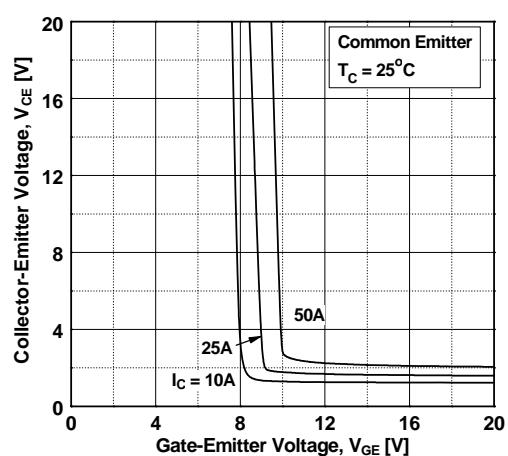


Figure 6. Saturation Voltage vs. V_{GE}



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. V_{GE}

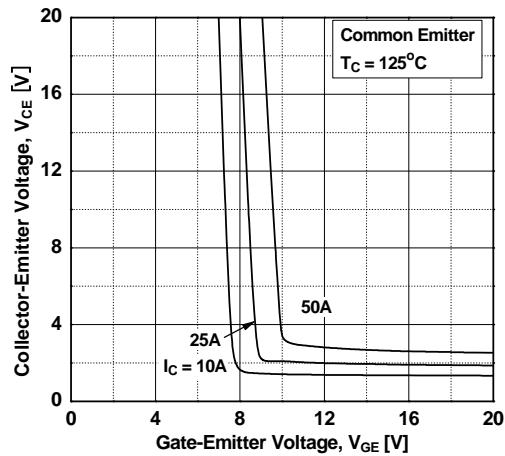


Figure 9. Capacitance Characteristics

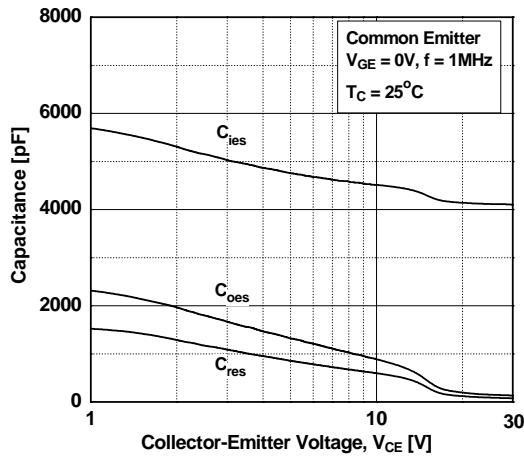


Figure 11. SOA Characteristics

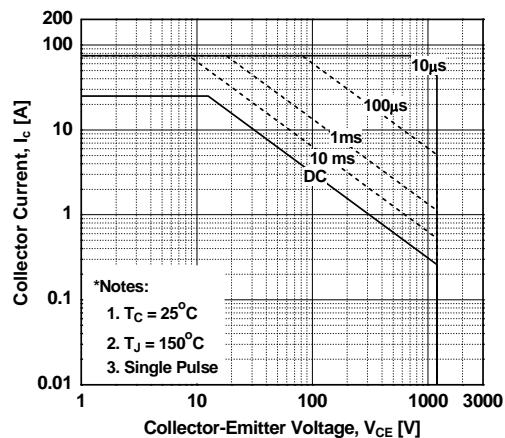


Figure 8. Load Current vs. Frequency

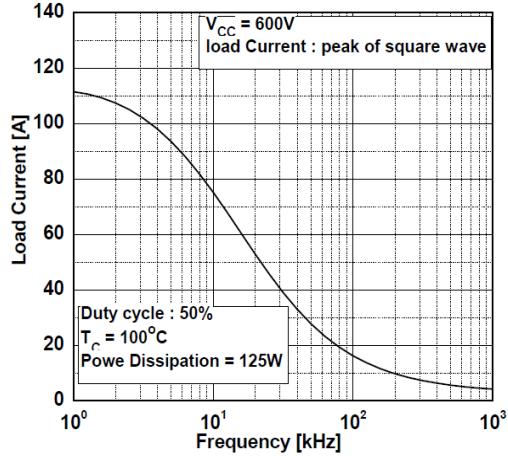


Figure 10. Gate Charge Characteristics

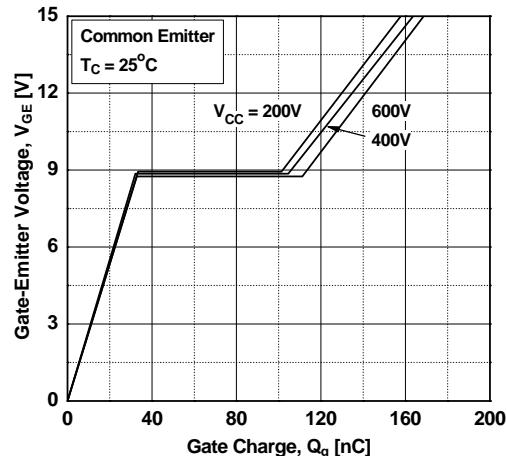
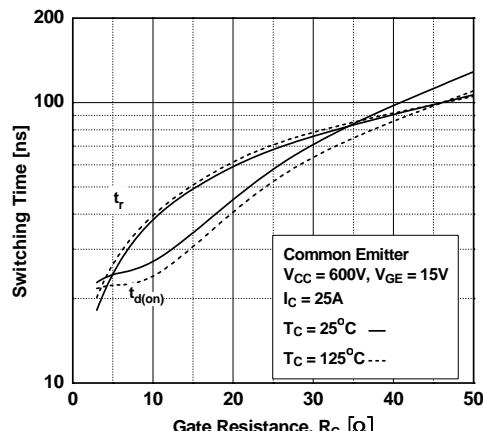


Figure 12. Turn-on Characteristics vs. Gate Resistance



Typical Performance Characteristics

Figure 13. Turn-off Characteristics vs. Gate Resistance

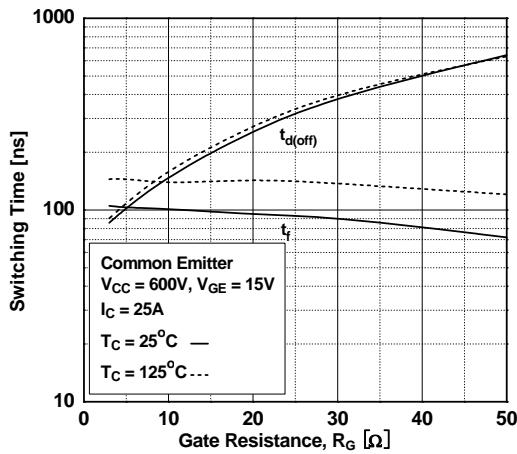


Figure 14. Turn-on Characteristics vs. Collector Current

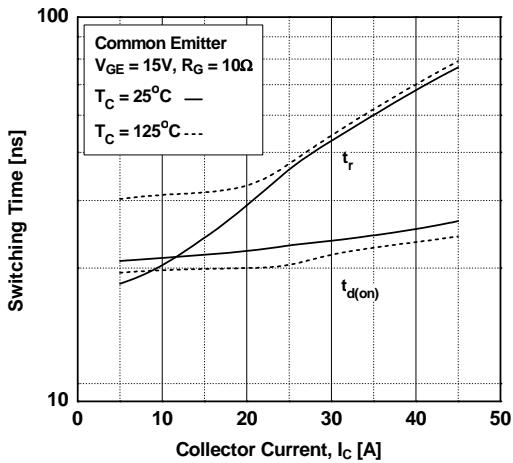


Figure 15. Turn-off Characteristics vs. Collector Current

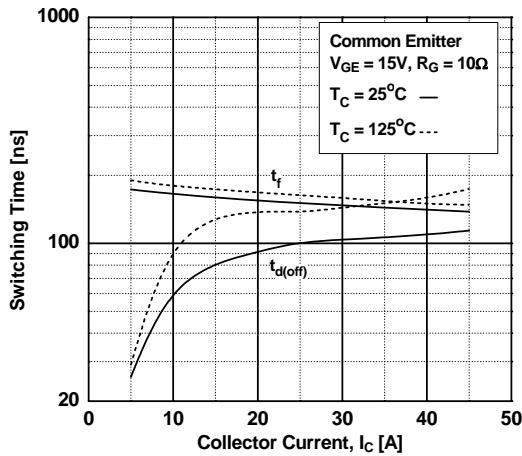


Figure 16. Switching Loss vs. Gate Resistance

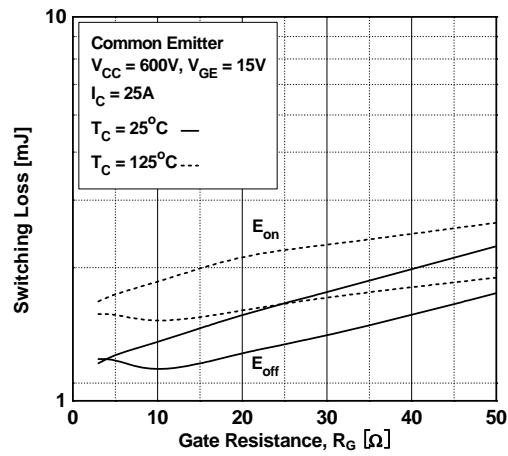


Figure 17. Switching Loss vs. Collector Current

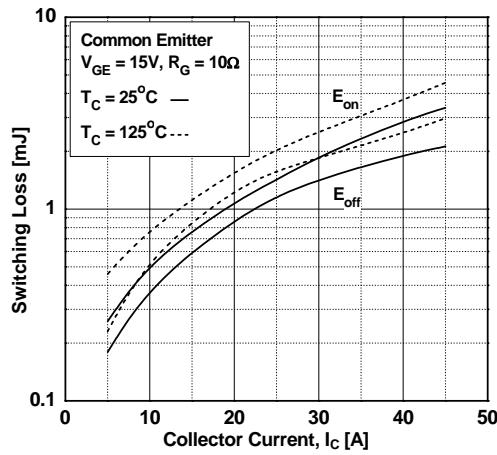
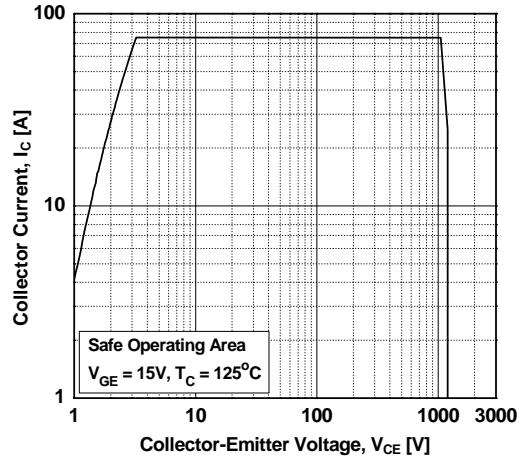


Figure 18. Turn off Switing SOA Characteristics



Typical Performance Characteristics

Figure 19. Forward Characteristics

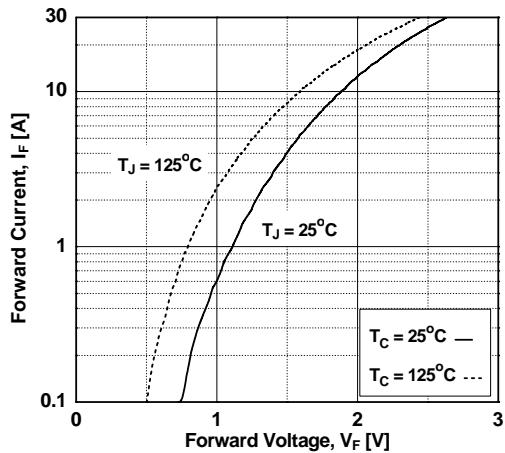


Figure 20. Reverse Recovery Current

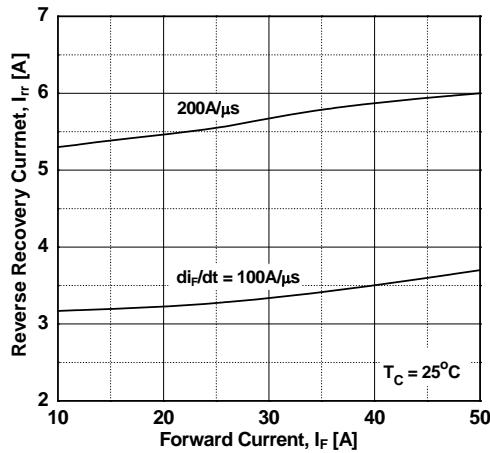


Figure 21. Stored Charge

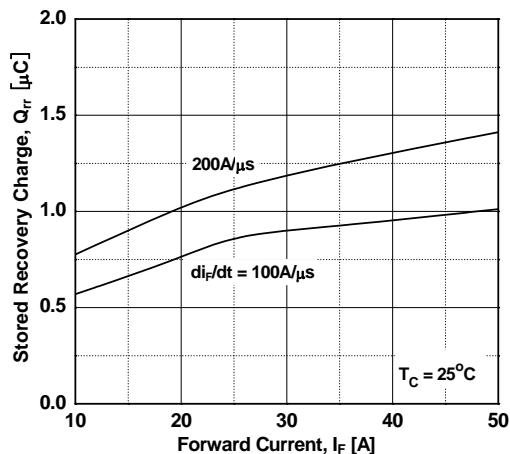


Figure 22. Reverse Recovery Time

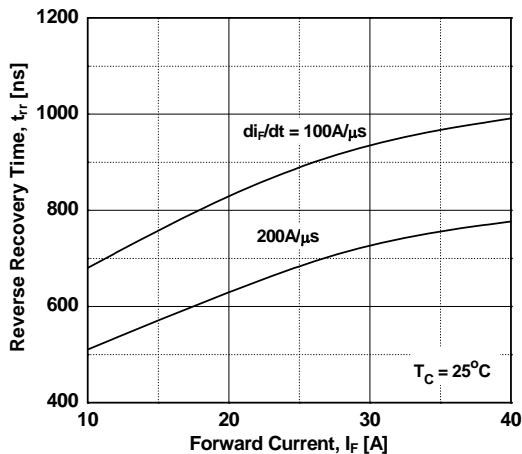
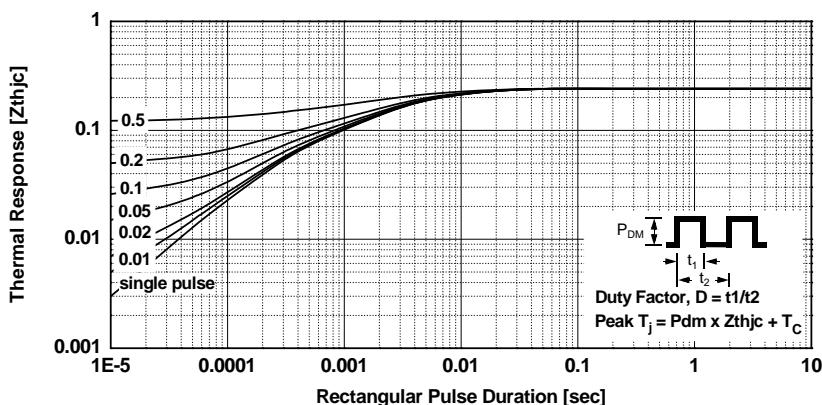
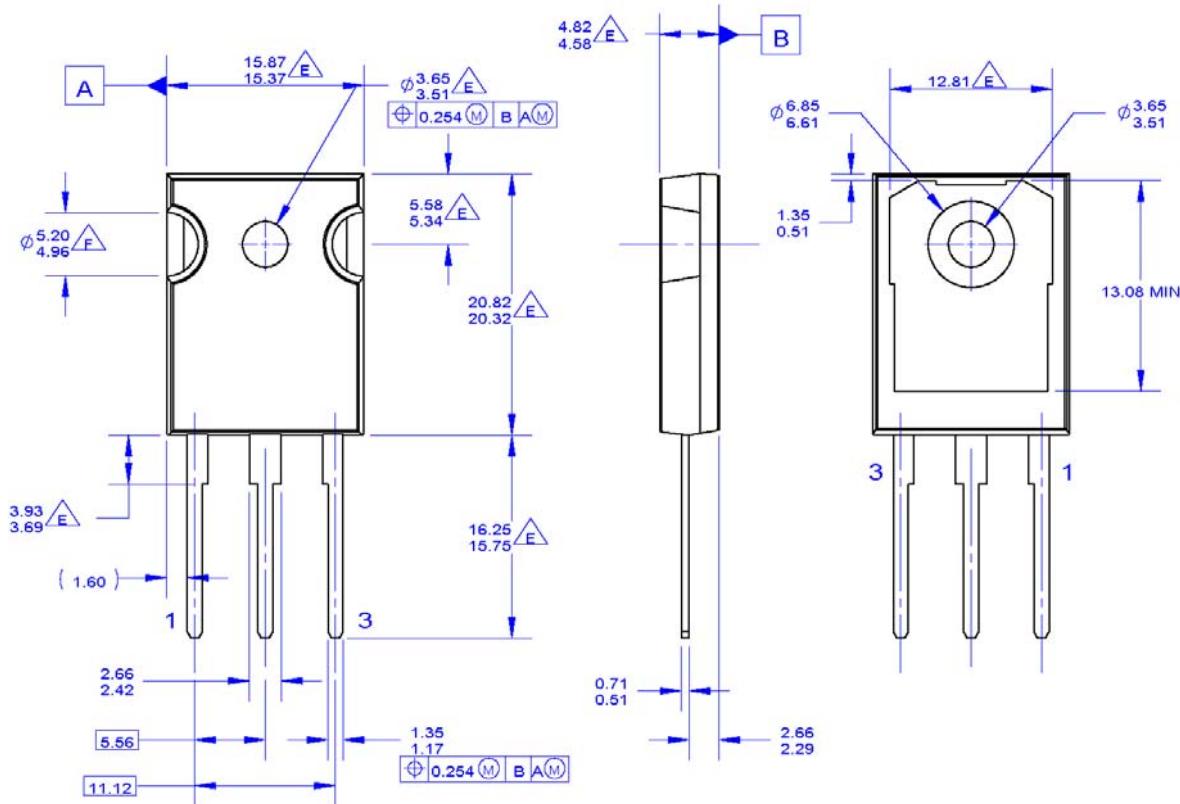


Figure 23. Transient Thermal Impedance of IGBT



Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED.

- A. PACKAGE REFERENCE: JEDEC TO-247, ISSUE E, VARIATION AB, DATED JUNE, 2004.
- B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DRAWING CONFORMS TO ASME Y14.5 - 1994

DOES NOT COMPLY JEDEC STANDARD VALUE

NOTCH MAY BE SQUARE

G. DRAWING FILENAME: MKT-T0247A03_REV03

Figure 24. TO-247 3L - TO-247, MOLDED, 3 LEAD, JEDEC VARIATION AB

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:

http://www.fairchildsemi.com/package/packageDetails.html?id=PN_TO247-003


TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™
AX-CAP®*
BitSiC™
Build it Now™
CorePLUS™
CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
DEUXPEED®
Dual Cool™
EcoSPARK®
EfficientMax™
ESBC™

F
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FETBench™
FPSTM

F-PFS™
FRFET®
Global Power Resource™
GreenBridge™
Green FPS™
Green FPS™ e-Series™
Gmax™
GTO™
IntelliMAX™
ISOPLANARTM
Marking Small Speakers Sound Louder
and Better™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MicroPak2™
MillerDrive™
MotionMax™
mWSaver®
OptoHiTT™
OPTOLOGIC®
OPTOPLANAR®

PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QS™
Quiet Series™
RapidConfigure™
Saving our world, 1mW/W/kW at a time™
SignalWise™
SmartMax™
SMART START™
Solutions for Your Success™
SPM®
STEALTH™
SuperFET®
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS®
SyncFET™

Sync-Lock™
E SYSTEM ®*
G GENERAL
TinyBoost®
TinyBuck®
TinyCalc™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TranSiC™
TriFault Detect™
TRUECURRENT®*
μSerDes™
M SerDes
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
VoltagePlus™
XS™

*Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used here in:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
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.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.Fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed application, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address and warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

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