

IGBT - Field Stop, Trench 650 V, 75 A FGH75T65SHDTL4

Description

Using novel field stop IGBT technology, **onsemi**'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.

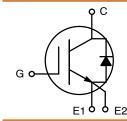
Features

- Maximum Junction Temperature: T_J =175°C
- Positive Temperature Co-efficient for Easy Parallel Operating
- High Current Capability
- Low Saturation Voltage: $V_{CE(sat)} = 1.6 \text{ V (Typ.)} @ I_C = 75 \text{ A}$
- 100% of the Parts Tested for I_{LM}
- High Input Impedance
- Fast Switching
- Tighten Parameter Distribution
- This Device is Pb-Free and is RoHS Compliant
- Do Not Recommend for Reflow and Full PKG Dipping

Applications

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

V _{CES}	I _C
650 V	75 A

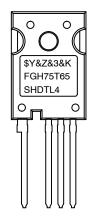


E1: Kelvin Emitter E2: Power Emitter



TO-247-4LD CASE 340CJ

MARKING DIAGRAM



FGH75T65SHDTL4 = Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

ABSOLUTE MAXIMUM RATINGS

Symbol	Description		FGH75T65SHDTL4	Unit
V _{CES}	Collector to Emitter Voltage		650	V
V _{GES}	Gate to Emitter Voltage		±20	V
	Transient Gate to Emitter Voltage		±30	V
I _C	Collector Current	T _C = 25°C	150	Α
	Ι Γ	T _C = 100°C	75	Α
I _{LM} (Note 1)	Pulsed Collector Current	T _C = 25°C	300	Α
I _{CM} (Note 2)	Pulsed Collector Current		300	Α
I _F	Diode Forward Current	T _C = 25°C	125	Α
	Diode Forward Current	T _C = 100°C	75	Α
I _{FM} (Note 2)	Pulsed Diode Maximum Forward Current		300	Α
P_{D}	Maximum Power Dissipation	T _C = 25°C	455	W
	Ι Γ	T _C = 100°C	227	W
TJ	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

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. $V_{CC} = 400 \text{ V}$, $V_{GE} = 15 \text{ V}$, $I_{C} = 300 \text{ A}$, $R_{G} = 73 \Omega$, Inductive Load.

2. Repetitive rating: Pulse width limited by max. junction temperature.

THERMAL CHARACTERISTICS

Symbol	Parameter	FGH75T65SHDTL4	Unit
R _{θJC} (IGBT)	Thermal Resistance, Junction to Case, Max.	0.33	°C/W
R _{θJC} (Diode)	Thermal Resistance, Junction to Case, Max.	0.65	°C/W
$R_{ heta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	°C/W

PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FGH75T65SHDTL4	FGH75T65SHDTL4	TO-247-4LD	Tube	_	1	30

ELECTRICAL CHARACTERISTICS OF THE IGBT (T_C = 25°C unless otherwise noted)

Symbol	Parameter Test Conditions		Min	Тур	Max	Unit
OFF CHARAC	TERISTICS					
BV _{CES}	Collector to Emitter Breakdown Voltage	V _{GE} = 0 V, I _C = 1 mA	650	-	_	V
Δ BV _{CES} / Δ T _J	Temperature Coefficient of Breakdown Voltage	I _C = 1 mA, Reference to 25°C	-	0.65	-	V/°C
I _{CES}	Collector Cut-Off Current	V _{CE} = V _{CES} , V _{GE} = 0 V	-	-	250	μΑ
I _{GES}	G-E Leakage Current	$V_{GE} = V_{GES}$, $V_{CE} = 0 V$	_	-	±400	nA
ON CHARACT	ERISTICS					
V _{GE(th)}	G-E Threshold Voltage	I_C = 75 mA, V_{CE} = V_{GE}	4.0	5.5	7.5	V
V _{CE(sat)}	Collector to Emitter Saturation Voltage	I _C = 75 A, V _{GE} = 15 V	-	1.6	2.1	٧
		I _C = 75 A, V _{GE} = 15 V, T _C = 175°C	-	2.28	-	V

ELECTRICAL CHARACTERISTICS OF THE IGBT ($T_C = 25^{\circ}C$ unless otherwise noted) (continued)

Symbol	Parameter	Test Conditions	Min	Тур	Max	Unit
DYNAMIC CHA	ARACTERISTICS					
C _{ies}	Input Capacitance	V _{CE} = 30 V, V _{GE} = 0 V, f = 1 MHz	-	3710	-	pF
C _{oes}	Output Capacitance	=	-	183	-	pF
C _{res}	Reverse Transfer Capacitance		-	43	-	pF
SWITCHING C	HARACTERISTICS					
T _{d(on)}	Turn-On Delay Time	$V_{CC} = 400 \text{ V}, I_{C} = 75 \text{ A},$ $R_{G} = 15 \Omega, V_{GE} = 15 \text{ V},$	-	55	-	ns
T _r	Rise Time	Inductive Load, T _C = 25°C	-	50	-	ns
T _{d(off)}	Turn-Off Delay Time		-	189	-	ns
T _f	Fall Time		-	39	-	ns
E _{on}	Turn-On Switching Loss		-	1.06	-	mJ
E _{off}	Turn-Off Switching Loss		-	1.56	-	mJ
E _{ts}	Total Switching Loss		-	2.62	-	mJ
T _{d(on)}	Turn-On Delay Time	$V_{CC} = 400 \text{ V}, I_{C} = 75 \text{ A},$ $R_{G} = 15 \Omega, V_{GE} = 15 \text{ V},$	-	48	-	ns
T _r	Rise Time	Inductive Load, T _C = 25°C	_	56	-	ns
T _{d(off)}	Turn-Off Delay Time		_	205	-	ns
T _f	Fall Time		-	40	-	ns
E _{on}	Turn-On Switching Loss		-	2.34	-	mJ
E _{off}	Turn-Off Switching Loss		-	1.81	-	mJ
E _{ts}	Total Switching Loss		-	4.15	-	mJ
Qg	Total Gate Charge	V _{CE} = 400 V, I _C = 75 A, V _{GE} = 15 V	-	126	-	nC
Q _{ge}	Gate to Emitter Charge	VGE = 13 V	-	24.1	-	nC
Q _{gc}	Gate to Collector Charge		-	47.6	-	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

ELECTRICAL CHARACTERISTICS OF THE DIODE (T_C = 25°C unless otherwise noted)

Symbol	Parameter	Test Co	Test Conditions		Тур	Max	Unit
V_{FM}	Diode Forward Voltage	I _F = 75 A	T _C = 25°C	-	1.8	2.1	V
			T _C = 175°C	-	1.7	-	
E _{rec}	Reverse Recovery Energy	I _F = 75 A, dI _F /dt = 200 A/μs	T _C = 175°C	-	160	-	μJ
T _{rr}	Diode Reverse Recovery Time	μι _{Γ/} αι – 200 <i>Α</i> /μδ	T _C = 25°C	-	76	-	ns
			T _C = 175°C	-	270	-	
Q _{rr}	Diode Reverse Recovery Charge		T _C = 25°C	-	206	-	nC
			T _C = 175°C	-	2199	-	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL PERFORMANCE CHARACTERISTICS

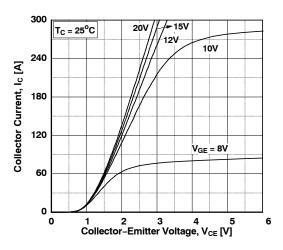


Figure 1. Typical Output Characteristics

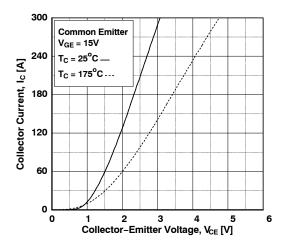


Figure 3. Typical Saturation Voltage Characteristics

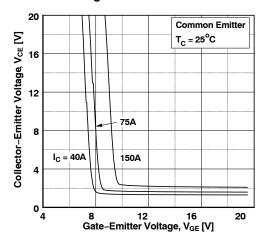


Figure 5. Saturation Voltage vs. V_{GE}

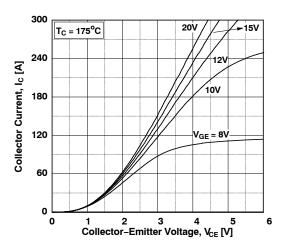


Figure 2. Typical Output Characteristics

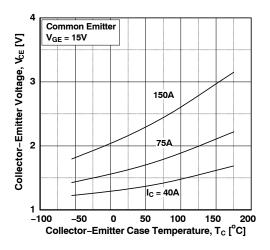


Figure 4. Saturation Voltage vs. Case Temperature at Variant Current Level

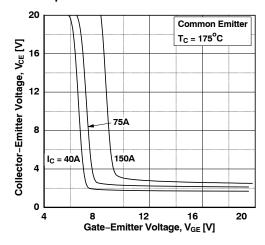


Figure 6. Saturation Voltage vs. V_{GE}

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

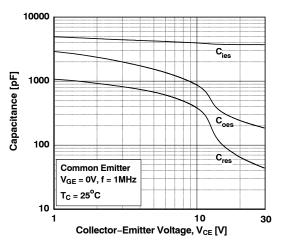


Figure 7. Capacitance Characteristics

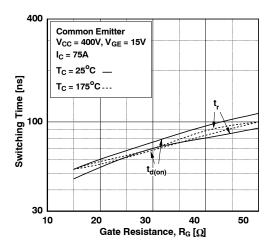


Figure 9. Turn-on Characteristics vs.
Gate Resistance

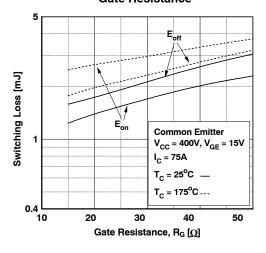


Figure 11. Switching Loss vs.

Gate Resistance

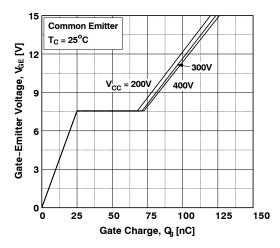


Figure 8. Gate Charge Characteristics

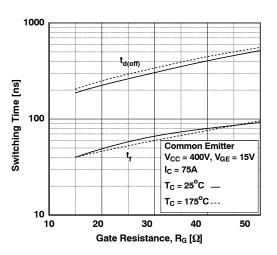


Figure 10. Turn-off Characteristics vs. Gate Resistance

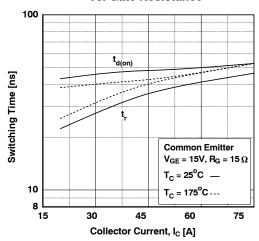


Figure 12. Turn-on Characteristics vs. Collector Current

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

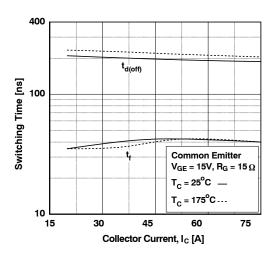


Figure 13. Turn-off Characteristics vs. Collector Current

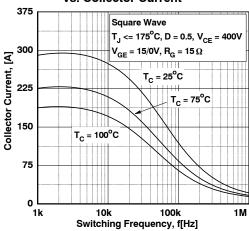


Figure 15. Load Current vs. Frequency

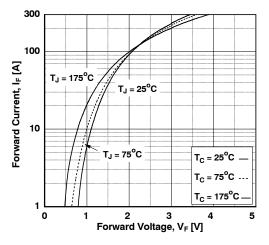


Figure 17. Forward Characteristics

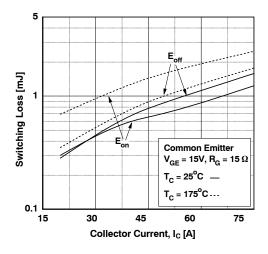


Figure 14. Switching Loss vs. Collector Current

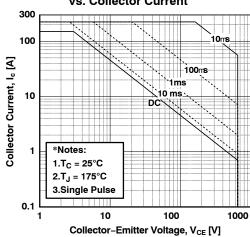


Figure 16. SOA Characteristics

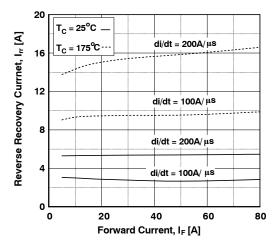
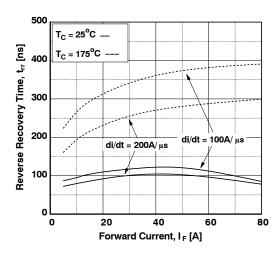


Figure 18. Reverse Recovery Current

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)



2500 T_C = 25°C -Stored Recovery Charge, Qrr [nC] = 175°C 2000 1500 1000 di/dt = 100A/ μs $di/dt = 200A/\mu s$ 500 0 0 20 40 60 80 Forward Current, I_F [A]

Figure 19. Reverse Recovery Time

Figure 20. Stored Charge

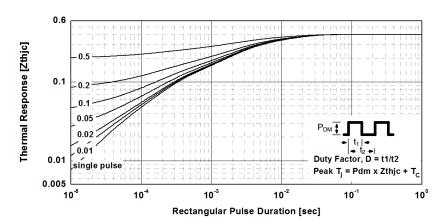


Figure 21. Transient Thermal Impedance of IGBT

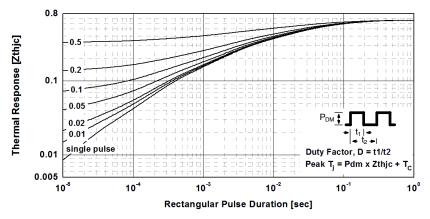


Figure 22. Transient Thermal Impedance of Diode

 \emptyset p1

D1

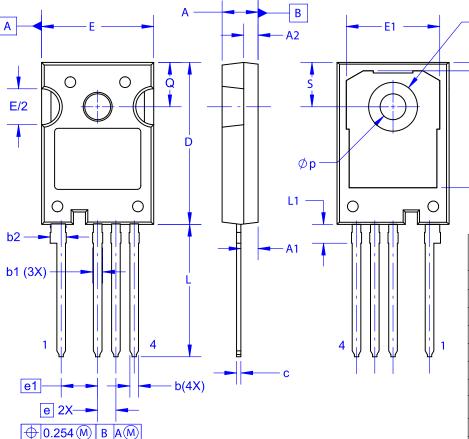
DIM

D2



TO-247-4LD CASE 340CJ **ISSUE A**

DATE 16 SEP 2019



NOTES:

- A. NO INDUSTRY STANDARD APPLIES TO THIS PACKAGE.
 B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD
 FLASH, AND TIE BAR EXTRUSIONS.
 C. ALL DIMENSIONS ARE IN MILLIMETERS.
 D. DRAWING CONFORMS TO ASME Y14.5-2009.

Α	4.80	5.00	5.20		
A1	2.10	2.40	2.70		
A2	1.80	2.00	2.20		
b	1.07	1.20	1.33		
b1	1.20	1.40	1.60		
b2	2.02	2.22	2.42		
С	0.50	0.60	0.70		
D	22.34	22.54	22.74		
D1	16.00	16.25	16.50		
D2	0.97	1.17	1.37		
е	2.54 BSC				
e1		5.08 BSC			
E	15.40	15.60	15.80		
E1	12.80	13.00	13.20		
E/2	4.80	5.00	5.20		
L	18.22	18.42	18.62		
L1	2.42	2.62	2.82		
р	3.40	3.60	3.80		
p1	6.60	6.80	7.00		
Q	5.97	6.17	6.37		
S	5.97	6.17	6.37		

MILLIMETERS

NOM

MAX

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