IGBT - Field Stop, Trench

650 V, 75 A

Product Preview

FGH75T65SHDTLN4

Using the novel field stop 3rd generation IGBT technology, FGH75T65SHDTLN4 offers the optimum performance for solar inverter, UPS, welder, telecom, ESS and PFC applications where low conduction loss and switching loss are essential.

Features

- Maximum Junction Temperature: T_J = 175°C
- Positive Temperature Co−efficient for Easy Parallel Operating
- High Current Capability
- Low Saturation Voltage: $V_{CE(Sat)}$ = 1.6 V (Typ.) @ I_C = 75 A
- 100% of the Parts Tested for I_{LM}(1)
- High Input Impedance
- Fast Switching
- Tight Parameter Distribution
- Pb Free and RoHS Compliant
- Not Recommended for Reflow and Full PKG Dipping

Typical Applications

- Solar Inverter
- UPS
- Welder
- Telecom
- ESS
- PFC

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Parameter		Symbol	Value	Unit
Collector−to−Emitter Voltage		V_{CES}	650	V
Gate−to−Emitter Voltage Transient Gate−to−Emitter Voltage		V_{GES}	±20 ±30	V
Collector Current	T_C = 25°C	I_C	150	A
	T_C = 100°C		75	
Pulsed Collector Current (Note 1)		I_{LM}	300	A
Pulsed Collector Maximum Current (Note 2)		I_{CM}	300	A
Diode Forward Current	T_C = 25°C	I_F	125	A
	T_C = 100°C		75	
Pulsed Diode Maximum Forward Current (Note 2)		I_{FM}	300	A
Maximum Power Dissipation	T_C = 25°C	P_D	455	W
	T_C = 100°C		227	
Operating Junction and Storage Temperature Range		T_J, T_{STG}	−55 to +175	°C
Maximum Lead Temperature for Soldering Purposes (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. V_{CC} = 400 V, V_{GE} = 15 V, I_C = 300 A, R_G = 73 Ω, Inductive Load
2. Repetitive rating: pulse width limited by max. Junction temperature

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

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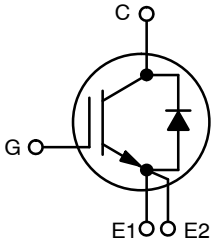
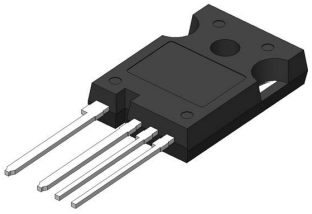
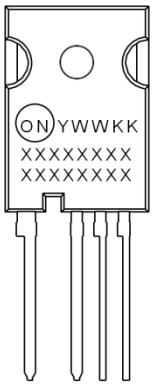
75 A, 650 V
$V_{CE(sat)}$ = 1.6 V
E_{on} = 1.06 mJ





TO−247
THIN LEADS
CASE 340CW

DEVICE MARKING INFORMATION



Line 1: Date Code
Line 2: Device Marking
Line 3: Device Marking

ORDERING INFORMATION

Device	Package	Shipping
FGH75T65SHDTLN4	TO−247	30 Units / Tube

Table 1. THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, for IGBT	0.33	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case, for Diode	0.65	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	40	°C/W

Table 2. ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector−emitter breakdown voltage, gate−emitter short−circuited	BV_{CES}	V_{GE} = 0 V, I_C = 1 mA	650	–	–	V
Temperature Coefficient of Breakdown Voltage	$\Delta BV_{CES}/\Delta T_J$	V_{GE} = 0 V, I_C = 1 mA	–	0.65	–	V/°C
Collector−emitter cut−off current, gate−emitter short−circuited	I_{CES}	V_{GE} = 0 V, V_{CE} = 650 V	–	–	250	μA
Gate leakage current, collector−emitter short−circuited	I_{GES}	V_{GE} = ±20 V, V_{CE} = 0 V	–	–	±400	nA
ON CHARACTERISTICS						
Gate−emitter threshold voltage	$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 75 mA	4.0	5.5	7.5	V
Collector−emitter saturation voltage	$V_{CE(sat)}$	V_{GE} = 15 V, I_C = 75 A, V_{GE} = 15 V, I_C = 75 A, T_J = 175°C	– –	1.6 2.28	2.1 –	mV/°C
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ies}	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	–	3710	–	pF
Output Capacitance	C_{oes}		–	183	–	
Reverse Transfer Capacitance	C_{res}		–	43	–	
Gate Charge Total	Q_g	V_{CE} = 400 V, I_C = 75 A, V_{GE} = 15 V	–	126	–	nC
Gate−to−Emitter Charge	Q_{ge}		–	24.1	–	
Gate−to−Collector Charge	Q_{gc}		–	47.6	–	
SWITCHING CHARACTERISTICS, INDUCTIVE LOAD						
Turn−On Delay Time	$t_{d(on)}$	T_C = 25°C V_{CC} = 400 V, I_C = 75 A Rg = 15 Ω V_{GE} = 15 V Inductive Load, T_C = 25°C	–	55	–	ns
Rise Time	t_r		–	50	–	
Turn−Off Delay Time	$t_{d(off)}$		–	189	–	
Fall Time	t_f		–	39	–	
Turn−On Switching Loss	E_{on}		–	1.06	–	mJ
Turn−Off Switching Loss	E_{off}		–	1.56	–	
Total Switching Loss	E_{ts}		–	2.62	–	
Turn−On Delay Time	$t_{d(on)}$	V_{CC} = 400 V, I_C = 75 A Rg = 15 Ω V_{GE} = 15 V Inductive Load, T_C = 175°C	–	48	–	ns
Rise Time	t_r		–	56	–	
Turn−Off Delay Time	$t_{d(off)}$		–	205	–	
Fall Time	t_f		–	40	–	
Turn−On Switching Loss	E_{on}		–	2.34	–	mJ
Turn−Off Switching Loss	E_{off}		–	1.81	–	
Total Switching Loss	E_{ts}		–	4.15	–	
DIODE CHARACTERISTICS						
Forward voltage	V_F	I_F = 75 A I_F = 75 A, T_J = 175°C	– –	1.8 1.7	2.1 –	V

Table 2. ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
DIODE CHARACTERISTICS						
Reverse Recovery Time	t_{rr}	T_J = 25°C I_F = 75 A, di_F/dt = 200 A/μs	–	36	–	ns
Reverse Recovery Charge	Q_{rr}		–	18	–	
Reverse Recovery Time	t_{rr}	T_J = 175°C I_F = 75 A, di_F/dt = 200 A/μs	–	270	–	ns
Reverse Recovery Charge	Q_{rr}		–	2199	–	μC
Reverse Recovery Energy	E_{rec}		–	160	–	μJ

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

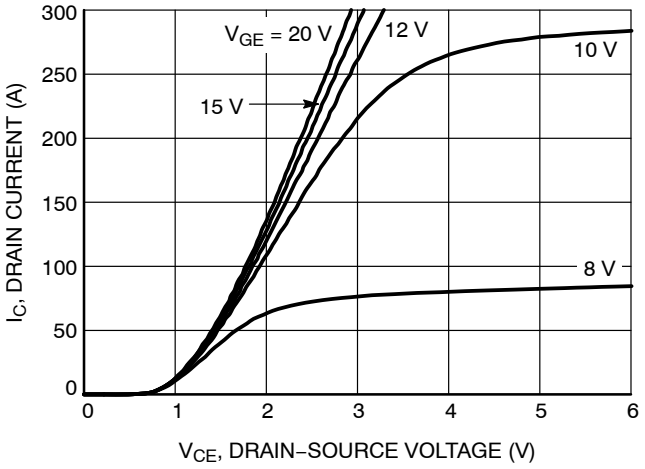


Figure 1. Typical Output Characteristics (25°C)

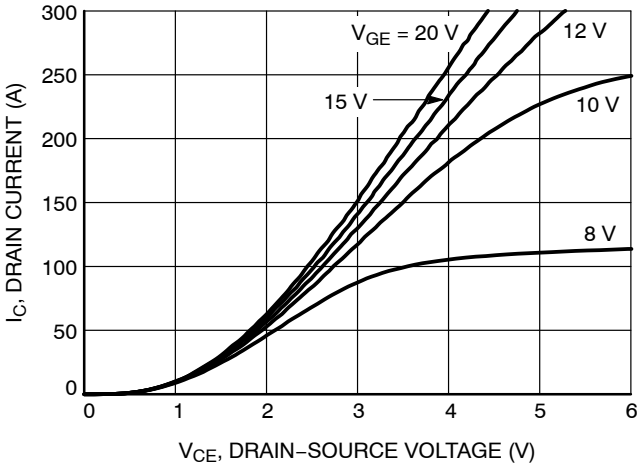


Figure 2. Typical Output Characteristics (175°C)

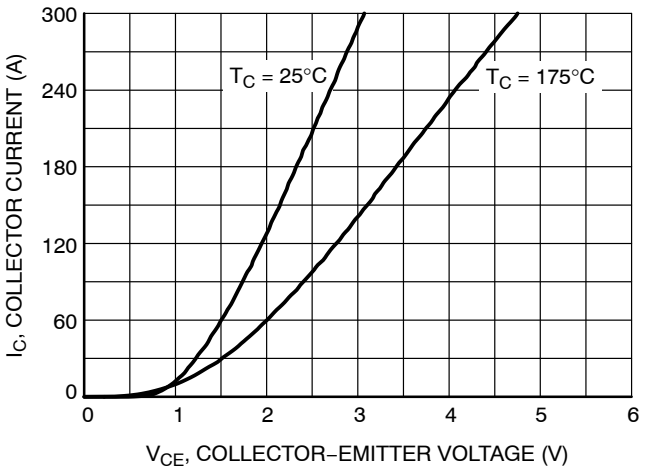


Figure 3. Typical Saturation Voltage Characteristics

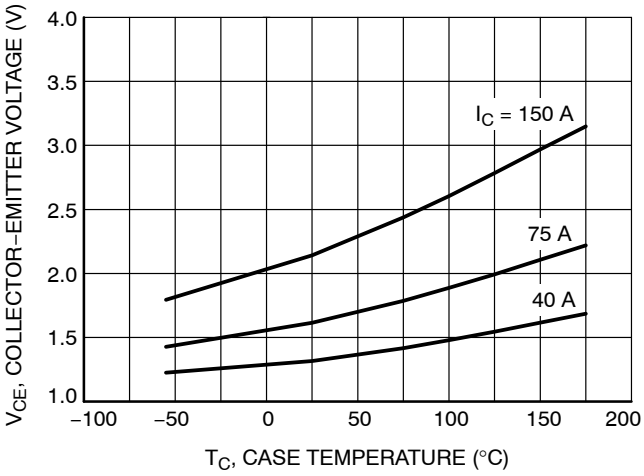


Figure 4. Saturation Voltage vs. Case Temperature at Variant Current Level

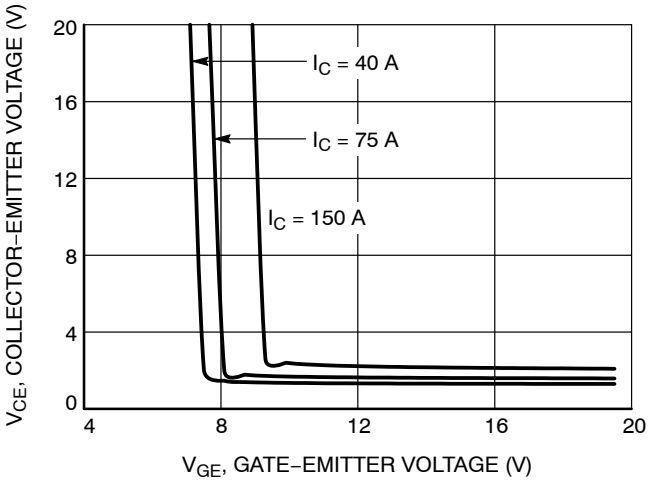


Figure 5. Saturation Voltage vs. V_{GE} (25°C)

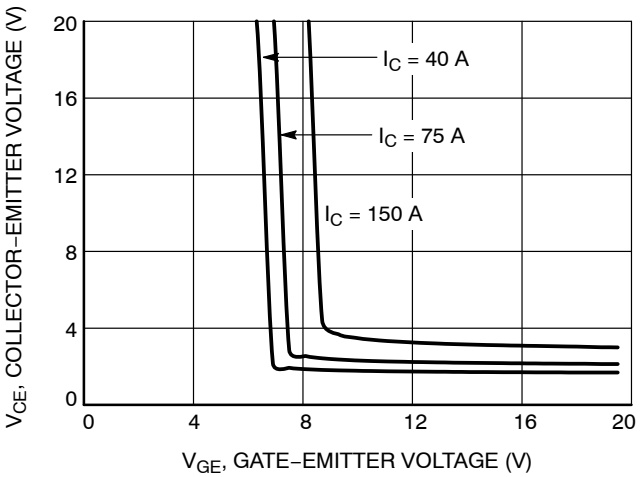


Figure 6. Saturation Voltage vs. V_{GE} (175°C)

TYPICAL CHARACTERISTICS

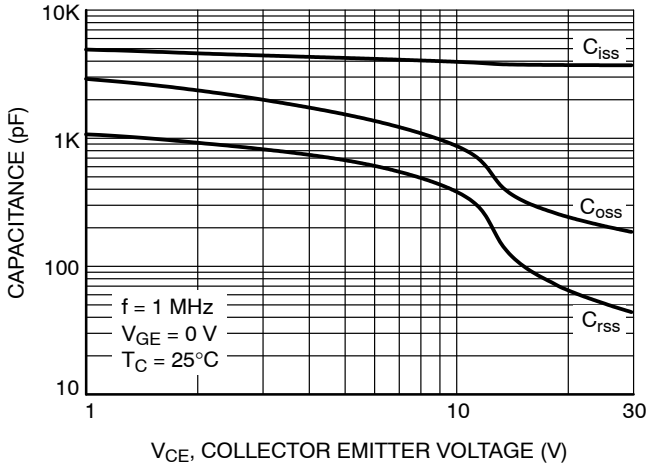


Figure 7. Capacitance Characteristics

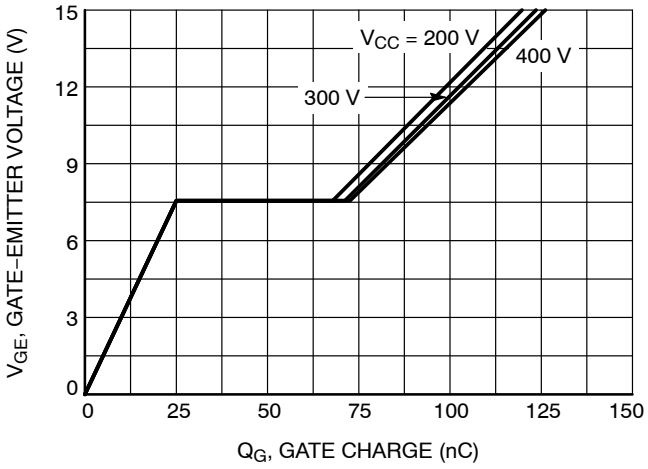


Figure 8. Gate Charge Characteristics

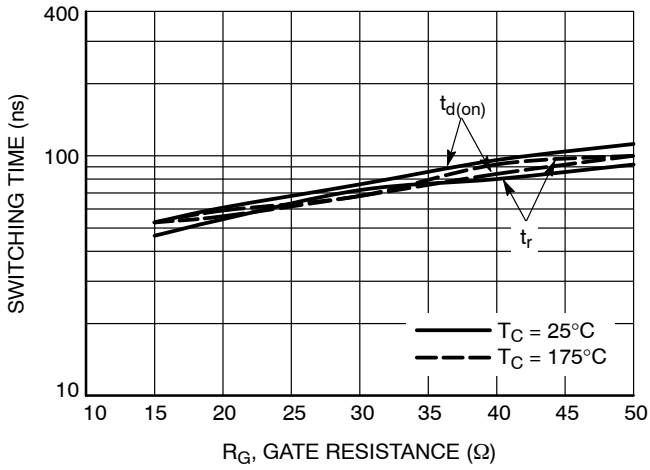


Figure 9. Turn−On Characteristics vs. Gate Resistance

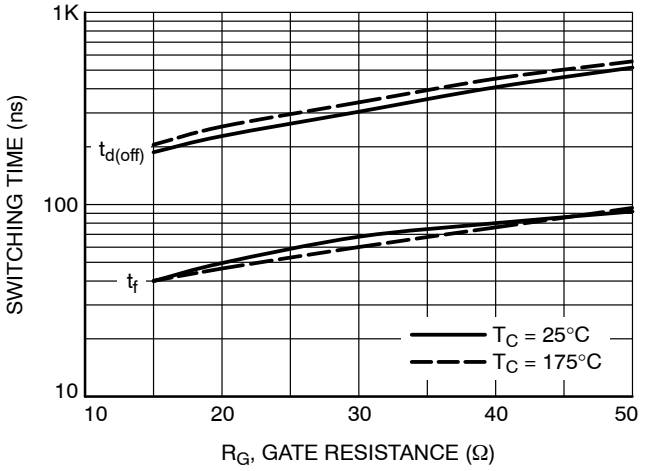


Figure 10. Turn−Off Characteristics vs. Gate Resistance

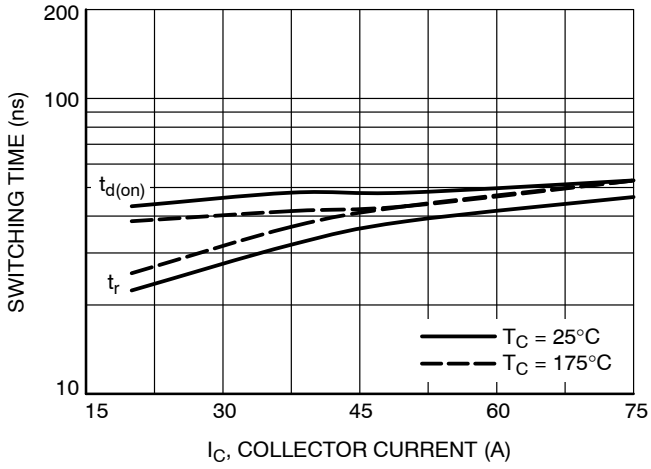


Figure 11. Turn−On Characteristics vs. Collector Current

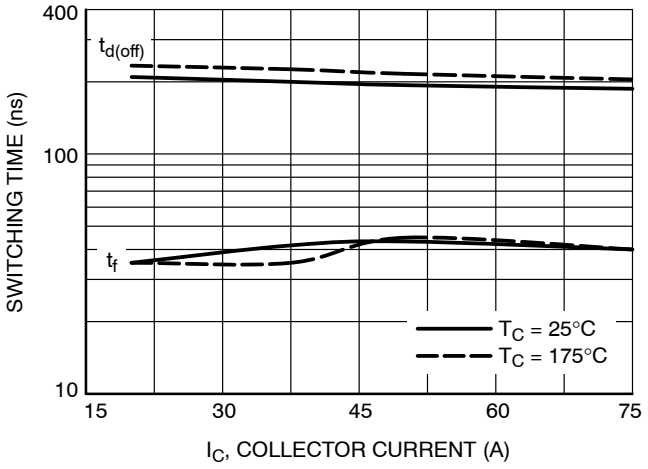


Figure 12. Turn−Off Characteristics vs. Collector Current

TYPICAL CHARACTERISTICS

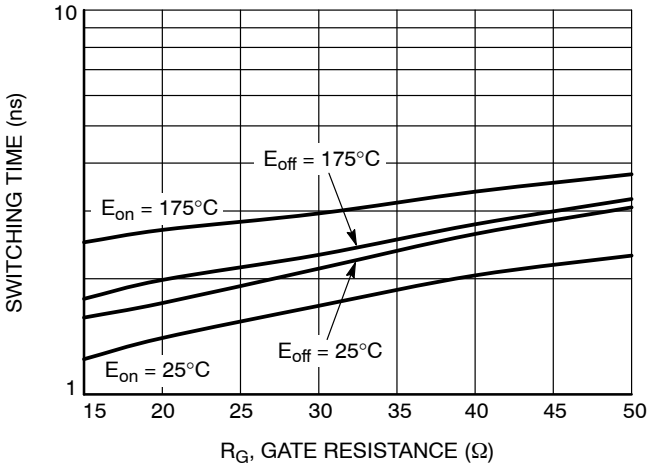


Figure 13. Switching Loss vs. Gate Resistance

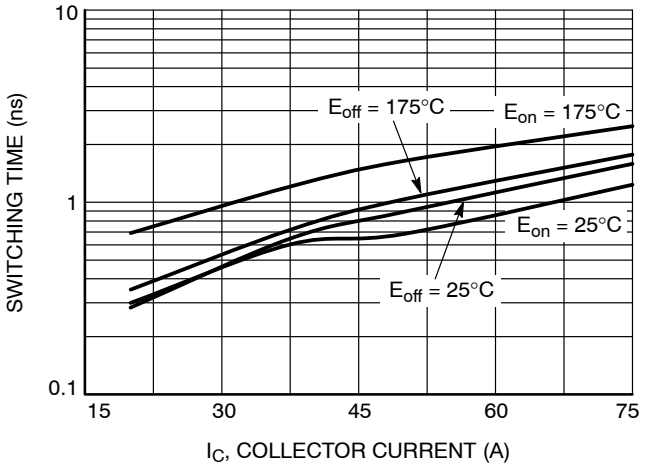


Figure 14. Switching Loss vs. Collector Current

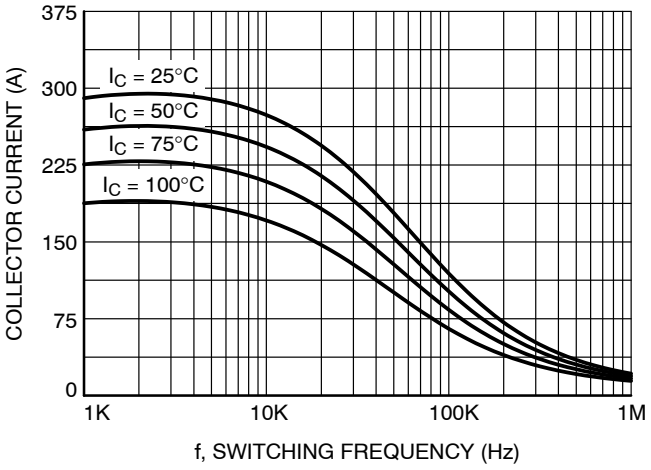


Figure 15. Load Frequency Template

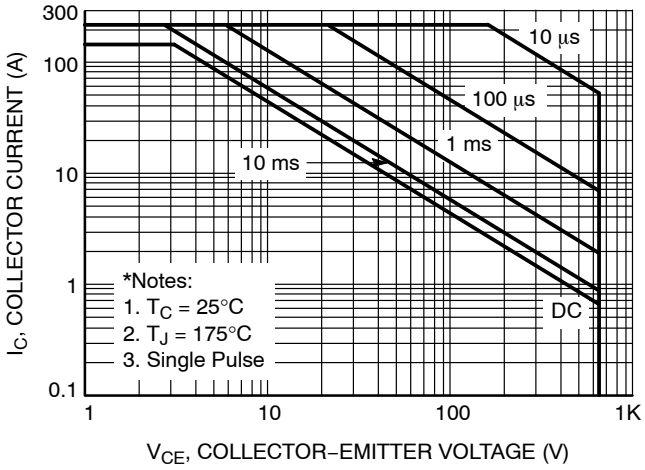


Figure 16. SOA Characteristics

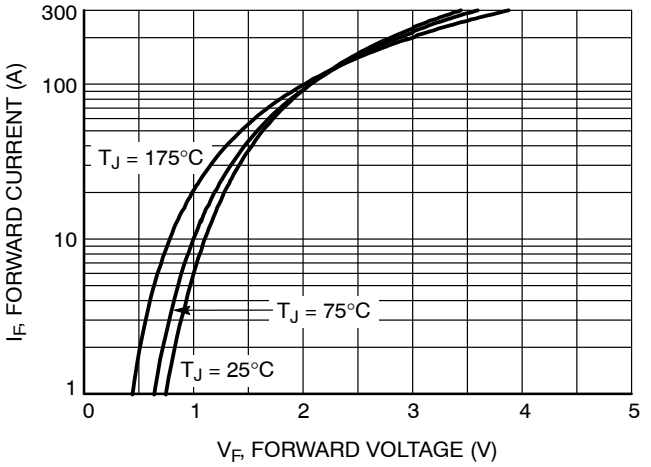


Figure 17. Forward Characteristics

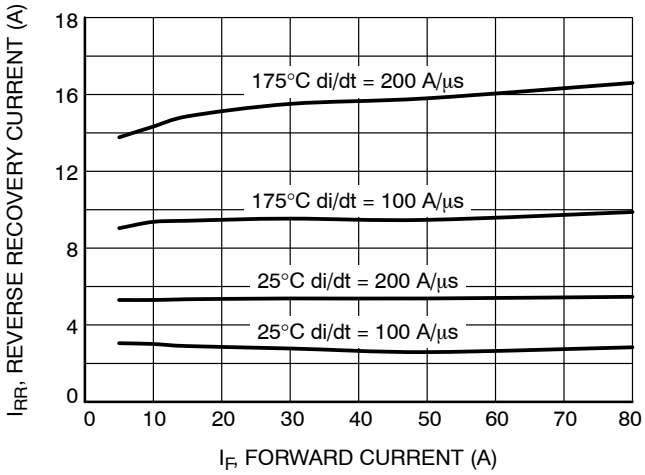


Figure 18. Reverse Recovery Current

TYPICAL CHARACTERISTICS

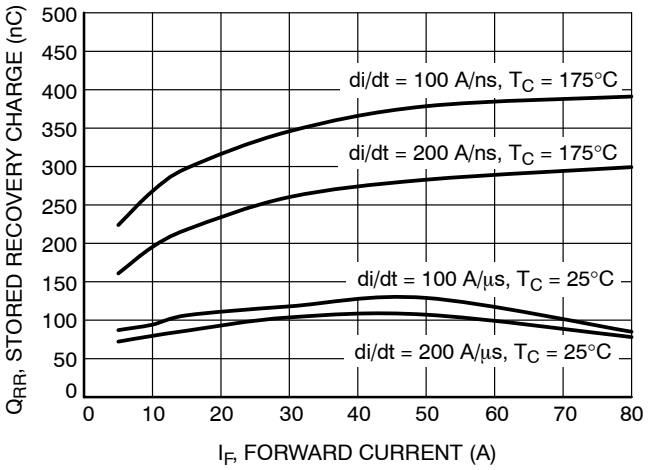


Figure 19. Reverse Recovery Time

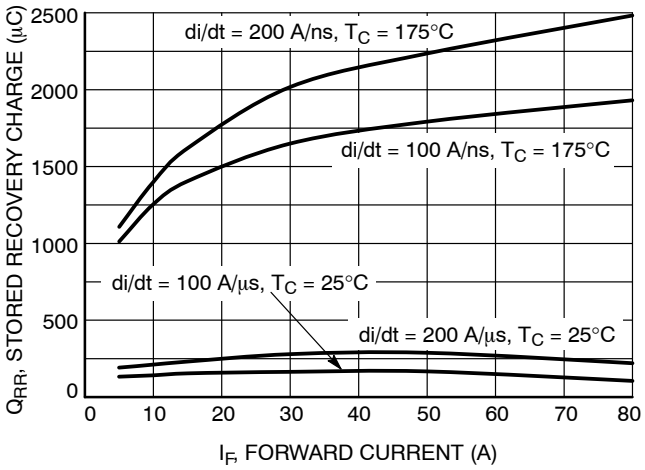


Figure 20. Stored Charge

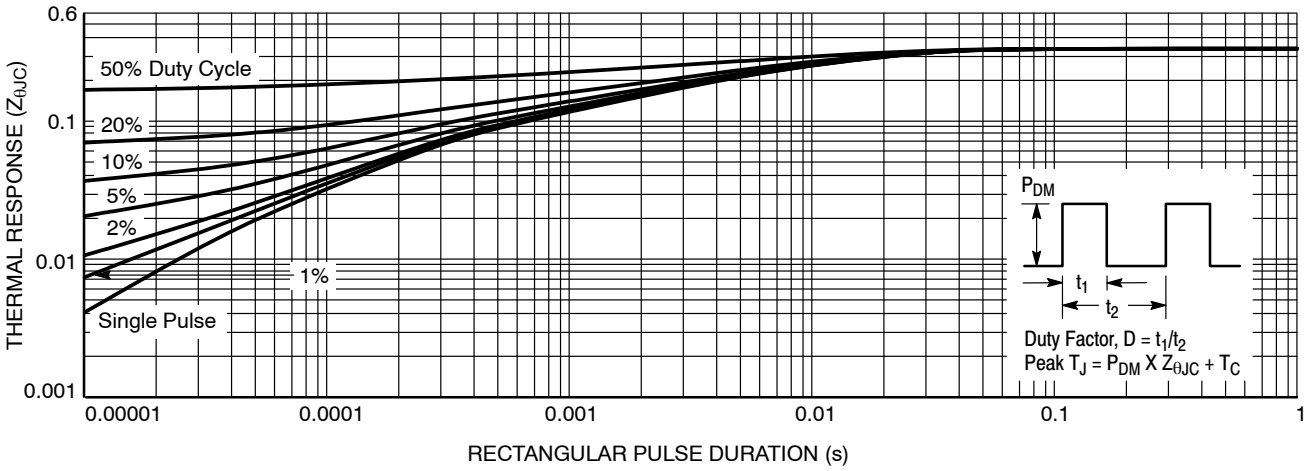


Figure 21. Transient Thermal Impedance of IGBT

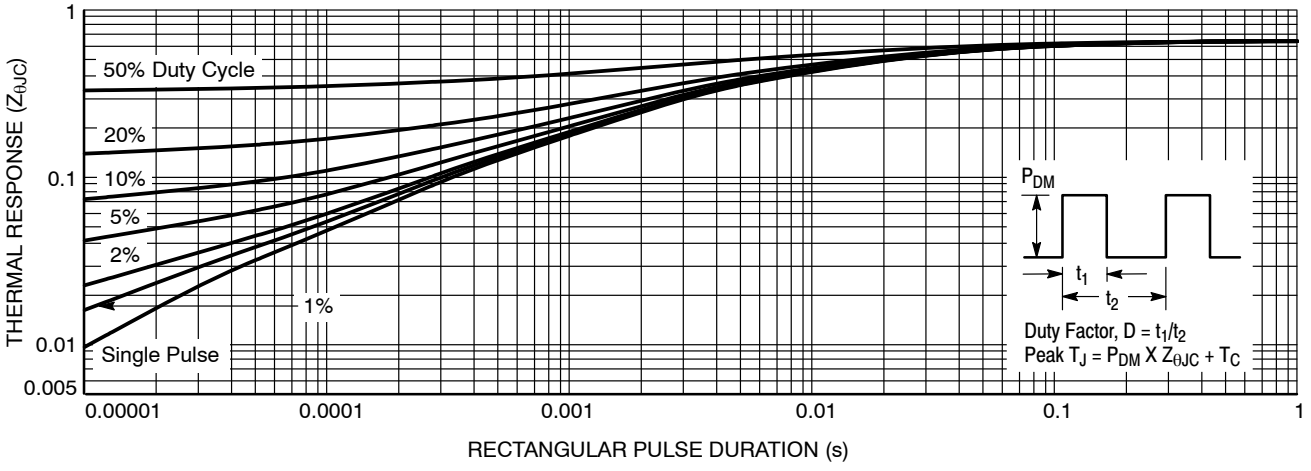
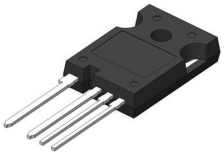


Figure 22. Transient Thermal Impedance of Diode

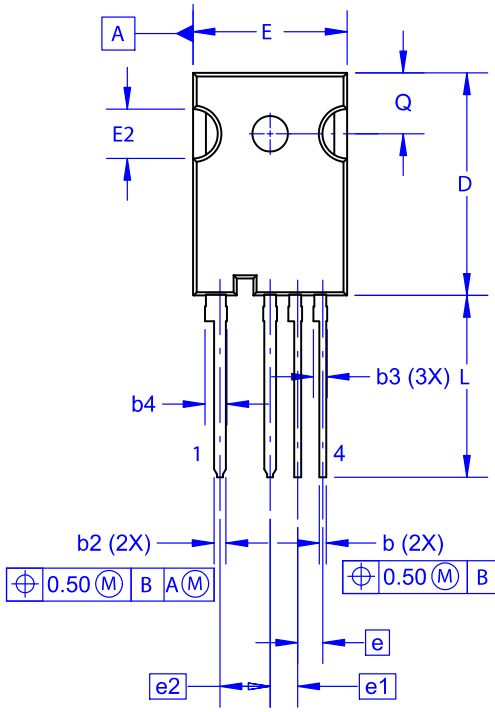
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®



TO−247 4−LEAD, THIN LEADS
CASE 340CW
ISSUE A

DATE 16 SEP 2019



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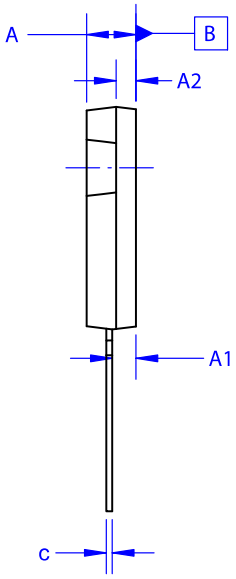

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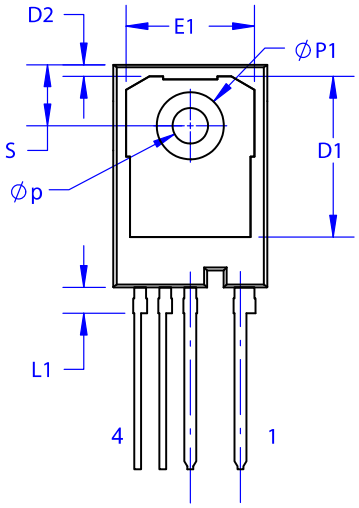

SCALE 1.5 : 1

NOTES:

A. NO INDUSTRY STANDARD APPLIES TO THIS PACKAGE.
B. DIMENSIONS ARE EXCLUSIVE OF BURRS,MOLD FLASH AND TIE BAR EXTRUSIONS.
C. ALL DIMENSIONS ARE IN MILLIMETERS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.10	2.40	2.70
A2	1.80	2.00	2.20
b	0.57	0.70	0.83
b2	1.07	1.20	1.33
b3	1.20	1.40	1.60
b4	2.02	2.22	2.42
c	0.50	0.60	0.70
D	22.34	22.54	22.74
D1	16.00	16.30	16.50
D2	0.97	1.17	1.37
e		2.54	
e1		2.79	
e2		5.08	
E	15.40	15.60	15.80
E1	12.80	13.00	13.20
E2	4.80	5.00	5.20
L	18.12	18.42	18.72
L1	2.42	2.62	2.82
Øp	3.40	3.60	3.80
ØP1	6.60	6.80	7.00
Q	5.97	6.17	6.37
S	5.97	6.17	6.37

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DESCRIPTION:	**TO−247 4−LEAD, THIN LEADS**		**PAGE 1 OF 1**

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