

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: $T_J = 175^\circ\text{C}$
- Positive Temperature Co-efficient for Easy Parallel Operating
- High Current Capability
- Low Saturation Voltage: $V_{CE(\text{Sat})} = 1.6\text{ V}$ (Typ.) @ $I_C = 75\text{ A}$
- 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 ($T_J = 25^\circ\text{C}$ 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	I_C	$T_C = 25^\circ\text{C}$	150	A
		$T_C = 100^\circ\text{C}$	75	
Pulsed Collector Current (Note 1)	I_{LM}	300	A	
Pulsed Collector Maximum Current (Note 2)	I_{CM}	300	A	
Diode Forward Current	I_F	$T_C = 25^\circ\text{C}$	125	A
		$T_C = 100^\circ\text{C}$	75	
Pulsed Diode Maximum Forward Current (Note 2)	I_{FM}	300	A	
Maximum Power Dissipation	P_D	$T_C = 25^\circ\text{C}$	455	W
		$T_C = 100^\circ\text{C}$	227	
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +175	$^\circ\text{C}$	
Maximum Lead Temperature for Soldering Purposes (1/8" from case for 5 seconds)	T_L	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. $V_{CC} = 400\text{ V}$, $V_{GE} = 15\text{ V}$, $I_C = 300\text{ A}$, $R_G = 73\ \Omega$, Inductive Load
2. Repetitive rating: pulse width limited by max. Junction temperature

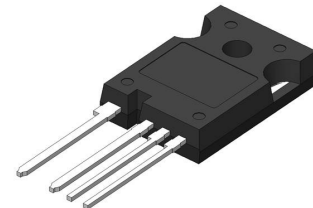
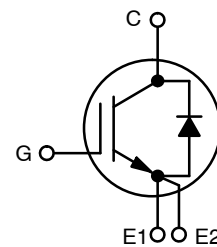
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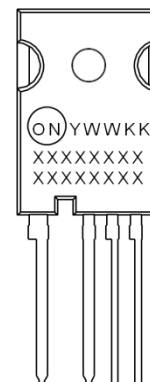
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75 A, 650 V
 $V_{CE(\text{sat})} = 1.6\text{ V}$
 $E_{\text{on}} = 1.06\text{ mJ}$



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

FGH75T65SHDTLN4

Table 1. THERMAL CHARACTERISTICS

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

Table 2. ELECTRICAL CHARACTERISTICS ($T_J = 25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Collector-emitter breakdown voltage, gate-emitter short-circuited	BV_{CES}	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$	650	-	-	V
Temperature Coefficient of Breakdown Voltage	$\Delta BV_{CES}/\Delta T_J$	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$	-	0.65	-	$\text{V}/^{\circ}\text{C}$
Collector-emitter cut-off current, gate-emitter short-circuited	I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 650\text{ V}$	-	-	250	μA
Gate leakage current, collector-emitter short-circuited	I_{GES}	$V_{GE} = \pm 20\text{ V}, V_{CE} = 0\text{ V}$	-	-	± 400	nA

ON CHARACTERISTICS

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 75\text{ mA}$	4.0	5.5	7.5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE} = 15\text{ V}, I_C = 75\text{ A}, V_{GE} = 15\text{ V}, I_C = 75\text{ A}, T_J = 175^{\circ}\text{C}$	-	1.6 2.28	2.1 -	$\text{mV}/^{\circ}\text{C}$

DYNAMIC CHARACTERISTICS

Input Capacitance	C_{ies}	$V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	-	3710	-	pF
Output Capacitance	C_{oes}		-	183	-	
Reverse Transfer Capacitance	C_{res}		-	43	-	
Gate Charge Total	Q_g	$V_{CE} = 400\text{ V}, I_C = 75\text{ A}, V_{GE} = 15\text{ V}$	-	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	$t_{d(on)}$	$T_C = 25^{\circ}\text{C}$ $V_{CC} = 400\text{ V}, I_C = 75\text{ A}$ $R_g = 15\ \Omega$ $V_{GE} = 15\text{ V}$ Inductive Load, $T_C = 25^{\circ}\text{C}$	-	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}	$V_{CC} = 400\text{ V}, I_C = 75\text{ A}$ $R_g = 15\ \Omega$ $V_{GE} = 15\text{ V}$ Inductive Load, $T_C = 175^{\circ}\text{C}$	-	1.06	-	mJ
Turn-Off Switching Loss	E_{off}		-	1.56	-	
Total Switching Loss	E_{ts}		-	2.62	-	
Turn-On Delay Time	$t_{d(on)}$		-	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	$I_F = 75\text{ A}$ $I_F = 75\text{ A}, T_J = 175^{\circ}\text{C}$	-	1.8 1.7	2.1 -	V
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FGH75T65SHDTLN4

Table 2. ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
DIODE CHARACTERISTICS						
Reverse Recovery Time	t_{rr}	$T_J = 25^\circ\text{C}$ $I_F = 75\text{ A}, di_F/dt = 200\text{ A}/\mu\text{s}$	-	36	-	ns
Reverse Recovery Charge	Q_{rr}		-	18	-	
Reverse Recovery Time	t_{rr}	$T_J = 175^\circ\text{C}$ $I_F = 75\text{ A}, di_F/dt = 200\text{ A}/\mu\text{s}$	-	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.

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TYPICAL CHARACTERISTICS

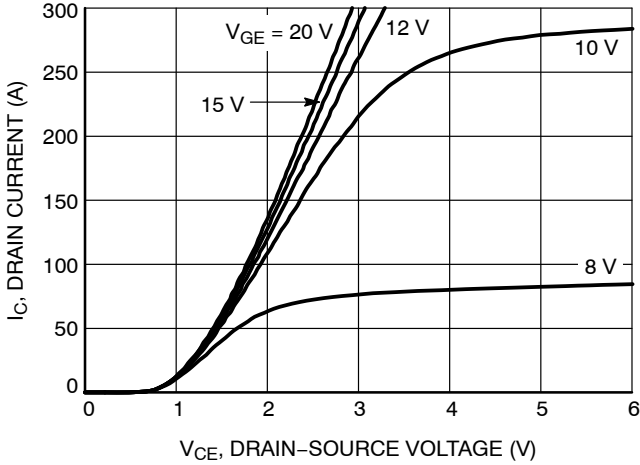


Figure 1. Typical Output Characteristics (25°C)

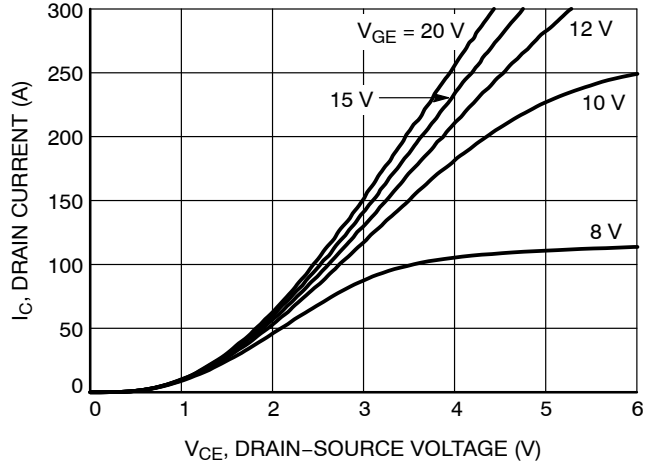


Figure 2. Typical Output Characteristics (175°C)

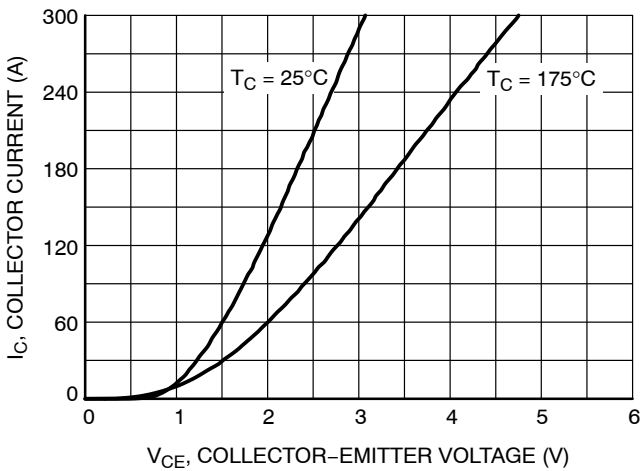


Figure 3. Typical Saturation Voltage Characteristics

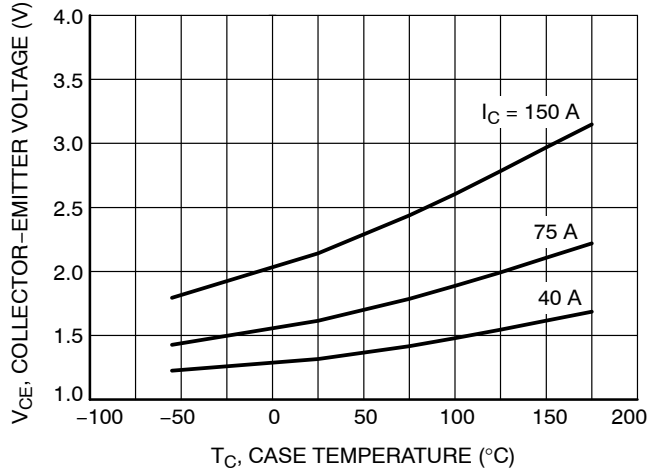


Figure 4. Saturation Voltage vs. Case Temperature at Variant Current Level

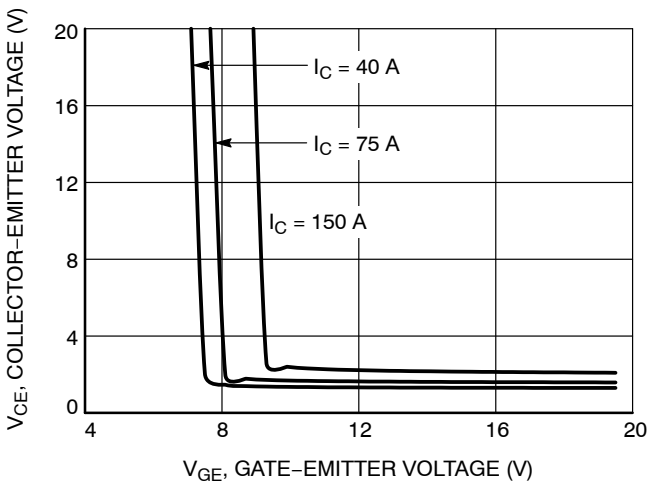


Figure 5. Saturation Voltage vs. V_{GE} (25°C)

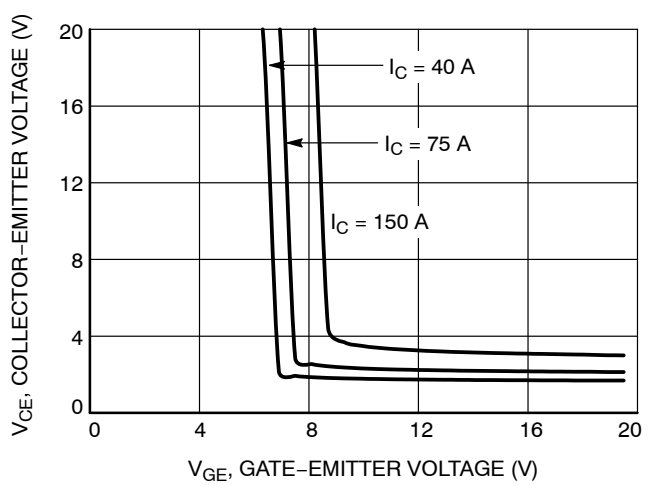


Figure 6. Saturation Voltage vs. V_{GE} (175°C)

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TYPICAL CHARACTERISTICS

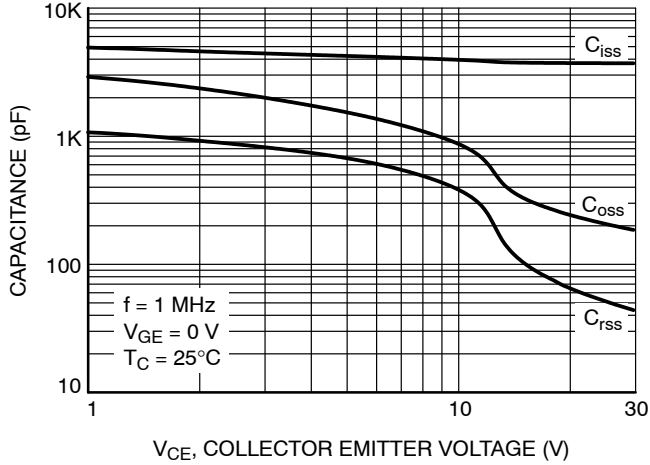


Figure 7. Capacitance Characteristics

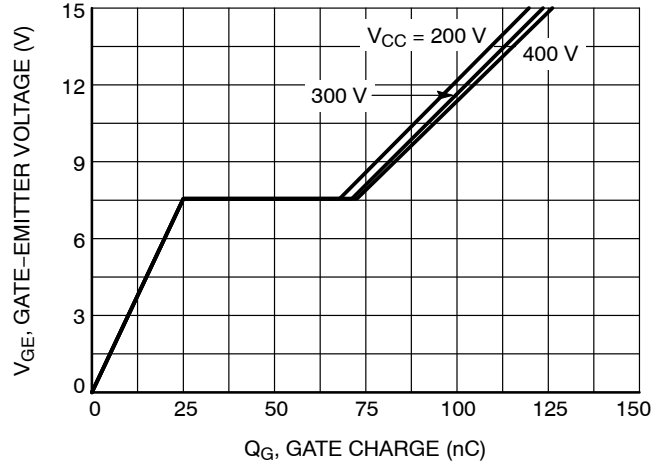


Figure 8. Gate Charge Characteristics

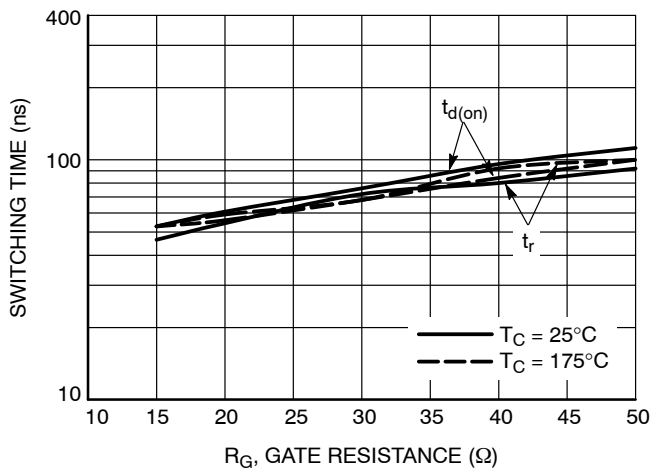


Figure 9. Turn-On Characteristics vs. Gate Resistance

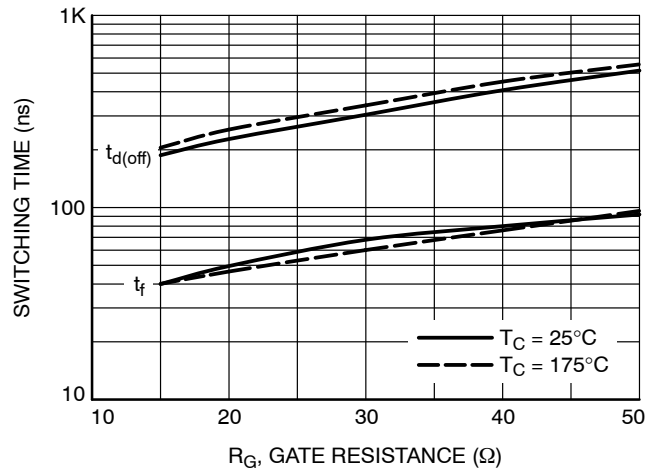


Figure 10. Turn-Off Characteristics vs. Gate Resistance

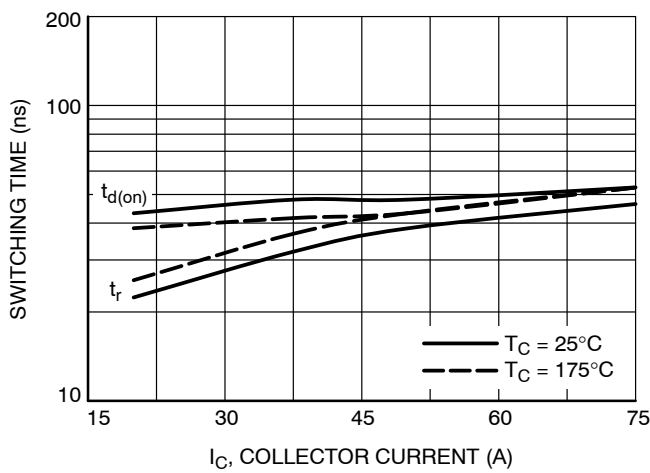


Figure 11. Turn-On Characteristics vs. Collector Current

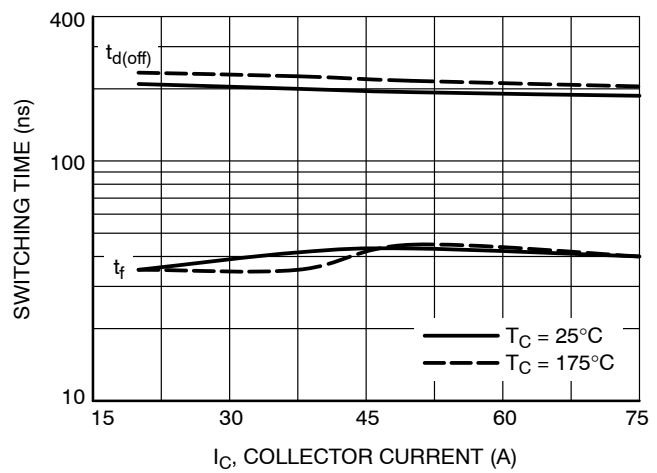


Figure 12. Turn-Off Characteristics vs. Collector Current

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TYPICAL CHARACTERISTICS

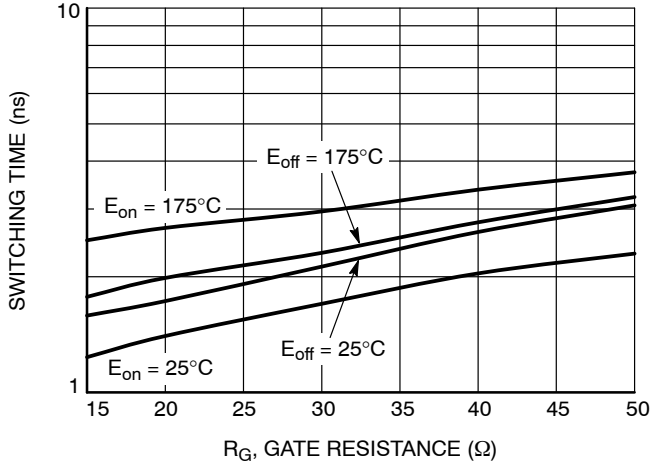


Figure 13. Switching Loss vs. Gate Resistance

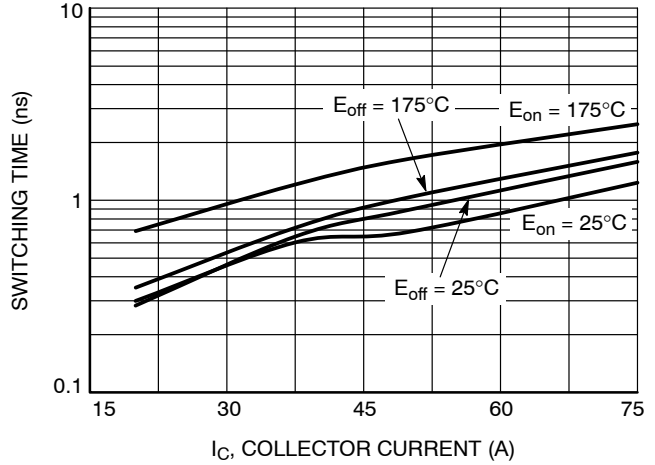


Figure 14. Switching Loss vs. Collector Current

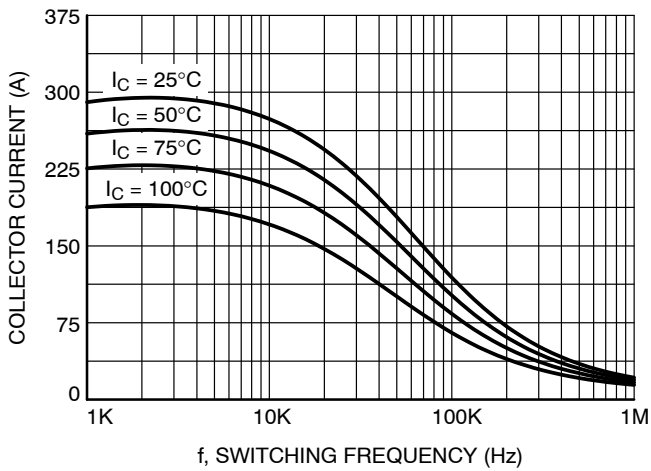


Figure 15. Load Frequency Template

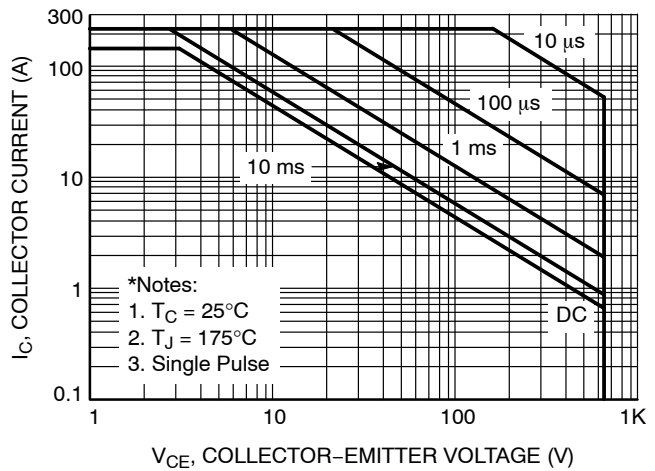


Figure 16. SOA Characteristics

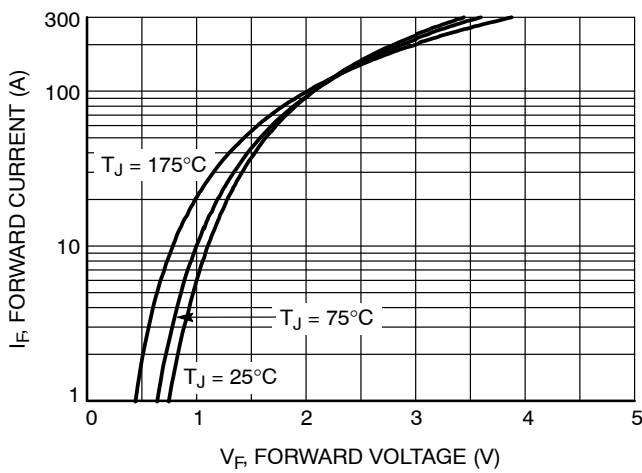


Figure 17. Forward Characteristics

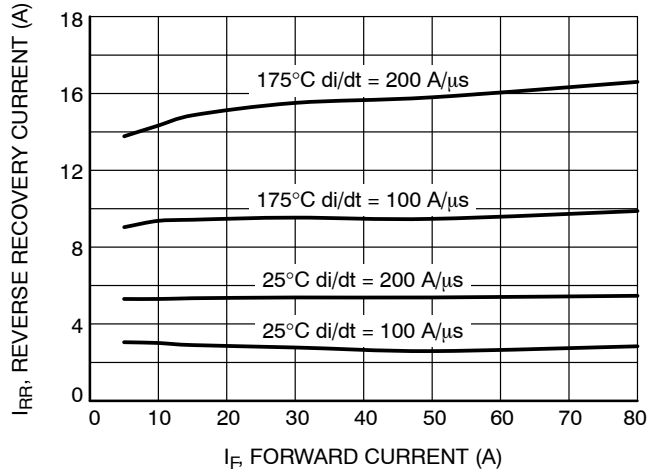


Figure 18. Reverse Recovery Current

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TYPICAL CHARACTERISTICS

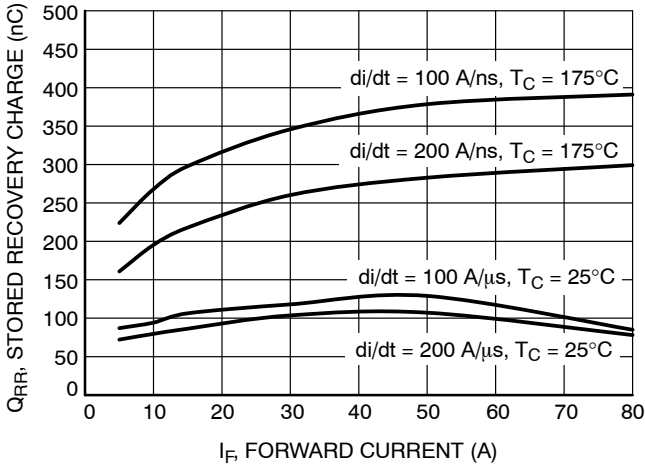


Figure 19. Reverse Recovery Time

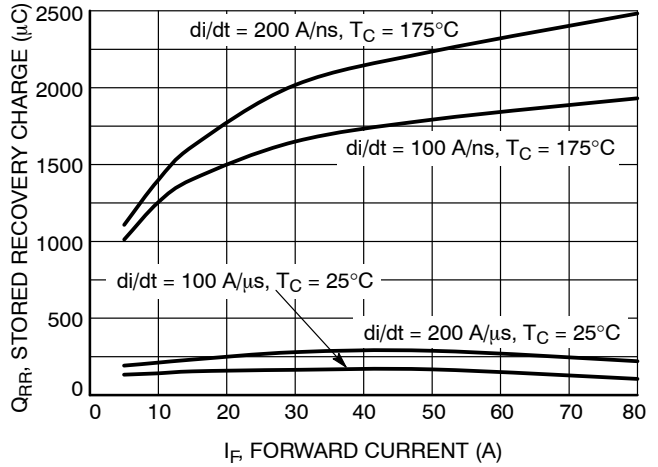


Figure 20. Stored Charge

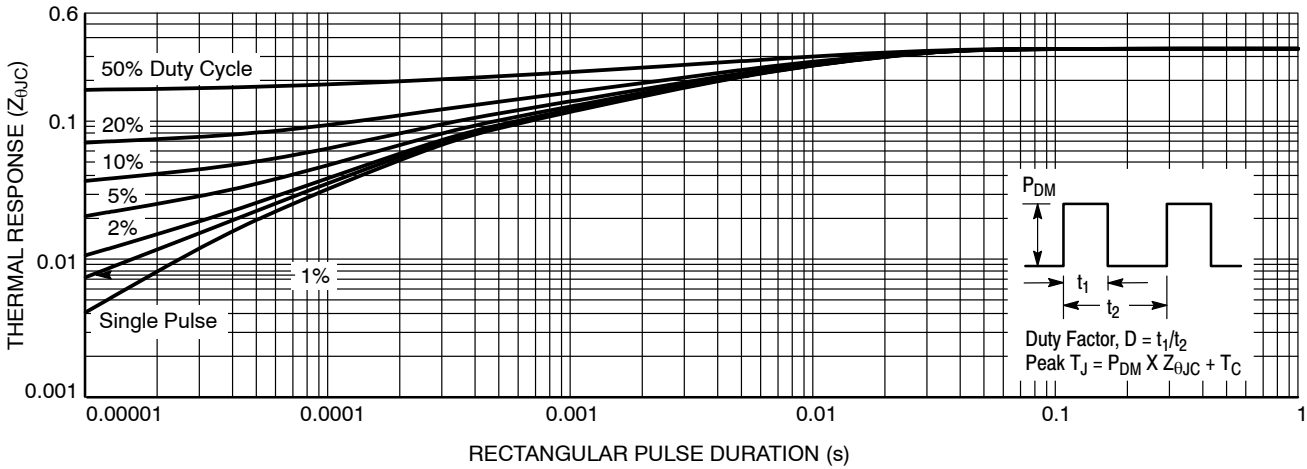


Figure 21. Transient Thermal Impedance of IGBT

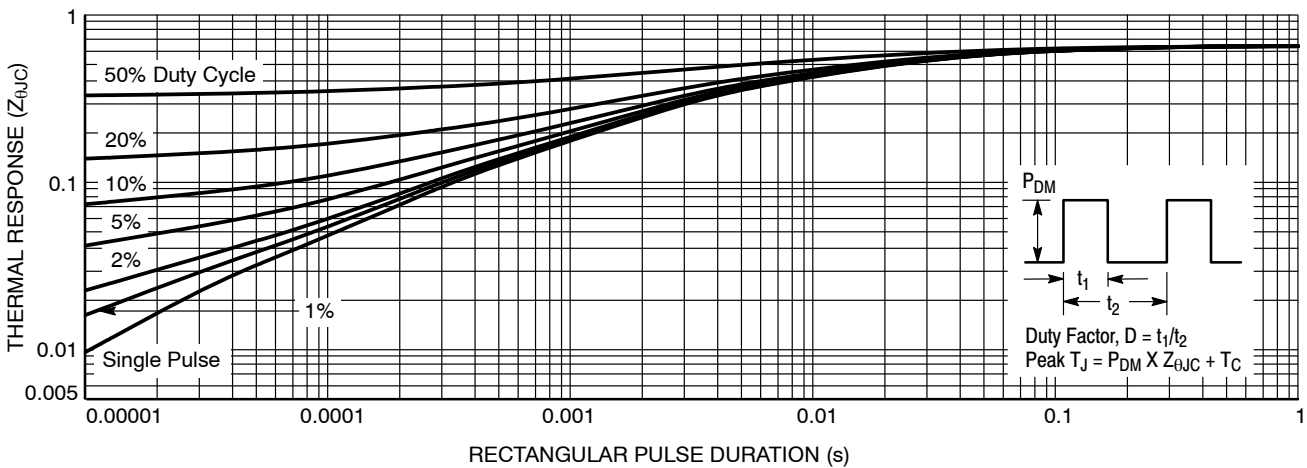
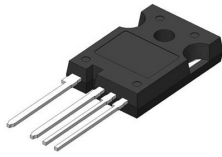


Figure 22. Transient Thermal Impedance of Diode

MECHANICAL CASE OUTLINE

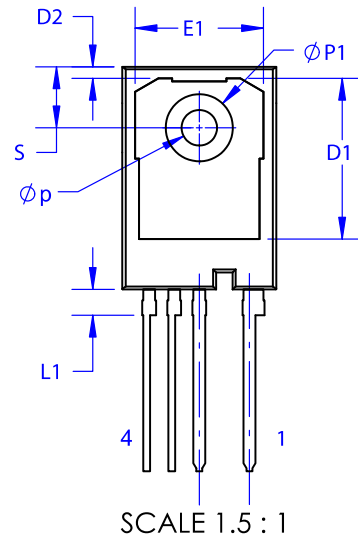
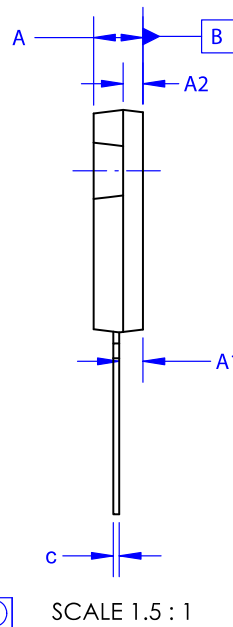
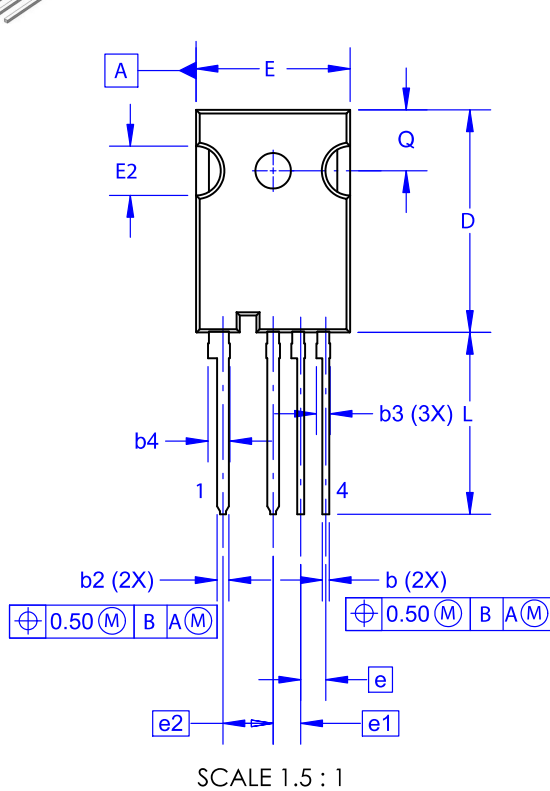
PACKAGE DIMENSIONS

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

DATE 16 SEP 2019



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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