IGBT - SMPS
300 V

FGH50N3

Description

Using ON Semiconductor's planar technology, this IGBT is ideal for many high voltage switching applications operating at high frequencies where low conduction losses are essential. This device has been optimized for medium frequency switch mode power supplies.

Features

- Low Saturation Voltage: $V_{CE(sat)}$ = 1.4 V Max
- Low E_{OFF} = 6.6 uJ/A
- SCWT = 8 μs @ = 125°C
- 300 V Switching SOA Capability
- Positive Temperature Coefficient above 50 A
- This is a Pb−Free Device

Applications

- SMPS

ON Semiconductor®

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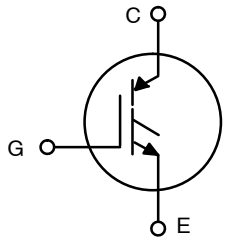
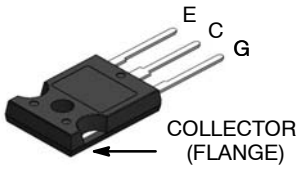
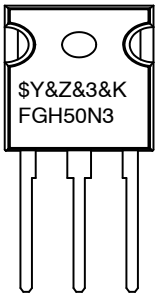




TO−247−3LD
CASE 340CK

MARKING DIAGRAM



$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Numeric Date Code
&K	= Lot Code
FGH50N3	= Specific Device Code

ORDERING INFORMATION

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

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

Parameter		Symbol	Ratings	Unit
Collector to Emitter Breakdown Voltage		BV_{CES}	300	V
Collector Current Continuous	T_C = 25°C	I_C	75	A
	T_C = 110°C		75	A
Collector Current Pulsed (Note 1)		I_{CM}	240	A
Gate to Emitter Voltage Continuous		V_{GES}	±20	V
Gate to Emitter Voltage Pulsed		V_{GEM}	±30	V
Switching Safe Operating Area at T_J = 150°C, Figure 2		SSOA	150 A at 300 V	
Single Pulse Avalanche Energy, I_{CE} = 30 A, L = 1.78 mH, V_{DD} = 50 V		E_{AS}	800	mJ
Single Pulse Reverse Avalanche Energy, I_{EC} = 30 A, L = 1.78 mH, V_{DD} = 50 V		E_{ARV}	800	mJ
Power Dissipation Total	T_C = 25°C	P_D	463	W
Power Dissipation Derating	T_C > 25°C		3.7	W/°C
Operating Junction Temperature Range		T_J	−55 to +150	°C
Storage Temperature Range Range		T_{STG}	−55 to +150	°C
Short Circuit Withstand Time (Note 2)		t_{SC}	8	μs

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. Pulse width limited by maximum junction temperature.
2. $V_{CE(PK)}$ = 180 V, T_J = 125°C, V_{GE} = 12 Vdc, R_G = 5 Ω

PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Package	Tape Width	Quantity
FGH50N3	FGH50N3	TO−247	N/A	30

THERMAL CHARACTERISTICS

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Thermal Resistance, Junction−Case	$R_{\theta JC}$	TO−247	–	–	0.27	°C/W

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

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
OFF STATE CHARACTERISTICS							
Collector to Emitter Breakdown Voltage	BV_{CES}	I_{CE} = 250 μA, V_{GE} = 0 V,		300	–	–	V
Emitter to Collector Breakdown Voltage	BV_{ECS}	I_{EC} = 10 mA, V_{GE} = 0 V		15	–	–	V
Collector to Emitter Leakage Current	I_{CES}	V_{CE} = 300 V	T_J = 25°C	–	–	250	μA
			T_J = 125°C	–	–	2.0	mA
Gate to Emitter Leakage Current	I_{GES}	V_{GE} = ±20 V		–	–	±250	nA
ON STATE CHARACTERISTICs							
Collector to Emitter Saturation Voltage	$V_{CE(SAT)}$	I_{CE} = 30 A, V_{GE} = 15 V	T_J = 25°C	–	1.30	1.4	V
			T_J = 125°C	–	1.25	1.4	V
DYNAMIC CHARACTERISTICS							
Gate Charge	$Q_{G(ON)}$	I_{CE} = 30 A, V_{CE} = 150 V	V_{GE} = 15 V	–	180	–	nC
			V_{GE} = 20 V	–	228	–	nC
Gate to Emitter Threshold Voltage	$V_{GE(TH)}$	I_{CE} = 250 μA, V_{CE}= V_{GE}		4.0	4.8	5.5	V
Gate to Emitter Plateau Voltage	V_{GEP}	I_{CE} = 30 A, V_{CE} = 150 V		–	7.0	–	V

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS						
Switching SOA	SSOA	T_J = 150°C, R_G = 5 Ω, V_{GE} = 15 V, L = 25 μH, V_{CE} = 300 V	150	–	–	A
Current Turn−On Delay Time	$t_{d(ON)I}$	IGBT and Diode at T_J = 25°C, I_{CE} = 30 A, V_{CE} = 180 V, V_{GE} = 15 V, R_G = 5 Ω, , L = 100 μH, Test Circuit − Figure 20	–	20	–	ns
Current Rise Time	t_{rI}		–	15	–	ns
Current Turn−Off Delay Time	$t_{d(OFF)I}$		–	135	–	ns
Current Fall Time	t_{fI}		–	12	–	ns
Turn−On Energy (Note 3)	E_{ON2}		–	130	–	μJ
Turn−Off Energy Loss (Note 4)	E_{OFF}		–	92	120	μJ
Current Turn−On Delay Time	$t_{d(ON)I}$	IGBT and Diode at T_J = 125°C, I_{CE} = 30 A, V_{CE} = 180 V, V_{GE} = 15 V, R_G = 5 Ω, , L = 100 μH, Test Circuit − Figure 20	–	19	–	ns
Current Rise Time	t_{rI}		–	13	–	ns
Current Turn−Off Delay Time	$t_{d(OFF)I}$		–	155	190	ns
Current Fall Time	t_{fI}		–	7	15	ns
Turn−On Energy (Note 3)	E_{ON2}		–	225	270	μJ
Turn−Off Energy (Note 4)	E_{OFF}		–	135	200	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.

3. E_{ON2} is the turn−on loss when a typical diode is used in the test circuit and the diode is at the same T_J as the IGBT. The diode type is specified in Figure 20.
4. Turn−Off Energy Loss (E_{OFF}) is defined as the integral of the instantaneous power loss starting at the trailing edge of the input pulse and ending at the point where the collector current equals zero (I_{CE} = 0 A). All devices were tested per JEDEC Standard No. 24−1 Method for Measurement of Power Device Turn−Off Switching Loss. This test method produces the true total Turn−Off Energy Loss.

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

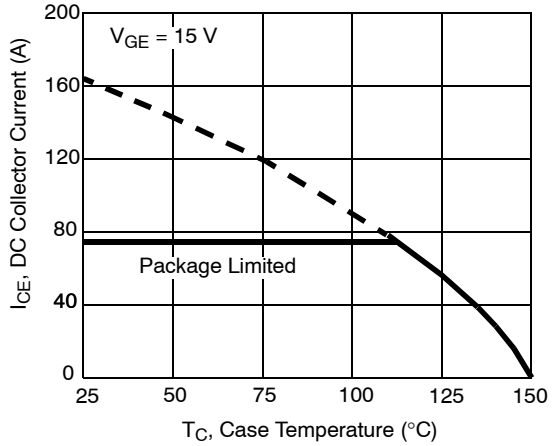


Figure 1. DC Collector Current vs. Case Temperature

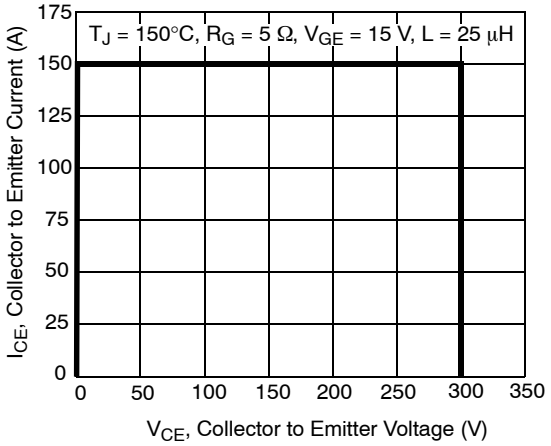


Figure 2. Minimum Switching Safe Operating Area

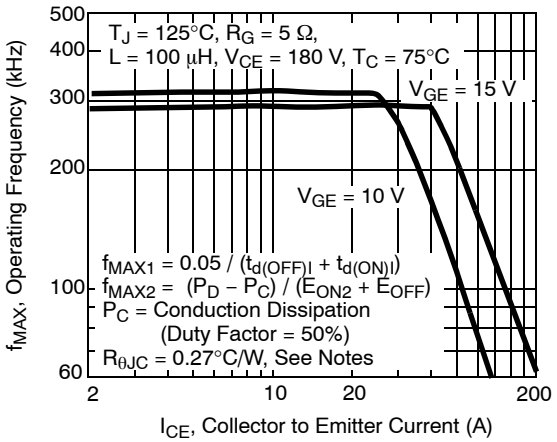


Figure 3. Operating Frequency vs. Collector to Emitter Current

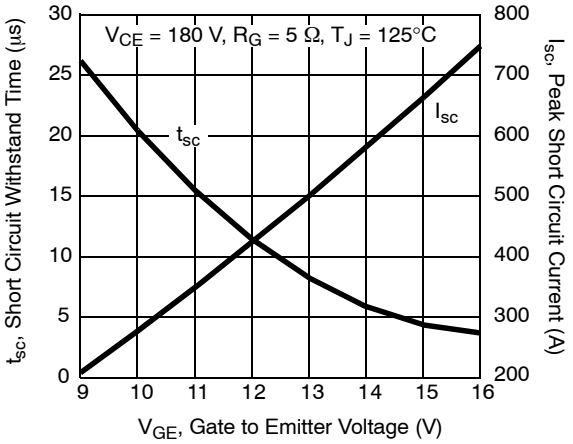


Figure 4. Short Circuit Withstand Time

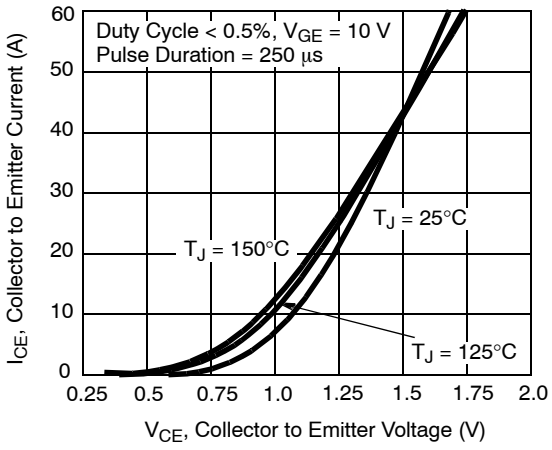


Figure 5. Collector to Emitter On−State Voltage

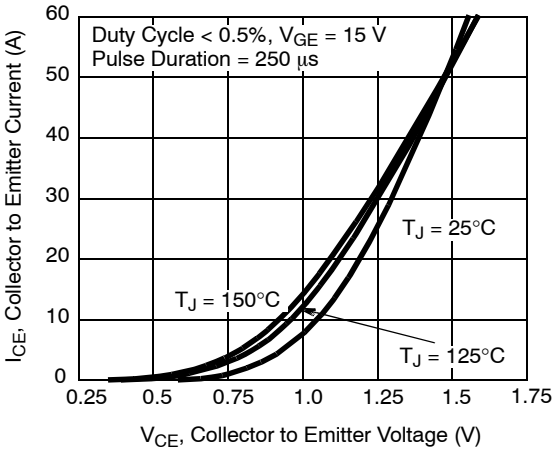


Figure 6. Collector to Emitter On−State Voltage

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted) (continued)

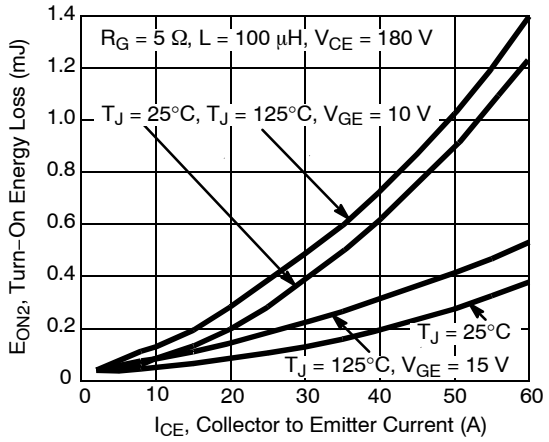


Figure 7. Turn−On Energy Loss vs. Collector to Emitter Current

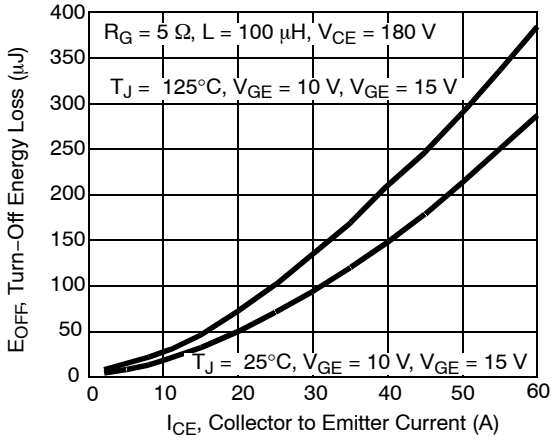


Figure 8. Turn−Off Energy Loss vs. Collector to Emitter Current

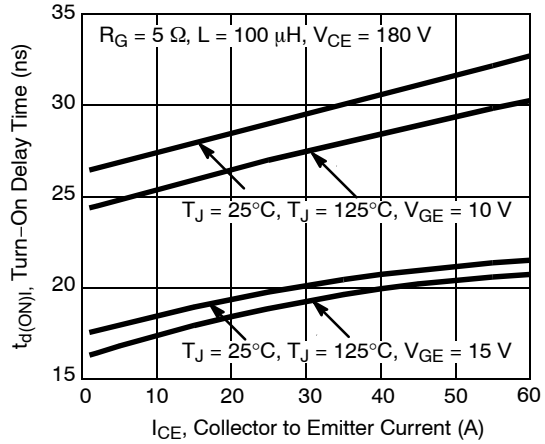


Figure 9. Turn−On Delay Time vs. Collector to Emitter Current

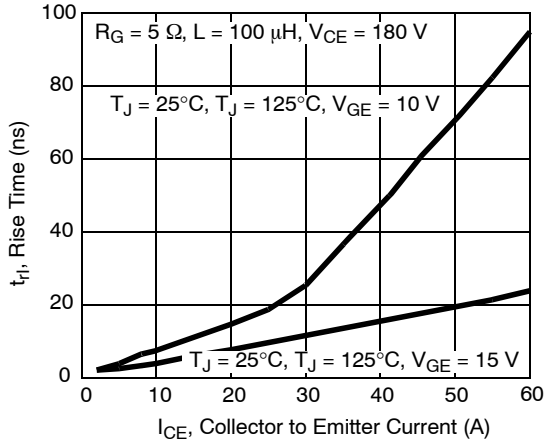


Figure 10. Turn−On Rise Time vs. Collector to Emitter Current

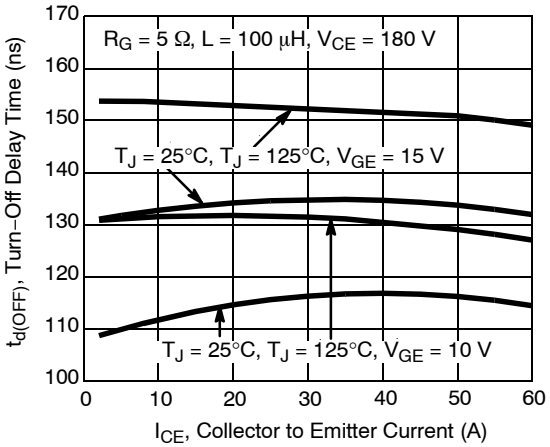


Figure 11. Turn−Off Delay Time vs. Collector to Emitter Current

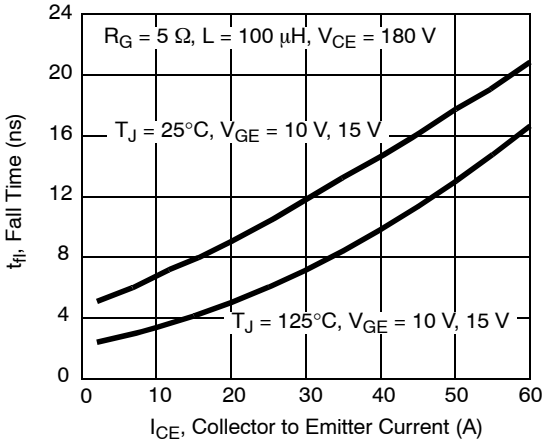


Figure 12. Fall Time vs. Collector to Emitter Current

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted) (continued)

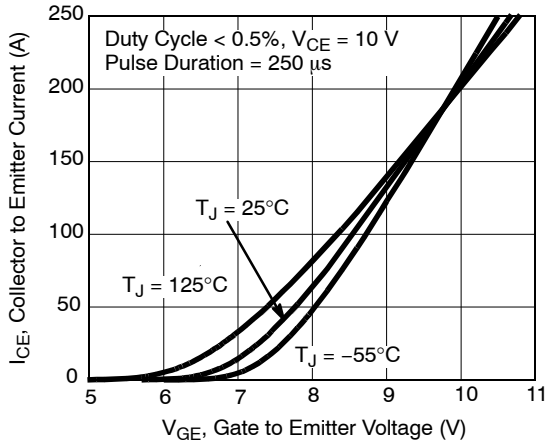


Figure 13. Transfer Characteristics

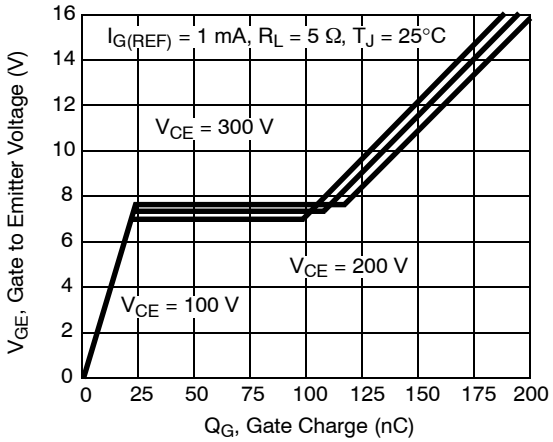


Figure 14. Gate Charge

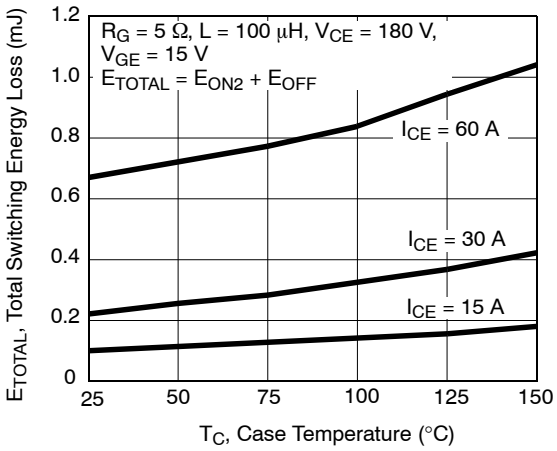


Figure 15. Total Switching Loss vs. Case Temperature

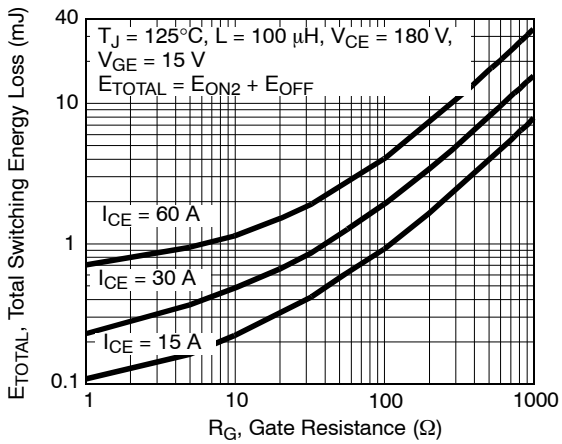


Figure 16. Total Switching Loss vs. Gate Resistance

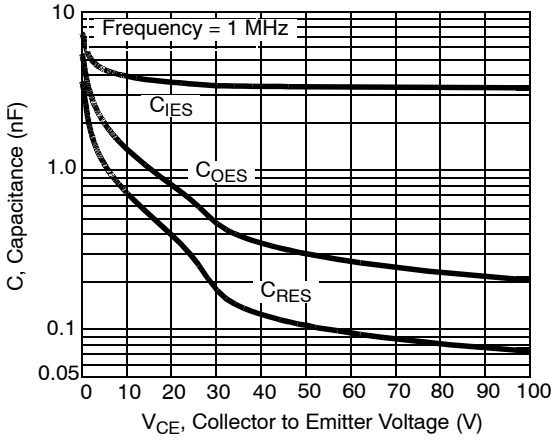


Figure 17. Capacitance vs. Collector to Emitter Voltage

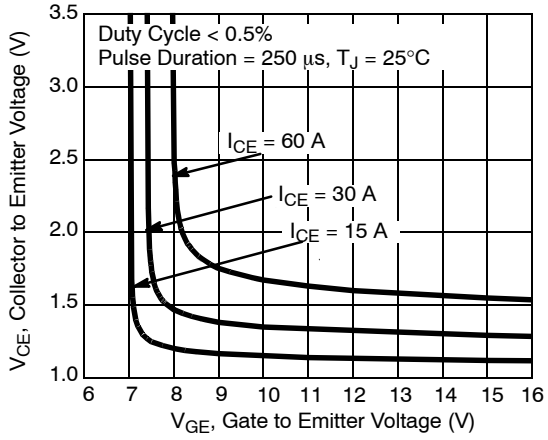


Figure 18. Collector to Emitter On−State Voltage vs. Gate to Emitter Voltage

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted) (continued)

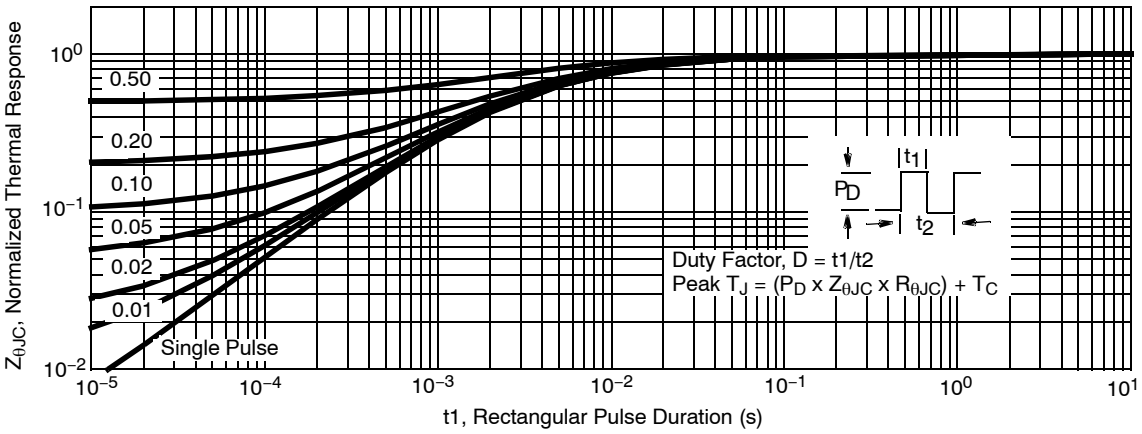


Figure 19. IGBT Normalized Transient Thermal Impedance, Junction to Case

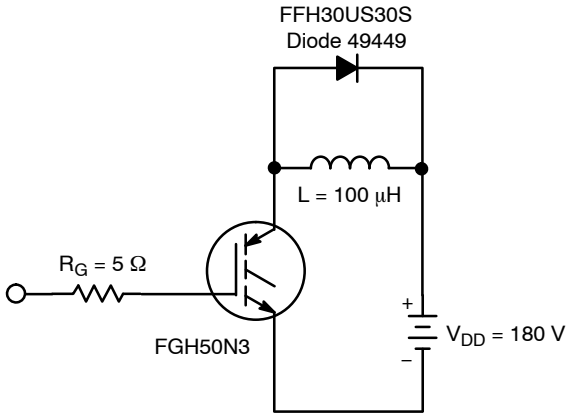


Figure 20. Inductive Switching Test Circuit

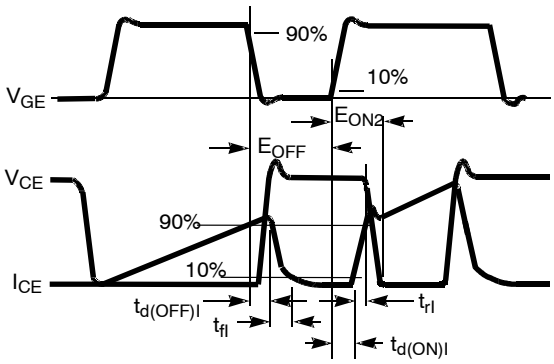


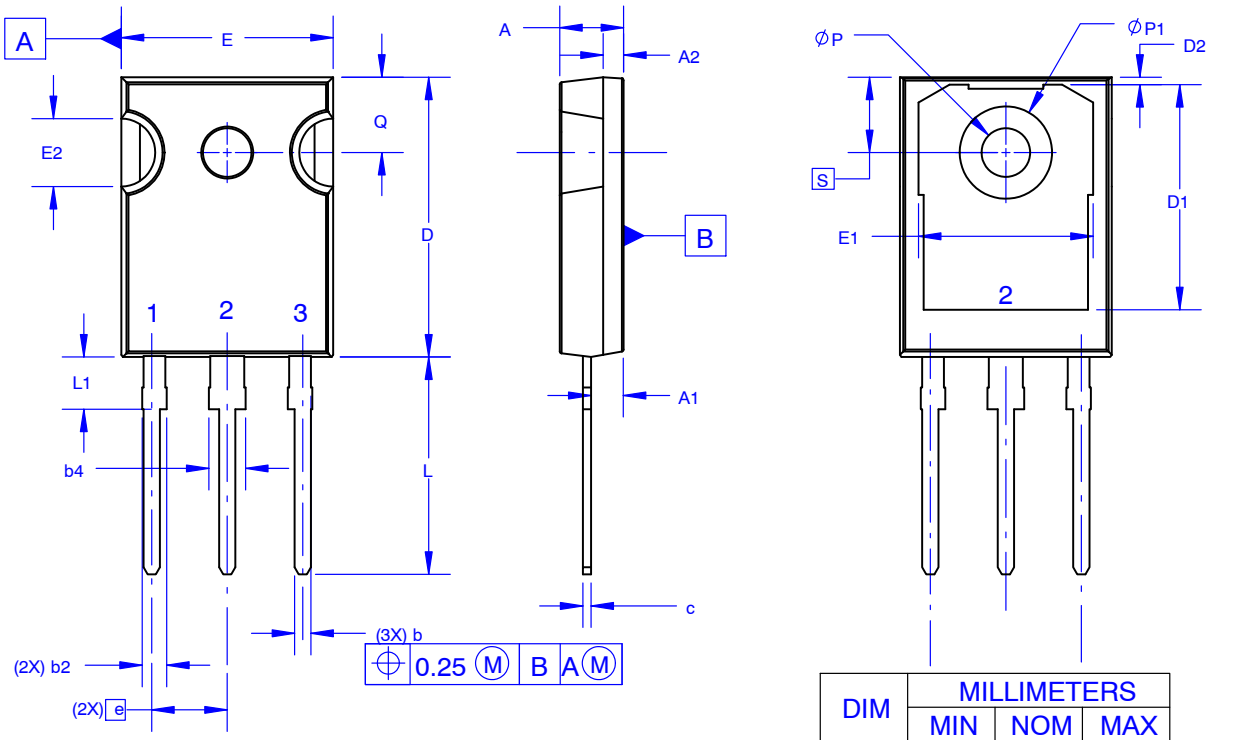
Figure 21. Switching Test Waveforms

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®

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

DATE 31 JAN 2019

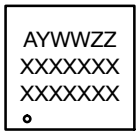


DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.58	4.70	4.82
A1	2.20	2.40	2.60
A2	1.40	1.50	1.60
b	1.17	1.26	1.35
b2	1.53	1.65	1.77
b4	2.42	2.54	2.66
c	0.51	0.61	0.71
D	20.32	20.57	20.82
D1	13.08	~	~
D2	0.51	0.93	1.35
E	15.37	15.62	15.87
E1	12.81	~	~
E2	4.96	5.08	5.20
e	~	5.56	~
L	15.75	16.00	16.25
L1	3.69	3.81	3.93
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

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.

GENERIC
MARKING DIAGRAM*



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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