IGBT - Field Stop, Trench

75 A, 650 V

FGHL75T65LQDT

ON Semiconductor®

www.onsemi.com

V_{CES}	I_C	$V_{CE(Sat)}$
650 V	75 A	1.15 V

Description

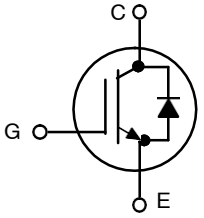
Field stop 4th generation Low Vce(sat) IGBT technology and Full current rated copak Diode technology.

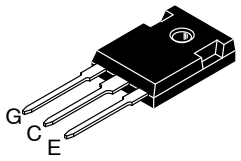
Features

- Maximum Junction Temperature: T_J = 175°C
- Positive Temperature Co−efficient for Easy Parallel Operating
- High Current Capability
- Low Saturation Voltage: $V_{CE(Sat)}$ = 1.15 V (Typ.) @ I_C = 75 A
- 100% Of The Part Are Tested For I_{LM} (Note 2)
- Smooth & Optimized Switching
- Tight Parameter Distribution
- Co−Packed With Soft And Fast Recovery Diode
- RoHS Compliant

Typical Applications

- Solar Inverter
- UPS, ESS
- PFC, Converters





TO−247−3L
CASE 340CX

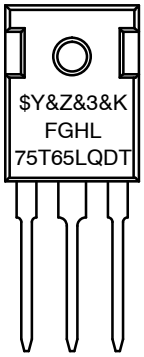
MAXIMUM RATINGS

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		±30	
Collector Current @ T_C = 25°C (Note 1)	I_C	80	A
Collector Current @ T_C = 100°C		75	
Pulsed Collector Current (Note 2)	I_{LM}	300	A
Pulsed Collector Current (Note 3)	I_{CM}	300	A
Diode Forward Current @ T_C = 25°C (Note 1)	I_F	80	A
Diode Forward Current @ T_C = 100°C		75	
Pulsed Diode Maximum Forward Current	I_{FM}	300	A
Maximum Power Dissipation @ T_C = 25°C	P_D	469	W
Maximum Power Dissipation @ T_C = 100°C		234	
Operating Junction Temperature / Storage Temperature Range	T_J, T_{STG}	−55 to +175	°C
Maximum Lead Temp. For soldering Purposes, ⅛" from case for 5 seconds	T_L	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, Inductive Load, 100% Tested.
3. Repetitive rating: pulse width limited by max. Junction temperature.

MARKING DIAGRAM



$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= 3−Digit Data Code
&K	= 2−Digit Lot Traceability Code
FGHL75T65LQDT	= Specific Device Code

ORDERING INFORMATION

Device	Package	Shipping
FGHL75T65LQDT	TO−247−3L	30 Units / Rail

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Units
Thermal Resistance Junction to Case, for IGBT	$R_{\theta JC}$	0.32	°C/W
Thermal Resistance Junction to Case, for Diode	$R_{\theta JC}$	0.6	°C/W
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	40	°C/W

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector−emitter Breakdown Voltage, Gate−emitter Short−circuited	V_{GE} = 0 V, I_C = 1mA	BV_{CES}	650	–	–	V
Temperature Coefficient of Breakdown Voltage	V_{GE} = 0 V, I_C = 1mA	$\Delta BV_{CES}/\Delta T_J$	–	0.6	–	V/°C
Collector−emitter Cut−off Current, Gate−emitter Short−circuited	V_{GE} = 0 V, V_{CE} = 650 V	I_{CES}	–	–	250	μA
Gate Leakage Current, Collector−emitter Short−circuited	V_{GE} = 20 V, V_{CE} = 0 V	I_{GES}	–	–	±400	nA
ON CHARACTERISTICS						
Gate−emitter Threshold Voltage	V_{GE} = V_{CE}, I_C = 75 mA	$V_{GE(th)}$	3.0	4.5	6.0	V
Collector−emitter Saturation Voltage	V_{GE} = 15 V, I_C = 75 A, T_J = 25°C	$V_{CE(sat)}$	–	1.15	1.35	V
	V_{GE} = 15 V, I_C = 75 A, T_J = 175°C		–	1.22	–	
DYNAMIC CHARACTERISTICS						
Input Capacitance	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	C_{ies}	–	15300	–	pF
Output Capacitance		C_{oes}	–	181	–	
Reverse Transfer Capacitance		C_{res}	–	68	–	
Gate Charge Total	V_{CE} = 400 V, I_C = 75 A, V_{GE} = 15 V	Q_g	–	793	–	nC
Gate to Emitter Charge		Q_{ge}	–	72	–	
Gate to Collector Charge		Q_{gc}	–	248	–	
SWITCHING CHARACTERISTICS, INDUCTIVE LOAD						
Turn−on Delay Time	T_J = 25°C V_{CC} = 400 V, I_C = 37.5 A Rg = 4.7 Ω V_{GE} = 15 V	$t_{d(on)}$	–	45	–	ns
Rise Time		t_r	–	20	–	
Turn−off Delay Time		$t_{d(off)}$	–	608	–	
Fall Time		t_f	–	160	–	
Turn−on Switching Loss		E_{on}	–	0.78	–	mJ
Turn−off Switching Loss		E_{off}	–	1.36	–	
Total Switching Loss		E_{ts}	–	2.14	–	
Turn−on Delay Time	T_J = 25°C V_{CC} = 400 V, I_C = 75 A Rg = 4.7 Ω V_{GE} = 15 V	$t_{d(on)}$	–	48	–	ns
Rise Time		t_r	–	40	–	
Turn−off Delay Time		$t_{d(off)}$	–	568	–	
Fall Time		t_f	–	128	–	
Turn−on Switching Loss		E_{on}	–	1.88	–	mJ
Turn−off Switching Loss		E_{off}	–	2.38	–	
Total Switching Loss		E_{ts}	–	4.26	–	

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS, INDUCTIVE LOAD						
Turn−on Delay Time	T_J = 175°C V_{CC} = 400 V, I_C = 37.5 A Rg = 4.7 Ω V_{GE} = 15 V	$t_{d(on)}$	−	44	−	ns
Rise Time		t_r	−	24	−	
Turn−off Delay Time		$t_{d(off)}$	−	680	−	
Fall Time		t_f	−	256	−	
Turn−on Switching Loss		E_{on}	−	1.54	−	mJ
Turn−off Switching Loss		E_{off}	−	2.11	−	
Total Switching Loss		E_{ts}	−	3.65	−	
Turn−on Delay Time	T_J = 175°C V_{CC} = 400 V, I_C = 75 A Rg = 4.7 Ω V_{GE} = 15 V	$t_{d(on)}$	−	44	−	ns
Rise Time		t_r	−	44	−	
Turn−off Delay Time		$t_{d(off)}$	−	632	−	
Fall Time		t_f	−	184	−	
Turn−on Switching Loss		E_{on}	−	3.14	−	mJ
Turn−off Switching Loss		E_{off}	−	3.58	−	
Total Switching Loss		E_{ts}	−	6.72	−	
DIODE CHARACTERISTICS						
Diode Forward Voltage	I_F = 75 A, T_J = 25°C	V_F	−	1.65	2.1	V
	I_F = 75 A, T_J = 175°C		−	1.55	−	
Reverse Recovery Energy	T_J = 25°C, V_R = 400 V, I_F = 37.5 A, di_F/dt = 1000 A/μs	Erec	−	105	−	μJ
Reverse Recovery Time		Trr	−	59	−	ns
Reverse Recovery Charge		Qrr	−	574	−	nC
Reverse Recovery Current		Irr	−	20	−	A
Reverse Recovery Energy	T_J = 25°C, V_R = 400 V, I_F = 75 A, di_F/dt = 1000 A/μs	Erec	−	152	−	μJ
Reverse Recovery Time		Trr	−	87	−	ns
Reverse Recovery Charge		Qrr	−	794	−	nC
Reverse Recovery Current		Irr	−	18	−	A
Reverse Recovery Energy	T_J = 175°C, V_R = 400 V, I_F = 37.5 A, di_F/dt = 1000 A/μs	Erec	−	550	−	μJ
Reverse Recovery Time		Trr	−	119	−	ns
Reverse Recovery Charge		Qrr	−	2154	−	nC
Reverse Recovery Current		Irr	−	36	−	A
Reverse Recovery Energy	T_J = 175°C, V_R = 400 V, I_F = 75 A, di_F/dt = 1000 A/μs	Erec	−	764	−	μJ
Reverse Recovery Time		Trr	−	145	−	ns
Reverse Recovery Charge		Qrr	−	2947	−	nC
Reverse Recovery Current		Irr	−	40	−	A

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 CHARACTERISTICS

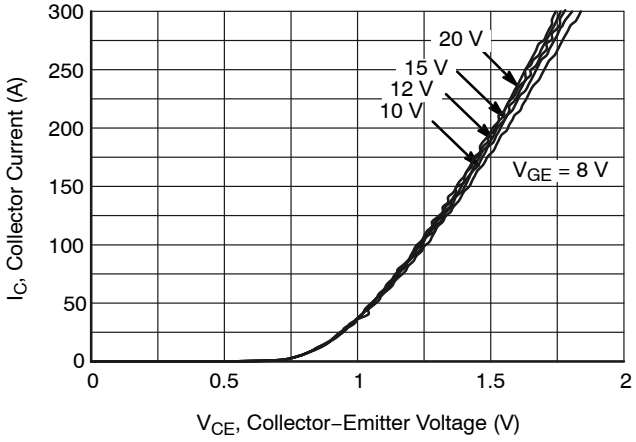


Figure 1. Typical Output Characteristics (T_J = 25°C)

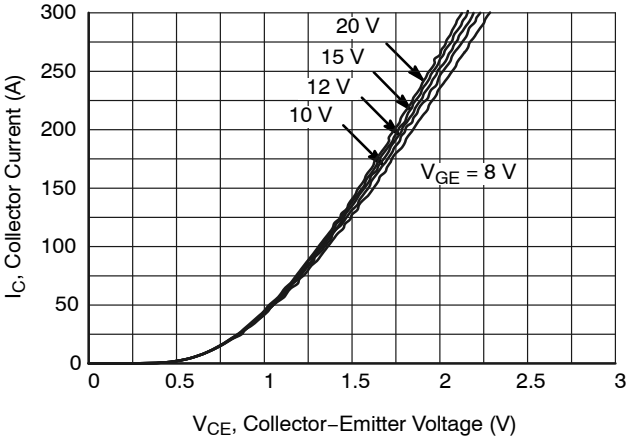


Figure 2. Typical Output Characteristics (T_J = 175°C)

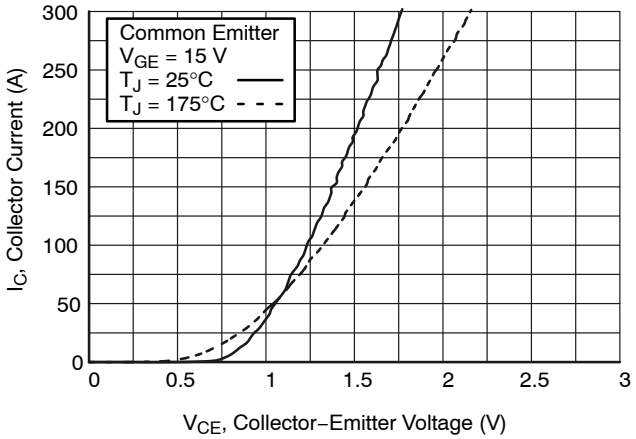


Figure 3. Typical Saturation Voltage Characteristics

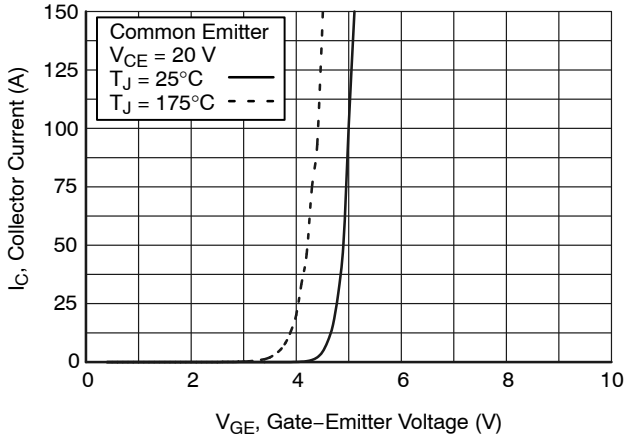


Figure 4. Typical Transfer Characteristics

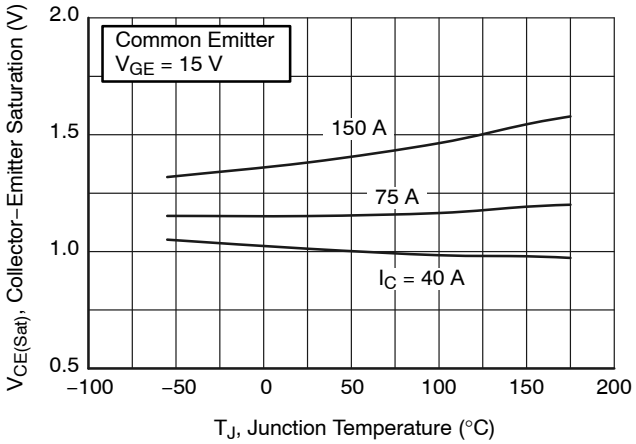


Figure 5. Saturation Voltage vs. Junction Temperature

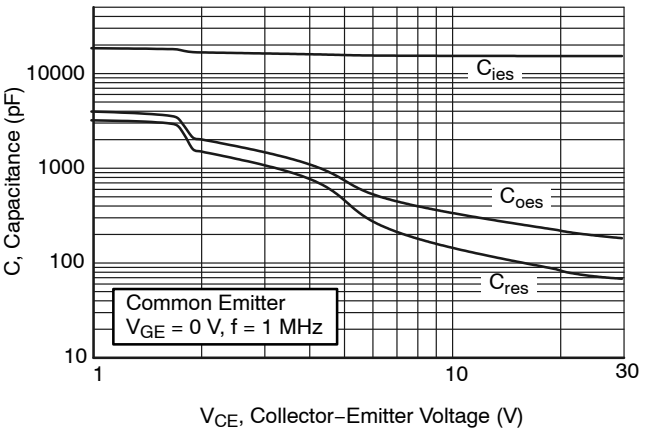


Figure 6. Capacitance Characteristics

TYPICAL CHARACTERISTICS (continued)

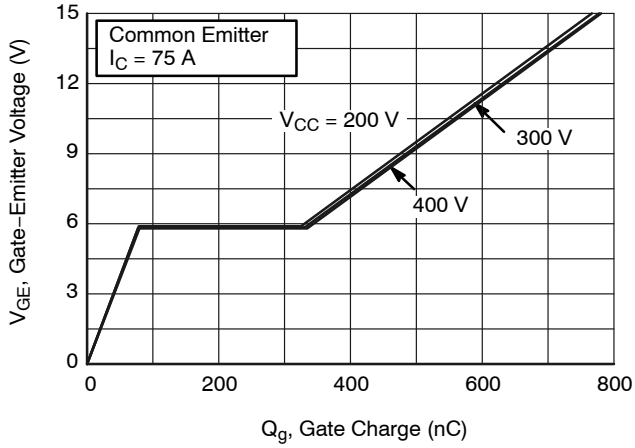


Figure 7. Gate Charge Characteristics

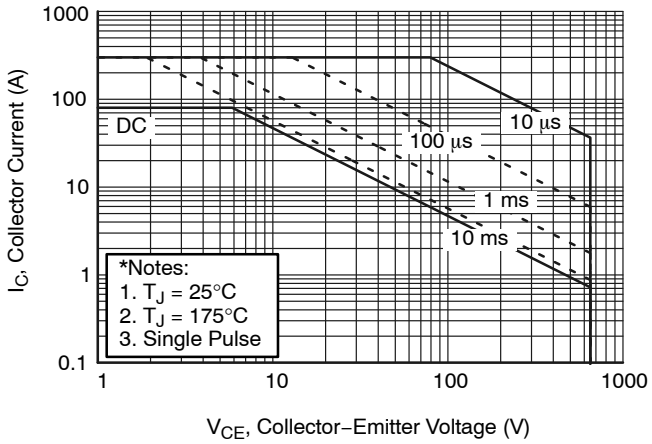


Figure 8. SOA Characteristics

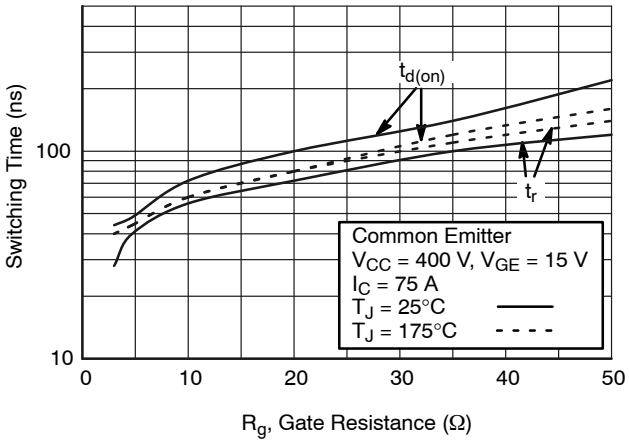


Figure 9. Turn−On Characteristics vs. Gate Resistance

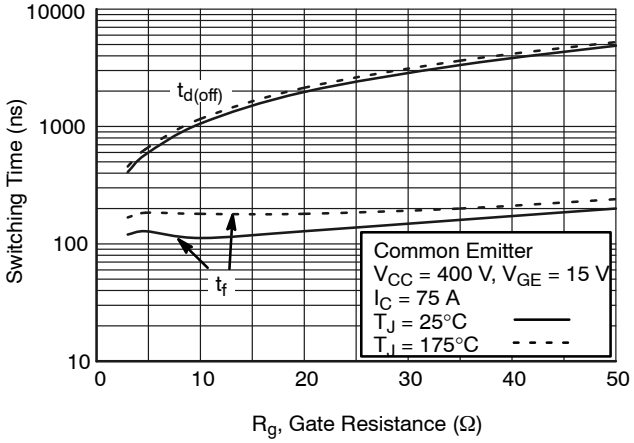


Figure 10. Turn−Off Characteristics vs. Gate Resistance

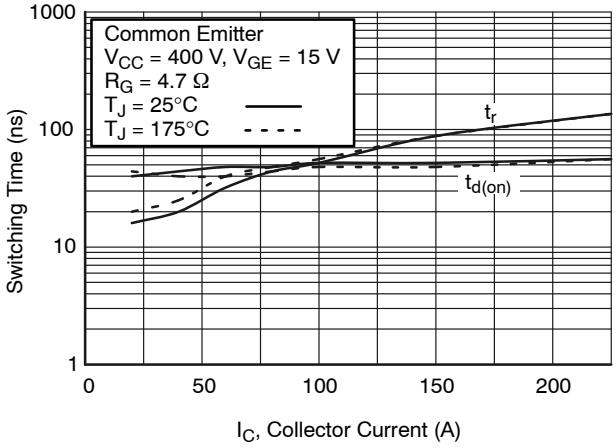


Figure 11. Turn−On Characteristics vs. Collector Current

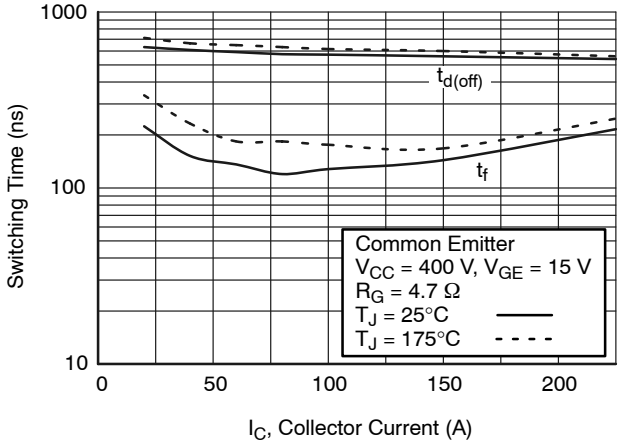


Figure 12. Turn−Off Characteristics vs. Collector Current

TYPICAL CHARACTERISTICS (continued)

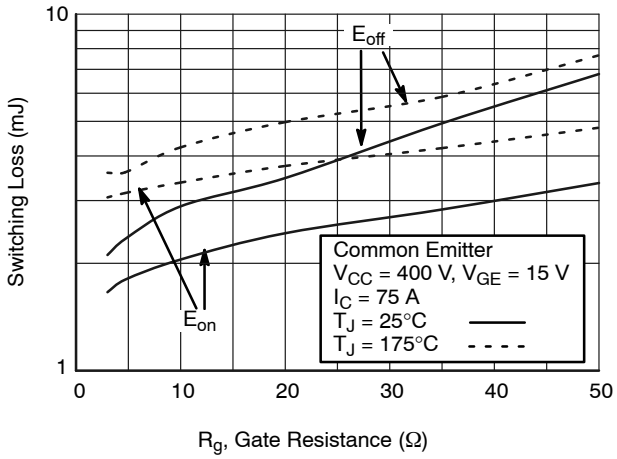


Figure 13. Switching Loss vs. Gate Resistance

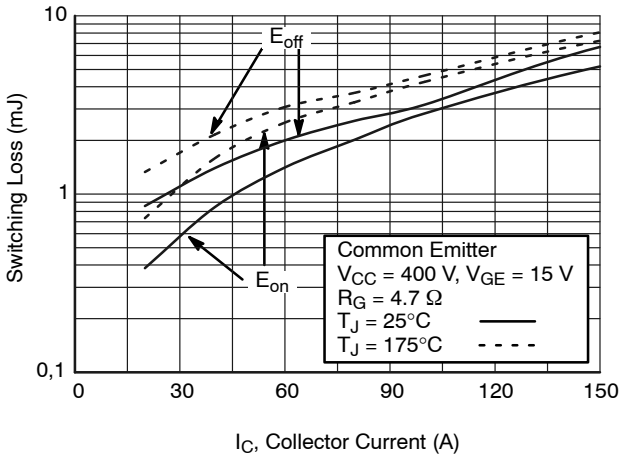


Figure 14. Switching Loss vs. Collector Current

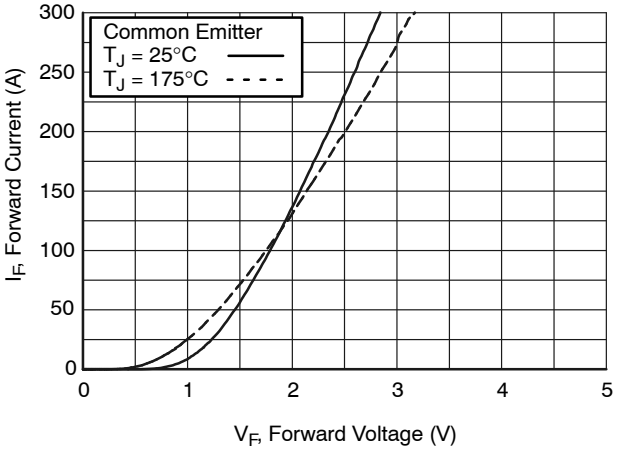


Figure 15. Forward Characteristics

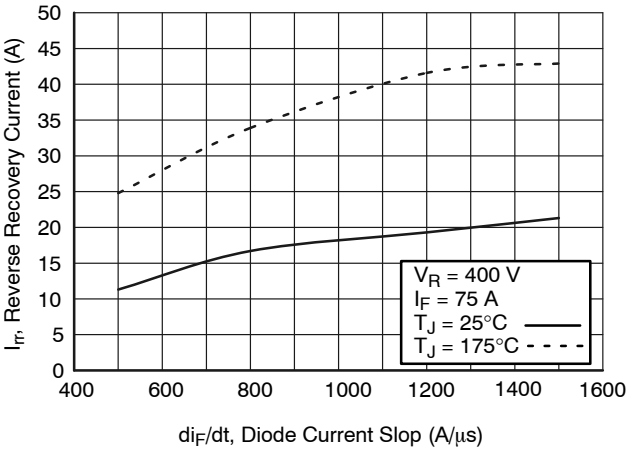


Figure 16. Reverse Recovery Current

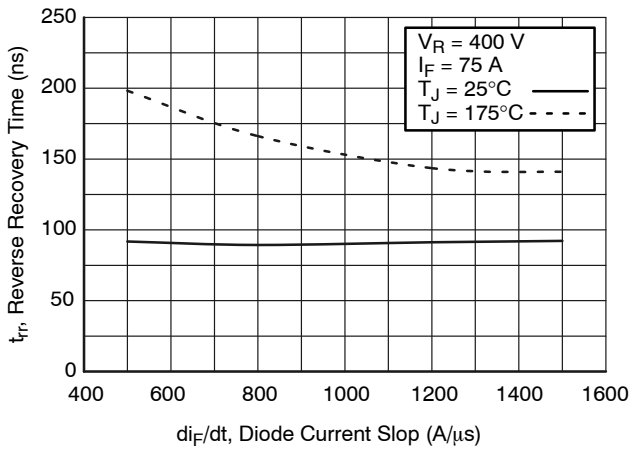


Figure 17. Reverse Recovery Time

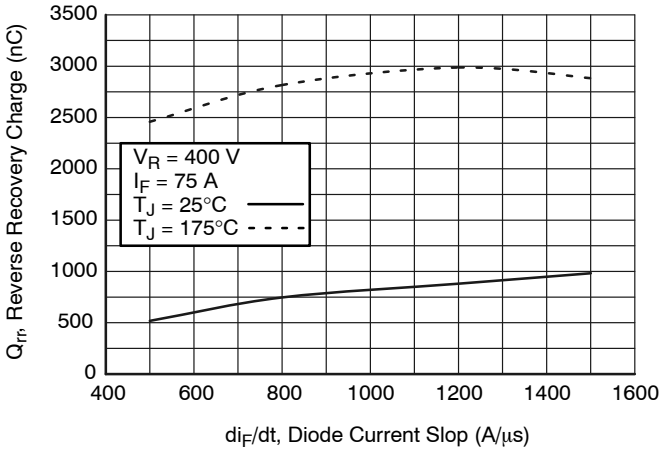


Figure 18. Stored Charge

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

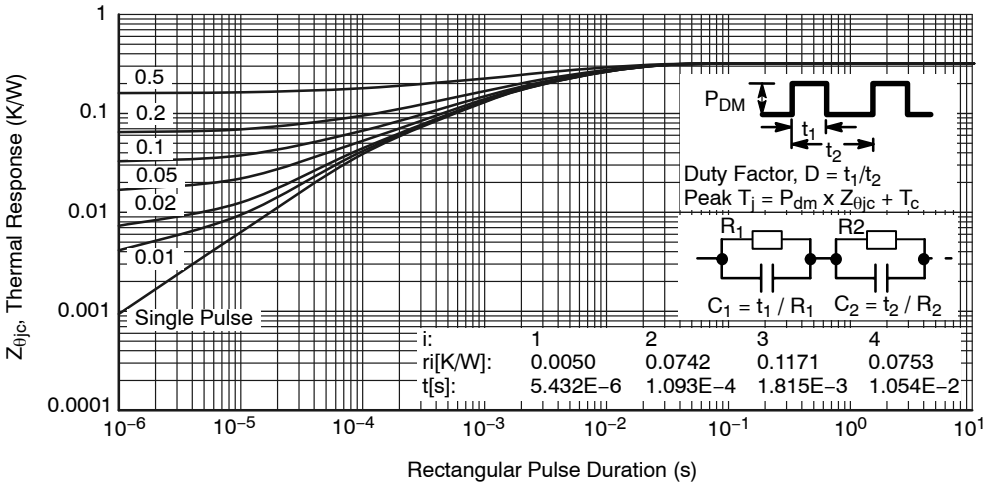


Figure 19. Transient Thermal Impedance of IGBT

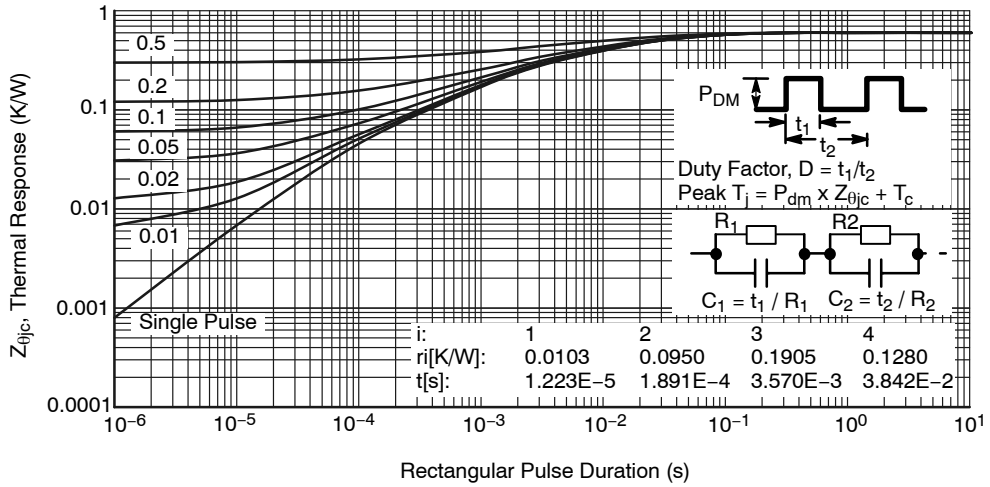


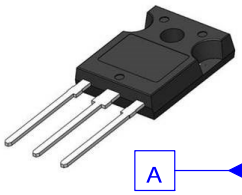
Figure 20. Transient Thermal Impedance of Diode

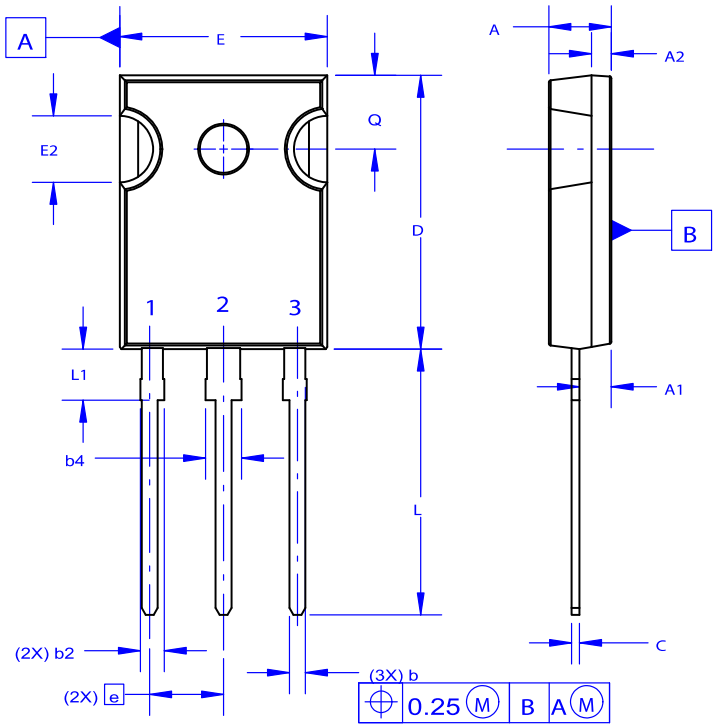
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®

TO−247−3LD
CASE 340CX
ISSUE A

DATE 06 JUL 2020





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.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.58	4.70	4.82
A1	2.20	2.40	2.60
A2	1.40	1.50	1.60
D	20.32	20.57	20.82
E	15.37	15.62	15.87
E2	4.96	5.08	5.20
e	~	5.56	~
L	19.75	20.00	20.25
L1	3.69	3.81	3.93
ØP	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
c	0.51	0.61	0.71
D1	13.08	~	~
D2	0.51	0.93	1.35
E1	12.81	~	~
ØP1	6.60	6.80	7.00

GENERIC MARKING DIAGRAM*

XXXXX = Specific Device Code
A = Assembly Location
Y = 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.

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