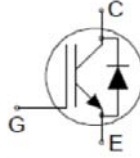


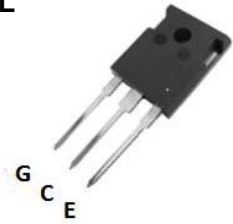
## Power Pack Silicon Trench Field FS IGBT IGBT 650V / 75A

### Features

- ◆ Fast Switching Field Stop IGBT Trench Technology
- ◆ Low Saturation Voltage:  
 $V_{CE(sat)} = 2.0V @ I_C = 75A$
- ◆ Low Switching Loss
- ◆ Superfast Diodes
- ◆ High Efficient Turn-on di/dt Controllability



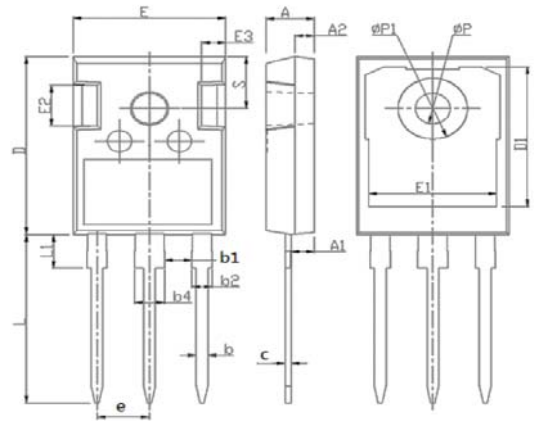
TO-247-3L



G = Gate, C = Collector, E = Emitter

### Applications

- ◆ Photovoltaic converters
- ◆ UPS & Solar Inverters
- ◆ Boost



### Maximum Ratings ( $T_C = 25^\circ C$ )

Item	Symbol	Rated Value	Unit
Collector-Emitter Voltage	$V_{CES}$	650	V
Gate-Emitter Voltage	$V_{GES}$	$\pm 25$	V
Collector Current	$I_C$	75	A
	$T_C = 100^\circ C$		
Pulsed Collector Current	$I_{CRM}$	300	A
Total Power Dissipation	$P_D$	468	W
	$T_J = 25^\circ C$		
Diode Continuous Forward Current	$I_F$	150 75	A
	$T_C = 25^\circ C$ $T_C = 100^\circ C$		
Diode Forward Current	$I_{FM}$	160	A
Junction Temperature Range	$T_J$	- 55 ~ + 175	$^\circ C$
Storage Temperature Range	$T_{stg}$	- 55 ~ + 175	$^\circ C$

Symbol	Dimensions(millimeters)	
	Min.	Max.
A	4.80	5.20
A1	2.21	2.61
A2	1.85	2.15
b	1.10	1.30
b1	2.55	2.85
b2	1.90	2.15
b4	3.00	3.20
c	0.50	0.75
D	20.70	21.30
D1	16.25	16.85
e	5.25	5.65
E	15.60	16.00
E1	13.06	13.46
E2	4.80	5.20
E3	1.80	2.50
L	19.62	20.22
L1	4.00	4.30
$\Phi P$	3.40	3.80
$\Phi P1$	7.00	7.30
S	5.95	6.35

## ■ Electrical Characteristics @ T<sub>C</sub>=25°C (unless otherwise specified)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Collector-Emitter Voltage	V <sub>GE</sub> =0V, I <sub>CE</sub> =250μA	V <sub>CE(s)</sub>	650	—	—	V
Collector-Emitter Saturation Voltage	V <sub>GE</sub> =15V, I <sub>C</sub> =75A T <sub>J</sub> = 25°C T <sub>J</sub> = 175°C	V <sub>CE(sat)</sub>	— —	2.00 2.80	2.40 —	V V
Gated Threshold Voltage	V <sub>CE</sub> = V <sub>GE</sub> , I <sub>C</sub> =1mA	V <sub>GE(th)</sub>	4.5	5.5	6.5	V
Collector-Emitter Leakage Current	V <sub>GE</sub> =0V, V <sub>CE</sub> =650V	I <sub>CE(s)</sub>	—	—	55	μA
Gate to Emitter Forward Leakage	V <sub>GE</sub> = +20V, V <sub>CE</sub> = 0V	I <sub>GES(F)</sub>	—	—	200	nA
Gate to Emitter Reverse Leakage	V <sub>GE</sub> = -20V, V <sub>CE</sub> = 0V	I <sub>GES(R)</sub>	—	—	-200	nA
<b>Dynamic Characteristics</b>						
Input Capacitance	V <sub>GE</sub> =0V,	C <sub>ies</sub>	—	3979	—	pF
Output Capacitance	V <sub>CE</sub> =25V,	C <sub>oes</sub>	—	187	—	pF
Reverse Transfer Capacitance	f=1.0MHZ	C <sub>res</sub>	—	36	—	pF
Gate Charge	V <sub>CE</sub> =520V, I <sub>C</sub> =75A, V <sub>GE</sub> =15V	Q <sub>g</sub>	—	156	—	nC
<b>Switching Characteristics</b>						
Turn-on Delay Time	V <sub>CE</sub> =400V, I <sub>C</sub> =75A, V <sub>GE</sub> =15V, R <sub>G</sub> =5Ω, T <sub>J</sub> = 25°C Inductive Load	t <sub>d(on)</sub>	—	29	—	nS
Rise Time		t <sub>r</sub>	—	66	—	
Turn-off Delay Time		t <sub>d(off)</sub>	—	110	—	
Fall Time		t <sub>f</sub>	—	58	—	
Turn-On Switching Loss		E <sub>on</sub>	—	1.25	—	mJ
Turn-Off Switching Loss		E <sub>off</sub>	—	1.10	—	
Total Switching Loss		E <sub>ts</sub>	—	2.35	—	

## ■ Electrical Characteristics of the Diode @T<sub>C</sub>= 25°C (unless otherwise specified)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
Diode Continuous Forward Current	T <sub>C</sub> = 100°C	I <sub>F</sub>	75	—	—	A
Diode Forward Voltage	I <sub>F</sub> = 75A T <sub>C</sub> = 25°C T <sub>C</sub> = 125°C T <sub>C</sub> = 175°C	V <sub>F</sub>	— — —	1.60 1.35 1.15	2.40 — —	V
Reverse Recovery Time	T <sub>J</sub> =25°C, I <sub>F</sub> =75A	t <sub>rr</sub>	—	36	—	nS
Reverse Recovery Charge	di/dt=200A/us	Q <sub>rr</sub>	—	96	—	nC

\*Pulse Test: Pulse Width <= 300μs, Duty Cycle< =2%

## ■ Thermal Characteristics

Parameter	Symbol	Min	Typ	MAX	Units
Thermal Resistance,Junction to case for IGBT	R <sub>θJC</sub>	—	—	0.32	°C/W
Thermal Resistance,Junction to case for Diode	R <sub>θJC</sub>	—	—	0.70	°C/W
Thermal Resistance,Junction to Ambient	R <sub>θJA</sub>	—	—	40	°C/W

Characteristics Curves

Figure 1. Forward Bias Safe Operating Area

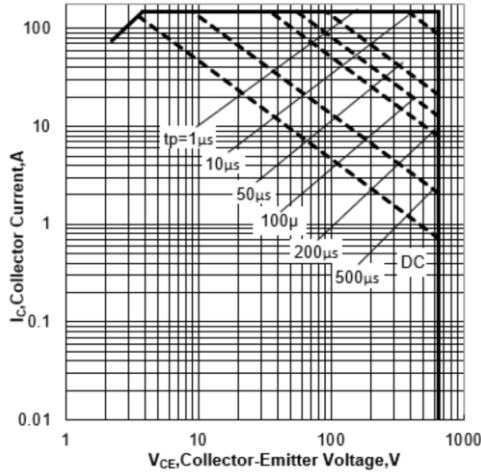


Figure 2. Power Dissipation vs Case Temperature

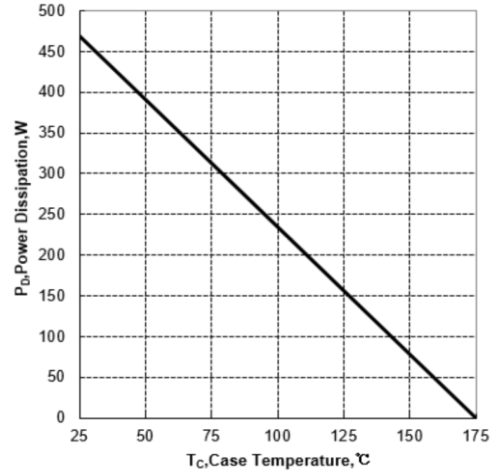


Figure 3. Collector Current vs Case Temperature

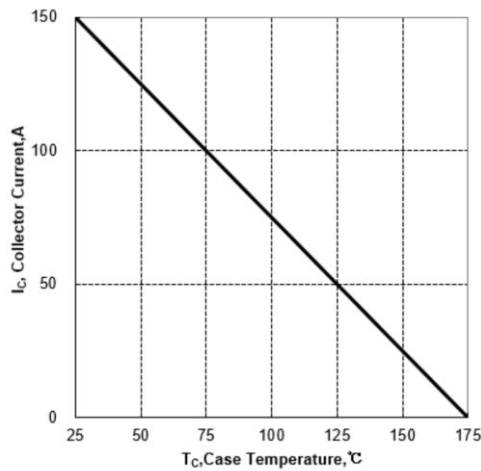


Figure 4. Typical Transfer Characteristics

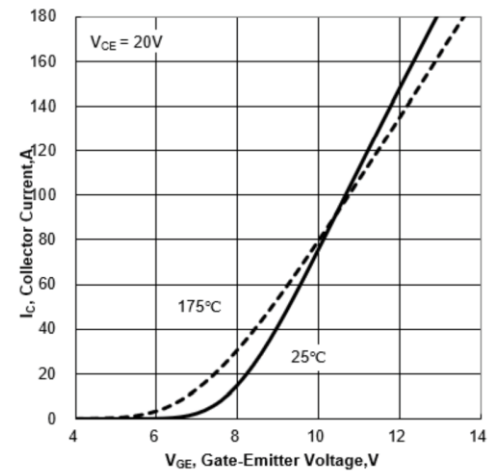


Figure 5. Typical Output Characteristics ( $T_J=25^\circ\text{C}$ )

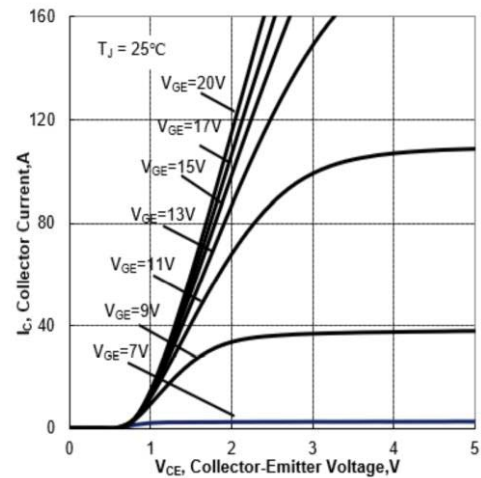
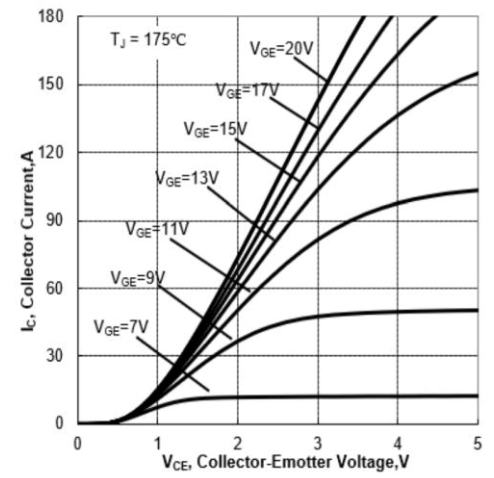


Figure 6. Typical Output Characteristics ( $T_J=175^\circ\text{C}$ )



Characteristics Curves

Figure 7. Typical Collector-Emitter Saturation Voltage vs Junction Temperature

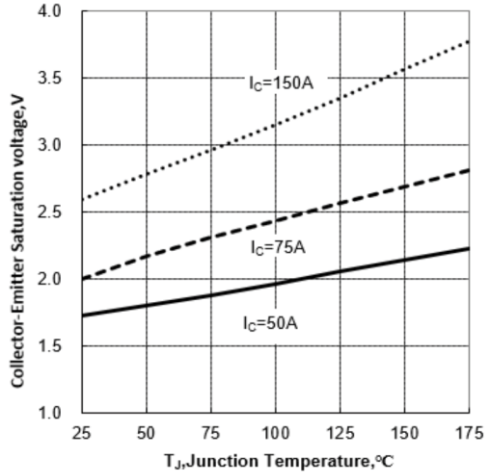


Figure 8. Typical Switching Times vs Gate Resistor (T<sub>J</sub>=25°C, V<sub>CE</sub>=400V, V<sub>GE</sub>=15/0V, I<sub>C</sub>=75A)

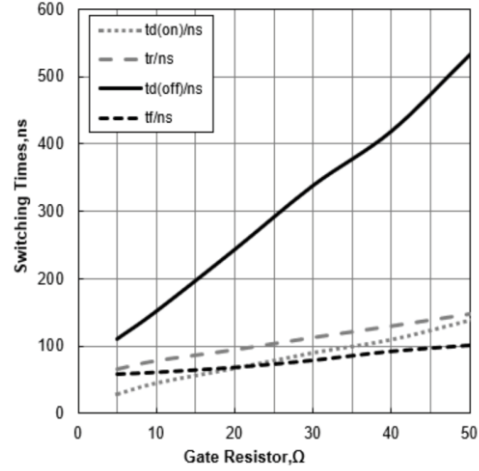


Figure 9. Typical Switching Times vs Junction Temperature (V<sub>CE</sub>=400V, V<sub>GE</sub>=15/0V, I<sub>C</sub>=75A)

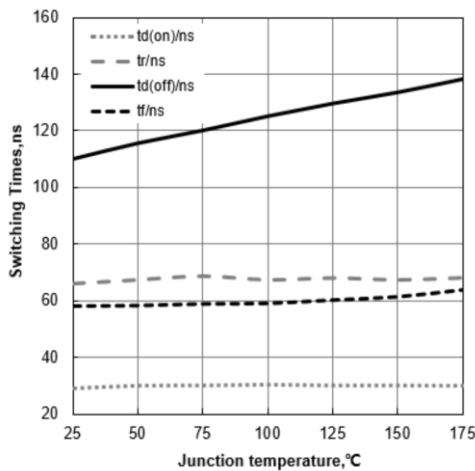


Figure 10. Typical Switching Times vs Collector Current (T<sub>J</sub>=25°C, V<sub>CE</sub>=400V, V<sub>GE</sub>=15/0V)

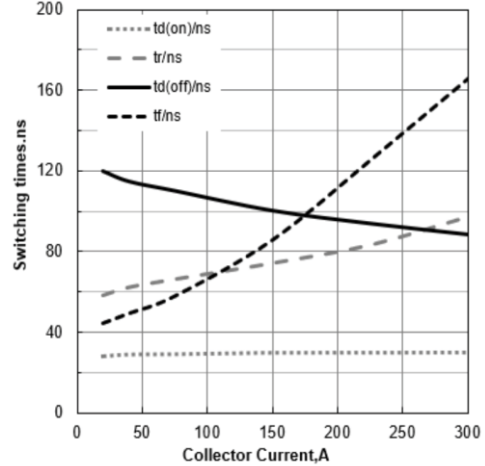


Figure 11. Typical Gate Charge

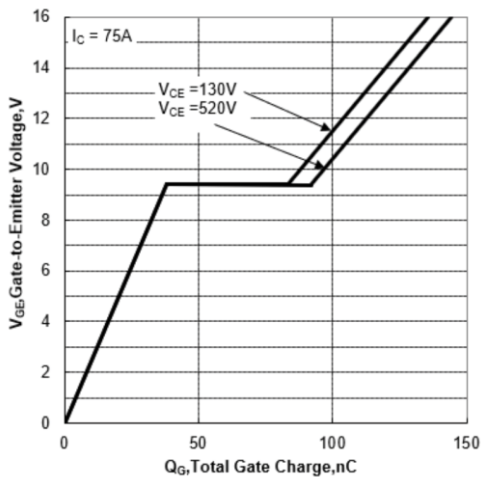
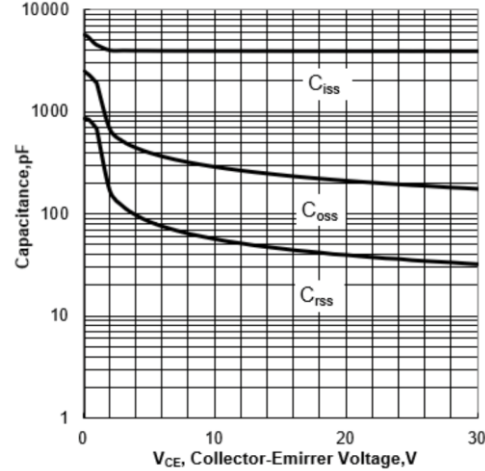
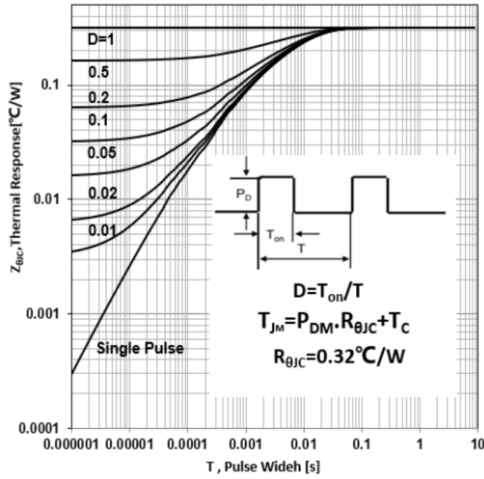


Figure 12. Typical Capacitance vs Collector-Emitter Voltage



## Characteristics Curves

Figure 13. IGBT Transient Thermal Impedance vs Pulse Width



## Test Circuit and Waveform

Figure 14. Inductive Switching Test Circuit

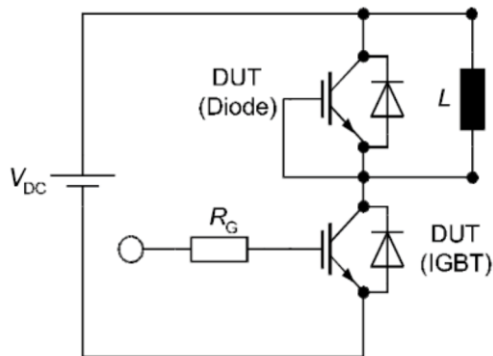


Figure 15. Definition of switching times

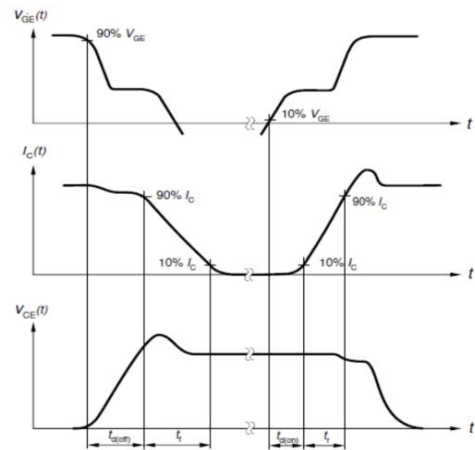


Figure 16. Definition of switching losses

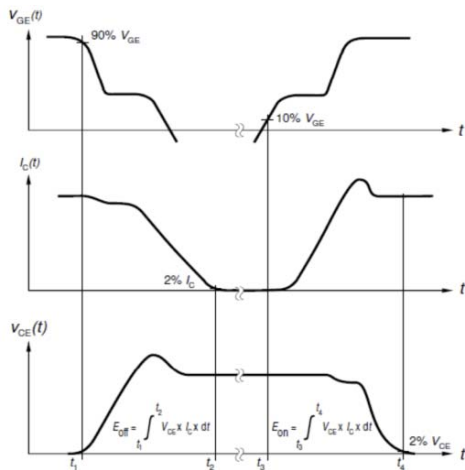
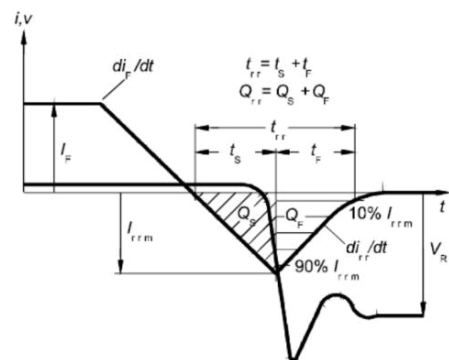


Figure 17. Definition of diode switching characteristics



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