

April 2012

FGH75T65UPD 650V, 75A Field Stop Trench IGBT

Features

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

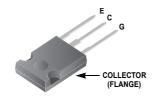


General Description

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		± 20	V
l _o	Collector Current	@ T _C = 25°C	150	Α
I _C	Collector Current	@ T _C = 100°C	75	А
I _{CM (1)}	Pulsed Collector Current		225	Α
I _F	Diode Forward Current	@ T _C = 25°C	75	Α
	Diode Forward Current	@ T _C = 100°C	50	Α
I _{FM(1)}	Pulsed Diode Maximum Forward Current		225	Α
P_{D}	Maximum Power Dissipation	@ T _C = 25°C	375	W
	Maximum Power Dissipation	@ T _C = 100°C	187	W
SCWT	Short Circuit Withstand Time	@ T _C = 25°C	5	us
T _J	Operating Junction Temperature		-55 to +175	°C
T _{stg}	Storage Temperature Range		-55 to +175	°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	Тур.	Max.	Units
R _{θJC} (IGBT)	R _{0JC} (IGBT) Thermal Resistance, Junction to Case		0.40	°C/W
$R_{\theta JC}(Diode)$	BJC(Diode) Thermal Resistance, Junction to Case		0.86	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient		40	°C/W

1

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.

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

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Units
Off Charac	teristics					
BV _{CES}	Collector to Emitter Breakdown Voltage	V_{GE} = 0V, I_{C} = 1mA	650	-	-	V
$\frac{\Delta BV_CES}{\Delta T_J}$	Temperature Coefficient of Breakdown Voltage	V _{GE} = 0V, I _C = 1mA	-	0.65	-	V/°C
I _{CES}	Collector Cut-Off Current	V _{CE} = V _{CES} , V _{GE} = 0V	-	-	250	μΑ
I _{GES}	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0V$	-	-	±400	nA
On Charac	teristics					
V _{GE(th)}	G-E Threshold Voltage	I _C = 75mA, V _{CE} = V _{GE}	4.0	6.0	7.5	V
. ,		I _C = 75A, V _{GE} = 15V	-	1.65	2.3	V
V _{CE(sat)}	Collector to Emitter Saturation Voltage	I _C = 75A, V _{GE} = 15V, T _C = 175°C	-	2.05	-	V
Dynamic C	haracteristics					
C _{ies}	Input Capacitance		-	5665	-	pF
C _{oes}	Output Capacitance	$V_{CE} = 30V_{,} V_{GE} = 0V_{,}$ f = 1MHz	-	205	-	pF
C _{res}	Reverse Transfer Capacitance	1 - IIVINZ	-	100	-	pF
Switching	Characteristics					
t _{d(on)}	Turn-On Delay Time		-	32	42	ns
t _r	Rise Time		-	43	56	ns
t _{d(off)}	Turn-Off Delay Time	V _{CC} = 400V, I _C = 75A,	-	166	216	ns
t _f	Fall Time	$R_G = 3\Omega$, $V_{GE} = 15V$,	-	24	33	ns
E _{on}	Turn-On Switching Loss	Inductive Load, T _C = 25°C	-	2.85	3.68	mJ
E _{off}	Turn-Off Switching Loss		-	1.20	1.60	mJ
E _{ts}	Total Switching Loss		-	4.05	5.3	mJ
t _{d(on)}	Turn-On Delay Time		-	30	-	ns
t _r	Rise Time		-	57	-	ns
t _{d(off)}	Turn-Off Delay Time	V _{CC} = 400V, I _C = 75A,	-	176	-	ns
t _f	Fall Time	$R_G = 3\Omega$, $V_{GE} = 15V$, Inductive Load, $T_C = 175^{\circ}C$	-	21	-	ns
E _{on}	Turn-On Switching Loss		-	4.45	-	mJ
E _{off}	Turn-Off Switching Loss		-	1.60	-	mJ
E _{ts}	Total Switching Loss		-	6.05	-	mJ
Tsc	Short Circuit Withstand Time	$V_{\rm GE}$ = 15V, $V_{\rm CC}$ \leq 400V, Rg = 10 Ω	5	-	-	us

Electrical Characteristics of the IGBT (Continued)

Symbol	Parameter	Test Conditions	Min.	Тур.	Max	Units
Q_g	Total Gate Charge		-	385	578	nC
Q _{ge}	Gate to Emitter Charge	V _{CE} = 400V, I _C = 75A, V _{GE} = 15V	-	45	68	nC
Q _{gc}	Gate to Collector Charge	VGE - 10V	-	210	315	nC

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

Symbol	Parameter	Test Conditions		Min.	Тур.	Max	Units
V _{FM}	Diode Forward Voltage	I _F = 50A	$T_{\rm C} = 25^{\rm o}{\rm C}$	-	2.1	2.6	V
FIVI	Blode Forward Vellage	1F 00/1	$T_{\rm C} = 175^{\rm o}{\rm C}$	-	1.7	-] '
E _{rec}	Reverse Recovery Energy		$T_{\rm C} = 175^{\rm o}{\rm C}$	-	40	-	uJ
t	Diode Reverse Recovery Time	I _F =50A, dI _F /dt = 200A/μs	$T_{\rm C} = 25^{\rm o}{\rm C}$	-	65	85	ns
'rr	2.000 1.010.00 1.00010.		$T_{\rm C} = 175^{\rm o}{\rm C}$	-	127	-	
Q _{rr}	Diode Reverse Recovery Charge		$T_{\rm C} = 25^{\rm o}{\rm C}$	-	120	170	nC
~ II	2.000 Hororox Hoodres, Gridings		$T_{\rm C} = 175^{\rm o}{\rm C}$	-	550	-	

Figure 1. Typical Output Characteristics

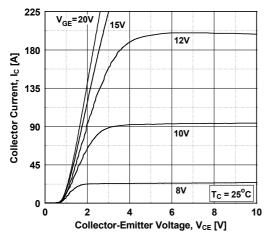


Figure 3. Typical Saturation Voltage Characteristics

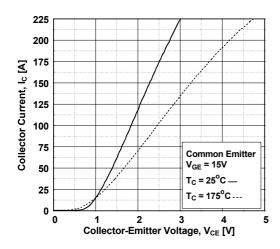


Figure 5. Saturation Voltage vs. Case
Temperature at Variant Current Level

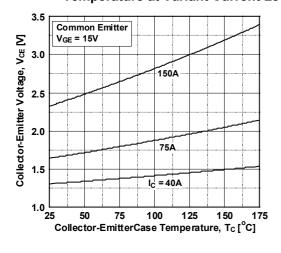


Figure 2. Typical Output Characteristics

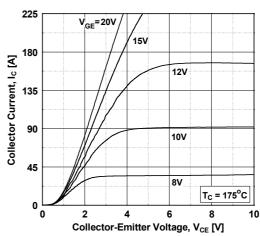


Figure 4. Transfer Characteristics

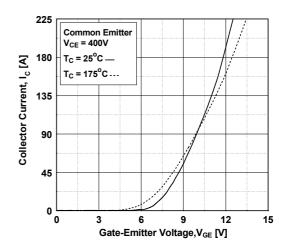


Figure 6. Saturation Voltage vs. V_{GE}

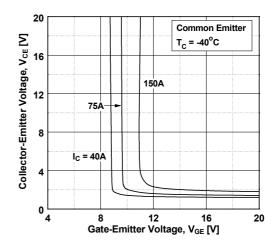


Figure 7. Saturation Voltage vs. V_{GE}

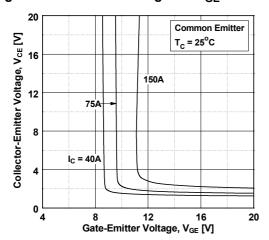


Figure 9. Capacitance Characteristics

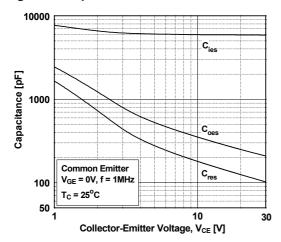


Figure 11. SOA Characteristics

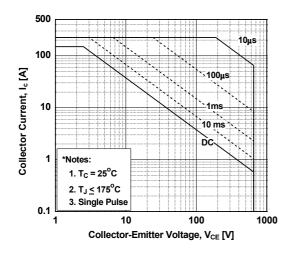


Figure 8. Saturation Voltage vs. V_{GE}

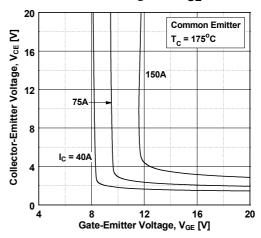


Figure 10. Gate charge Characteristics

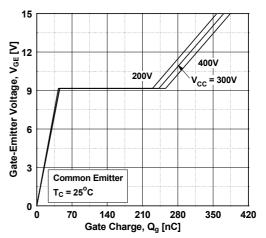


Figure 12. Turn-on Characteristics vs.

Gate Resistance

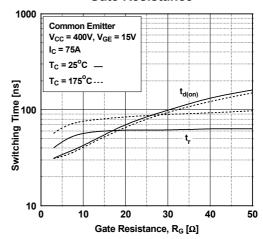


Figure 13. Turn-off Characteristics vs.
Gate Resistance

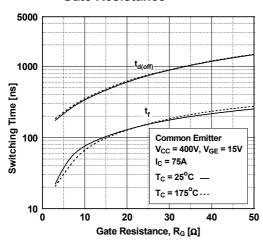


Figure 15. Turn-off Characteristics vs. Collector Current

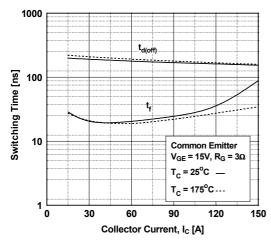


Figure 17. Switching Loss vs. Collector Current

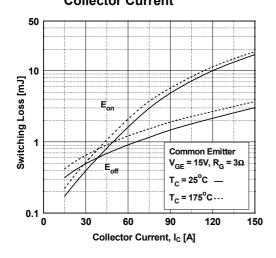


Figure 14. Turn-on Characteristics vs.
Collector Current

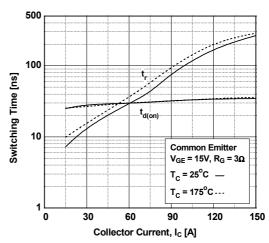


Figure 16. Switching Loss vs.

Gate Resistance

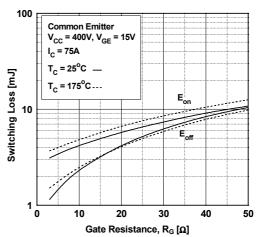


Figure 18. Turn off Switching SOA Characteristics

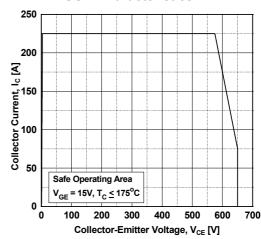


Figure 19. Current Derating

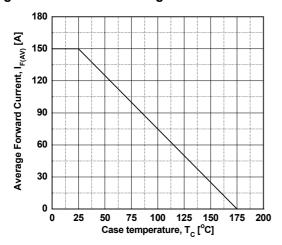


Figure 21. Forward Characteristics

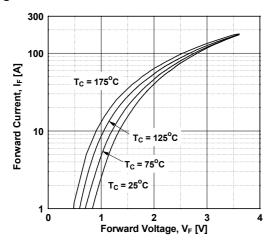


Figure 23. Stored Charge

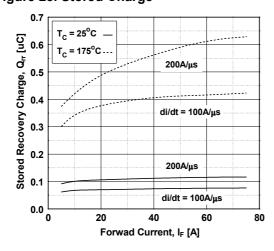


Figure 20. Load Current Vs. Frequence

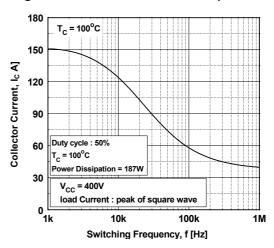


Figure 22. Reverse Recovery Current

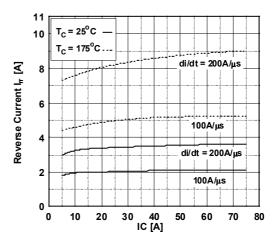


Figure 24. Reverse Recovery Time

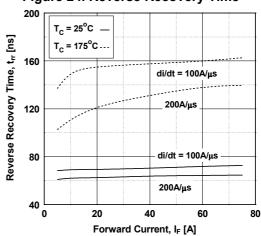


Figure 25. Transient Thermal Impedance of IGBT

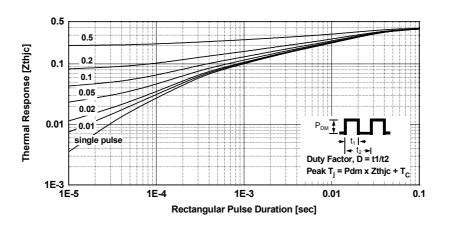
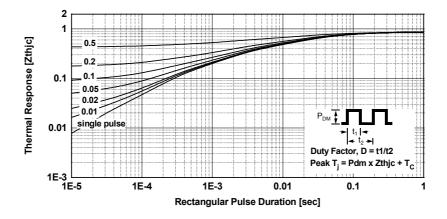
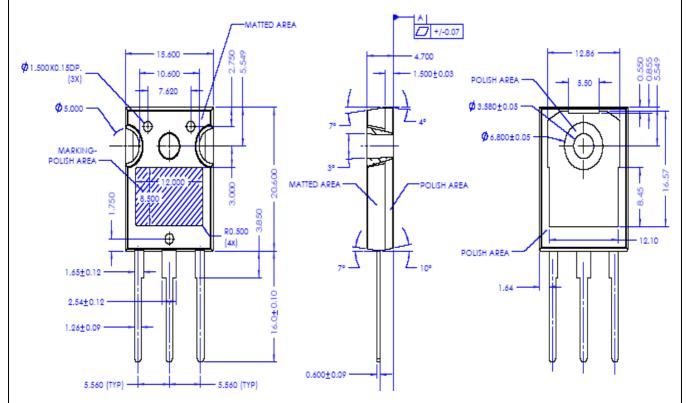


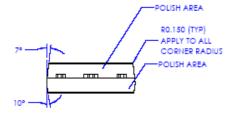
Figure 26.Transient Thermal Impedance of Diode



Mechanical Dimensions

TO - 247AB (FKS PKG CODE 001)









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.

2Cool™ AccuPower™ AX-CAP™* BitSiC® Build it Now™ CorePLUS™ CorePOWER™ CROSSVOLTTM CTL™

Current Transfer Logic™ DEUXPEED® Dual Cool™

EcoSPARK® EfficentMax™ ESBC™

Fairchild[®] Fairchild Semiconductor® FACT Quiet Series™ FACT®

FAST® FastvCore™ FETBench™

FlashWriter® * FPS™

F-PFS™ FRFET®

Global Power ResourceSM Green Bridge™ Green FPS™

Green FPS™ e-Series™ Gmax™

GTO™ IntelliMAX™ ISOPLANAR™

Marking Small Speakers Sound Louder

and Better™ MegaBuck™ MICROCOUPLER™ MicroFET™ MicroPak™ MicroPak2™

MillerDrive™ MotionMax™ Motion-SPM™ mWSaver™ OptoHiT™ OPTOLOGIC® OPTOPLANAR®

PowerTrench® PowerXS^{TI}

Programmable Active Droop™ QFĒT 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™

SYSTEM ®* GENERAL

The Power Franchise® bwer TinyBoost™ TinyBuck™

TinyCalc™ TinyLogic[®] TINYOPTO™ TinyPower™ TinyPWM™ TinyWire™ TranSiC® TriFault Detect™

TRUECURRENT®* <u>μSerD</u>es™

UHC® Ultra FRFET™ UniFET™ VCX^{TM} VisualMax™ VoltagePlus™ XSTM

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

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 CODUCTS.

LIFE SUPPORT POLICYFAIRCHILD'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.

- 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
- 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 manufactures 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 handing 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 Producti		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. 161