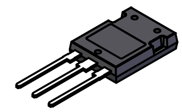
onsemi

DATA SHEET
www.onsemi.com

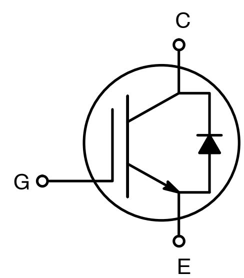
IGBT, Field Stop

600 V, 75 A

FGY75N60SMD



TO−247−3LD
CASE 340CD



General Description

Using novel field stop IGBT technology, **onsemi**’s new series of field stop 2nd generation IGBTs offer the optimum performance for solar inverter, UPS, welder and PFC applications where low conduction and switching losses are essential.

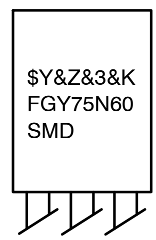
Features

- High Current Capability
- Low Saturation Voltage: $V_{CE(sat)}$ = 1.9 V @ I_C = 75 A
- High Input Impedance
- Fast Switching: E_{OFF} = 10 μJ/A
- RoHS Compliant

Applications

- Solar Inverter, UPS, Welder, SMPS, PFC

MARKING DIAGRAM



$Y = Logo
&Z = Assembly Plant Code
&3 = Date Code (Year & Week)
&K = Lot Run Traceability Code
FGY75N60SMD = Specific Device Code

ORDERING INFORMATION

Device	Package	Shipping
FGY75N60SMD	TO−247−3LD (Pb−Free)	450 / Tube

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CES}	Collector to Emitter Voltage	600	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	A
	Collector Current, @ T_C = 100°C	75	A
$I_{CM(1)}$	Pulsed Collector Current, @ T_C = 25°C	225	A
I_F	Diode Forward Current, @ T_C = 25°C	75	A
	Diode Forward Current, @ T_C = 100°C	50	A
$I_{FM(1)}$	Pulsed Diode Maximum Forward Current	225	A
P_D	Maximum Power Dissipation, @ T_C = 25°C	750	W
	Maximum Power Dissipation, @ T_C = 100°C	375	W
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 s	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. Repetitive rating: Pulse width limited by max. junction temperature.

THERMAL CHARACTERISTICS

Symbol	Parameter	Typ	Max	Unit
$R_{\theta JC}$(IGBT)	Thermal Resistance, Junction to Case	–	0.2	°C/W
$R_{\theta JC}$(Diode)	Thermal Resistance, Junction to Case	–	0.48	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	–	40	°C/W

October, 2021 − Rev. 3
Publication Order Number:
FGY75N60SMD/D

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{CES}	Collector to Emitter Breakdown Voltage	V_{GE} = 0 V, I_C = 250 μA	600	–	–	V
$\Delta BV_{CES} / \Delta T_J$	Temperature Coefficient of Breakdown Voltage	V_{GE} = 0 V, I_C = 250 μA	–	0.67	–	V/°C
I_{CES}	Collector Cut–Off Current	$V_{CE} = V_{CES}$, V_{GE} = 0 V	–	–	250	μA
I_{GES}	G–E Leakage Current	$V_{GE} = V_{GES}$, V_{CE} = 0 V	–	–	±400	nA
ON CHARACTERISTICS						
$V_{GE(th)}$	G–E Threshold Voltage	I_C = 250 μA, $V_{CE} = V_{GE}$	3.5	5.0	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 75 A, V_{GE} = 15 V	–	1.90	2.50	V
		I_C = 75 A, V_{GE} = 15 V, T_C = 175°C	–	2.14	–	V
DYNAMIC CHARACTERISTICS						
C_{ies}	Input Capacitance	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	–	3800	–	pF
C_{oes}	Output Capacitance		–	390	–	pF
C_{res}	Reverse Transfer Capacitance		–	105	–	pF
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn–On Delay Time	V_{CC} = 400 V, I_C = 75 A, R_G = 3 Ω, V_{GE} = 15 V, Inductive Load, T_C = 25°C	–	24	32	ns
t_r	Rise Time		–	56	73	ns
$t_{d(off)}$	Turn–Off Delay Time		–	136	177	ns
t_f	Fall Time		–	22	29	ns
E_{on}	Turn–On Switching Loss		–	2.3	2.99	mJ
E_{off}	Turn–Off Switching Loss		–	0.77	1.00	mJ
E_{ts}	Total Switching Loss		–	3.07	3.99	mJ
$t_{d(on)}$	Turn–On Delay Time	V_{CC} = 400 V, I_C = 75 A, R_G = 3 Ω, V_{GE} = 15 V, Inductive Load, T_C = 175°C	–	23	–	ns
t_r	Rise Time		–	53	–	ns
$t_{d(off)}$	Turn–Off Delay Time		–	146	–	ns
t_f	Fall Time		–	15	–	ns
E_{on}	Turn–On Switching Loss		–	3.60	–	mJ
E_{off}	Turn–Off Switching Loss		–	1.11	–	mJ
E_{ts}	Total Switching Loss		–	4.71	–	mJ
Q_g	Total Gate Charge	V_{CE} = 400 V, I_C = 75 A, V_{GE} = 15 V	–	248	370	nC
Q_{ge}	Gate to Emitter Charge		–	28	42	nC
Q_{gc}	Gate to Collector Charge		–	129	195	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 Conditions		Min	Typ	Max	Unit
V_{FM}	Diode Forward Voltage	I_F = 50 A	T_C = 25°C	–	1.75	2.1	V
			T_C = 175°C	–	1.35	–	
E_{rec}	Reverse Recovery Energy	I_F = 50 A, di_F/dt = 200 A/μs V_R = 400 V	T_C = 175°C	–	0.14	–	mJ
t_{rr}	Diode Reverse Recovery Time		T_C = 25°C	–	41	55	ns
			T_C = 175°C	–	126	–	
Q_{rr}	Diode Reverse Recovery Charge		T_C = 25°C	–	81	115	nC
			T_C = 175°C	–	736	–	

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

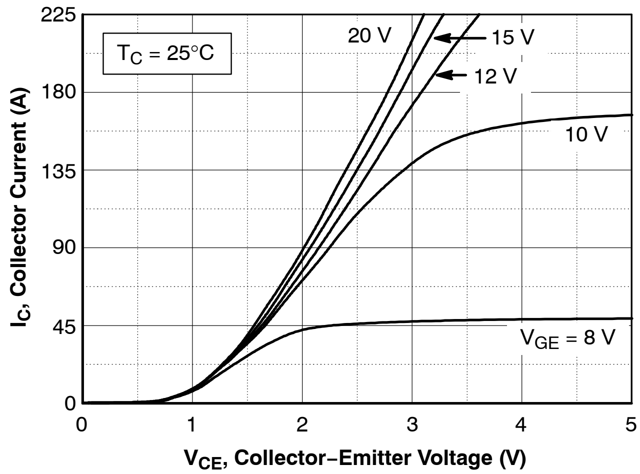


Figure 1. Typical Output Characteristics

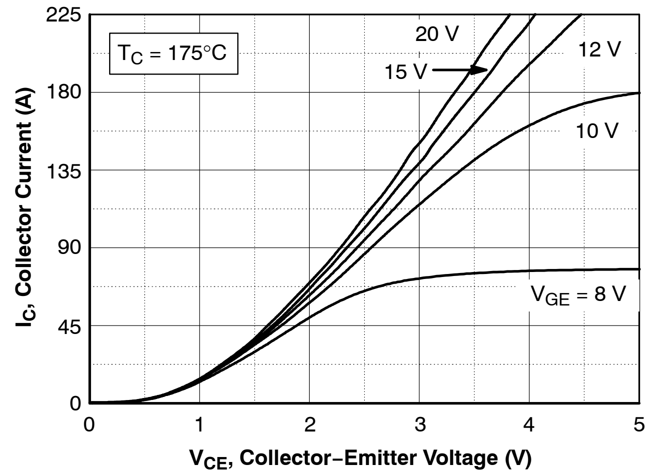


Figure 2. Typical Output Characteristics

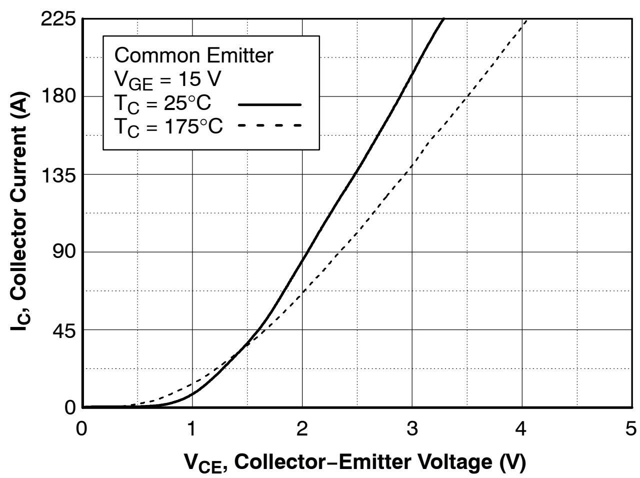


Figure 3. Typical Saturation Voltage Characteristics

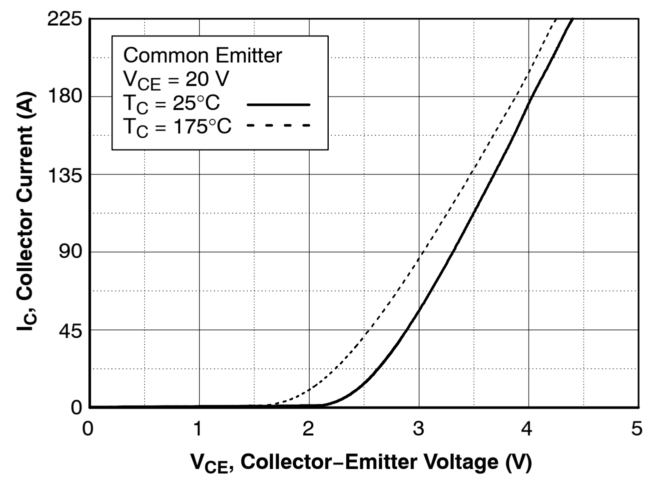


Figure 4. Transfer Characteristics

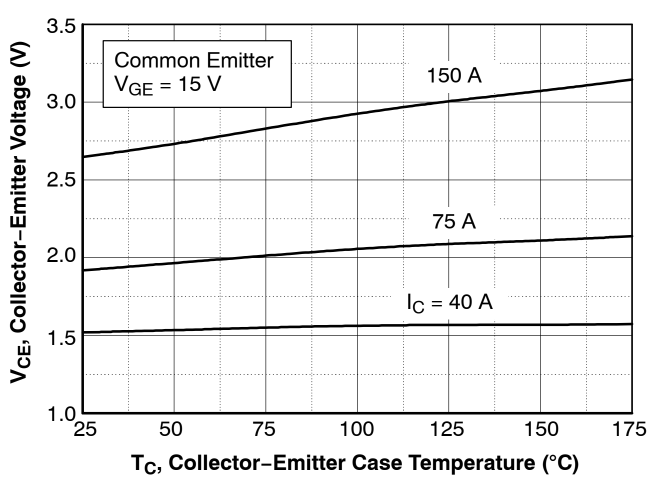


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

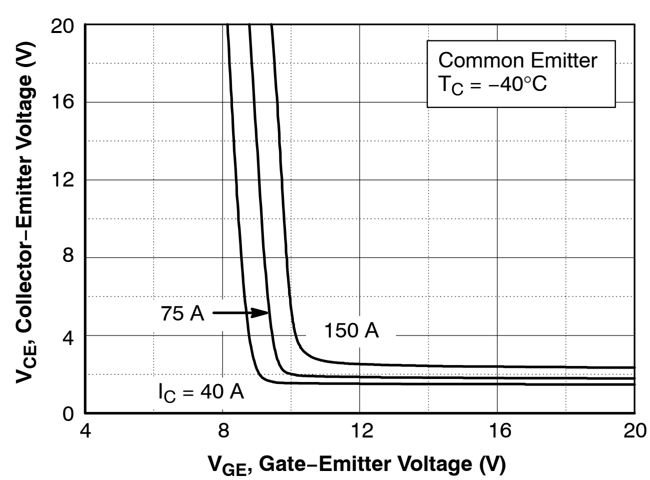


Figure 6. Saturation Voltage vs. V_{GE}

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

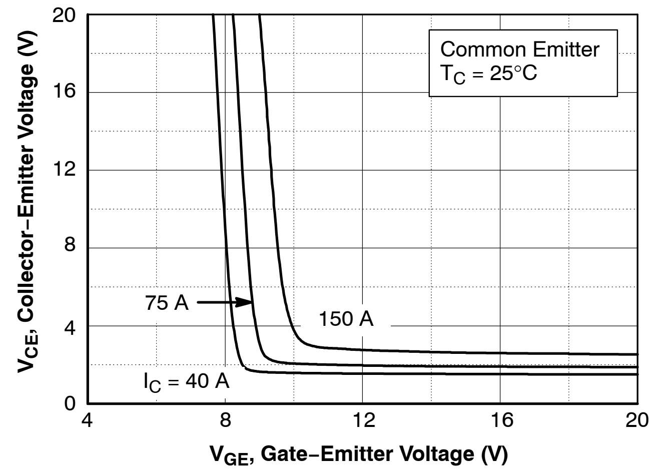


Figure 7. Saturation Voltage vs. V_{GE}

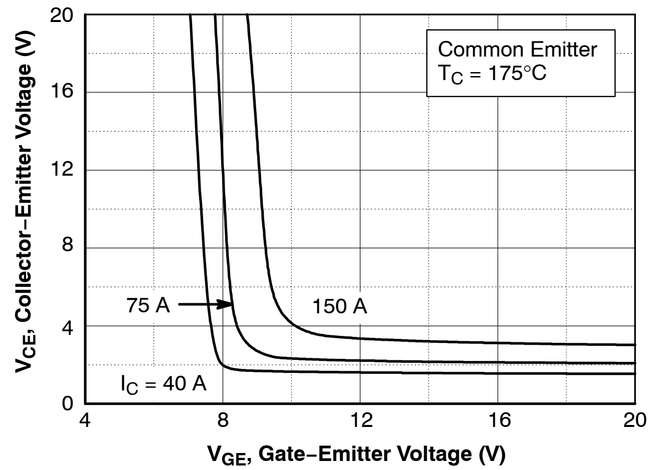


Figure 8. Saturation Voltage vs. V_{GE}

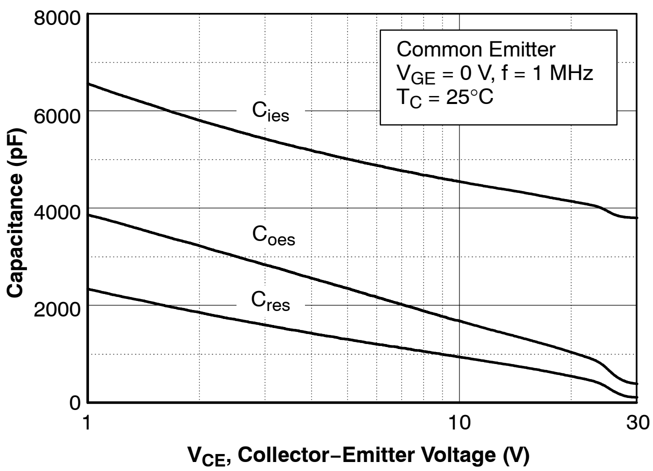


Figure 9. Capacitance Characteristics

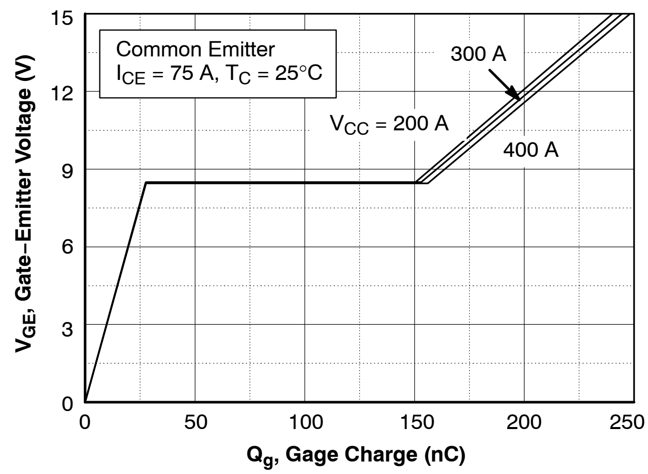


Figure 10. Gate Charge Characteristics

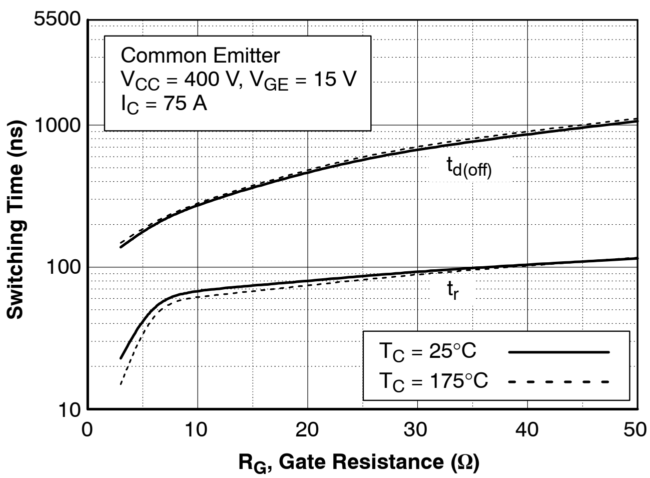


Figure 11. Turn−off Characteristics vs. Gate Resistance

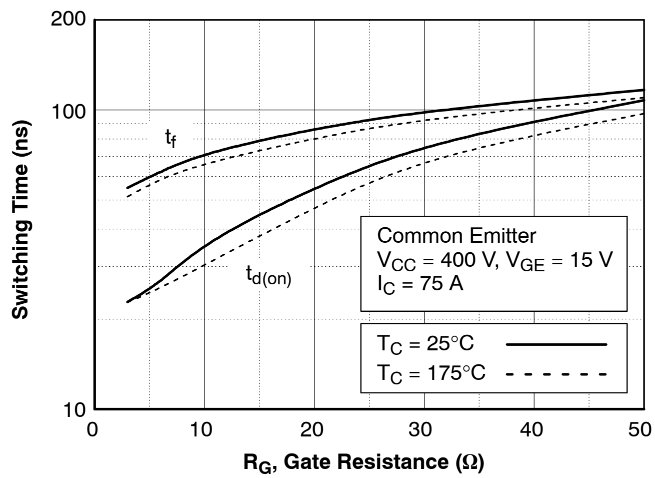


Figure 12. Turn−on Characteristics vs. Gate Resistance

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

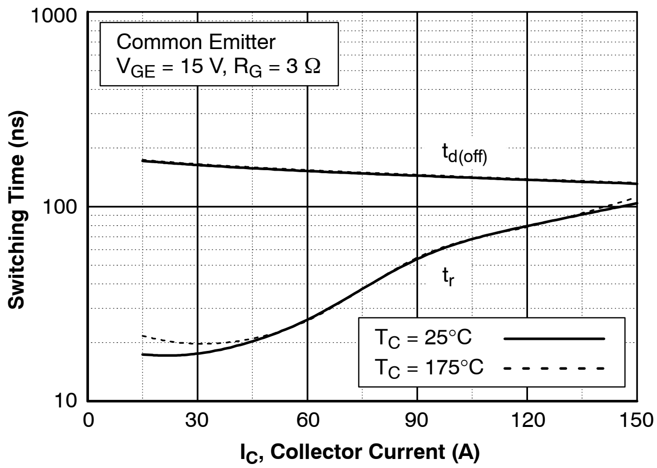


Figure 13. Turn−off Characteristics vs. Collector Current

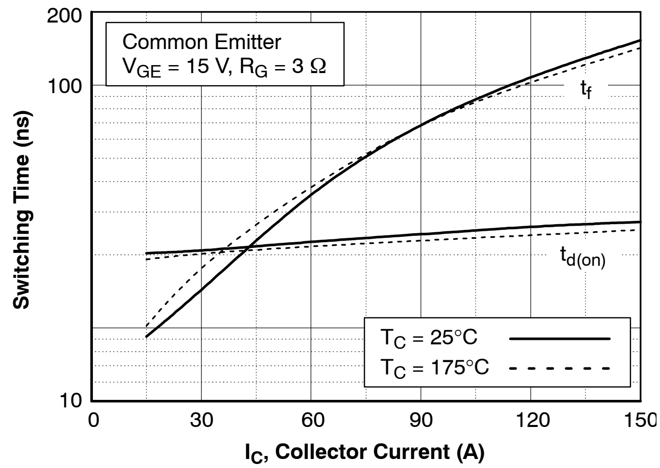


Figure 14. Turn−on Characteristics vs. Collector Current

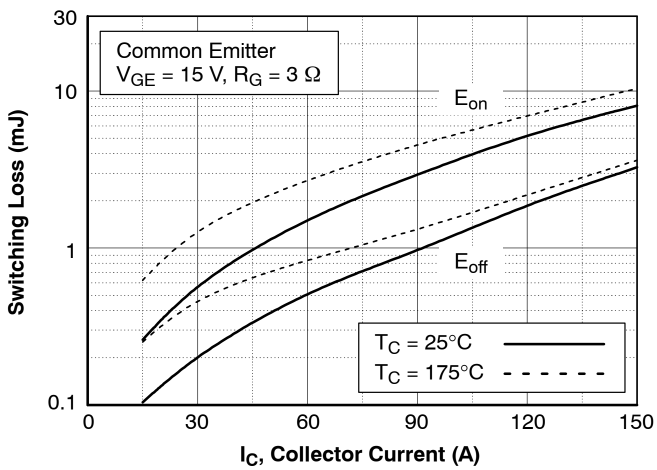


Figure 15. Switching Loss vs. Collector Current

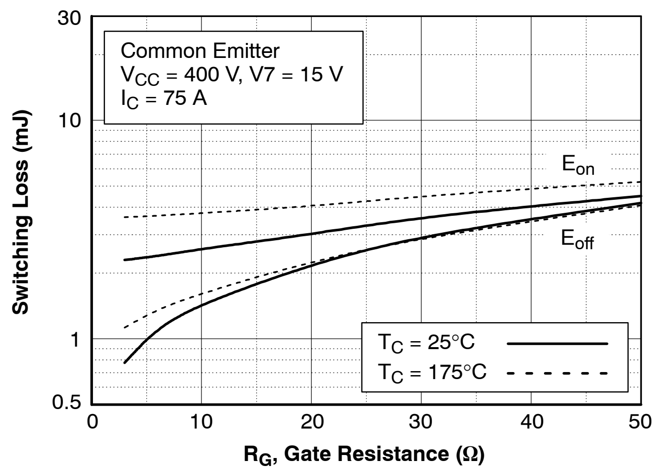


Figure 16. Switching Loss vs. Gate Resistance

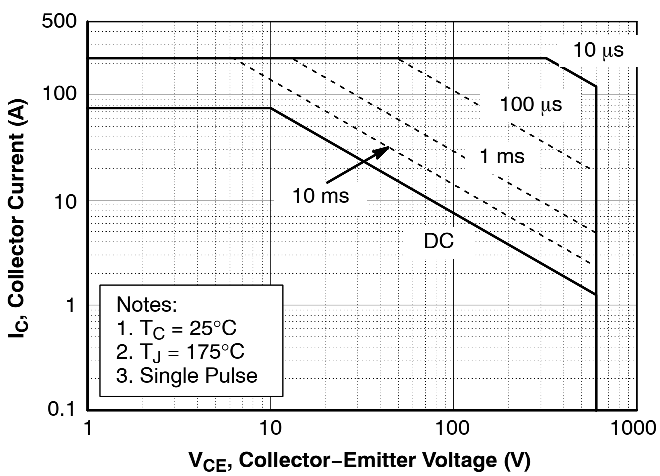


Figure 17. SOA Characteristics

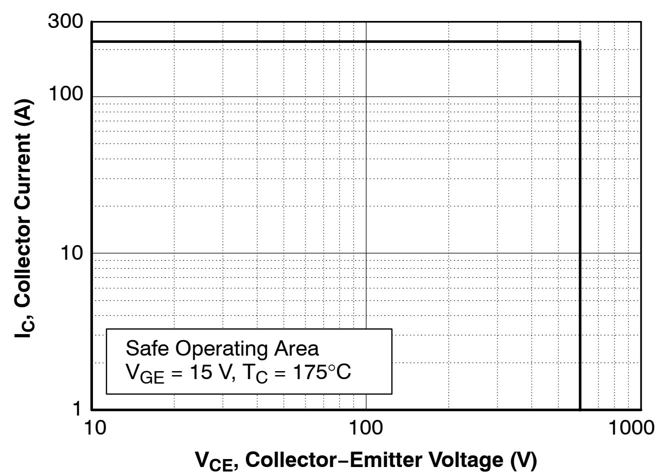


Figure 18. Turn Off Switching SOA Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

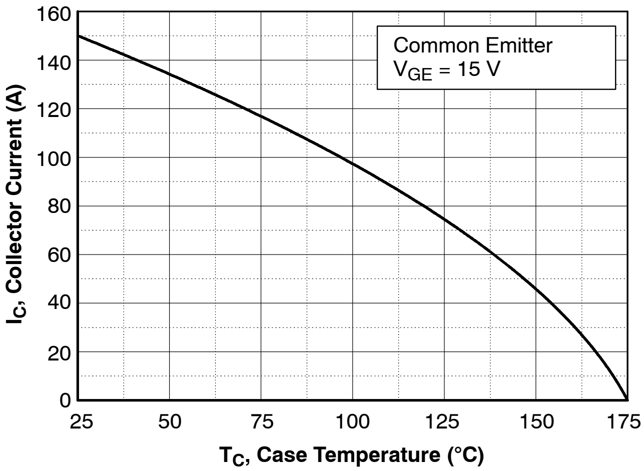


Figure 19. Current Derating

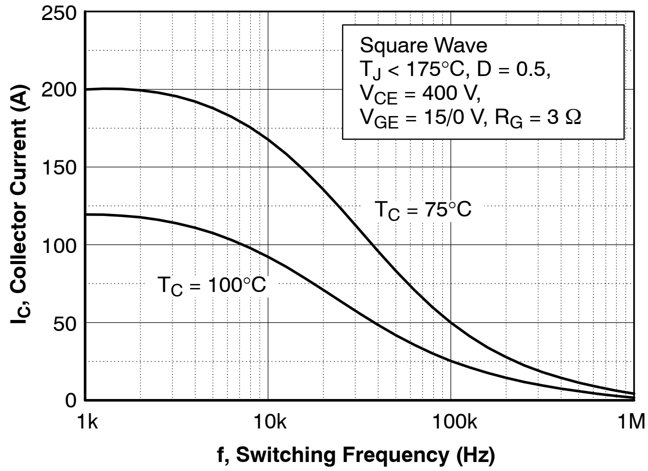


Figure 20. Load Current vs. Frequency

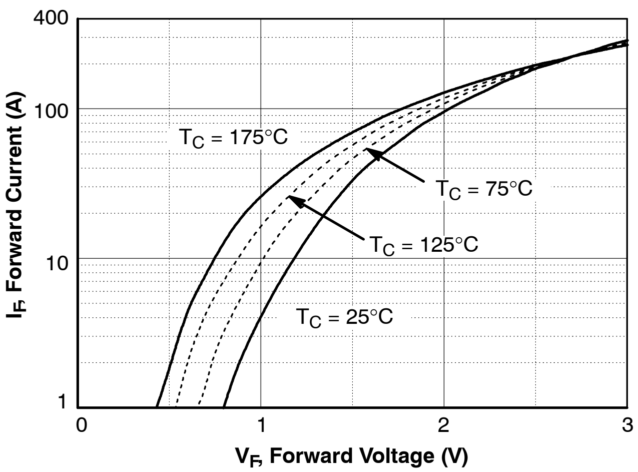


Figure 21. Forward Characteristics

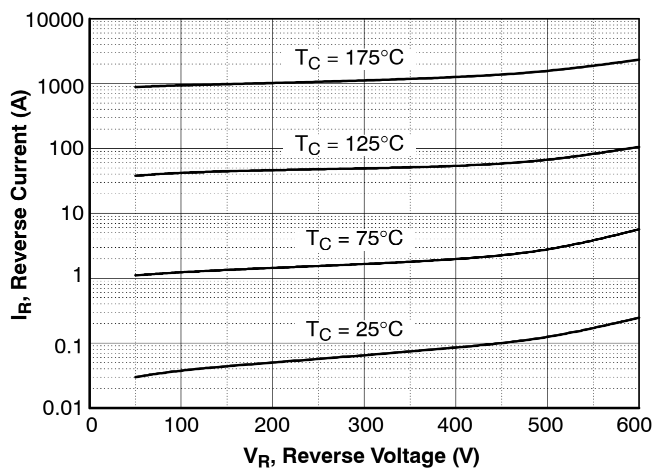


Figure 22. Reverse Current

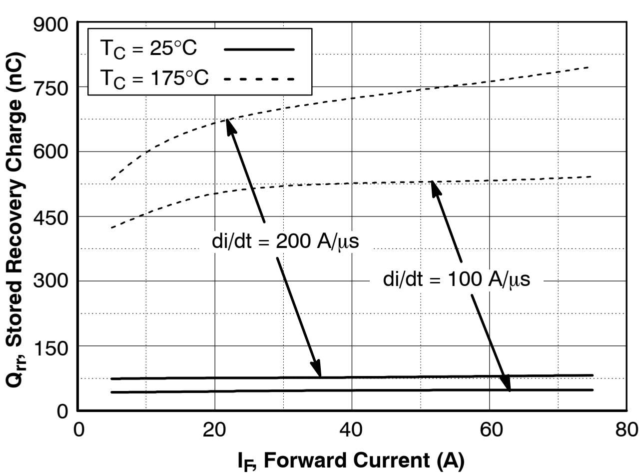


Figure 23. Stored Charge

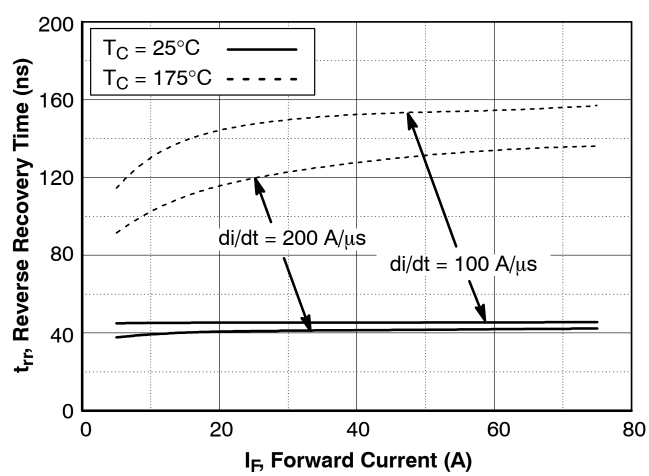


Figure 24. Reverse Recovery Current

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

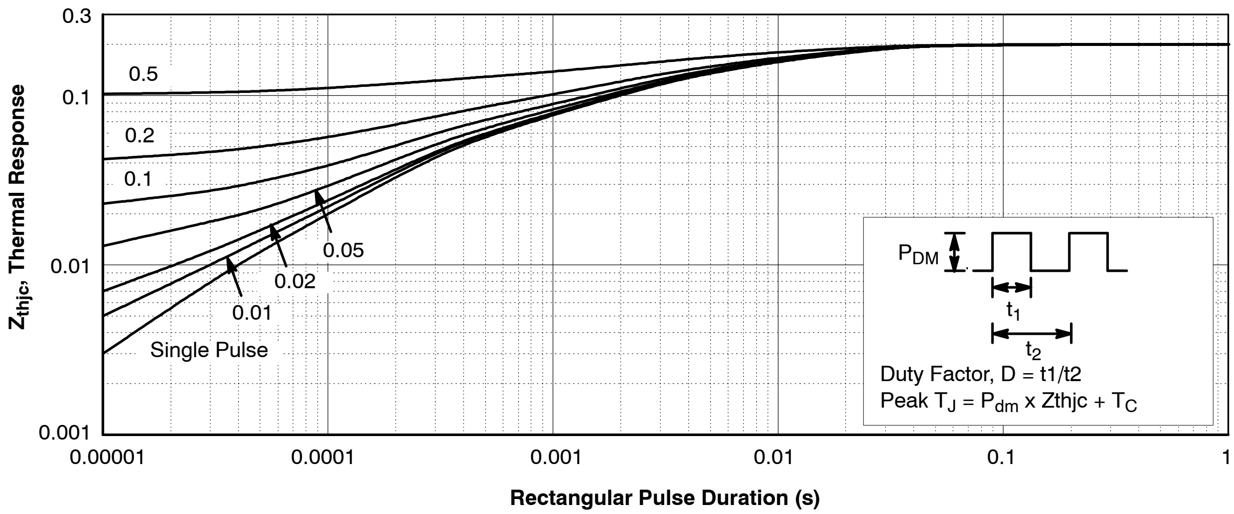


Figure 25. Transient Thermal Impedance of IGBT

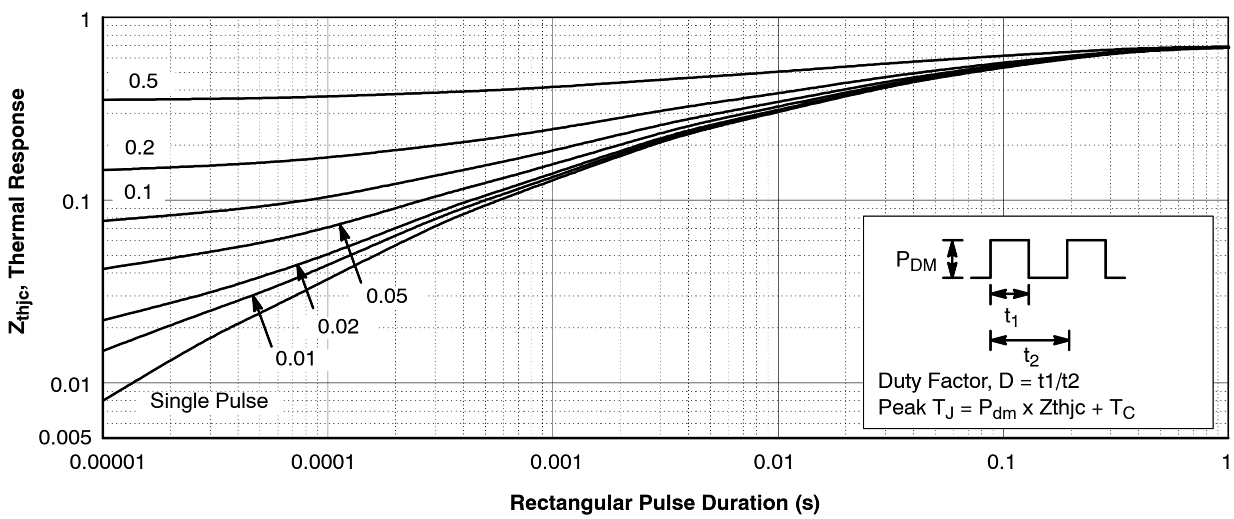
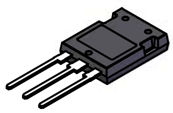


Figure 26. Transient Thermal Impedance of Diode

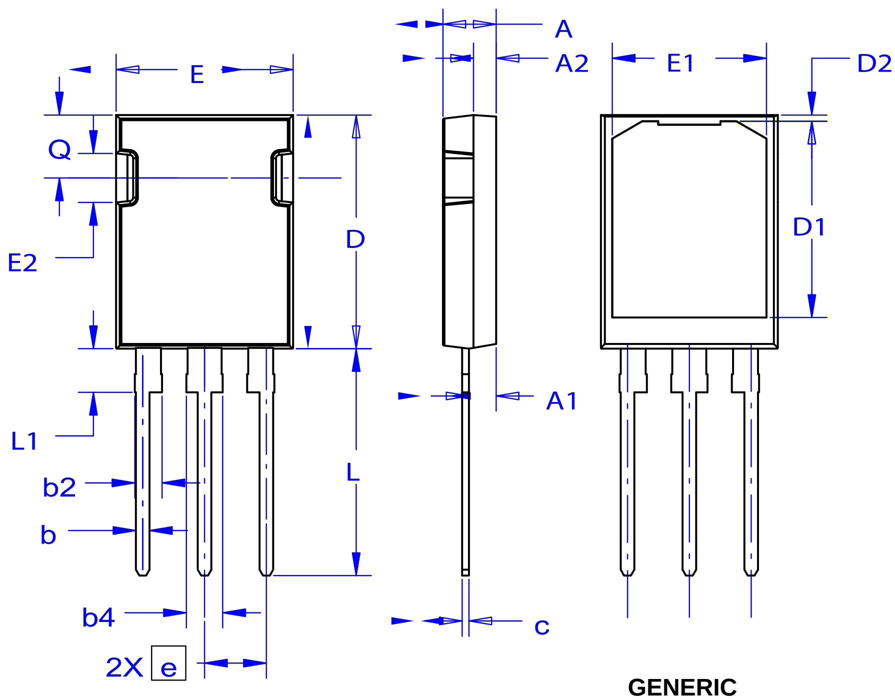


TO−247−3LD
CASE 340CD
ISSUE A

DATE 18 SEP 2018

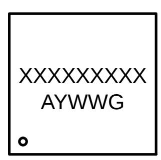
NOTES:

A. THIS PACKAGE DOES NOT CONFORM TO ANY STANDARDS.
B. ALL DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
D. DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.



DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.58	4.70	4.82
A1	2.20	2.40	2.60
A2	1.80	2.00	2.20
D	20.32	20.57	20.82
E	15.37	15.62	15.87
E2	4.12	4.32	4.52
e	~	5.45	~
L	19.90	20.00	20.10
L1	3.69	3.81	3.93
Q	5.34	5.46	5.58
b	1.10	1.20	1.30
b2	2.10	2.24	2.39
b4	2.87	3.04	3.20
c	0.51	0.61	0.71
D1	16.63	16.83	17.03
D2	0.51	0.93	1.35
E1	13.40	13.60	13.80

GENERIC MARKING DIAGRAM*



XXXX = 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.

DOCUMENT NUMBER:	**98AON13857G**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**TO−247−3LD**	**PAGE 1 OF 1**

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT
North American Technical Support:
Voice Mail: 1 800−282−9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:
Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative