

1350V, 15A, Trench NPT IGBT

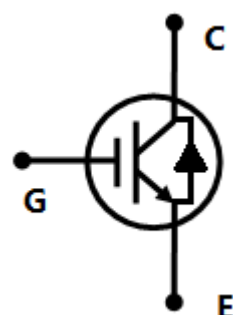
Features

- Trench NPT(Non Punch Through) IGBT
- High speed switching
- Low saturation voltage: $V_{CE(sat)}=2.0V@I_C=15A$
- High input impedance



Applications

- Inductive heating, Microwave oven, Inverter, UPS, etc.
- Soft switching applications



Absolute Maximum Ratings

Symbol	Description	Ratings	Units
V_{CES}	Collector to Emitter Voltage	1350	V
V_{GES}	Gate to Emitter Voltage	+/-30	V
I_C	Continuous Collector Current @ $T_C=25^{\circ}C$	30	A
	Continuous Collector Current @ $T_C=100^{\circ}C$	15	A
$I_{CM}(1)$	Pulsed Collector Current	45	A
I_F	Diode Continuous Forward Current @ $T_C=100^{\circ}C$	15	
I_{FM}	Diode Maximum Forward Current	90	A
P_D	Maximum Power Dissipation @ $T_C=25^{\circ}C$	220	W
	Maximum Power Dissipation @ $T_C=100^{\circ}C$	88	W
T_J	Operating Junction Temperature	-55 to +150	$^{\circ}C$
T_{stg}	Storage Temperature Range	-55 to +150	$^{\circ}C$
T_L	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5seconds	300	$^{\circ}C$

Notes:

1. Repetitive rating, Pulse width limited by max. junction temperature

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\square JC}$	Thermal Resistance, Junction to Case	-	0.57	$^{\circ}C/W$
R_{JA}	Thermal Resistance, Junction to Ambient	-	40	$^{\circ}C/W$

Electrical Characteristics of the IGBT $T_C=25^{\circ}C$

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV _{CES}	Collector to Emitter Breakdown Voltage	V _{GE} =0V, I _c =1mA	1350	-	-	V
I _{CES}	Collector Cut-Off Current	V _{CE} = V _{CES} , V _{GE} =0V	-	-	1	mA
I _{GES}	G-E Leakage Current	V _{GE} = V _{GES} , V _{CE} =0V	-	-	+/-250	nA
On Characteristics						
V _{GE(th)}	G-E Threshold Voltage	I _C =15mA, V _{CE} =V _{GE}	4.0	5.5	7.0	V
V _{CE(sat)}	Collector to Emitter Saturation Voltage	I _C =15A, V _{GE} =15V T _C =25°C	-	2	2.5	V
		I _C =15A, V _{GE} =15V T _C =125°C	-	2.15	-	V
Dynamic Characteristics						
C _{ies}	Input Capacitance	V _{CE} =30V, V _{GE} =0V, f=1MHz	-	2350	-	pF
C _{oes}	Output Capacitance		-	70	-	pF
C _{res}	Reverse Transfer Capacitance		-	45	-	pF
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{CC} =600V,I _C =15A, R _G =10Ω,V _{GE} =15V, Resistive Load, T _C =25°C	-	33	-	ns
t _r	Rise Time		-	80	-	ns
t _{d(off)}	Turn-Off Delay Time		-	160	-	ns
t _f	Fall Time		-	255	330	ns
E _{on}	Turn-On Switching Loss		-	0.3	-	mJ
E _{off}	Turn-Off Switching Loss		-	0.58	0.74	mJ
E _{ts}	Total Switching Loss		-	0.88	-	mJ
t _{d(on)}	Turn-On Delay Time	V _{CC} =600V,I _C =15A, R _G =10Ω,V _{GE} =15V, Resistive Load, T _C =125°C	-	30	-	ns
t _r	Rise Time		-	115	-	ns
t _{d(off)}	Turn-Off Delay Time		-	170	-	ns
t _f	Fall Time		-	390	-	ns
E _{on}	Turn-On Switching Loss		-	0.38	-	mJ
E _{off}	Turn-Off Switching Loss		-	0.89	-	mJ
E _{ts}	Total Switching Loss		-	1.27	-	mJ
Q _g	Total Gate Charge	V _{CC} =600V,I _C =15A, V _{GE} =15V	-	100	-	nC
Q _{ge}	Gate to Emitter Charge		-	19	-	nC
Q _{gc}	Gate to Collector Charge		-	45	-	nC

Electrical Characteristics of Diode $T_C=25^{\circ}\text{C}$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V _{FM}	Diode Forward Voltage	I _F =15A	25°C		1.4	1.8	V
			125°C		1.42		V
t _{rr}	Diode Reverse Recovery Time	I _F =15A, dI/dt=200A/us	25°C		575		ns
			125°C		577		ns
I _{rr}	Diode Peak Reverse Recovery Current		25°C		30	A	
			125°C		37	A	
Q _{rr}	Diode Reverse Recovery Charge		25°C		8.7		uC
			125°C		10.7		uC

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

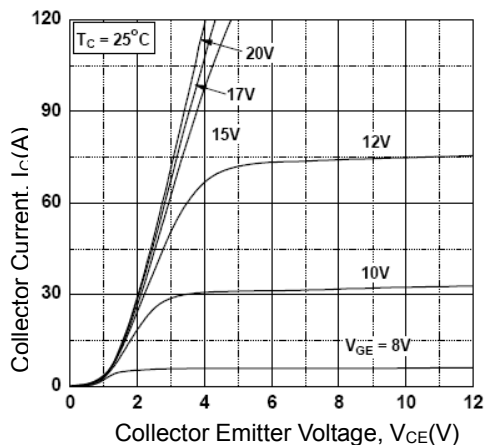


Figure 2. Typical Saturation Voltage Characteristics

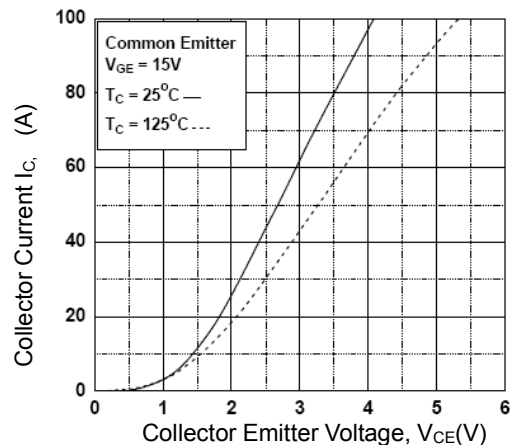


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

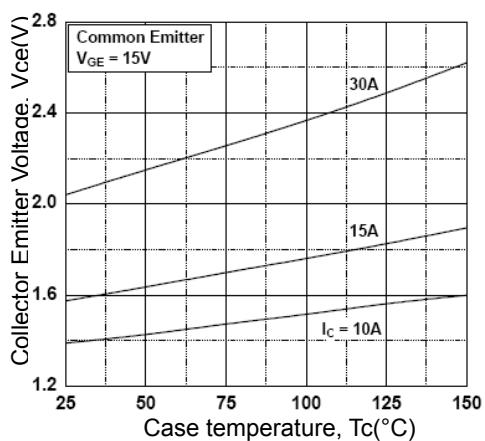


Figure 4. Saturation Voltage vs. V_GE

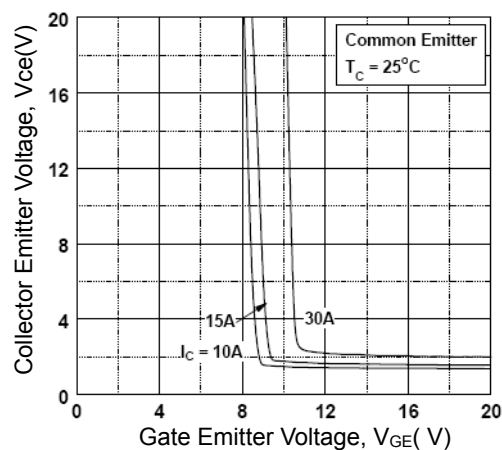


Figure 5. Saturation Voltage vs. V_GE

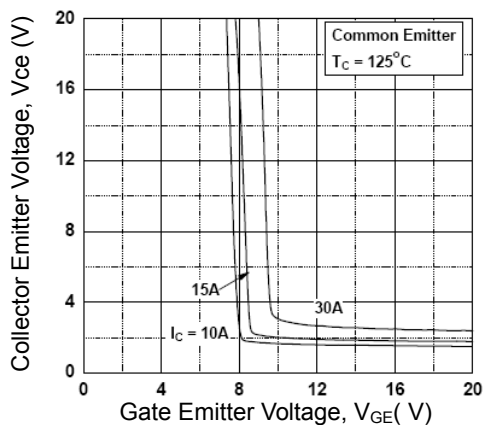
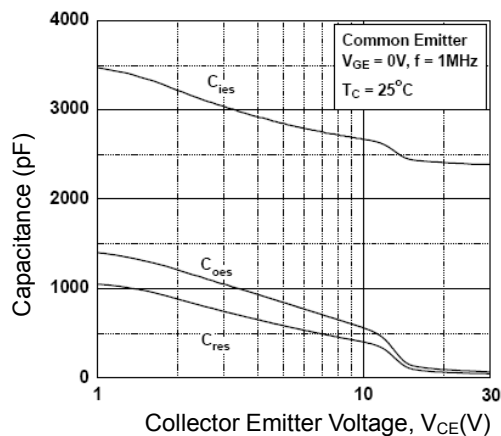


Figure 6. Capacitance Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Turn-on Characteristics vs. Gate Resistance

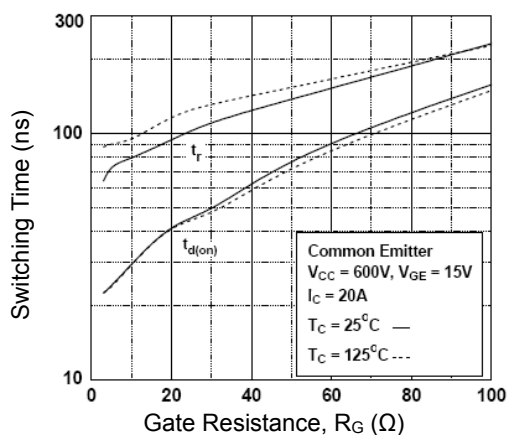


Figure 8. Turn-off Characteristics vs. Gate Resistance

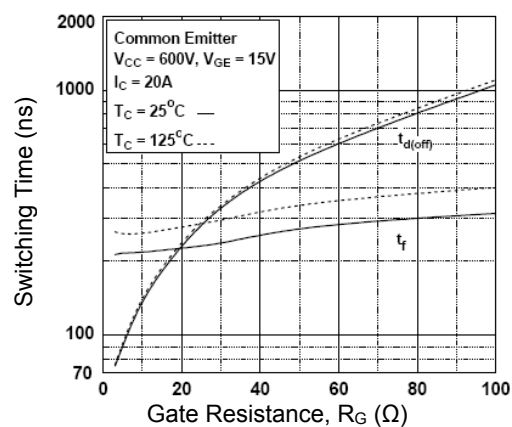


Figure 9. Switching Loss vs. Gate Resistance

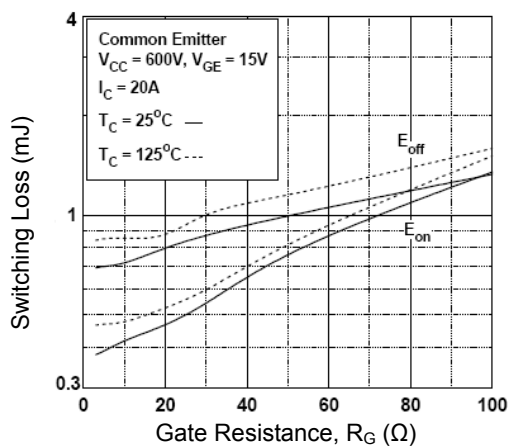


Figure 10. Turn-on Characteristics vs. Collector Current

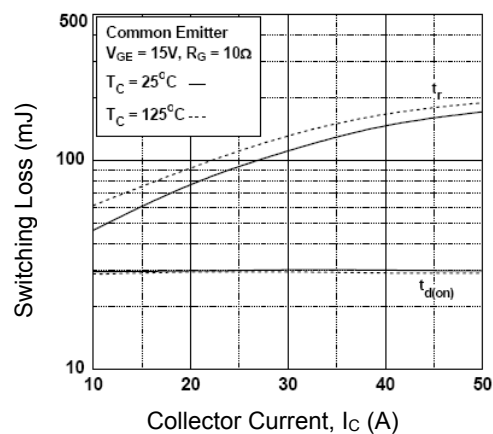


Figure 11. Turn-Off Characteristics vs. Collector Current

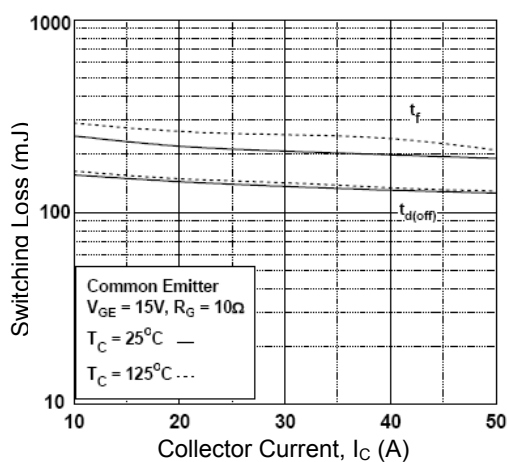
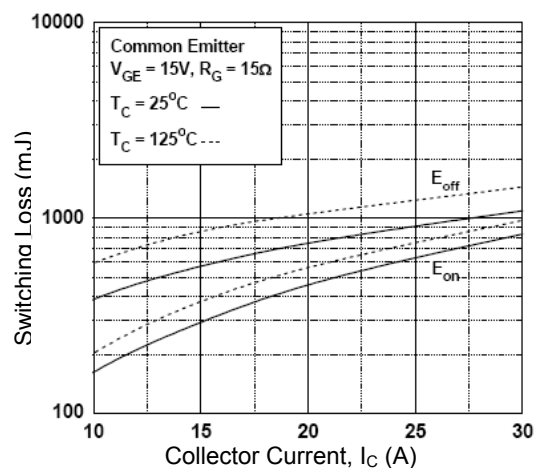


Figure 12. Switching Loss vs. Collector Current



Typical Performance Characteristics (Continued)

Figure 13. Gate Charge Characteristics

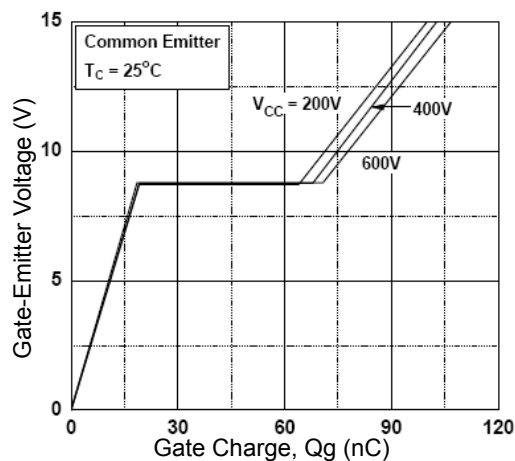


Figure 14. SOA Characteristics

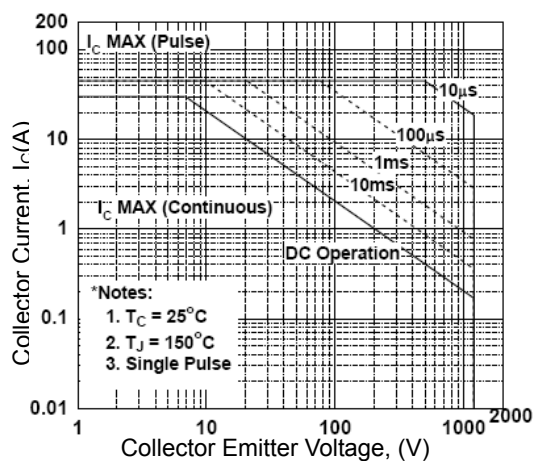


Figure 15. Turn-Off SOA

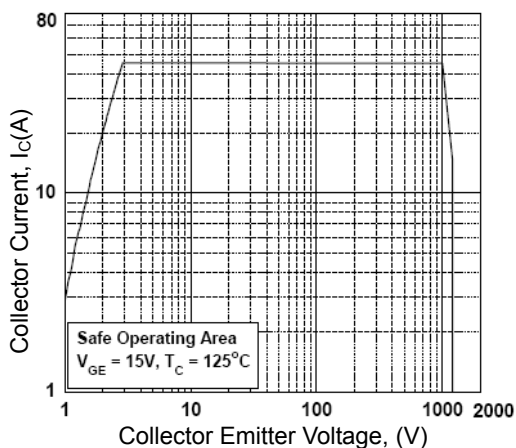
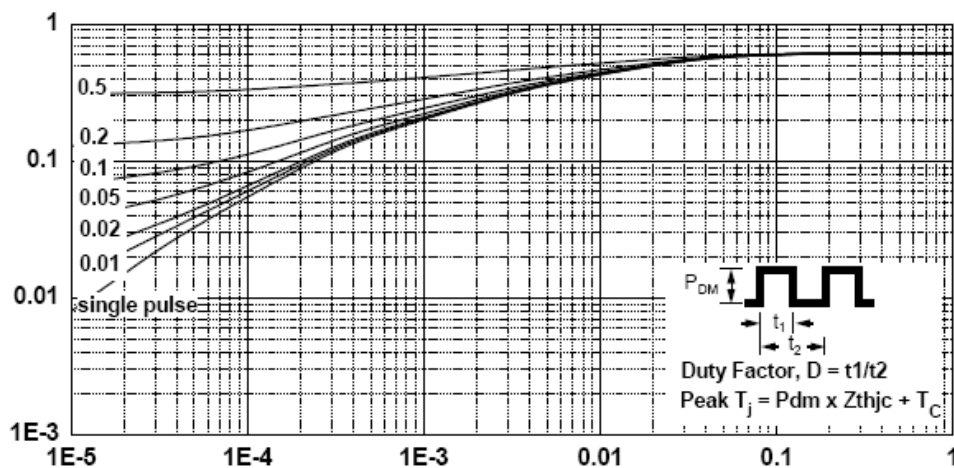
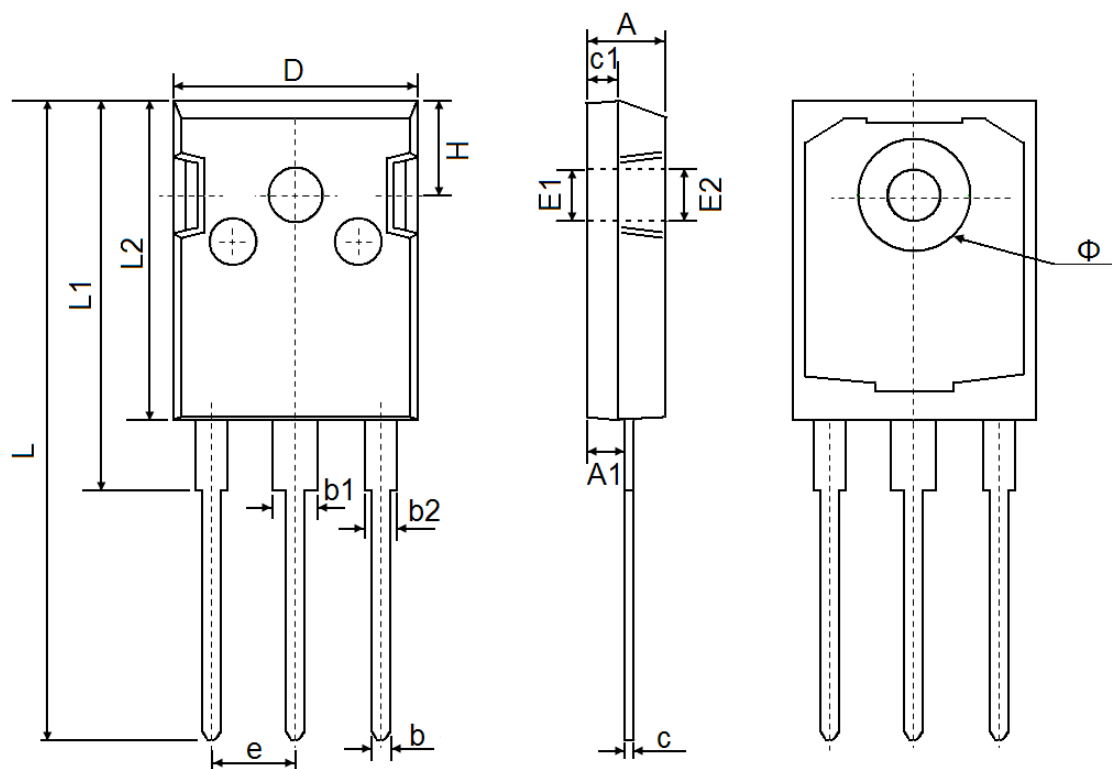


Figure 16. Transient Thermal Impedance of IGBT



TO-247 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.850	5.150	0.191	0.200
A1	2.200	2.600	0.087	0.102
b	1.000	1.400	0.039	0.055
b1	2.800	3.200	0.110	0.126
b2	1.800	2.200	0.071	0.087
c	0.500	0.700	0.020	0.028
c1	1.900	2.100	0.075	0.083
D	15.450	15.750	0.608	0.620
E1	3.500 REF		0.138 REF	
E2	3.600 REF		0.142 REF	
L	40.900	41.300	1.610	1.626
L1	24.800	25.100	0.976	0.988
L2	20.300	20.600	0.799	0.811
Φ	7.100	7.300	0.280	0.287
e	5.450 TYP		0.215 TYP	
H	5.980 REF		0.235 REF	