Field Stop Trench IGBT 650 V, 75 A

FGHL75T65MQD

Field stop 4th generation mid speed IGBT technology and Full current rated copak Diode technology.

Features

- Maximum Junction Temperature: T_J = 175°C
- Positive Temperature Co-efficient for Easy Parallel Operating
- High Current Capability
- Low Saturation Voltage: $V_{CE(sat)} = 1.45 \text{ V (Typ.)}$ @ $I_C = 75 \text{ A}$
- 100% of the Parts are Tested for I_{LM} (Note 2)
- Smooth & Optimized Switching
- Tight Parameter Distribution
- RoHS Compliant

Typical Applications

- Solar Inverter
- UPS, ESS
- PFC, Converters

MAXIMUM RATINGS

Parameter	Symbol	Value	Unit	
Collector-to-Emitter Voltage	V _{CES}	650	V	
Gate-to-Emitter Voltage		V_{GES}	±20	V
Transient Gate-to-Emitter Voltage		V_{GES}	±30	V
Collector Current (Note 1)	T _C = 25°C	Ic	80	Α
	T _C = 100°C		75	
Pulsed Collector Current (Note 2)		I_{LM}	300	Α
Pulsed Collector Current (Note 3)	I _{CM}	300	Α	
Diode Forward Current (Note 1)	T _C = 25°C	I _F	80	Α
	T _C = 65°C		75	
Pulsed Diode Maximum Forward C	I _{FM(2)}	300	Α	
Non-Repetitive Forward Surge Cu (Half-Sine Pulse, t_p = 8.3 ms, T_C = (Half-Sine Pulse, t_p = 8.3 ms, T_C =	I _{F,SM}	255 225	Α	
Maximum Power Dissipation	T _C = 25°C	P_{D}	375	W
	T _C = 100°C		188	
Operating Junction and Storage Te Range	T _J , T _{stg}	-55 to +175	°C	
Maximum Lead Temperature for Soldering Purposes (1/8" from case for 5 s)		TL	260	°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.

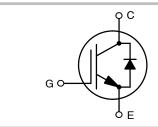
- 1. Value limit by bond wire
- 2. V_{CC} = 400 V, V_{GE} = 15 V, I_{C} = 300 A, R_{G} = 14 Ω , Inductive Load, 100% Tested 3. Repetitive rating: Pulse width limited by max. junction temperature

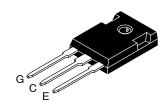


ON Semiconductor®

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BV _{CES}	V _{CE(sat)} TYP	I _C MAX
650 V	1.45 V	75 A





TO-247 LONG LEADS CASE 340CX

MARKING DIAGRAM



\$Y = ON Semiconductor Logo &Z = Assembly Plant Code &3 = 3-Digit Date Code = 2-Digit Lot Traceability Code FGHL75T65MQD = Specific Device Code

ORDERING INFORMATION

Device	Package	Shipping
FGHL75T65MQD	TO-247-3L	30 Units / Rail

Table 1. THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance Junction-to-Case, for IGBT	$R_{\theta JC}$	0.40	°C/W
Thermal Resistance Junction-to-Case, for Diode	$R_{\theta JC}$	0.6	
Thermal Resistance Junction-to-Ambient	$R_{\theta JA}$	40	

Table 2. ELECTRICAL CHARACTERISTICS ($T_J = 25^{\circ}C$ unless otherwise specified)

Parameter	Test Conditions	Symbol	Min	Тур	Max	Unit
OFF CHARACTERISTIC						
Collector-emitter breakdown voltage, gate-emitter short-circuited	V _{GE} = 0 V, I _C = 1 mA	BV _{CES}	650	-	-	V
Temperature Coefficient of Breakdown Voltage	V _{GE} = 0 V, I _C = 1 mA	ΔBV _{CES} / ΔΤ _J	-	0.6	-	V/°C
Collector-emitter cut-off current, gate-emitter short-circuited	V _{GE} = 0 V, V _{CE} = 650 V	I _{CES}	_	-	250	μΑ
Gate leakage current, collector-emitter short-circuited	V _{GE} = 20 V, V _{CE} = 0 V	I _{GES}	-	-	±400	nA
ON CHARACTERISTIC	•	•		•	•	
Gate-emitter threshold voltage	$V_{GE} = V_{CE}$, $I_C = 75 \text{ mA}$	V _{GE(th)}	3.0	4.5	6.0	V
Collector-emitter saturation voltage	V _{GE} = 15 V, I _C = 75 A V _{GE} = 15 V, I _C = 75 A, T _J = 175°C	V _{CE(sat)}	-	1.45 1.65	1.8 -	V
DYNAMIC CHARACTERISTIC	•	•		•	•	
Input capacitance	V _{CE} = 30 V, V _{GE} = 0 V, f = 1 MHz	C _{ies}	-	4913	_	pF
Output capacitance	1	C _{oes}	ı	131	_	1
Reverse transfer capacitance	7	C _{res}	-	15	_	1
Gate charge total	V _{CE} = 400 V, I _C = 75 A, V _{GE} = 15 V	Qg	-	145	_	nC
Gate-to-Emitter charge	7	Q_{ge}	_	25	_	
Gate-to-Collector charge	7	Q_{gc}	_	33	_	
SWITCHING CHARACTERISTIC, INC	DUCTIVE LOAD					
Turn-on delay time	T _C = 25°C	t _{d(on)}	-	29	-	ns
Rise time	V_{CC} = 400 V, I_C = 37.5 A R_G = 10 Ω	t _r	-	29	-	
Turn-off delay time	V _{GE} = 15 V Inductive Load	t _{d(off)}	-	193	_]
Fall time	1	t _f	-	47	_]
Turn-on switching loss	1	E _{on}	-	0.75	_	mJ
Turn-off switching loss		E _{off}	1	0.48	_	
Total switching loss	1	E _{ts}	-	1.22	_]
Turn-on delay time	T _C = 25°C	t _{d(on)}	-	33	_	ns
Rise time	$V_{CC} = 400 \text{ V}, I_{C} = 75 \text{ A}$ $R_{G} = 10 \Omega$ $V_{GE} = 15 \text{ V}$	t _r	ı	60	_	
Turn-off delay time	V _{GE} = 15 V Inductive Load	t _{d(off)}	İ	176	_	
Fall time		t _f	1	76	-	<u> </u>
Turn-on switching loss		E _{on}	ı	1.94	-	mJ
Turn-off switching loss		E _{off}	ı	1.55	-	
Total switching loss		E _{ts}	-	3.49	_	

Table 2. ELECTRICAL CHARACTERISTICS ($T_J = 25^{\circ}C$ unless otherwise specified) (continued)

Parameter	Test Conditions	Symbol	Min	Тур	Max	Unit
SWITCHING CHARACTERISTIC, IN	NDUCTIVE LOAD	•		•		•
Turn-on delay time	T _C = 175°C	t _{d(on)}	-	27	_	ns
Rise time	$V_{CC} = 400 \text{ V}, I_C = 37.5 \text{ A}$ $R_G = 10 \Omega$	t _r	-	31	-	1
Turn-off delay time	V _{GE} = 15 V Inductive Load	t _{d(off)}	-	214	-	1
Fall time	7	t _f	-	66	-	1
Turn-on switching loss	7	E _{on}	_	1.49	_	mJ
Turn-off switching loss	7	E _{off}	-	0.72	_	1
Total switching loss	7	E _{ts}	-	2.21	_	
Turn-on delay time	T _C = 175°C	t _{d(on)}	-	31	_	ns
Rise time	$V_{CC} = 400 \text{ V, I}_{C} = 75 \text{ A}$ $R_{G} = 10 \Omega$	t _r	-	61	_	1
Turn-off delay time	V _{GE} = 15 V Inductive Load	t _{d(off)}	-	191	_	1
Fall time		t _f	-	85	_	1
Turn-on switching loss	7	E _{on}	-	3.23	_	mJ
Turn-off switching loss	7	E _{off}	-	1.90	-	1
Total switching loss	7	E _{ts}	-	5.12	_	1
DIODE CHARACTERISTIC						
Diode Forward Voltage	I _F = 75 A, T _C = 25°C I _F = 75 A, T _C = 175°C	V _{FM}	- -	2.3 1.9	2.6 -	V
Reverse Recovery Energy	$I_F = 75 \text{ A}, \text{ d}I_F/\text{d}t = 200 \text{ A/}\mu\text{s}, \text{ T}_C = 175^{\circ}\text{C}$	E _{rec}	-	49	-	μJ
Diode Reverse Recovery Time	$I_F = 75 \text{ A}, \ dI_F/dt = 200 \ A/\mu s, \ T_C = 25^{\circ} C$ $I_F = 75 \text{ A}, \ dI_F/dt = 200 \ A/\mu s, \ T_C = 175^{\circ} C$	T _{rr}	-	36 204	-	ns
Diode Reverse Recovery Charge	I_F = 75 A, dI_F/dt = 200 A/ μ s, T_C = 25°C I_F = 75 A, dI_F/dt = 200 A/ μ s, T_C = 175°C	Q _{rr}	-	51 990	_	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.

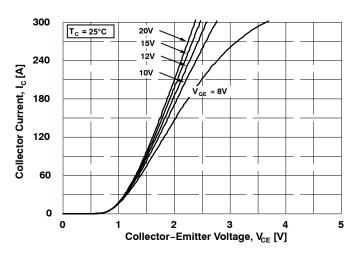


Figure 1. Typical Output Characteristics (25°C)

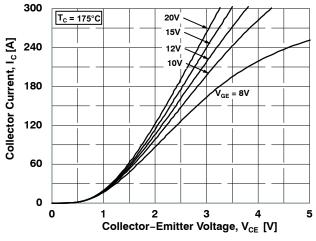


Figure 2. Typical Output Characteristics (175°C)

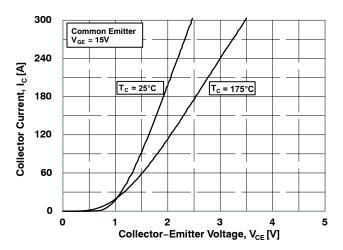


Figure 3. Typical Saturation Voltage Characteristics

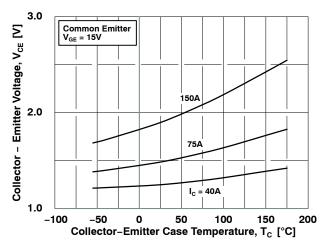


Figure 4. Saturation Voltage vs. Case Temperature at Variant Current Level

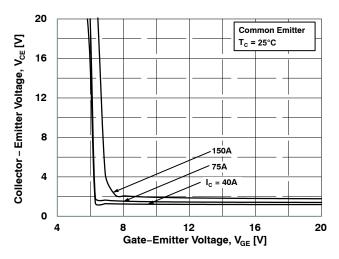


Figure 5. Saturation Voltage vs. V_{GE} (25°C)

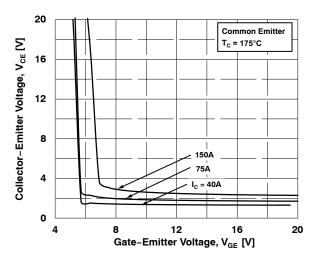


Figure 6. Saturation Voltage vs. V_{GE} (175°C)

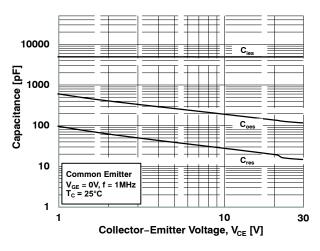


Figure 7. Capacitance Characteristics

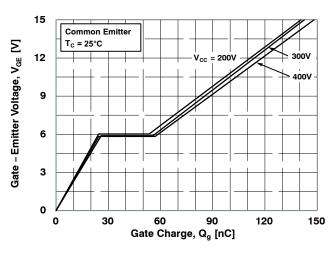


Figure 8. Gate Charge Characteristics

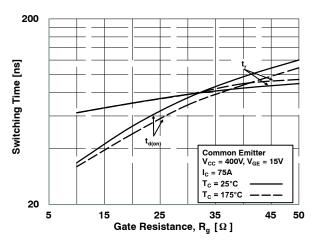


Figure 9. Turn-On Characteristics vs. Gate Resistance

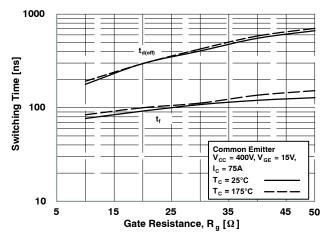


Figure 10. Turn-Off Characteristics vs. Gate Resistance

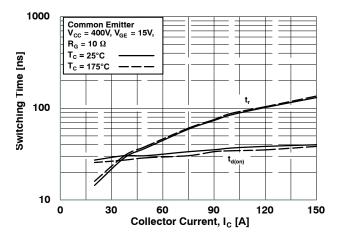


Figure 11. Turn-On Characteristics vs.
Collector Current

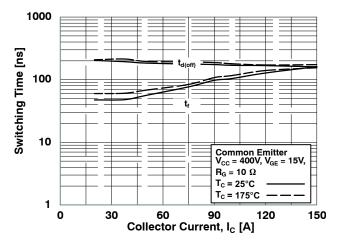


Figure 12. Turn-Off Characteristics vs.
Collector Current

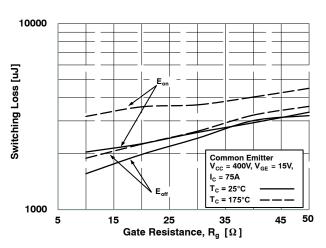


Figure 13. Switching Loss vs. Gate Resistance

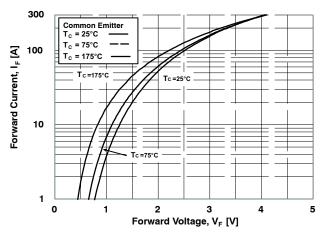


Figure 15. Forward Characteristics

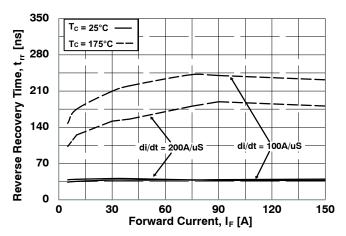


Figure 17. Reverse Recovery Time

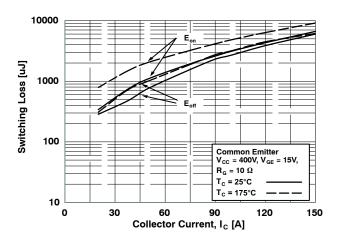


Figure 14. Switching Loss vs. Collector Current

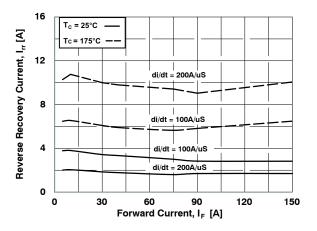


Figure 16. Reverse Recovery Current

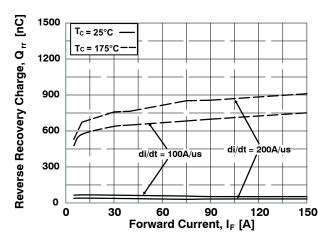


Figure 18. Stored Charge

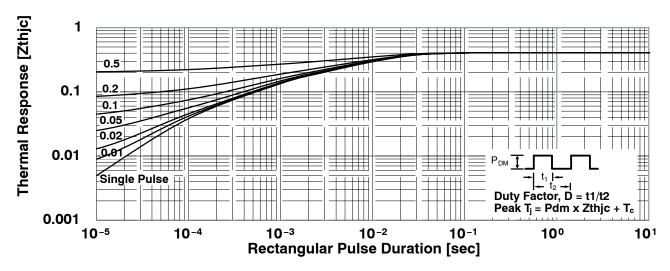


Figure 19. Transient Thermal Impedance of IGBT

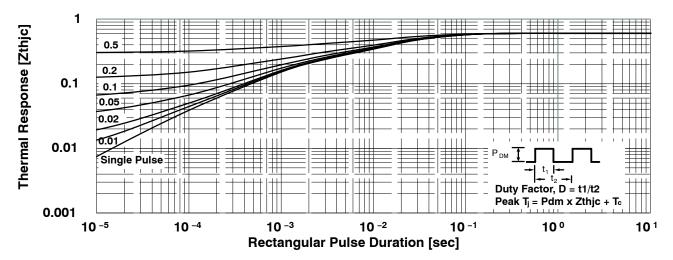
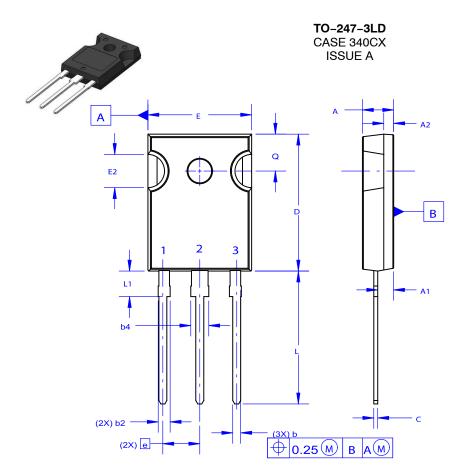
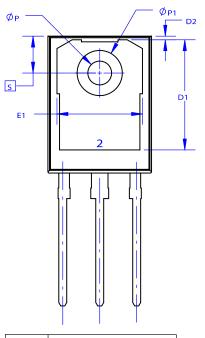


Figure 20. Transient Thermal Impedance of Diode



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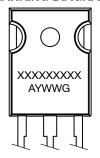


NOTES: UNLESS OTHERWISE SPECIFIED.

- A. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

 B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DRAWING CONFORMS TO ASME Y14.5 2009.
- D. DIMENSION A1 TO BE MEASURED IN THE REGION DEFINED BY L1.
- E. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.

GENERIC MARKING DIAGRAM*



XXXXX = Specific Device Code = Assembly Location

= Year WW = Work Week G = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot " =", may or may not be present. Some products may not follow the Generic Marking.

DIM	MILLIMETERS			
DIM	MIN	NOM	MAX	
Α	4.58	4.70	4.82	
A 1	2.20	2.40	2.60	
A2	1.40	1.50	1.60	
D	20.32	20.57	20.82	
Е	15.37	15.62	15.87	
E2	4.96	5.08	5.20	
е	~	5.56	~	
L	19.75	20.00	20.25	
L1	3.69	3.81	3.93	
ØΡ	3.51	3.58	3.65	
Q	5.34	5.46	5.58	
S	5.34	5.46	5.58	
b	1.17	1.26	1.35	
b2	1.53	1.65	1.77	
b4	2.42	2.54	2.66	
С	0.51	0.61	0.71	
D1	13.08	~	?	
D2	0.51	0.93	1.35	
E1	12.81	~	1	
ØP1	6.60	6.80	7.00	

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