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October 2013

FGH40T65SPD 650 V, 40 A Field Stop Trench IGBT

Features

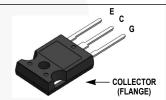
- Maximum Junction Temperature : T_J = 175°C
- · Positive Temperaure Co-efficient for Easy Parallel Operating
- · High Current Capability
- Low Saturation Voltage: V_{CE(sat)} = 1.85 V (Typ.) @ I_C = 40 A
- · High Input Impedance
- · Fast Switching
- · Tighten Parameter Distribution
- · RoHS Compliant
- Short Circuit Ruggedness > 5 us @ 25°C

General Description

Using novel field stop IGBT technology, Fairchild's new series of field stop 3rd generation IGBTs offer the optimum performance for solar inverter, UPS, welder, telecom, ESS and PFC applications where low conduction and switching losses are essential.

Applications

· Solar Inverter UPS, Welder, PFC, Telecom, ESS





Absolute Maximum Ratings

Symbol	Description		FGH40T65SPD_F155	Unit
V _{CES}	Collector to Emitter Voltage		650	V
V _{GES}	Gate to Emitter Voltage		± 20	V
	Transient Gate to Emitter Voltage		± 30	V
Ic	Collector Current	@ T _C = 25°C	80	А
iC	Collector Current	$@ T_C = 100^{\circ}C$	40	Α
I _{CM}	Pulsed Collector Current		120	А
l _F	Diode Forward Current @ T _C = 25°C		40	Α
'F	Diode Forward Current @ T _C = 100		20	Α
I _{FM}	Pulsed Diode Maximum Forward Current		120	А
P _D	Maximum Power Dissipation	@ T _C = 25°C	267	W
Maximum Power Dissipation		@ T _C = 100°C	134	W
SCWT	Short Circuit Withstand Time	@ T _C = 25°C	5	μS
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.	Unit
$R_{\theta JC}(IGBT)$	Thermal Resistance, Junction to Case	-	0.56	°C/W
$R_{\theta JC}(Diode)$	de) Thermal Resistance, Junction to Case		1.71	°C/W
$R_{\theta JA}$ Thermal Resistance, Junction to Ambient		-	40	°C/W

Package Marking and Ordering Information

Device Marking Device		Package	Reel Size	Tape Width	Qty per Tube
FGH40T65SPD FGH40T65SPD_F155		TO-247 G03	-	-	30ea

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

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Charac	eteristics					
BV _{CES}	Collector to Emitter Breakdown Voltage	V _{GE} = 0 V, I _C = 1 mA	650	-	-	V
$\frac{\Delta BV_{CES}}{\Delta T_{J}}$	Temperature Coefficient of Breakdown Voltage	V _{GE} = 0 V, I _C = 1 mA	-	0.6	-	V/°C
I _{CES}	Collector Cut-Off Current	V _{CE} = V _{CES} , V _{GE} = 0 V	-	-	250	μА
I _{GES}	G-E Leakage Current	V _{GE} = V _{GES} , V _{CE} = 0 V	/-	-	± 400	nA
On Charac	teristics					
V _{GE(th)}	G-E Threshold Voltage	I _C = 40 mA, V _{CE} = V _{GE}	4	5.5	7.5	V
	/	I _C = 40 A, V _{GE} = 15 V	-	1.85	2.4	V
V _{CE(sat)}	Collector to Emitter Saturation Voltage	I _C = 40 A, V _{GE} = 15 V, T _C = 175°C	-	2.51	-	٧
Dynamic C	Characteristics		•			
C _{ies}	Input Capacitance		-	1370	-	pF
C _{oes}	Output Capacitance	V _{CE} = 30 V _, V _{GE} = 0 V, f = 1 MHz	-	94	-	pF
C _{res}	Reverse Transfer Capacitance	1 - 1 1/11/12	-	16	-	pF
Switching	Characteristics		•			
T _{d(on)}	Turn-On Delay Time		-	16	-	ns
T _r	Rise Time	V _{CC} = 400 V, I _C = 40 A,	-	42	-	ns
T _{d(off)}	Turn-Off Delay Time		-	37	-	ns
T _f	Fall Time	$R_G = 6 \Omega$, $V_{GE} = 15 V$,	-	11	-	ns
E _{on}	Turn-On Switching Loss	Inductive Load, T _C = 25°C	/	1.16	-	mJ
E _{off}	Turn-Off Switching Loss		-/	0.28	-	mJ
E _{ts}	Total Switching Loss		_	1.44	- /	mJ
T _{d(on)}	Turn-On Delay Time		-	14	->	ns
T _r	Rise Time		-	49		ns
T _{d(off)}	Turn-Off Delay Time	$V_{CC} = 400 \text{ V}, I_{C} = 40 \text{ A},$	-	38	/-	ns
T _f	Fall Time	$R_G = 6 \Omega$, $V_{GE} = 15 V$,	-	18	- //	ns
E _{on}	Turn-On Switching Loss	Inductive Load, T _C = 175°C	-	1.54	- [mJ
E _{off}	Turn-Off Switching Loss		-	0.52	- \	mJ
E _{ts}	Total Switching Loss		-	2.06	-	mJ
T _{SC}	Short Circuit Withstand Time	$V_{CC} = 400 \text{ V}, V_{GE} = 15 \text{ V},$ $R_G = 10 \Omega$	5	-	-	μS

Electrical Characteristics of the IGBT (Continued)

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Qg	Total Gate Charge		-	35	-	nC
Q _{ge}	Gate to Emitter Charge	V _{CE} = 400 V, I _C = 40 A, V _{GE} = 15 V	-	11	-	nC
Q _{gc}	Gate to Collector Charge	VGE - 10 V	-	12	-	nC

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

Symbol	Parameter		Test Conditio	ns	Min.	Тур.	Max.	Unit
V _{FM}	Diode Forward Voltage	I- =	20 A	T _C = 25°C	-	2.2	2.7	V
FIM	2.500 r o.ma.u romago	'F =	20 A	T _C = 175°C	-	1.9	-	_
E _{rec}	Reverse Recovery Energy			T _C = 175°C	-	76	-	μJ
T _{rr}	Diode Reverse Recovery Time	 -=	20 A, dI _F /dt = 200 A/μs	T _C = 25°C	-	34	-	ns
	2.000 November November 9 mine	'	- 20 A, αιρ/αι – 200 A/μ3	T _C = 175°C	/ -	196	-	
Q _{rr}	Diode Reverse Recovery Charge			T _C = 25°C	-	52	-	nC
~11	2.533 . to . 5.53 . to oo vory ondings			$T_{\rm C} = 175^{\rm o}{\rm C}$	-	638	-	

Figure 1. Typical Output Characteristics

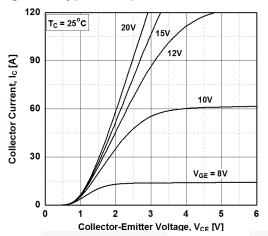


Figure 3. Typical Saturation Voltage Characteristics

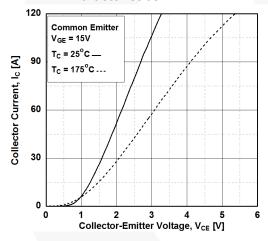


Figure 5. Saturation Voltage vs. V_{GE}

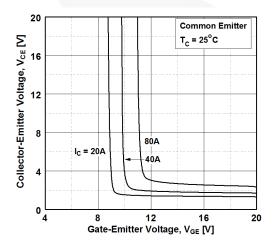


Figure 2. Typical Output Characteristics

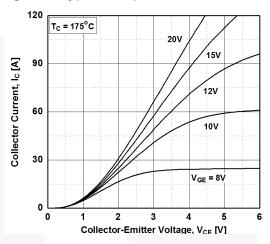


Figure 4. Saturation Voltage vs. Case
Temperature at Variant Current Level

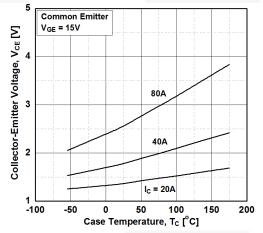


Figure 6. Saturation Voltage vs. V_{GE}

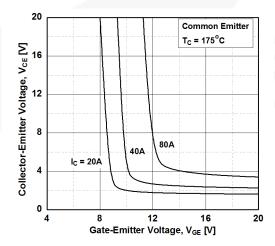


Figure 7. Capacitance Characteristics

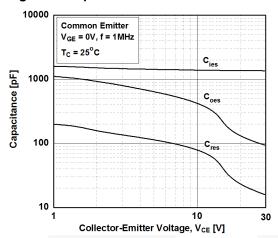


Figure 9. Turn-on Characteristics vs.
Gate Resistance

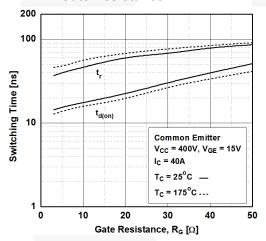


Figure 11. Switching Loss vs.
Gate Resistance

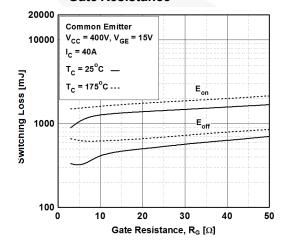


Figure 8. Gate charge Characteristics

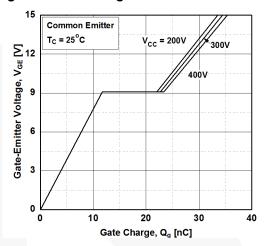


Figure 10. Turn-off Characteristics vs. Gate Resistance

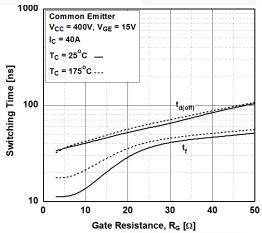


Figure 12. Turn-on Characteristics vs. Collector Current

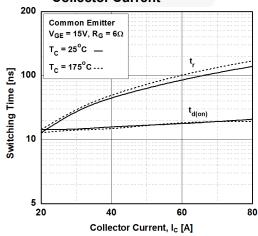


Figure 13. Turn-off Characteristics vs. Collector Current

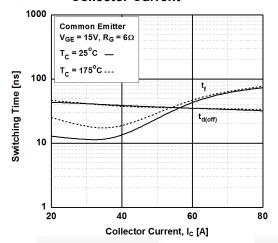


Figure 15. Load Current Vs. Frequency

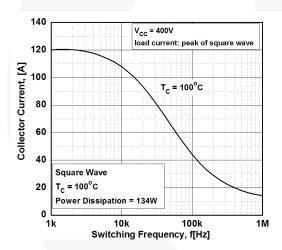


Figure 17. Forward Characteristics

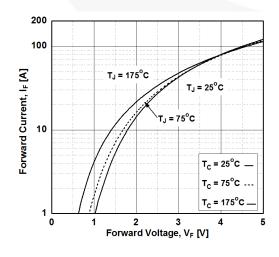


Figure 14. Switching Loss vs. Collector Current

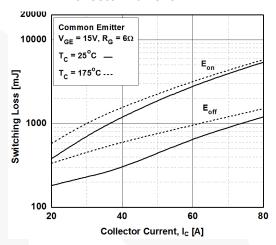


Figure 16. SOA Characteristics

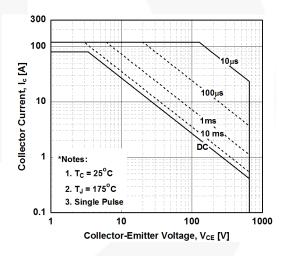


Figure 18. Reverse Recovery Current

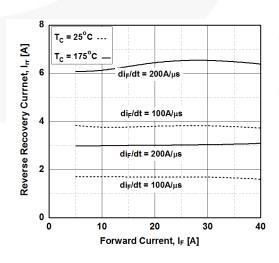


Figure 19. Reverse Recovery Time

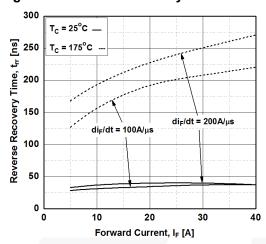


Figure 20. Stored Charge

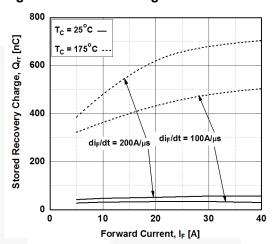


Figure 21. Transient Thermal Impedance of IGBT

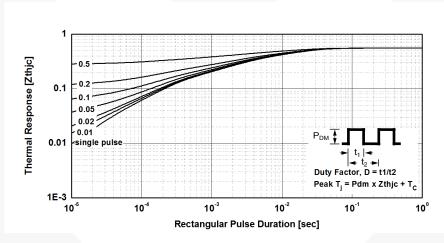
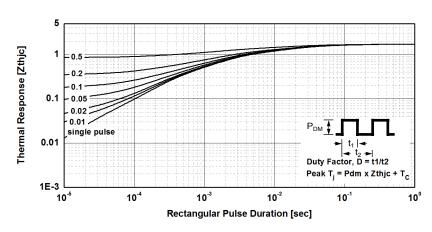


Figure 22. Transient Thermal Impedance of Diode



Mechanical Dimensions

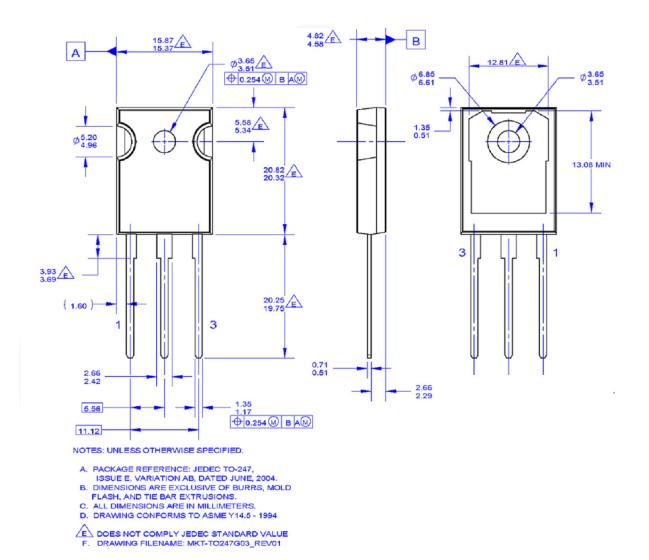


Figure 23. TO-247 3L - TO-247, MOLDED, 3 LEADS, JEDEC AB LONG LEADS

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