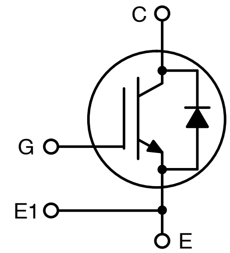
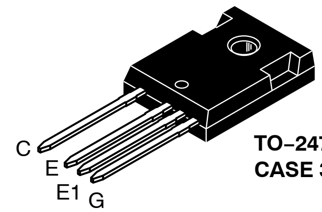
IGBT - Field Stop, IV/4 Lead
FGH75T65SQDNL4

75 A, 650 V
V_{CEsat} (Typ.) = 1.6 V





TO−247−4LD
CASE 340CJ

This Insulated Gate Bipolar Transistor (IGBT) features a robust and cost effective Field Stop IV Trench construction, and provides superior performance in demanding switching applications, offering both low on state voltage and minimal switching loss. In addition, this new device is packaged in a TO−247−4L package that provides significant reduction in E_{on} Losses compared to standard TO−247−3L package. The IGBT is well suited for UPS and solar applications. Incorporated into the device is a soft and fast co−packaged free wheeling diode with a low forward voltage.

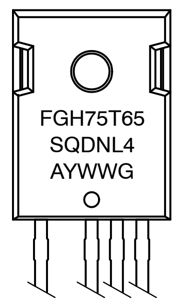
Features

- Extremely Efficient Trench with Field Stop Technology
- T_{Jmax} = 175°C
- Improved Gate Control Lowers Switching Losses
- Separate Emitter Drive Pin
- TO−247−4L for Minimal E_{on} Losses
- Optimized for High Speed Switching
- 100% of the Parts Tested for I_{LM}
- These are Pb−Free Devices

Typical Applications

- Solar Inverter
- Uninterruptible Power Inverter Supplies (UPS)
- Neutral Point Clamp Topology

MARKING DIAGRAM



A = Assembly Location
Y = Year
WW = Work Week
G = Pb−Free Package

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector−emitter voltage	V_{CES}	650	V
Collector current @ T_C = 25°C @ T_C = 100°C	I_C	 150 75	A
Diode Forward Current @ T_C = 25°C @ T_C = 100°C	I_F	 150 75	A
Diode Pulsed Current T_{PULSE} Limited by T_J Max	I_{FM}	300	A
Pulsed collector current, T_{pulse} limited by T_{Jmax}	I_{CM} I_{LM}	300	A
Gate−emitter voltage	V_{GE}	±20	V
Transient gate−emitter voltage (T_{PULSE} = 5 μs, D < 0.10)		±30	V
Power Dissipation @ T_C = 25°C @ T_C = 100°C	P_D	 375 188	W
Operating junction temperature range	T_J	−55 to +175	°C
Storage temperature range	T_{stg}	−55 to +175	°C
Lead temperature for soldering, 1/8″ from case for 5 seconds	T_{SLD}	260	°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.

ORDERING INFORMATION

Device	Package	Shipping
FGH75T65SQDNL4	TO−247 (Pb−Free)	30 Units / Rail

March, 2022 − Rev. 5
Publication Order Number:
FGH75T65SQDNL4/D

THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal resistance junction−to−case, for IGBT	$R_{\theta JC}$	0.4	°C/W
Thermal resistance junction−to−case, for Diode	$R_{\theta JC}$	0.65	°C/W
Thermal resistance junction−to−ambient	$R_{\theta JA}$	40	°C/W

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
STATIC CHARACTERISTIC						
Collector−emitter breakdown voltage, gate−emitter short−circuited	V_{GE} = 0 V, I_C = 500 μA	$V_{(BR)CES}$	650	–	–	V
Collector−emitter saturation voltage	V_{GE} = 15 V, I_C = 75 A V_{GE} = 15 V, I_C = 75 A, T_J = 175°C	V_{CEsat}	– –	1.6 1.92	2.1 –	V
Gate−emitter threshold voltage	V_{GE} = V_{CE}, I_C = 75 mA	$V_{GE(th)}$	4.0	4.8	5.6	V
Collector−emitter cut−off current, gate−emitter short−circuited	V_{GE} = 0 V, V_{CE} = 650 V V_{GE} = 0 V, V_{CE} = 650 V, T_J = 175°C	I_{CES}	– –	– 6.0	0.25 –	mA
Gate leakage current, collector−emitter short−circuited	V_{GE} = 20 V , V_{CE} = 0 V	I_{GES}	–	–	±250	nA
DYNAMIC CHARACTERISTIC						
Input capacitance	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	C_{ies}	–	5100	–	pF
Output capacitance		C_{oes}	–	115	–	
Reverse transfer capacitance		C_{res}	–	12	–	
Gate charge total	V_{CE} = 400 V, I_C = 75 A, V_{GE} = 15 V	Q_g	–	152	–	nC
Gate to emitter charge		Q_{ge}	–	29	–	
Gate to collector charge		Q_{gc}	–	39	–	
SWITCHING CHARACTERISTIC, INDUCTIVE LOAD						
Turn−on delay time	T_J = 25°C V_{CC} = 400 V, I_C = 75 A R_g = 20 Ω V_{GE} = 15 V	$t_{d(on)}$	–	59	–	ns
Rise time		t_r	–	58	–	
Turn−off delay time		$t_{d(off)}$	–	354	–	
Fall time		t_f	–	69	–	
Turn−on switching loss		E_{on}	–	1.82	–	mJ
Turn−off switching loss		E_{off}	–	1.86	–	
Total switching loss		E_{ts}	–	3.68	–	
Turn−on delay time	T_J = 175°C V_{CC} = 400 V, I_C = 75 A R_g = 20 Ω V_{GE} = 15 V	$t_{d(on)}$	–	56	–	ns
Rise time		t_r	–	57	–	
Turn−off delay time		$t_{d(off)}$	–	394	–	
Fall time		t_f	–	73	–	
Turn−on switching loss		E_{on}	–	2.22	–	mJ
Turn−off switching loss		E_{off}	–	2.02	–	
Total switching loss		E_{ts}	–	4.24	–	
DIODE CHARACTERISTIC						
Forward voltage	V_{GE} = 0 V, I_F = 75 A V_{GE} = 0 V, I_F = 75 A, T_J = 175°C	V_F	– –	1.60 1.70	2.0 –	V
Reverse recovery time	T_J = 25°C I_F = 75 A, V_R = 200 V di_F/dt = 200 A/μs	t_{rr}	–	134	–	ns
Reverse recovery charge		Q_{rr}	–	0.78	–	μC
Reverse recovery current		I_{rrm}	–	10	–	A
Reverse recovery time	T_J = 175°C I_F = 75 A, V_R = 200 V di_F/dt = 200 A/μs	t_{rr}	–	202	–	ns
Reverse recovery charge		Q_{rr}	–	2.54	–	μC
Reverse recovery current		I_{rrm}	–	20.2	–	A

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

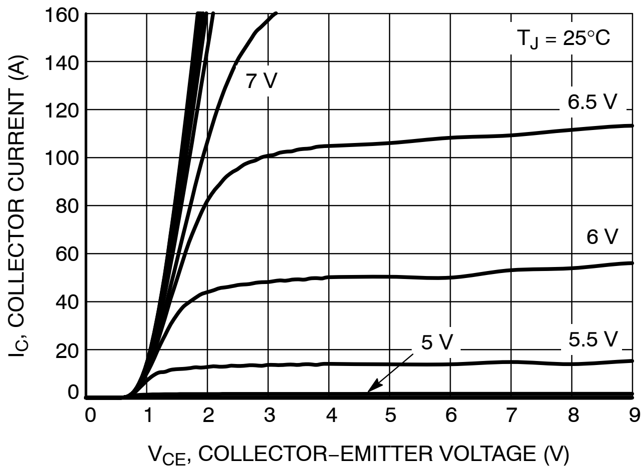


Figure 1. Output Characteristics

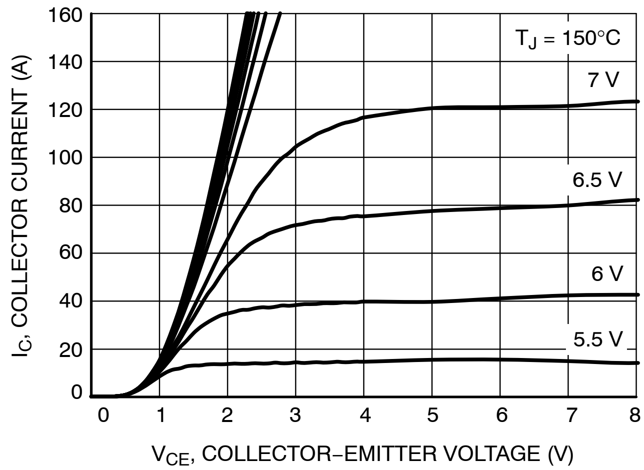


Figure 2. Output Characteristics

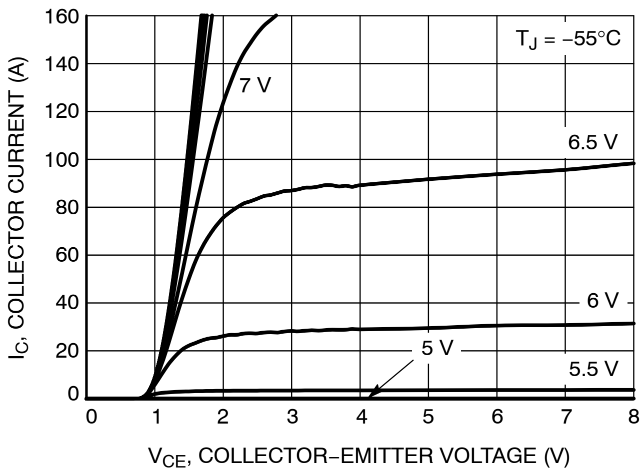


Figure 3. Output Characteristics

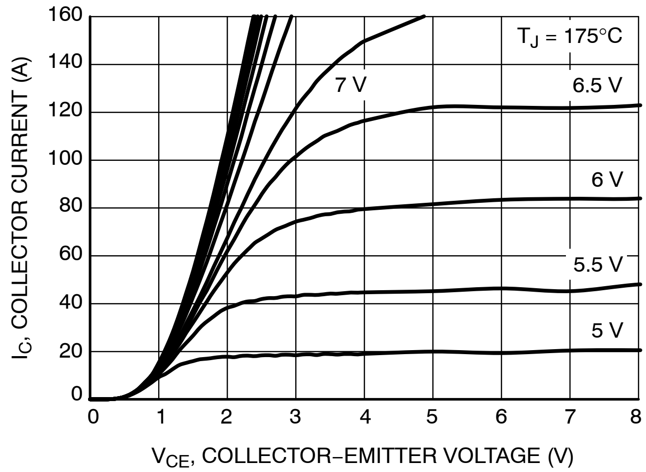


Figure 4. Output Characteristics

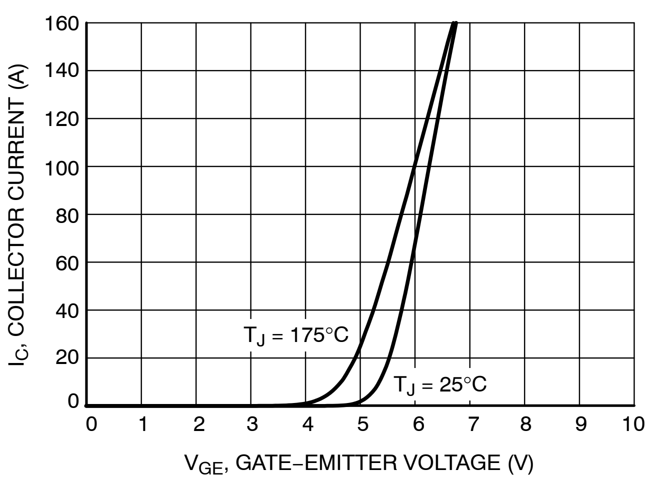


Figure 5. Typical Transfer Characteristics

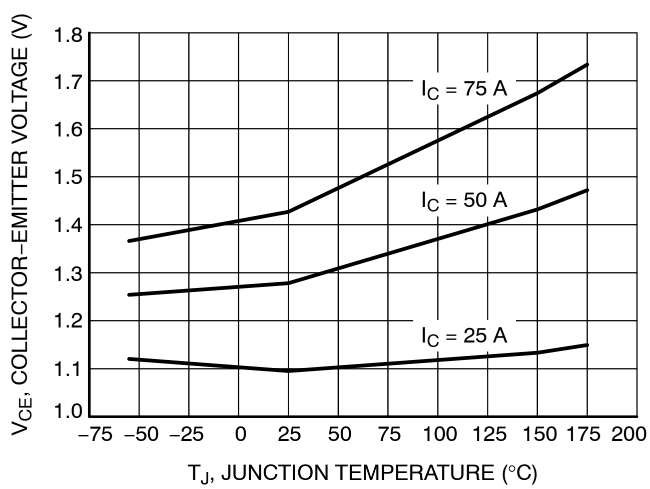


Figure 6. $V_{CE(sat)}$ vs. T_J

TYPICAL CHARACTERISTICS

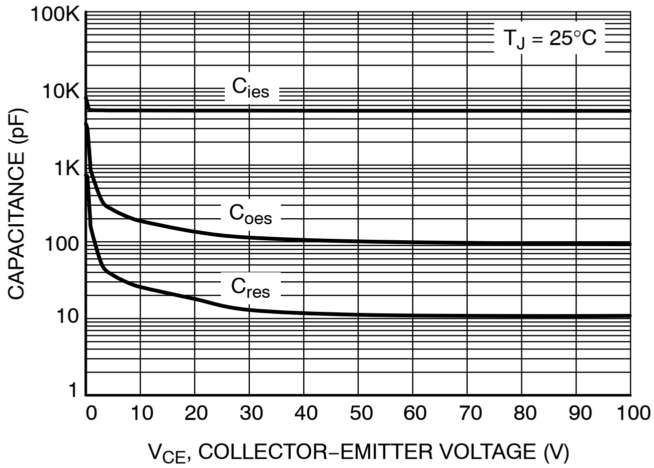


Figure 7. Typical Capacitance

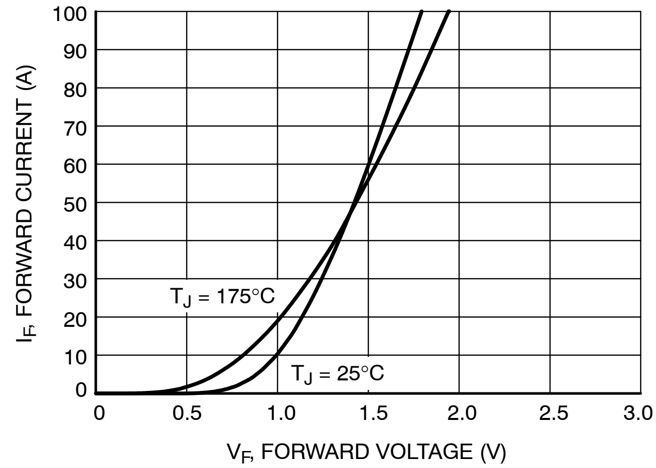


Figure 8. Diode Forward Characteristics

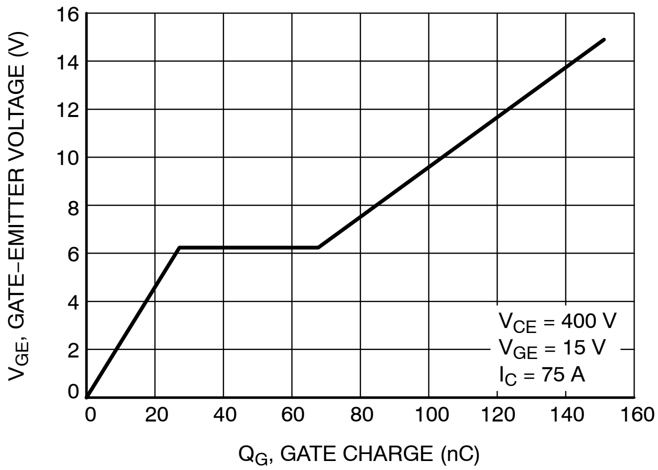


Figure 9. Typical Gate Charge

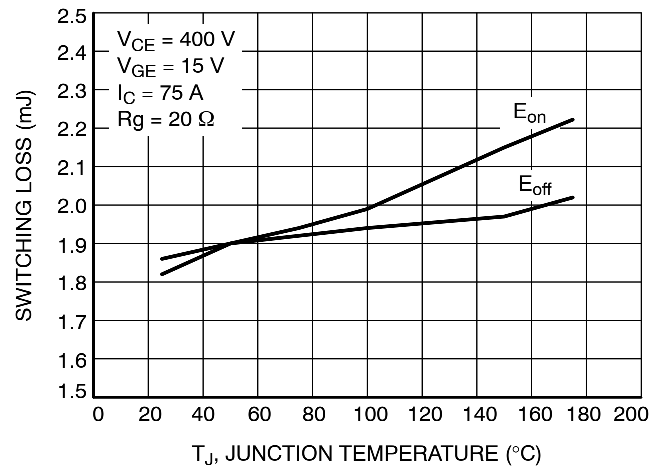


Figure 10. Switching Loss vs. Temperature

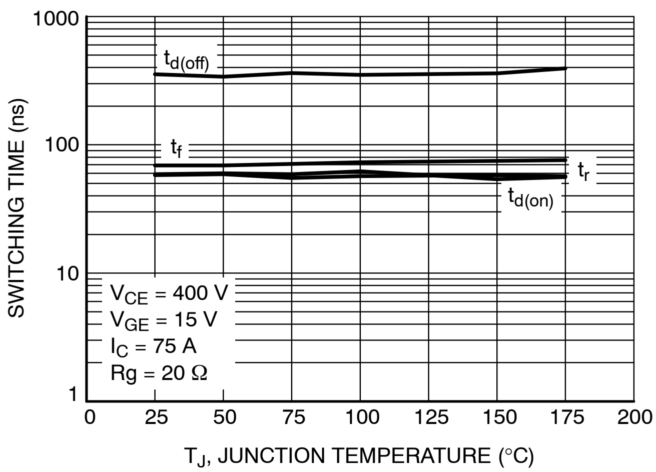


Figure 11. Switching Time vs. Temperature

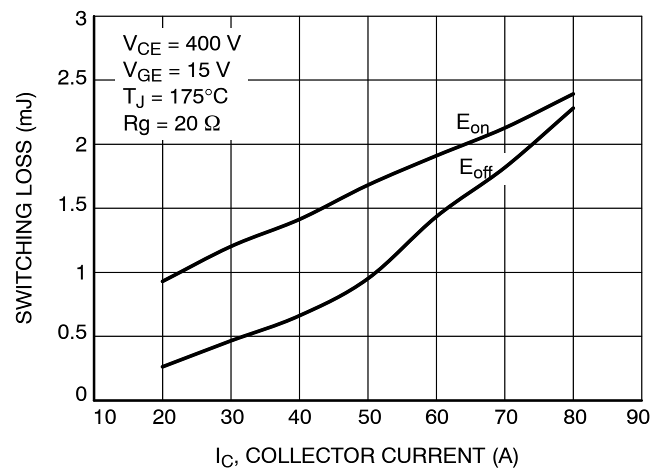


Figure 12. Switching Loss vs. IC

TYPICAL CHARACTERISTICS

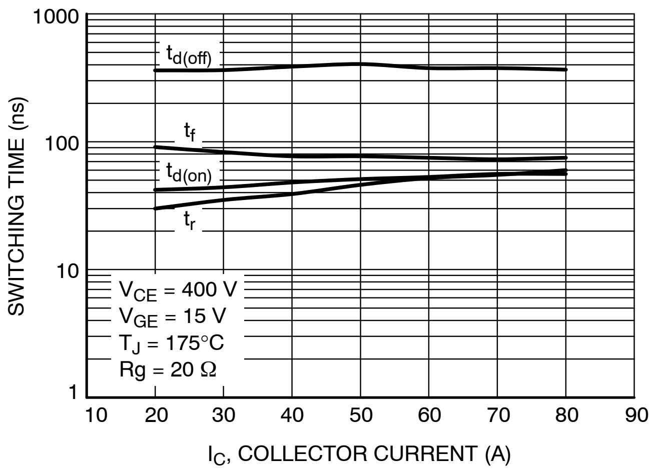


Figure 13. Switching Time vs. IC

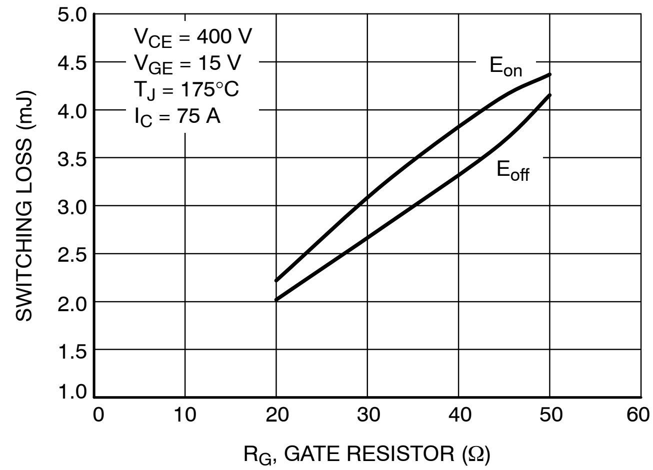


Figure 14. Switching Loss vs. R_G

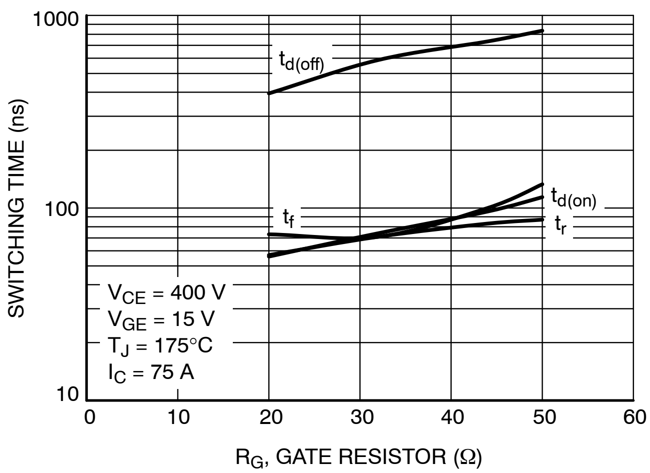


Figure 15. Switching Time vs. R_G

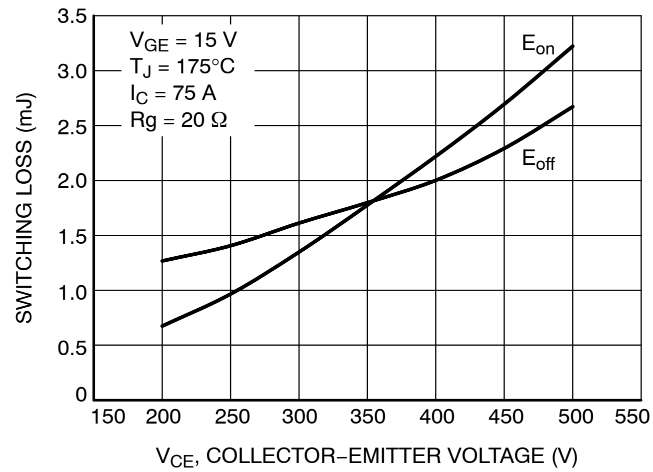


Figure 16. Switching Loss vs. V_{CE}

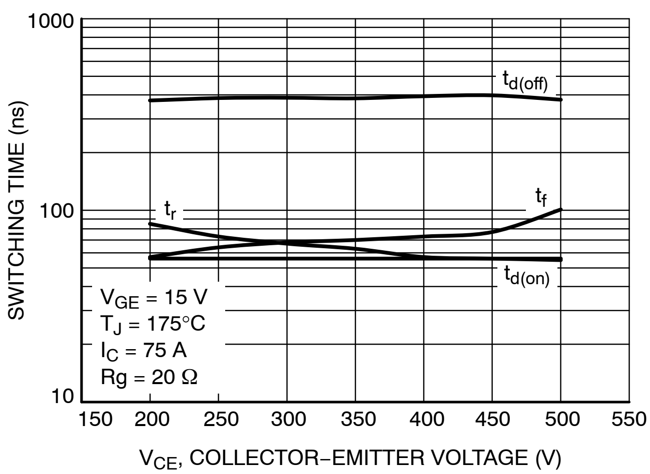


Figure 17. Switching Time vs. V_{CE}

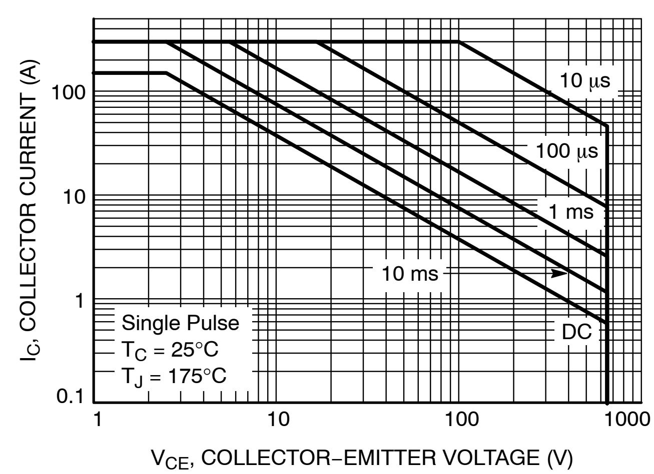


Figure 18. Safe Operating Area

TYPICAL CHARACTERISTICS

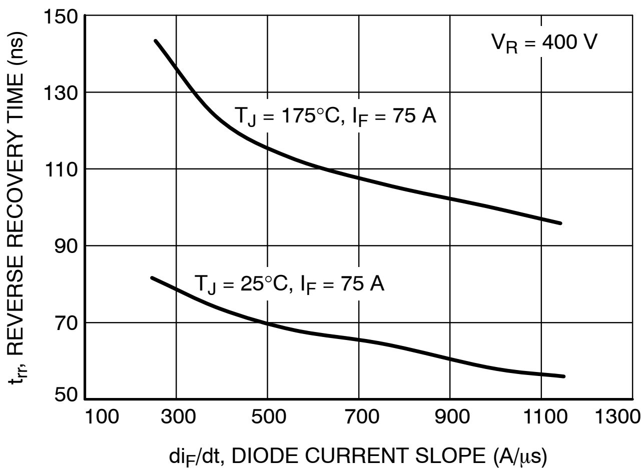


Figure 19. t_{rr} vs. di_F/dt

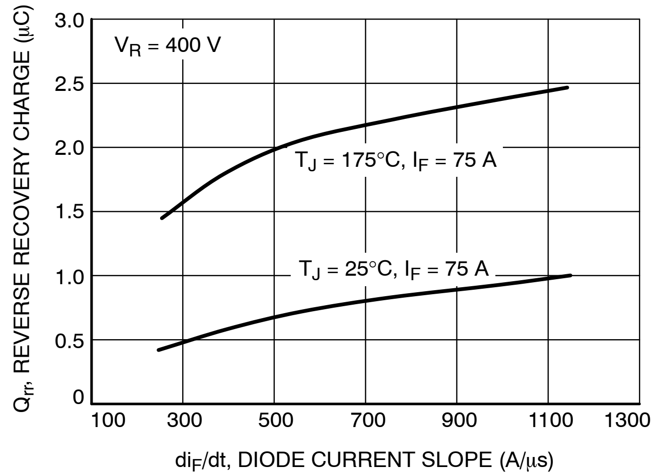


Figure 20. Q_{rr} vs. di_F/dt

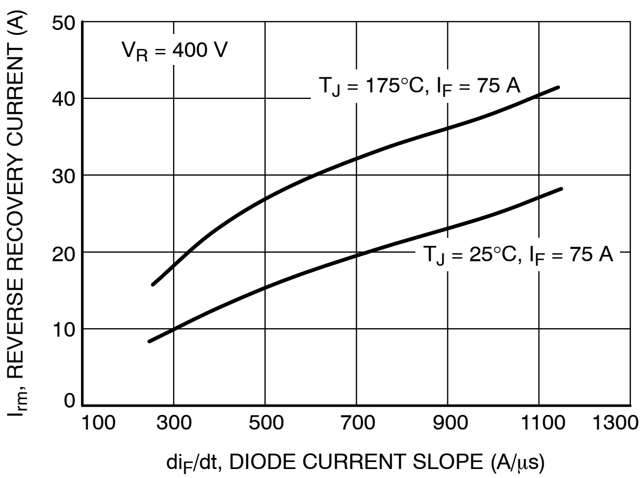


Figure 21. I_{rm} vs. di_F/dt

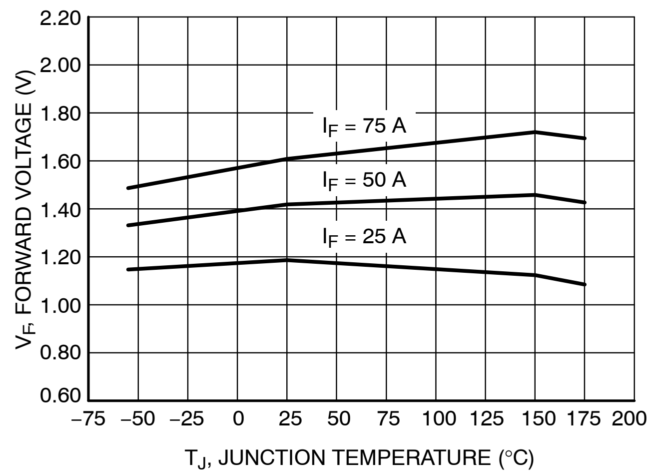


Figure 22. V_F vs. T_J

TYPICAL CHARACTERISTICS

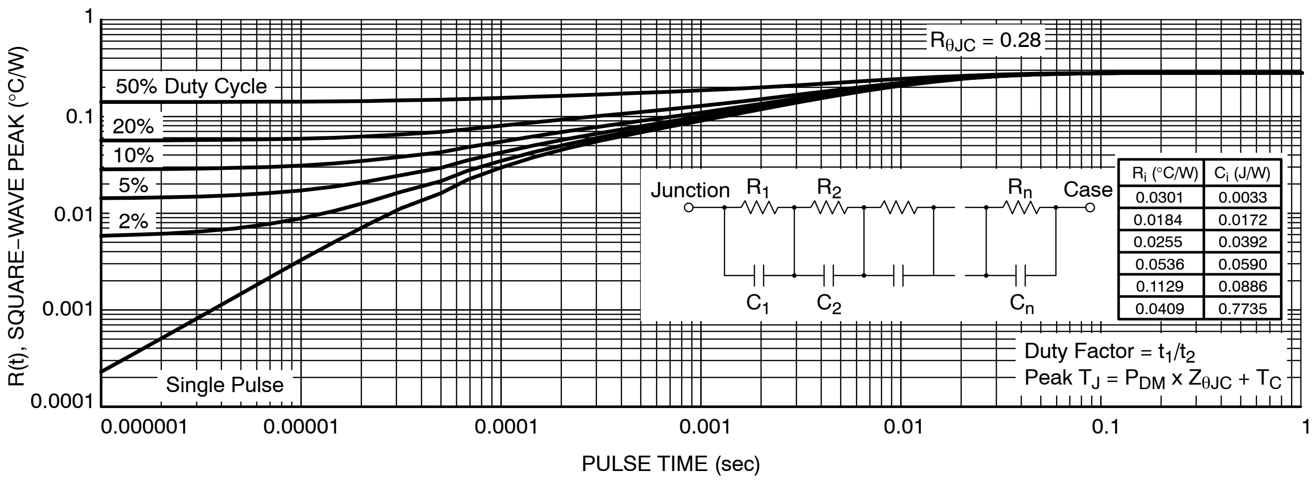


Figure 23. IGBT Transient Thermal Impedance

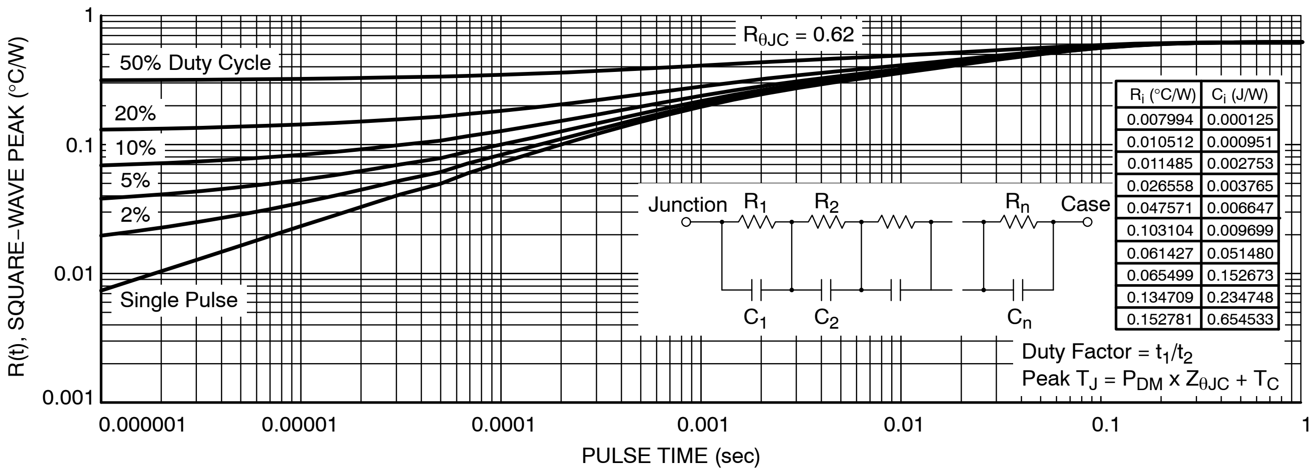


Figure 24. Diode Transient Thermal Impedance

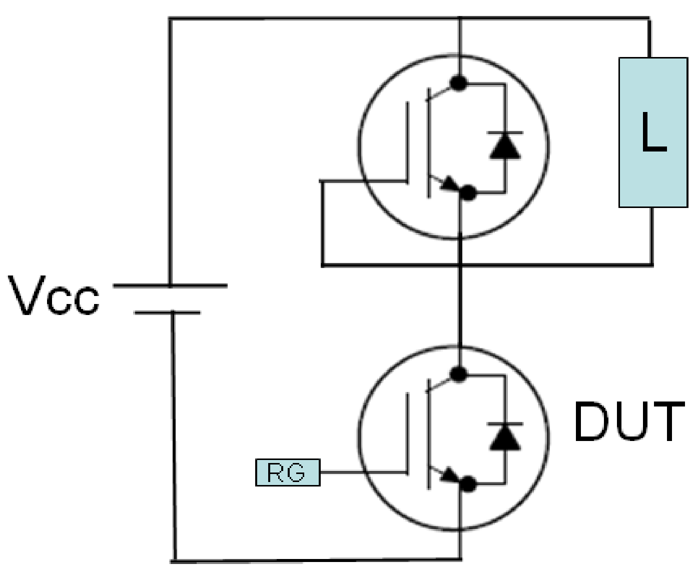


Figure 25. Test Circuit for Switching Characteristics

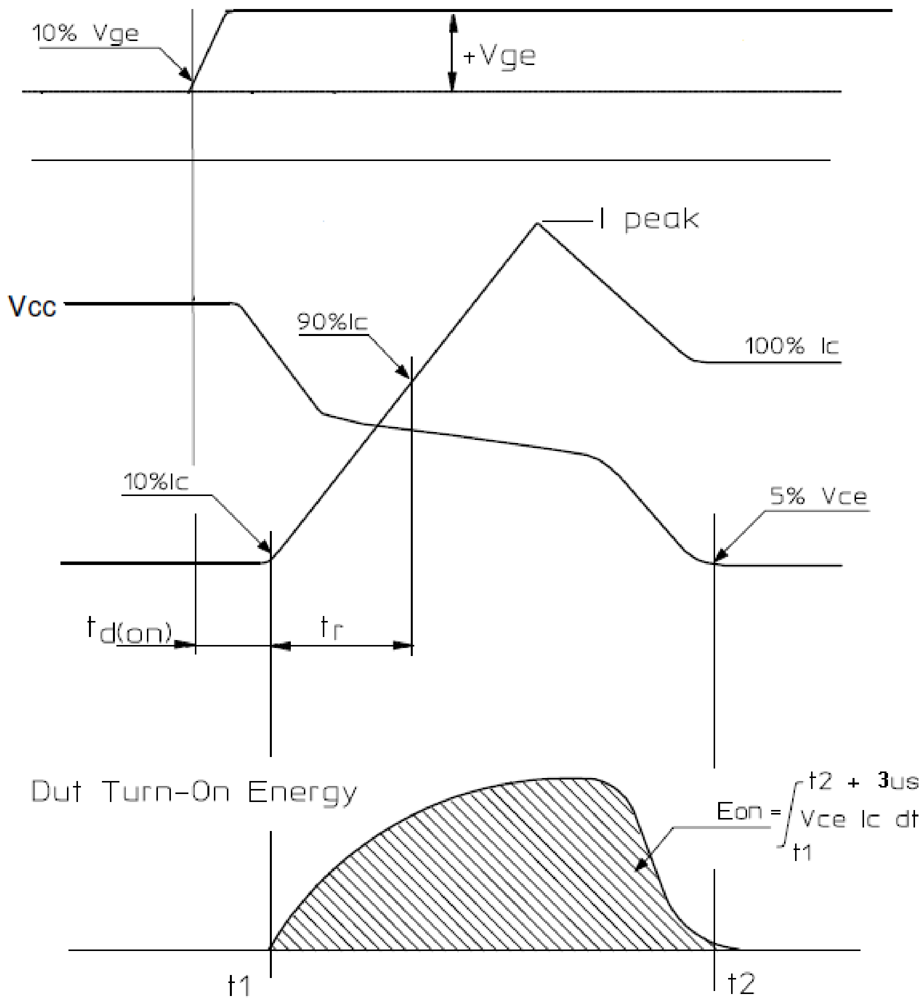


Figure 26. Definition of Turn On Waveform

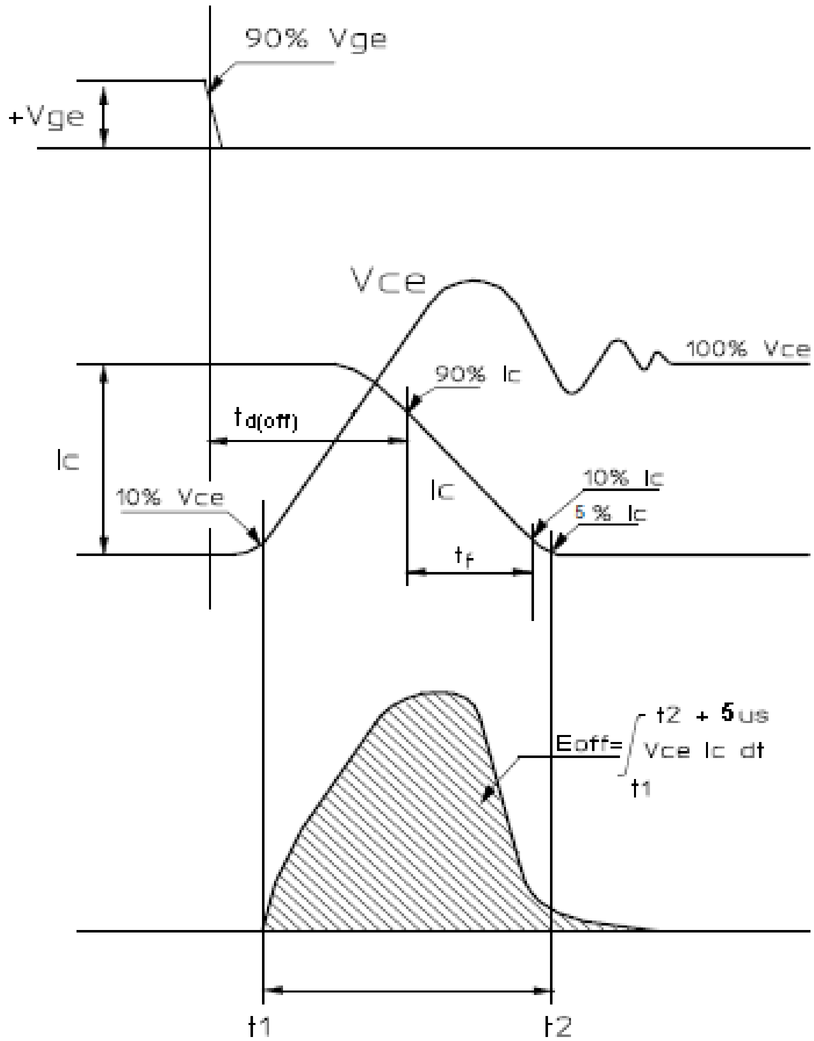
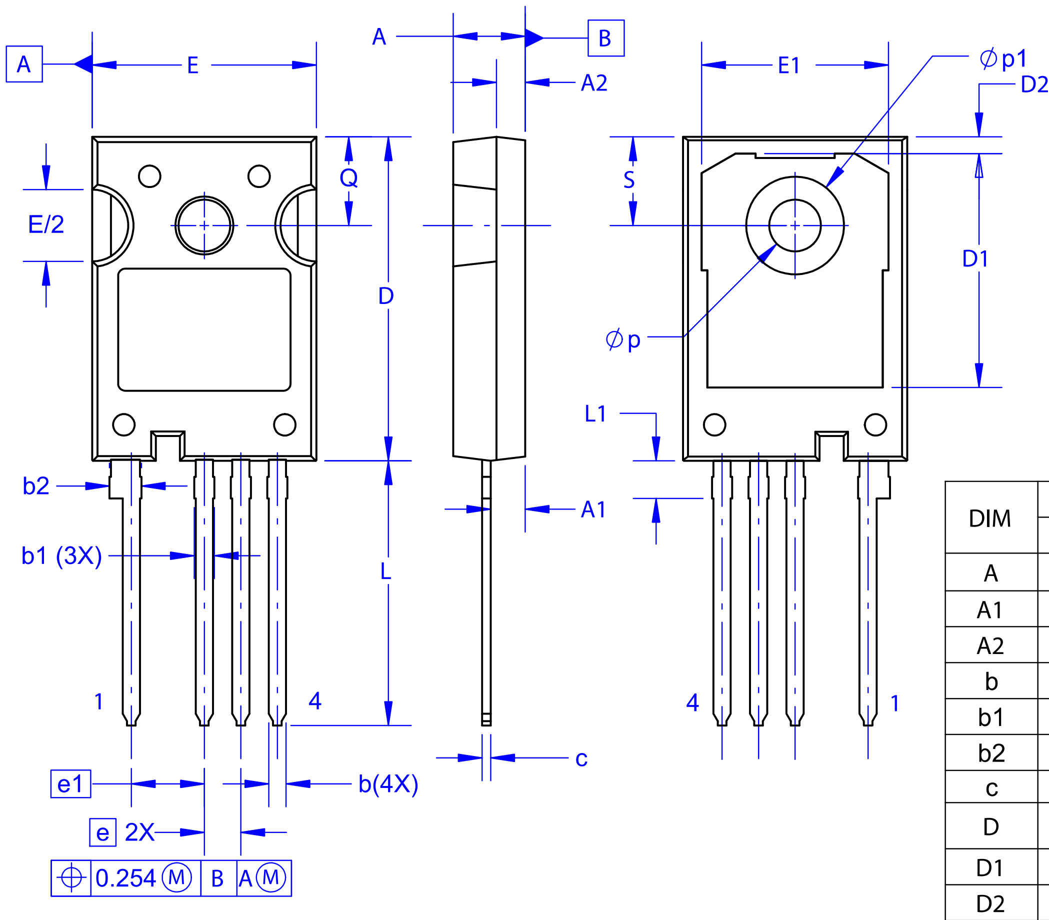


Figure 27. Definition of Turn Off Waveform

TO−247−4LD
CASE 340CJ
ISSUE A

DATE 16 SEP 2019



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.
D. DRAWING CONFORMS TO ASME Y14.5-2009.

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	1.07	1.20	1.33
b1	1.20	1.40	1.60
b2	2.02	2.22	2.42
c	0.50	0.60	0.70
D	22.34	22.54	22.74
D1	16.00	16.25	16.50
D2	0.97	1.17	1.37
e		2.54 BSC	
e1		5.08 BSC	
E	15.40	15.60	15.80
E1	12.80	13.00	13.20
E/2	4.80	5.00	5.20
L	18.22	18.42	18.62
L1	2.42	2.62	2.82
p	3.40	3.60	3.80
p1	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−247−4LD**	**PAGE 1 OF 1**