IGBT - Field Stop
600 V, 80 A

FGH80N60FD

Description

Using Novel Field Stop IGBT Technology, ON Semiconductor's field stop IGBTs offer the optimum performance for induction heating, telecom, ESS and PFC applications where low conduction and switching losses are essential.

Features

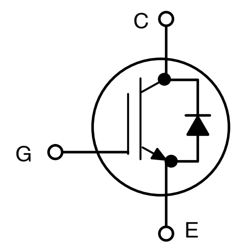
- High Current Capability
- Low Saturation Voltage: $V_{CE(sat)}$ = 1.8 V @ I_C = 40 A
- High Input Impedance
- Fast Switching
- This Device is Pb−Free and is RoHS Compliant

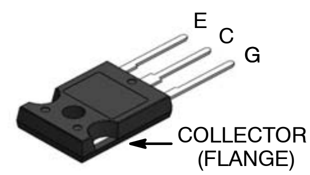
Applications

- Induction Heating, PFC, Telecom, ESS

ON Semiconductor®

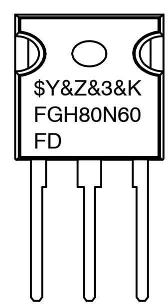
www.onsemi.com





TO−247−3LD
CASE 340CK

MARKING DIAGRAM



$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Numeric Date Code
&K	= Lot Code
FGH80N60FD	= Specific Device Code

ORDERING INFORMATION

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

February, 2020 − Rev. 3

Publication Order Number:
FGH80N60FD/D

ABSOLUTE MAXIMUM RATINGS

Description		Symbol	Ratings	Unit
Collector to Emitter Voltage		V_{CES}	600	V
Gate to Emitter Voltage		V_{GES}	±20	V
Collector Current	T_C = 25°C	I_C	80	A
	T_C = 100°C		40	A
Pulsed Collector Current	T_C = 25°C	I_{CM} (Note 1)	160	A
Maximum Power Dissipation	T_C = 25°C	P_D	290	W
	T_C = 100°C		116	W
Operating Junction Temperature		T_J	−55 to +150	°C
Storage Temperature Range		T_{stg}	−55 to +150	°C
Maximum Lead Temperature for Soldering, 1/8″ from Case for 5 Seconds		T_L	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

Parameter	Symbol	Max.	Unit
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$ (IGBT)	0.43	°C/W
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$ (Diode)	1.5	°C/W
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	40	°C/W

PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Mark	Package	Package Method	Reel Size	Tape Width	Quantity
FGH80N60FDTU	FGH80N60FD	TO−247	Tube	N/A	N/A	30

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector to Emitter Breakdown Voltage	BV_{CES}	V_{GE} = 0 V, I_C = 250 μA	600	–	–	V
Temperature Coefficient of Breakdown Voltage	$\Delta BV_{CES}/\Delta T_J$	V_{GE} = 0 V, I_C = 250 μA	–	0.6	–	V/°C
Collector Cut−Off Current	I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0 V	–	–	250	μA
G−E Leakage Current	I_{GES}	V_{GE} = V_{GES}, V_{CE} = 0 V	–	–	±400	nA
ON CHARACTERISTICs						
G−E Threshold Voltage	$V_{GE(th)}$	I_C = 250 μA, V_{CE} = V_{GE}	4.5	5.5	7.0	V
Collector to Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 40 A, V_{GE} = 15 V	–	1.8	2.4	V
		I_C = 40 A, V_{GE} = 15 V, T_C = 125°C	–	2.05	–	V
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ies}	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	–	2110	–	pF
Output Capacitance	C_{oes}		–	200	–	pF
Reverse Transfer Capacitance	C_{res}		–	60	–	pF

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS						
Turn−On Delay Time	$t_{d(on)}$	V_{CC} = 400 V, I_C = 40 A, R_G = 10 Ω, V_{GE} = 15 V, Inductive Load, T_C = 25°C	–	21	–	ns
Rise Time	t_r		–	56	–	ns
Turn−Off Delay Time	$t_{d(off)}$		–	126	–	ns
Fall Time	t_f		–	50	100	ns
Turn−On Switching Loss	E_{on}		–	1	1.5	mJ
Turn−Off Switching Loss	E_{off}		–	0.52	0.78	mJ
Total Switching Loss	E_{ts}		–	1.52	2.28	mJ
Turn−On Delay Time	$t_{d(on)}$	V_{CC} = 400 V, I_C = 40 A, R_G = 10 Ω, V_{GE} = 15 V, Inductive Load, T_C = 125°C	–	20	–	ns
Rise Time	t_r		–	54	–	ns
Turn−Off Delay Time	$t_{d(off)}$		–	131	–	ns
Fall Time	t_f		–	70	–	ns
Turn−On Switching Loss	E_{on}		–	1.1	–	mJ
Turn−Off Switching Loss	E_{off}		–	0.78	–	mJ
Total Switching Loss	E_{ts}		–	1.88	–	mJ
Total Gate Charge	Q_g	V_{CE} = 400 V, I_C = 40 A, V_{GE} = 15 V	–	120	–	nC
Gate to Emitter Charge	Q_{ge}		–	14	–	nC
Gate to Collector Charge	Q_{gc}		–	58	–	nC

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

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Diode Forward Voltage	V_{FM}	I_F = 20 A	T_C = 25°C	–	2.3	2.8	V
			T_C = 125°C	–	1.7	–	
Diode Reverse Recovery Time	t_{rr}	I_F = 20 A, di_F/dt = 200 A/μs	T_C = 25°C	–	36	–	ns
			T_C = 125°C	–	105	–	
Diode Reverse Recovery Current	I_{rr}		T_C = 25°C	–	2.6	–	A
			T_C = 125°C	–	7.8	–	
Diode Reverse Recovery Charge	Q_{rr}		T_C = 25°C	–	46.8	–	nC
			T_C = 125°C	–	409	–	

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

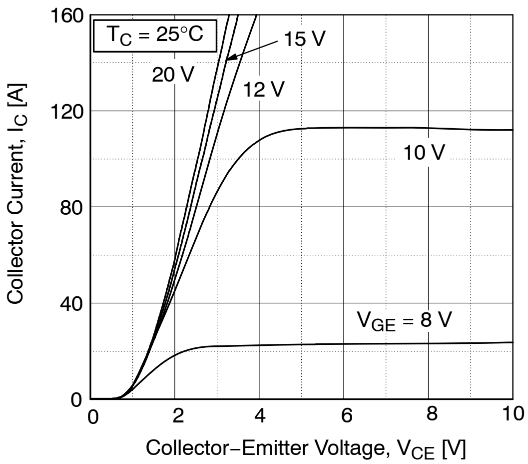


Figure 1. Typical Output Characteristics

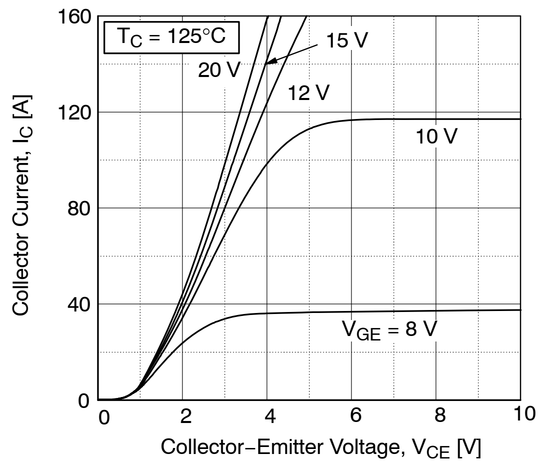


Figure 2. Typical Saturation Voltage Characteristics

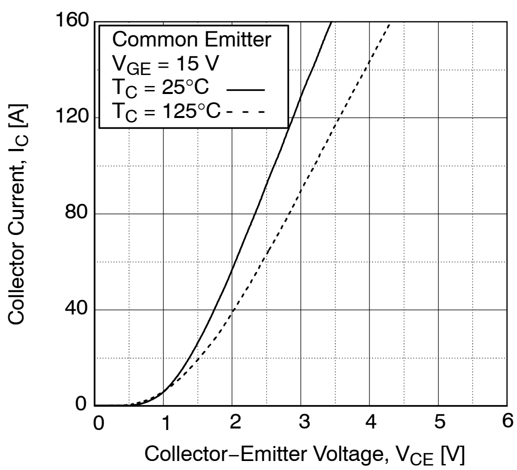


Figure 3. Typical Saturation Voltage Characteristics

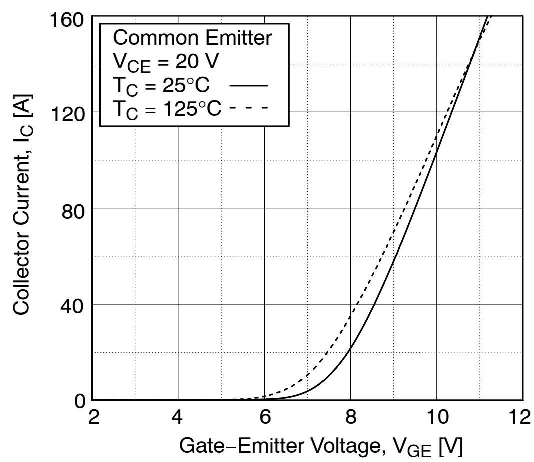


Figure 4. Transfer Characteristics

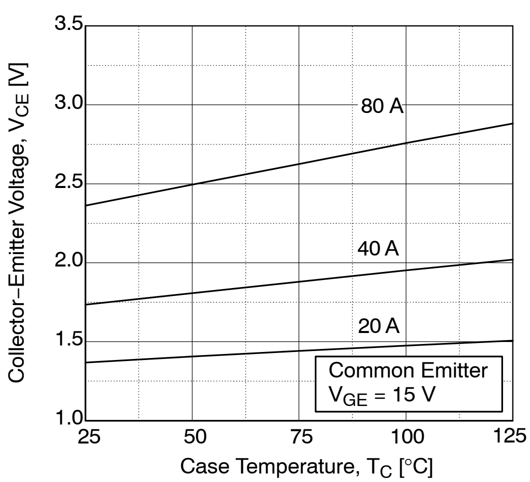


Figure 5. Saturation Voltage vs. Case Temperature

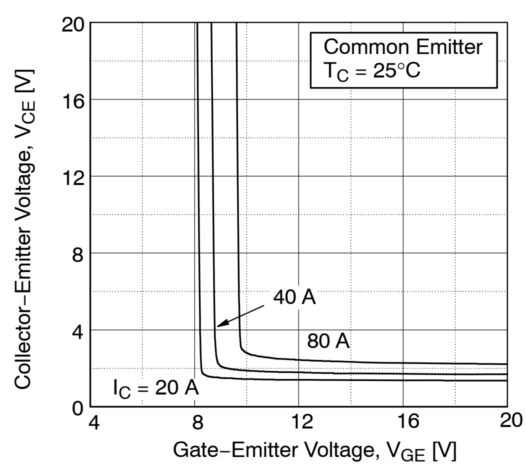


Figure 6. Saturation Voltage vs. V_{GE}

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

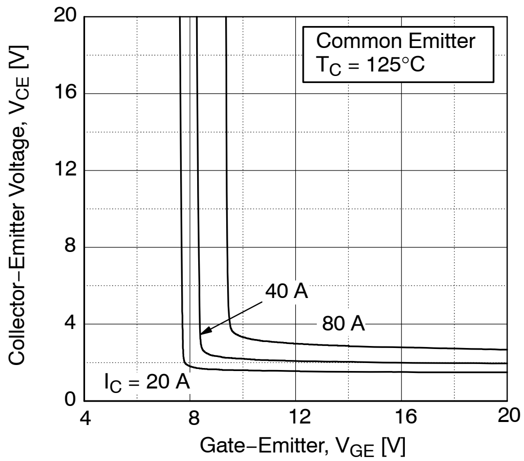


Figure 7. Saturation Voltage vs. V_{GE}

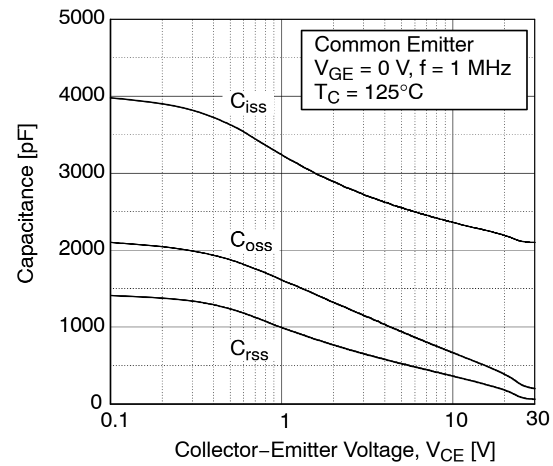


Figure 8. Capacitance Characteristics

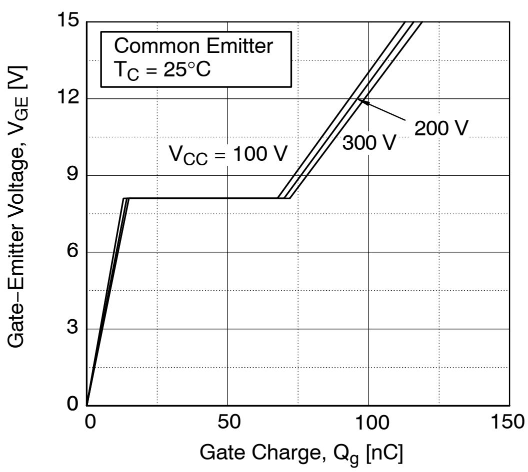


Figure 9. Gate Charge Characteristics

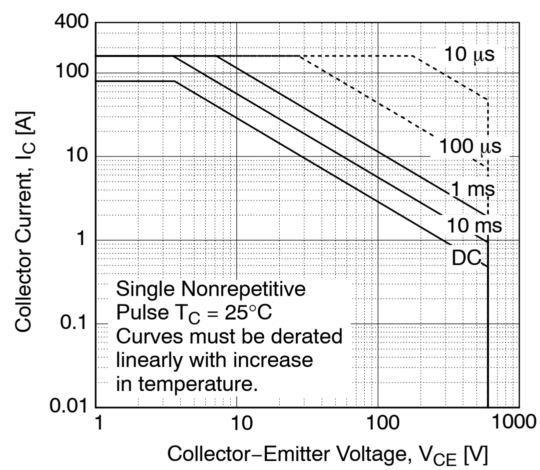


Figure 10. SOA Characteristics

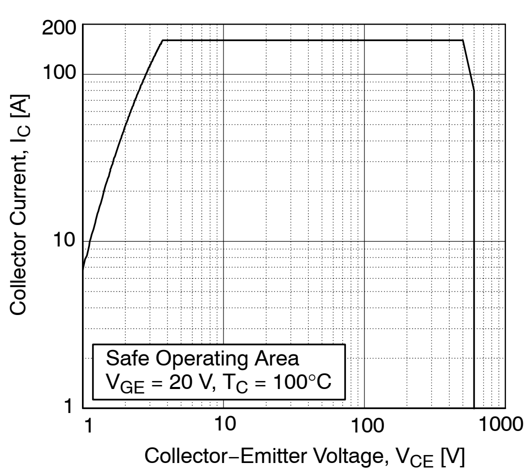


Figure 11. Turn−Off Switching SOA Characteristics

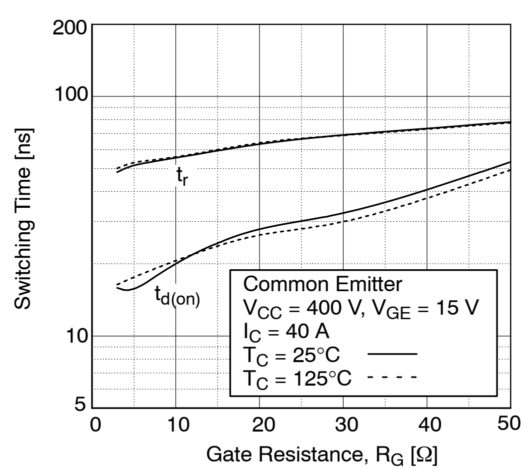


Figure 12. Turn−On Characteristics vs. Gate Resistance

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

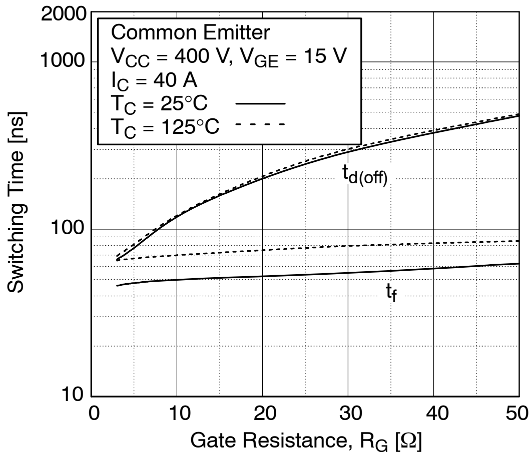


Figure 13. Turn−Off Characteristics vs. Gate Resistance

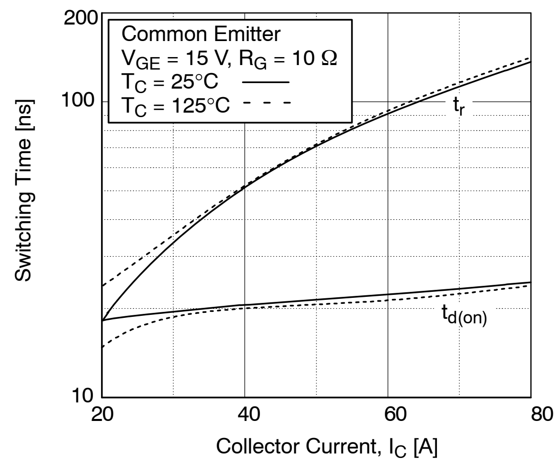


Figure 14. Turn−On Characteristics vs. Collector Current

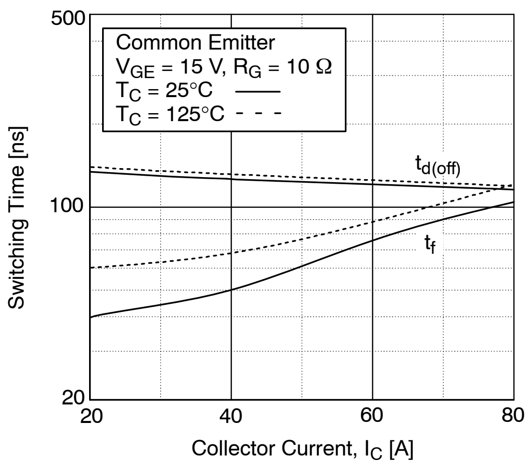


Figure 15. Turn−Off Characteristics vs. Collector Current

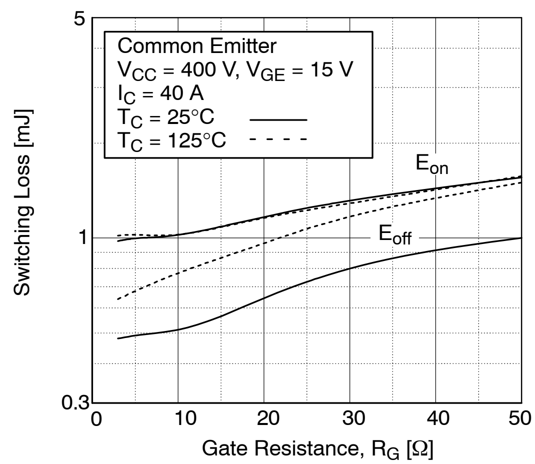


Figure 16. Switching Loss vs. Gate Resistance

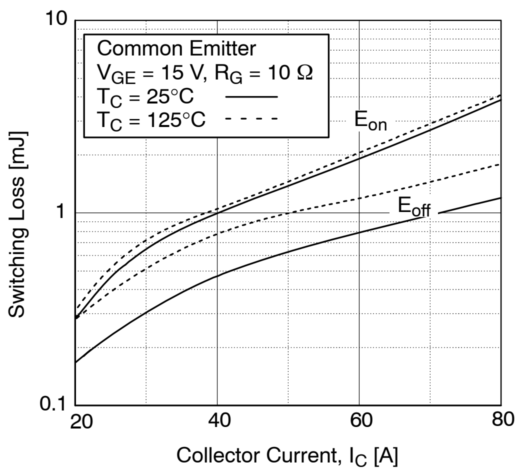


Figure 17. Switching Loss vs. Collector Current

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

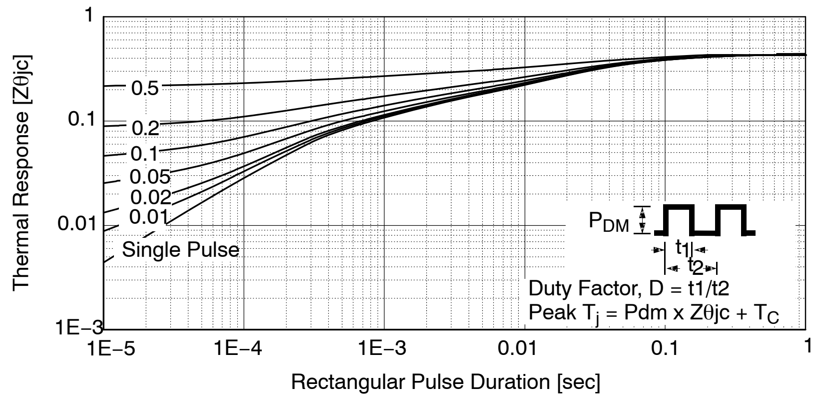


Figure 18. Transient Thermal Impedance of IGBT

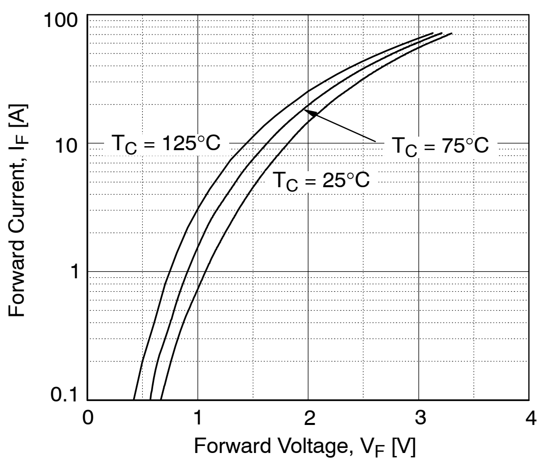


Figure 19. Forward Characteristics

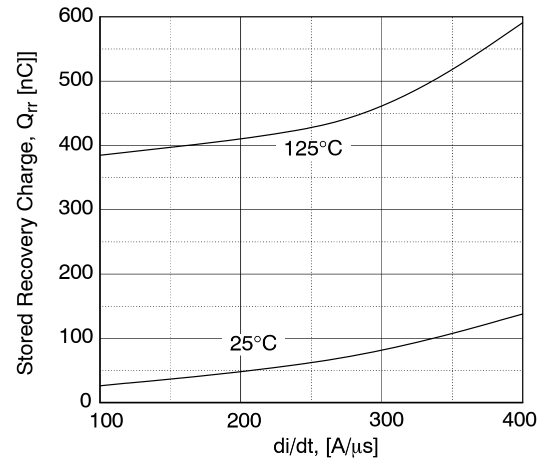


Figure 20. Stored Charge

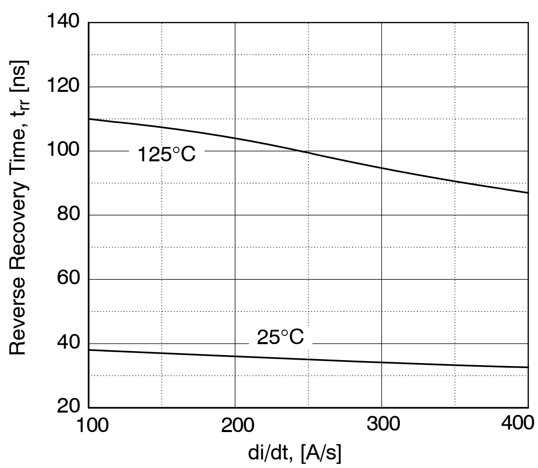


Figure 21. Reverse Recovery Time

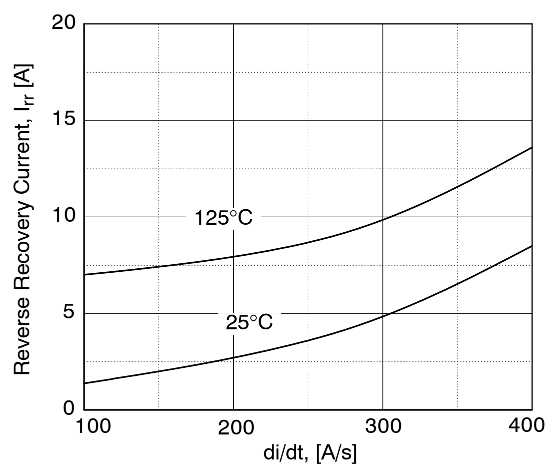


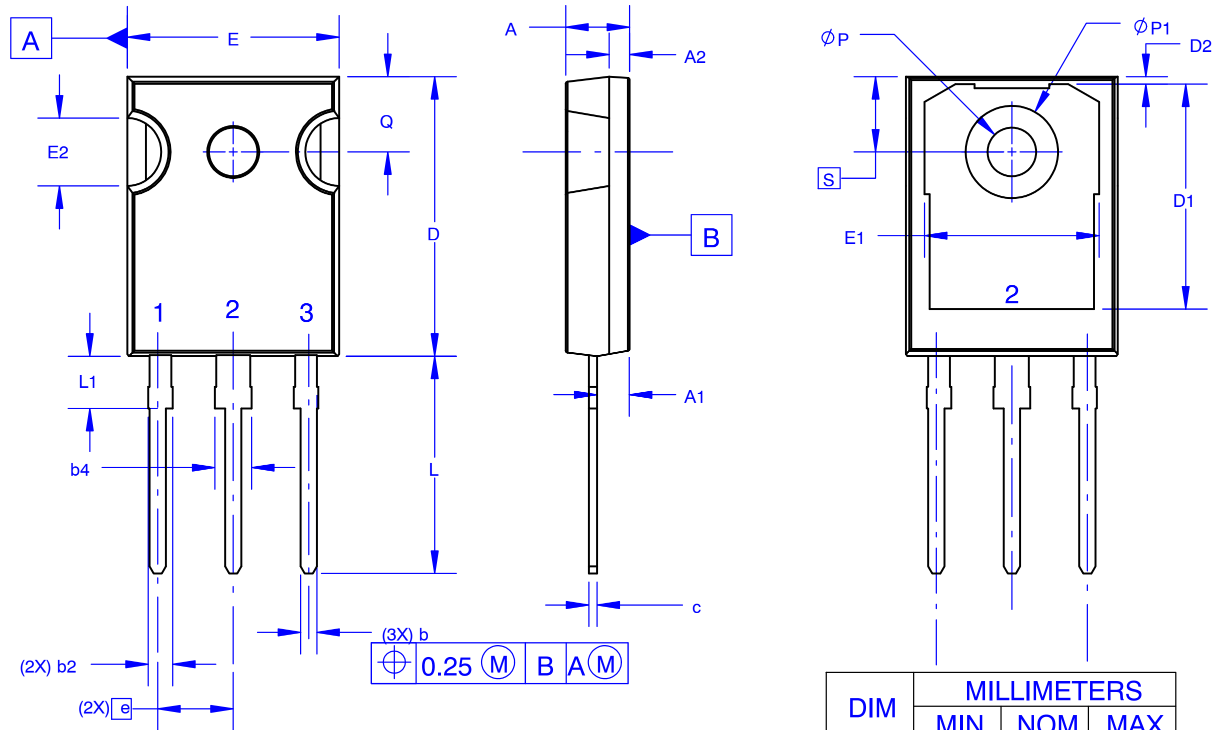
Figure 22. Reverse Recovery Current

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®

TO−247−3LD SHORT LEAD
CASE 340CK
ISSUE A

DATE 31 JAN 2019



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
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
D	20.32	20.57	20.82
D1	13.08	~	~
D2	0.51	0.93	1.35
E	15.37	15.62	15.87
E1	12.81	~	~
E2	4.96	5.08	5.20
e	~	5.56	~
L	15.75	16.00	16.25
L1	3.69	3.81	3.93
ØP	3.51	3.58	3.65
ØP1	6.60	6.80	7.00
Q	5.34	5.46	5.58
S	5.34	5.46	5.58

GENERIC MARKING DIAGRAM*

AYWWZZ
XXXXXXX
XXXXXXX
∘

XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Assembly Lot Code

*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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DESCRIPTION:	TO−247−3LD SHORT LEAD	PAGE 1 OF 1

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