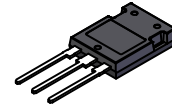


# IGBT, Field Stop

## 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 2<sup>nd</sup> 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:  $V_{CE(sat)} = 1.9\text{ V @ } I_C = 75\text{ A}$
- High Input Impedance
- Fast Switching:  $E_{OFF} = 10\text{ }\mu\text{J/A}$
- RoHS Compliant

#### Applications

- Solar Inverter, UPS, Welder, SMPS, PFC

#### ABSOLUTE MAXIMUM RATINGS

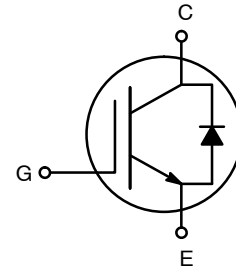
Symbol	Parameter	Value	Unit
$V_{CES}$	Collector to Emitter Voltage	600	V
$V_{GES}$	Gate to Emitter Voltage	$\pm 20$	V
	Transient Gate to Emitter Voltage	$\pm 30$	V
$I_C$	Collector Current, @ $T_C = 25^\circ\text{C}$	150	A
	Collector Current, @ $T_C = 100^\circ\text{C}$	75	A
$I_{CM(1)}$	Pulsed Collector Current, @ $T_C = 25^\circ\text{C}$	225	A
$I_F$	Diode Forward Current, @ $T_C = 25^\circ\text{C}$	75	A
	Diode Forward Current, @ $T_C = 100^\circ\text{C}$	50	A
$I_{FM(1)}$	Pulsed Diode Maximum Forward Current	225	A
$P_D$	Maximum Power Dissipation, @ $T_C = 25^\circ\text{C}$	750	W
	Maximum Power Dissipation, @ $T_C = 100^\circ\text{C}$	375	W
$T_J$	Operating Junction Temperature	-55 to +175	$^\circ\text{C}$
$T_{stg}$	Storage Temperature Range	-55 to +175	$^\circ\text{C}$
$T_L$	Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5 s	300	$^\circ\text{C}$

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.

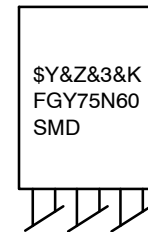
1. Repetitive rating: Pulse width limited by max. junction temperature.

#### THERMAL CHARACTERISTICS

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



#### 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

# FGY75N60SMD

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$BV_{CES}$	Collector to Emitter Breakdown Voltage	$V_{GE} = 0\text{ V}, I_C = 250\ \mu\text{A}$	600	–	–	V
$\Delta BV_{CES} / \Delta T_J$	Temperature Coefficient of Breakdown Voltage	$V_{GE} = 0\text{ V}, I_C = 250\ \mu\text{A}$	–	0.67	–	V/ $^\circ\text{C}$
$I_{CES}$	Collector Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0\text{ V}$	–	–	250	$\mu\text{A}$
$I_{GES}$	G–E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0\text{ V}$	–	–	$\pm 400$	nA

### ON CHARACTERISTICS

$V_{GE(th)}$	G–E Threshold Voltage	$I_C = 250\ \mu\text{A}, V_{CE} = V_{GE}$	3.5	5.0	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 75\text{ A}, V_{GE} = 15\text{ V}$	–	1.90	2.50	V
		$I_C = 75\text{ A}, V_{GE} = 15\text{ V}, T_C = 175^\circ\text{C}$	–	2.14	–	V

### DYNAMIC CHARACTERISTICS

$C_{ies}$	Input Capacitance	$V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	–	3800	–	pF
$C_{oes}$	Output Capacitance		–	390	–	pF
$C_{res}$	Reverse Transfer Capacitance		–	105	–	pF

### SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 400\text{ V}, I_C = 75\text{ A}, R_G = 3\ \Omega, V_{GE} = 15\text{ V},$ Inductive Load, $T_C = 25^\circ\text{C}$	–	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	$V_{CC} = 400\text{ V}, I_C = 75\text{ A}, R_G = 3\ \Omega, V_{GE} = 15\text{ V},$ Inductive Load, $T_C = 175^\circ\text{C}$	–	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	$V_{CE} = 400\text{ V}, I_C = 75\text{ A}, V_{GE} = 15\text{ V}$	–	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 ( $T_C = 25^\circ\text{C}$ unless otherwise noted.)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit	
$V_{FM}$	Diode Forward Voltage	$I_F = 50\text{ A}$	$T_C = 25^\circ\text{C}$	–	1.75	2.1	V
			$T_C = 175^\circ\text{C}$	–	1.35	–	
$E_{rec}$	Reverse Recovery Energy	$I_F = 50\text{ A},$ $di_F/dt = 200\text{ A}/\mu\text{s}$ $V_R = 400\text{ V}$	$T_C = 175^\circ\text{C}$	–	0.14	–	mJ
$t_{rr}$	Diode Reverse Recovery Time		$T_C = 25^\circ\text{C}$	–	41	55	ns
			$T_C = 175^\circ\text{C}$	–	126	–	
$Q_{rr}$	Diode Reverse Recovery Charge		$T_C = 25^\circ\text{C}$	–	81	115	nC
		$T_C = 175^\circ\text{C}$	–	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

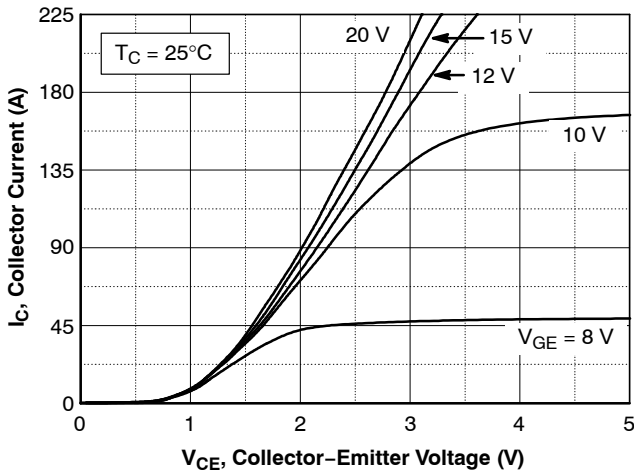


Figure 1. Typical Output Characteristics

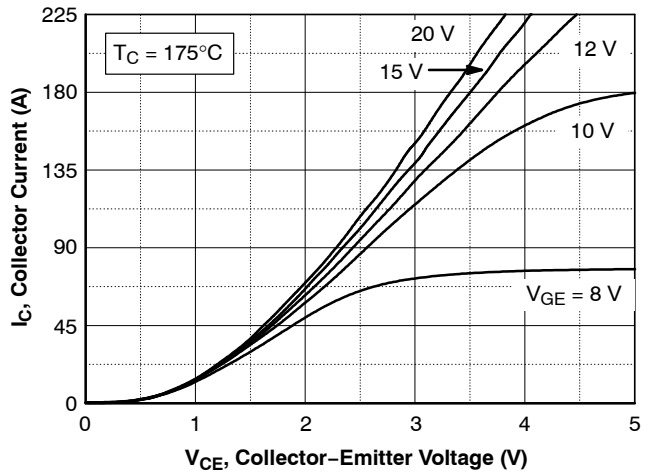


Figure 2. Typical Output Characteristics

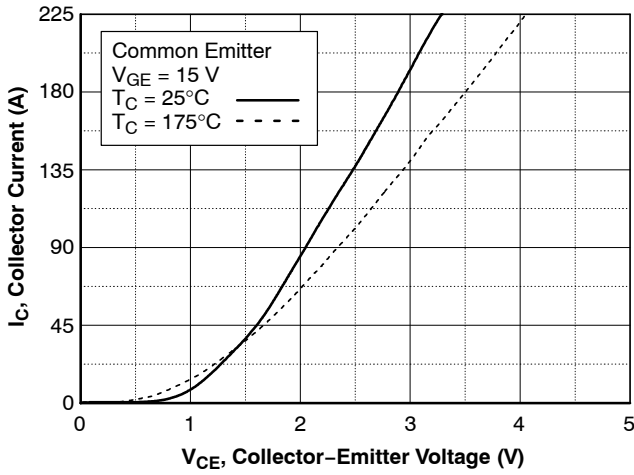


Figure 3. Typical Saturation Voltage Characteristics

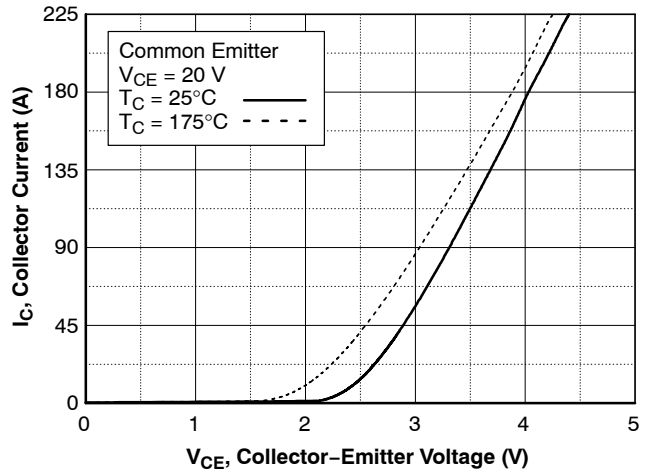


Figure 4. Transfer Characteristics

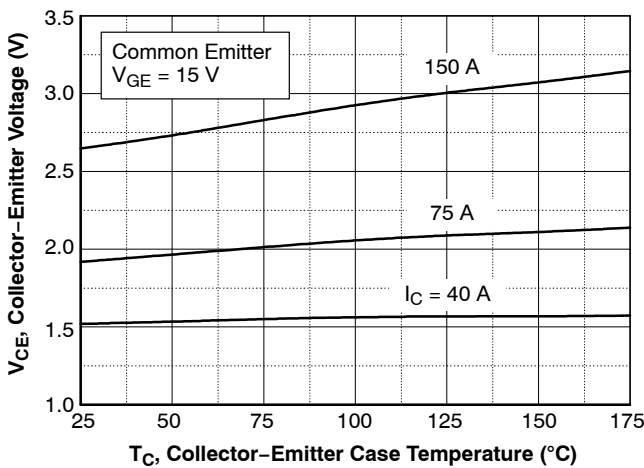


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

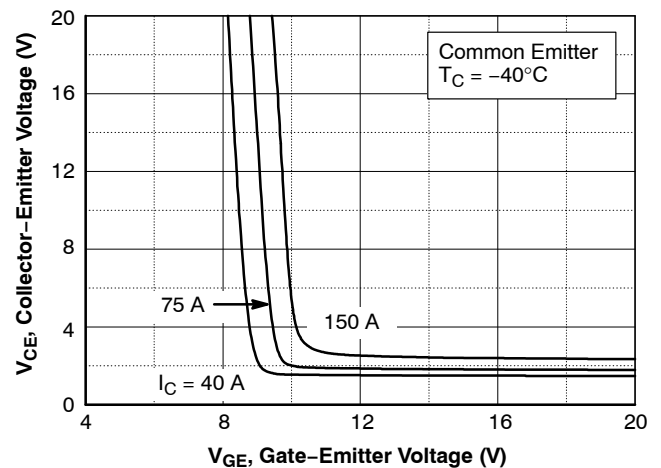


Figure 6. Saturation Voltage vs. VGE

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

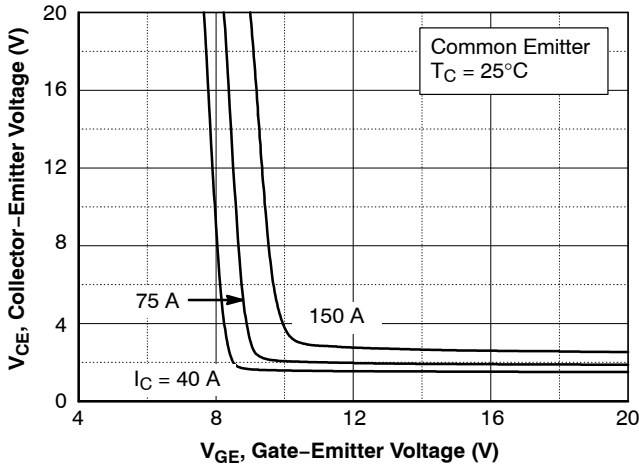


Figure 7. Saturation Voltage vs.  $V_{GE}$

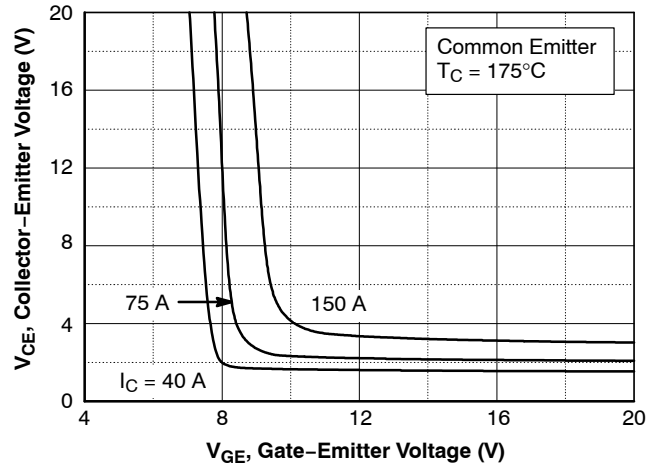


Figure 8. Saturation Voltage vs.  $V_{GE}$

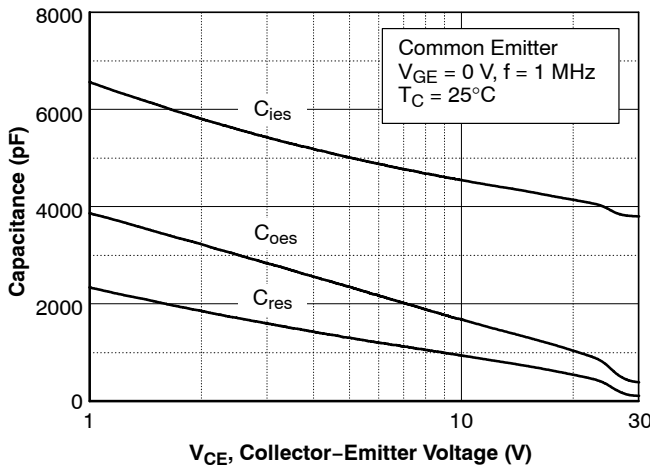


Figure 9. Capacitance Characteristics

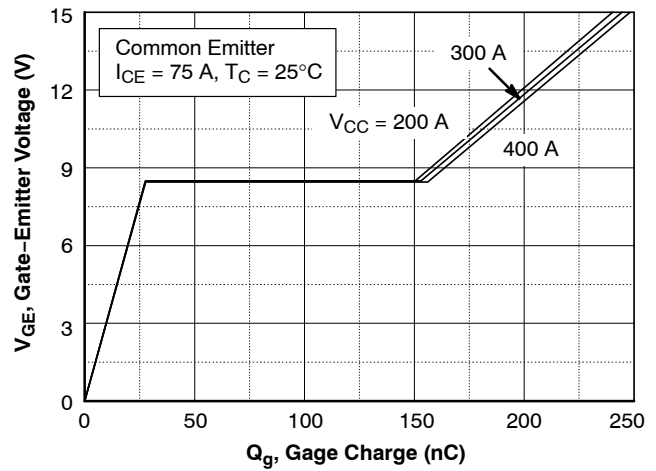


Figure 10. Gate Charge Characteristics

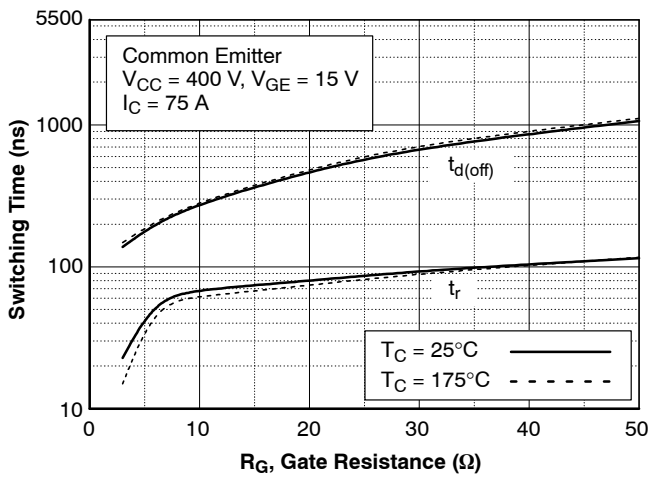


Figure 11. Turn-off Characteristics vs. Gate Resistance

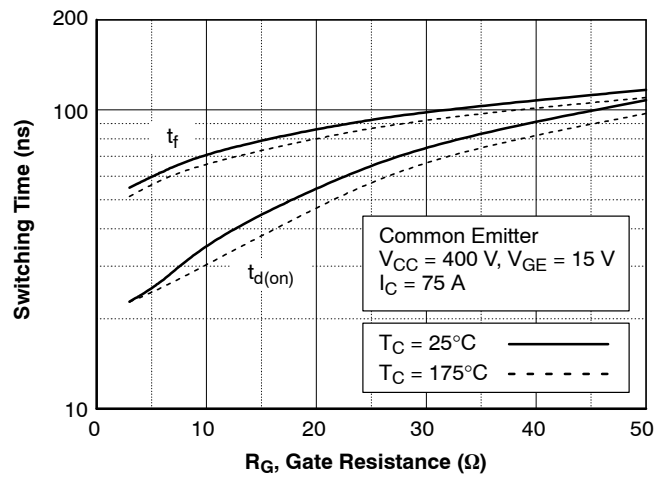


Figure 12. Turn-on Characteristics vs. Gate Resistance

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

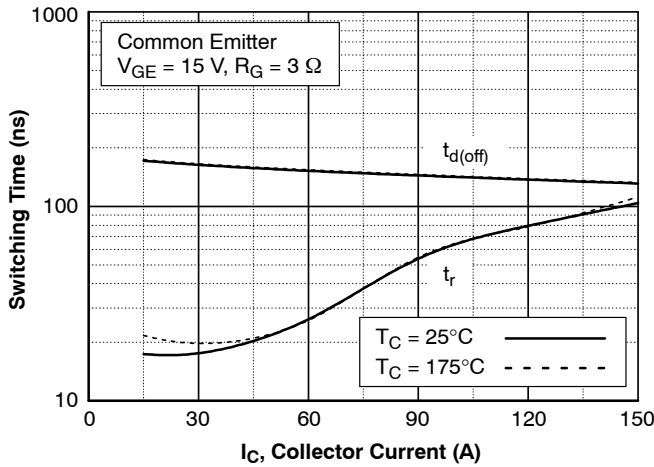


Figure 13. Turn-off Characteristics vs. Collector Current

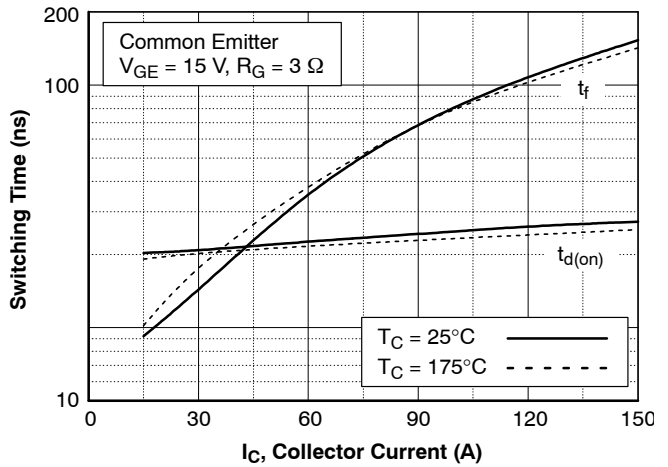


Figure 14. Turn-on Characteristics vs. Collector Current

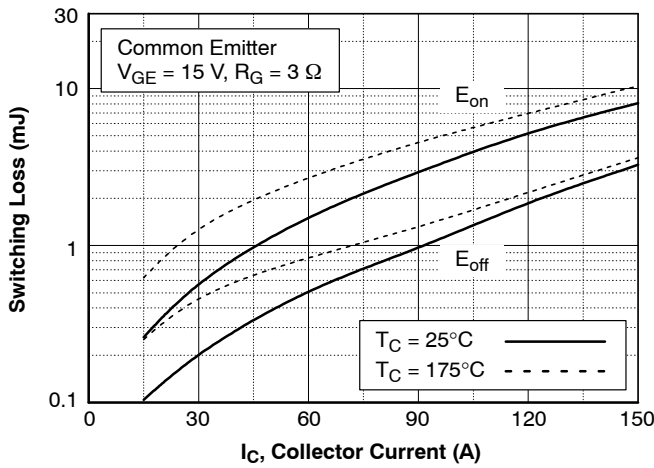


Figure 15. Switching Loss vs. Collector Current

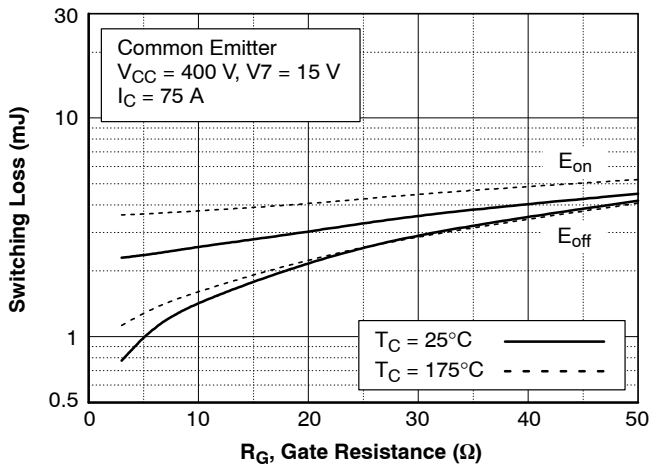


Figure 16. Switching Loss vs. Gate Resistance

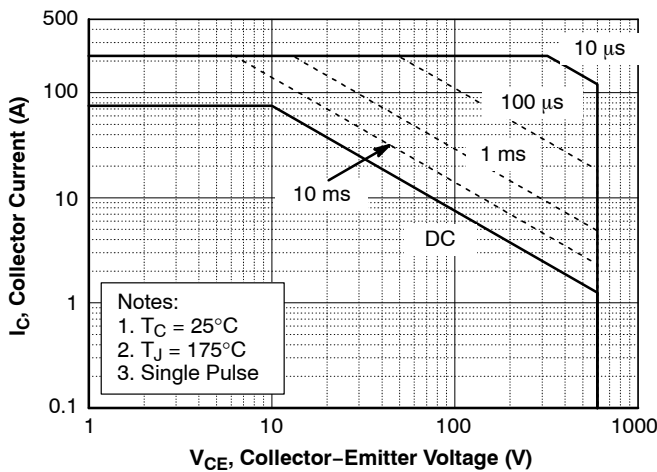


Figure 17. SOA Characteristics

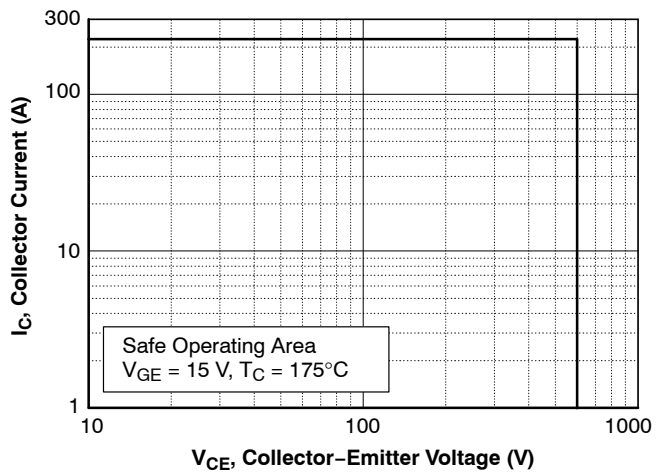


Figure 18. Turn Off Switching SOA Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

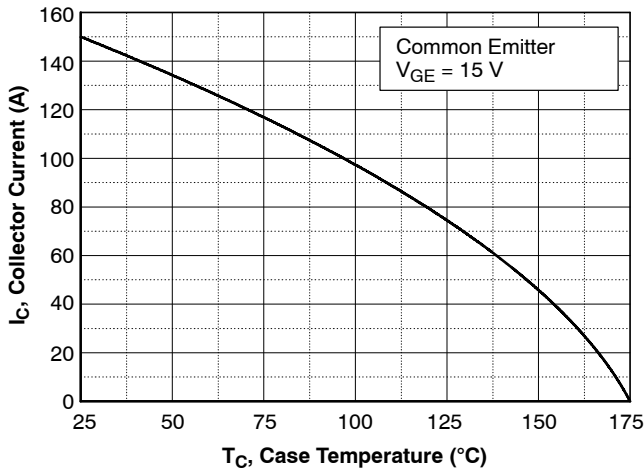


Figure 19. Current Derating

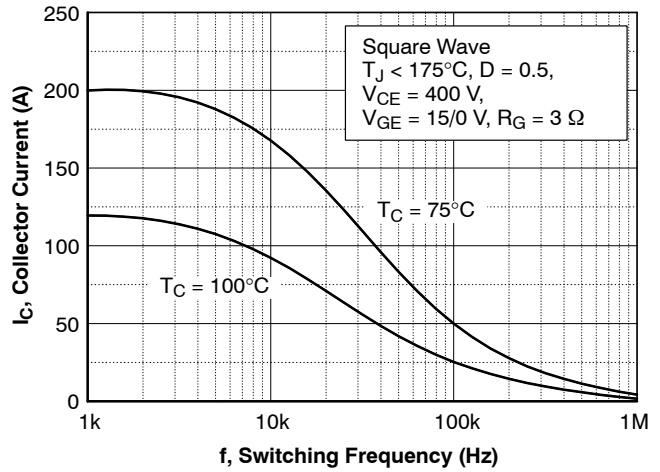


Figure 20. Load Current vs. Frequency

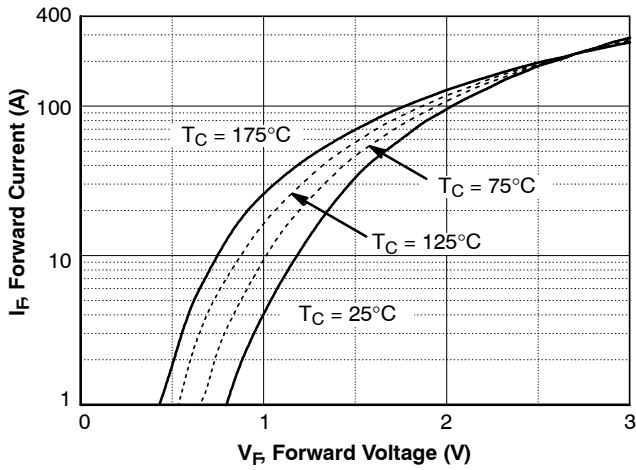


Figure 21. Forward Characteristics

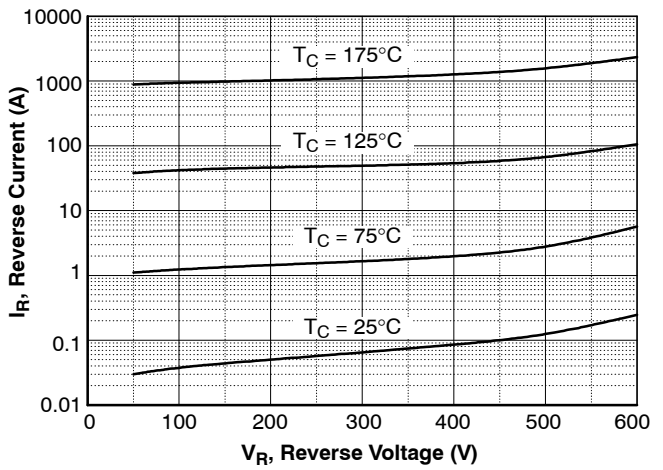


Figure 22. Reverse Current

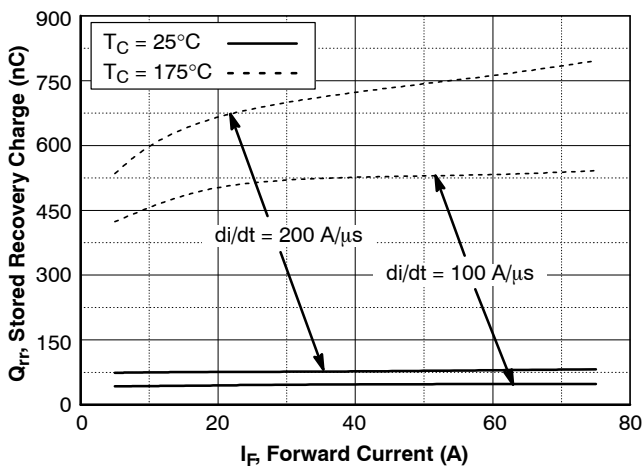


Figure 23. Stored Charge

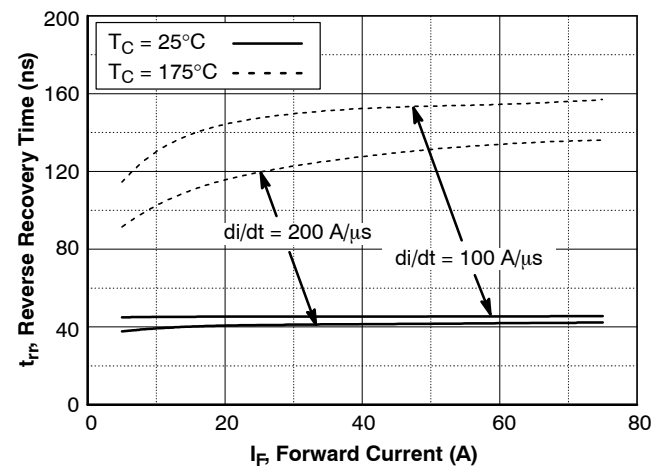


Figure 24. Reverse Recovery Current

# FGY75N60SMD

## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

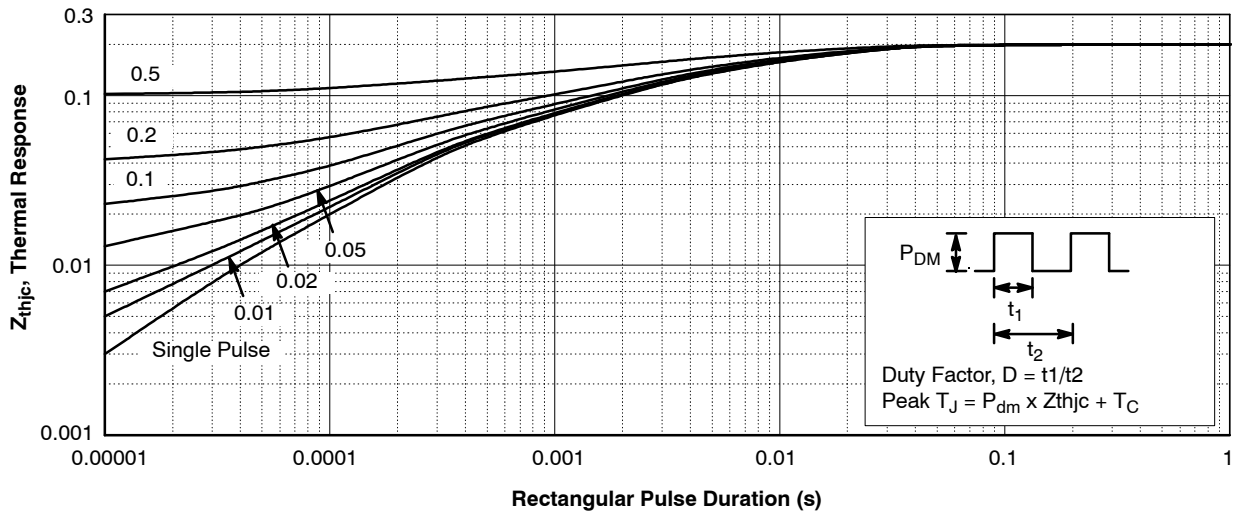


Figure 25. Transient Thermal Impedance of IGBT

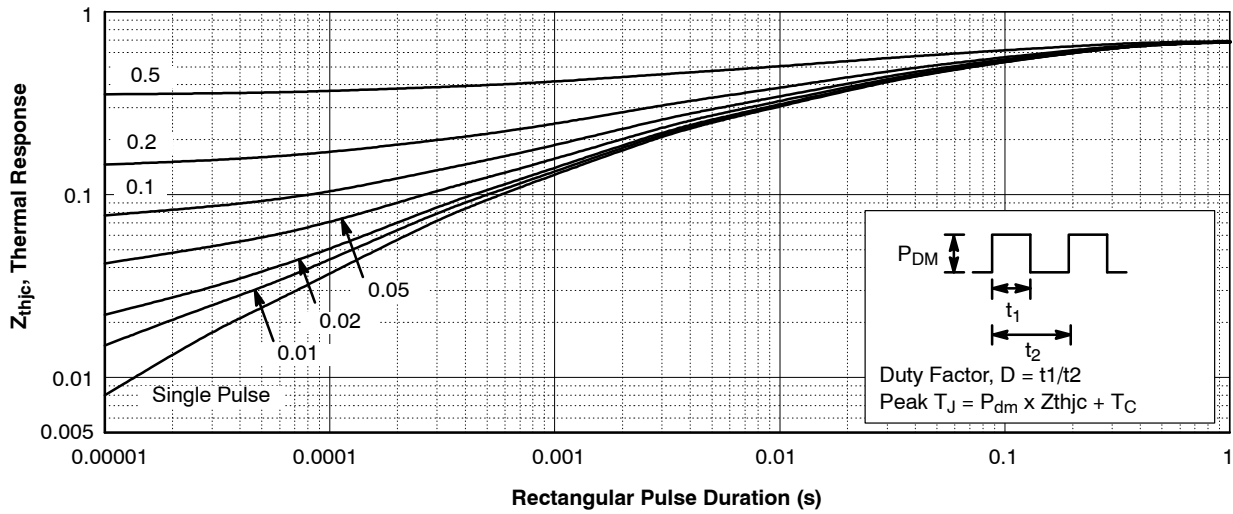


Figure 26. Transient Thermal Impedance of Diode

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



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.

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<b>DESCRIPTION:</b>	<b>TO-247-3LD</b>	<b>PAGE 1 OF 1</b>

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