

# IGBT - Shorted-anode

1500 V, 30 A

## FGH30S150P

### Description

Using advanced field stop trench and shorted-anode technology, ON Semiconductor's shorted-anode trench IGBTs offer superior conduction and switching performances for soft switching applications. The device can operate in parallel configuration with exceptional avalanche capability. This device is designed for induction heating and microwave oven.

### Features

- High Speed Switching
- Low Saturation Voltage:  $V_{CE(sat)} = 1.85 \text{ V @ } I_C = 30 \text{ A}$
- High Input Impedance
- This Device is Pb-Free and is RoHS Compliant

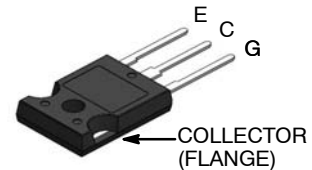
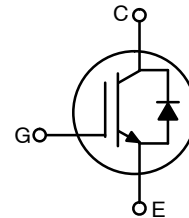
### Applications

- Induction Heating, Microwave Oven



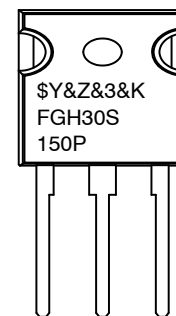
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TO-247-3LD  
CASE 340CK

### MARKING DIAGRAM



\$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Numeric Date Code
&K	= Lot Code
FGH30S150P	= Specific Device Code

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# FGH30S150P

## ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25°C unless otherwise noted)

Description		Symbol	Rating	Unit
Collector to Emitter Voltage		V <sub>CES</sub>	1500	V
Gate to Emitter Voltage		V <sub>GES</sub>	±25	V
Collector Current	T <sub>C</sub> = 25°C	I <sub>C</sub>	60	A
Collector Current	T <sub>C</sub> = 100°C		30	A
Pulsed Collector Current		I <sub>CM</sub> (Note 1)	90	A
Diode Continuous Forward Current	T <sub>C</sub> = 25°C	I <sub>F</sub>	60	A
Diode Continuous Forward Current	T <sub>C</sub> = 100°C		30	A
Maximum Power Dissipation	T <sub>C</sub> = 25°C	P <sub>D</sub>	500	W
Maximum Power Dissipation	T <sub>C</sub> = 100°C		250	W
Operating Junction Temperature		T <sub>J</sub>	–55 to +175	°C
Storage Temperature Range		T <sub>stg</sub>	–55 to +175	°C
Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds		T <sub>L</sub>	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. Limited by T<sub>jmax</sub>.

## THERMAL CHARACTERISTICS

Parameter	Symbol	Typ	Max	Unit
Thermal Resistance, Junction to Case, Max	R <sub>θJC</sub> (IGBT)	–	0.3	°C/W
Thermal Resistance, Junction to Ambient, Max	R <sub>θJA</sub>	–	40	°C/W

## PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Mark	Package	Reel Size	Tape Width	Quantity
FGH30S150P	FGH30S150P	TO-247	–	–	30

## ELECTRICAL CHARACTERISTICS OF THE IGBT (T<sub>C</sub> = 25°C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Collector to Emitter Breakdown Voltage	BV <sub>CES</sub>	V <sub>GE</sub> = 0 V, I <sub>C</sub> = 1 mA	1500	–	–	V
Temperature Coefficient of Breakdown Voltage	ΔBV <sub>CES</sub> /ΔT <sub>J</sub>	V <sub>GE</sub> = 0 V, I <sub>C</sub> = 1 mA	–	1.5	–	V/°C
Collector Cut-Off Current	I <sub>CES</sub>	V <sub>CE</sub> = 1500, V <sub>GE</sub> = 0 V	–	–	1	mA
G–E Leakage Current	I <sub>GES</sub>	V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0 V	–	–	±500	nA

### ON CHARACTERISTICS

G–E Threshold Voltage	V <sub>GE(th)</sub>	I <sub>C</sub> = 30 mA, V <sub>CE</sub> = V <sub>GE</sub>	4.5	6.0	7.5	V
Collector to Emitter Saturation Voltage	V <sub>CE(sat)</sub>	I <sub>C</sub> = 30 A, V <sub>GE</sub> = 15 V, T <sub>C</sub> = 25°C	–	1.85	2.4	V
		I <sub>C</sub> = 30 A, V <sub>GE</sub> = 15 V, T <sub>C</sub> = 125°C	–	2.06	–	V
		I <sub>C</sub> = 30 A, V <sub>GE</sub> = 15 V, T <sub>C</sub> = 175°C	–	2.15	–	V
Diode Forward Voltage	V <sub>FM</sub>	I <sub>F</sub> = 30 A, T <sub>C</sub> = 25°C	–	1.61	2.2	V
		I <sub>F</sub> = 30 A, T <sub>C</sub> = 175°C	–	1.96	–	V

# FGH30S150P

## ELECTRICAL CHARACTERISTICS OF THE IGBT ( $T_C = 25^\circ\text{C}$ unless otherwise noted) (continued)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
DYNAMIC CHARACTERISTICS						
Input Capacitance	$C_{ies}$	$V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	–	3310	–	pF
Output Capacitance	$C_{oes}$		–	70	–	pF
Reverse Transfer Capacitance	$C_{res}$		–	55	–	pF
SWITCHING CHARACTERISTICS						
Turn–On Delay Time	$t_{d(on)}$	$V_{CC} = 600\text{ V}, I_C = 30\text{ A},$ $R_G = 10\text{ }\Omega, V_{GE} = 15\text{ V},$ Resistive Load, $T_C = 25^\circ\text{C}$	–	32	–	ns
Rise Time	$t_r$		–	292	–	ns
Turn–Off Delay Time	$t_{d(off)}$		–	492	–	ns
Fall Time	$t_f$		–	214	–	ns
Turn–On Switching Loss	$E_{on}$		–	1.16	–	mJ
Turn–Off Switching Loss	$E_{off}$		–	0.9	–	mJ
Total Switching Loss	$E_{ts}$			2.06	–	mJ
Turn–On Delay Time	$t_{d(on)}$	$V_{CC} = 600\text{ V}, I_C = 30\text{ A},$ $R_G = 10\text{ }\Omega, V_{GE} = 15\text{ V},$ Resistive Load, $T_C = 175^\circ\text{C}$	–	36	–	ns
Rise Time	$t_r$		–	336	–	ns
Turn–Off Delay Time	$t_{d(off)}$		–	560	–	ns
Fall Time	$t_f$		–	520	–	ns
Turn–On Switching Loss	$E_{on}$		–	1.39	–	mJ
Turn–Off Switching Loss	$E_{off}$		–	1.86	–	mJ
Total Switching Loss	$E_{ts}$		–	3.25	–	mJ
Total Gate Charge	$Q_g$	$V_{CE} = 600\text{ V}, I_C = 30\text{ A}, V_{GE} = 15\text{ V}$	–	369	–	nC
Gate to Emitter Charge	$Q_{ge}$		–	23.5	–	nC
Gate to Collector Charge	$Q_{gc}$		–	199	–	nC

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

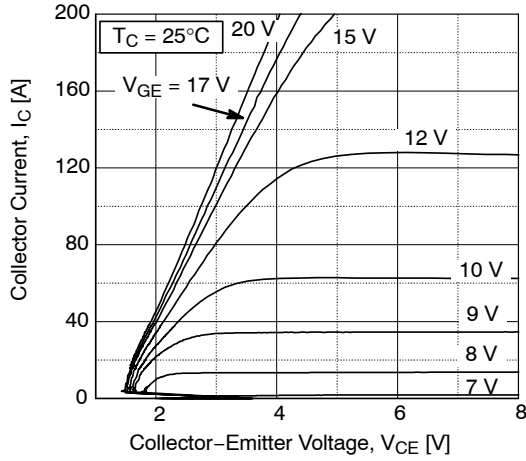


Figure 1. Typical Output Characteristics

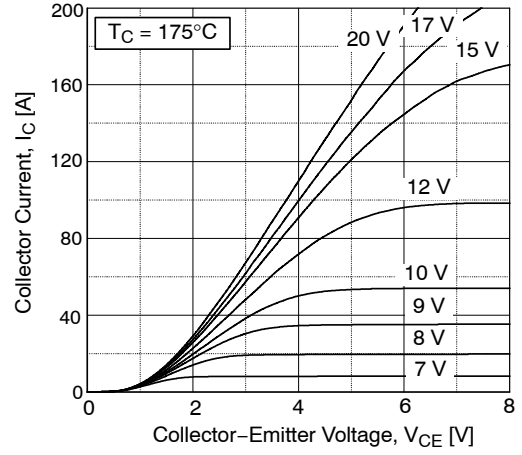


Figure 2. Typical Output Characteristics

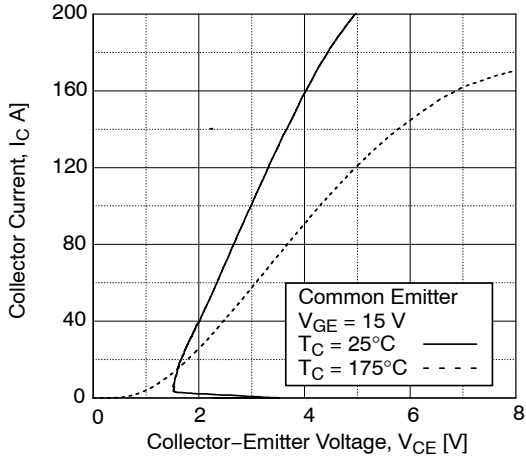


Figure 3. Typical Saturation Voltage Characteristics

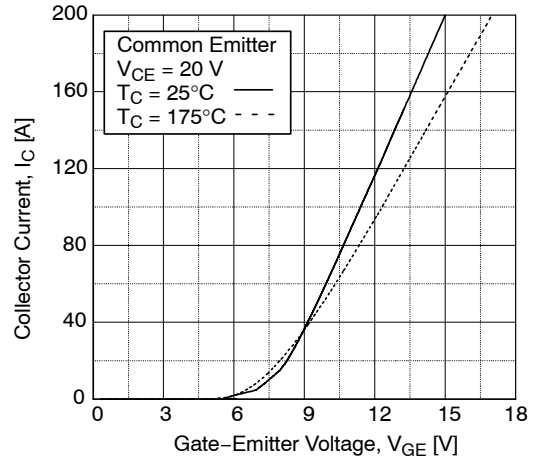


Figure 4. Transfer Characteristics

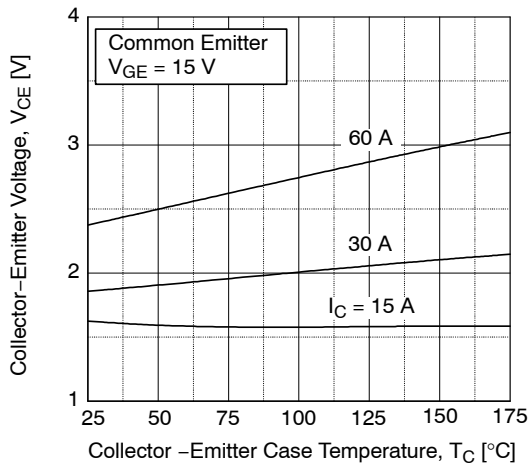


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

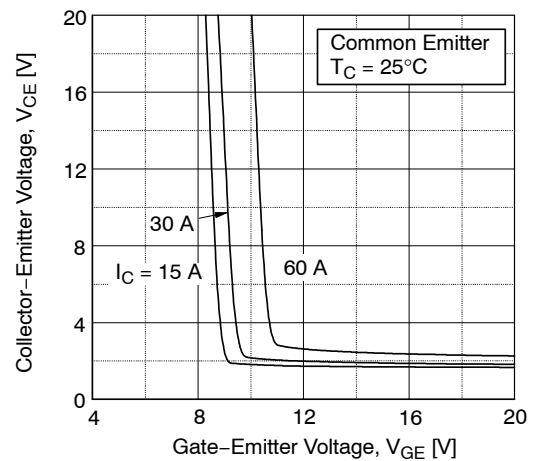


Figure 6. Saturation Voltage vs  $V_{GE}$

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

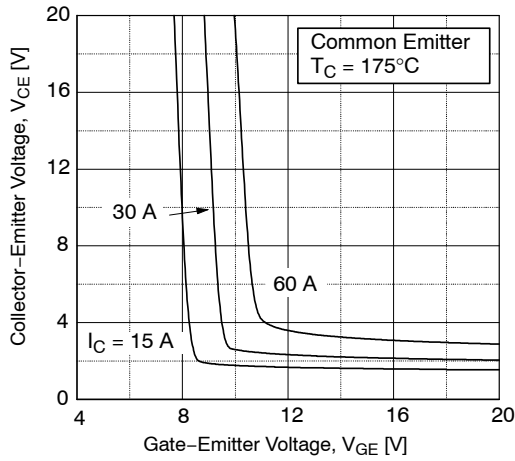


Figure 7. Saturation Voltage vs.  $V_{GE}$

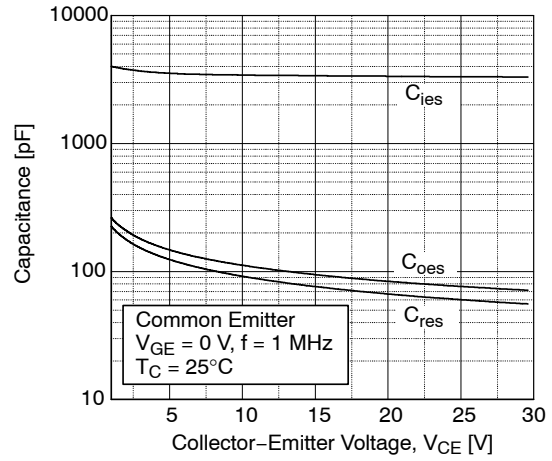


Figure 8. Capacitance Characteristic

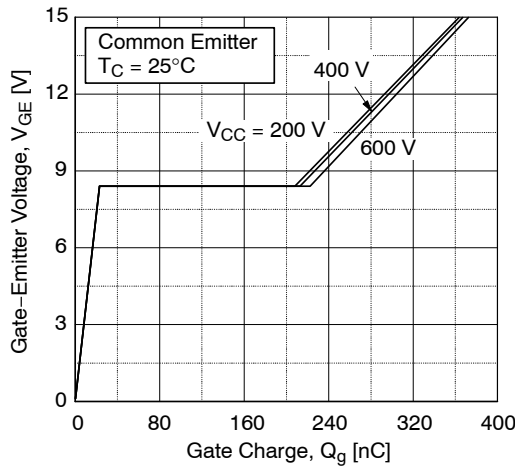


Figure 9. Gate Charge Characteristics

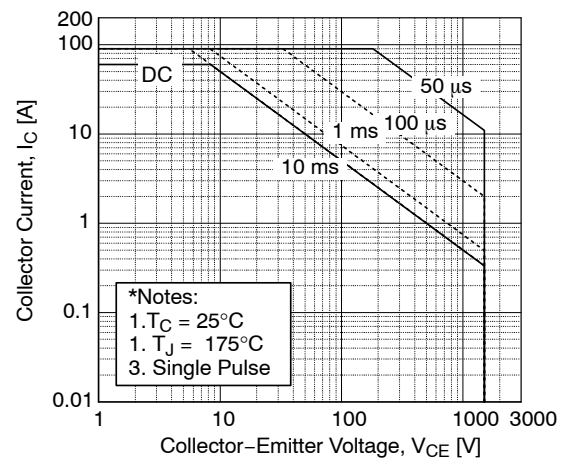


Figure 10. SOA Characteristics

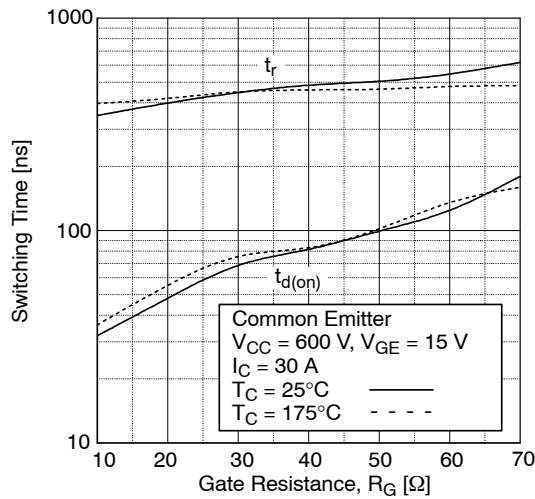


Figure 11. Turn-On Characteristics vs. Gate Resistance

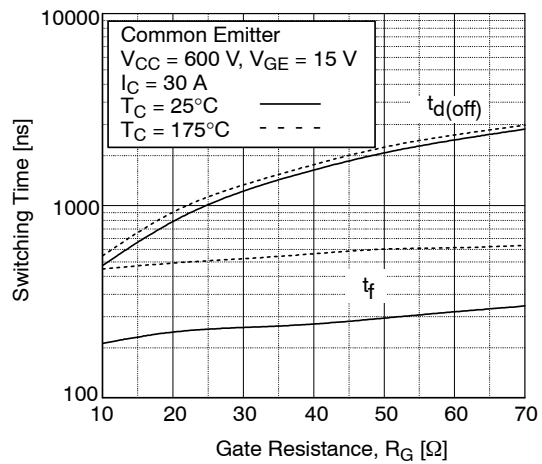


Figure 12. Turn-Off Characteristics vs. Gate Resistance

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

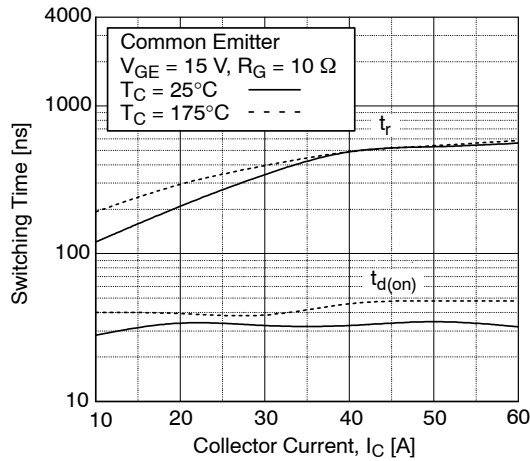


Figure 13. Turn-On Characteristics vs. Collector Current

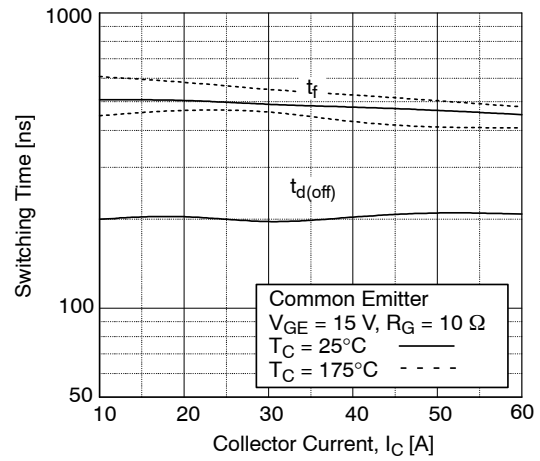


Figure 14. Turn-Off Characteristics vs. Collector Current

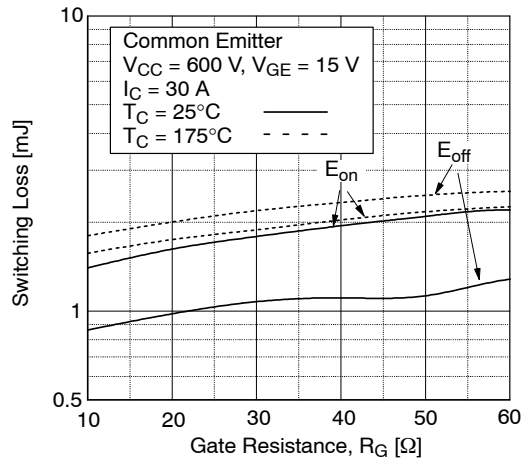


Figure 15. Switching Loss vs. Gate Resistance

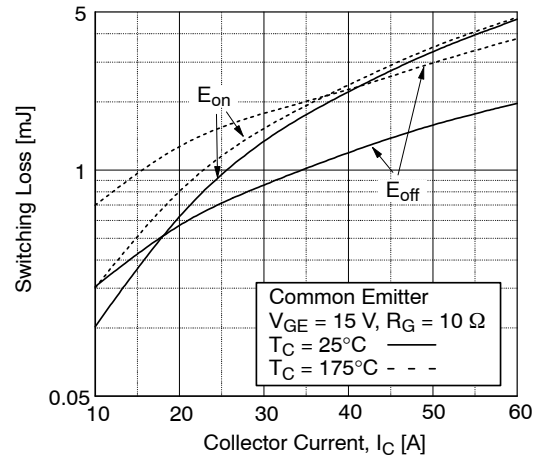


Figure 16. Switching Loss vs. Collector Current

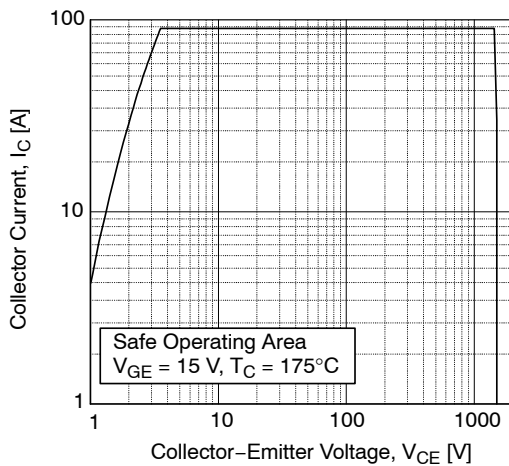


Figure 17. Turn-Off Switching SOA Characteristics

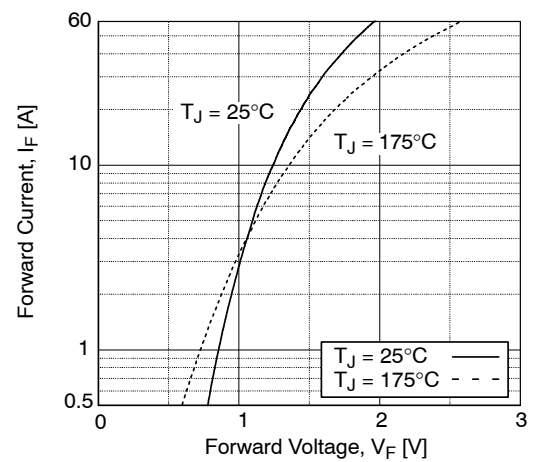


Figure 18. Forward Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

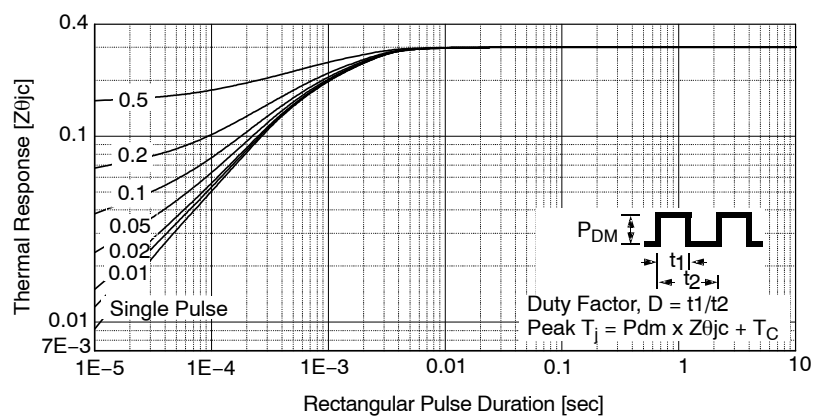
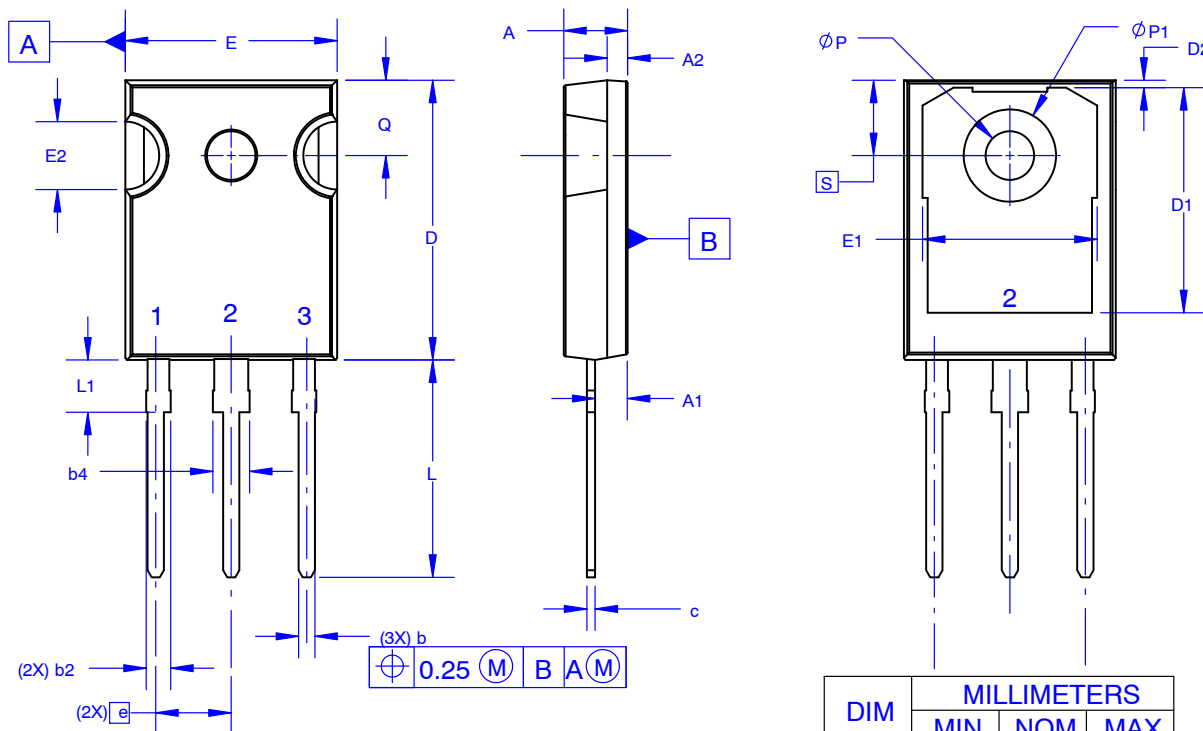


Figure 19. Transient Thermal Impedance of IGBT

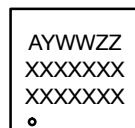
**TO-247-3LD SHORT LEAD**  
**CASE 340CK**  
**ISSUE A**

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.

**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.

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
$\phi P$	3.51	3.58	3.65
$\phi P1$	6.60	6.80	7.00
Q	5.34	5.46	5.58
S	5.34	5.46	5.58

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