

## 1350V, 20A, Trench FS IGBT

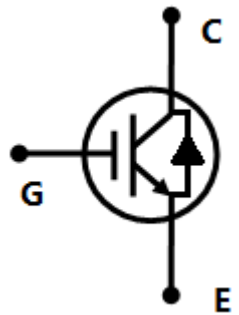
### Features

- Trench FS( Field Stop) IGBT
- High speed switching
- Low saturation voltage:  $V_{CE(sat)}=2.0V@I_C=20A$
- 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 @ $T_C=25^{\circ}C$	40	A
	Continuous Collector Current @ $T_C=100^{\circ}C$	20	A
$I_{CM}(1)$	Pulsed Collector Current	60	A
$I_F$	Diode Continuous Forward Current @ $T_C=100^{\circ}C$	20	
$I_{FM}$	Diode Maximum Forward Current	60	A
$P_D$	Maximum Power Dissipation @ $T_C=25^{\circ}C$	340	W
	Maximum Power Dissipation @ $T_C=100^{\circ}C$	170	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	260	$^{\circ}C$

**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	-	0.37	$^{\circ}C/W$
$R_{JA}$	Thermal Resistance, Junction to Ambient	-	40	$^{\circ}C/W$

## Electrical Characteristics $T_C=25^{\circ}C$

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
<b>Off Characteristics</b>						
$BV_{CES}$	Collector to Emitter Breakdown Voltage	$V_{GE}=0V, I_C=1mA$	1350	-	-	V
$I_{CES}$	Collector Cut-Off Current	$V_{CE}=1350V, V_{GE}=0V$	-	-	100	$\mu A$
$I_{GES}$	G-E Leakage Current	$V_{GE}=30V, V_{CE}=0V$	-	-	+/-100	nA
<b>On Characteristics</b>						
$V_{GE(th)}$	G-E Threshold Voltage	$I_C=1mA, V_{CE}=V_{GE}$	5		7	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=20A, V_{GE}=15V$ $T_C=25^{\circ}C$	-	1.7	2	V
		$I_C=20A, V_{GE}=15V$ $T_C=125^{\circ}C$	-	2	-	V
<b>Dynamic Characteristics</b>						
$C_{ies}$	Input Capacitance	$V_{CE}=30V, V_{GE}=0V,$ $f=1MHz$	-	2050	-	pF
$C_{oes}$	Output Capacitance		-	70	-	pF
$C_{res}$	Reverse Transfer Capacitance		-	40	-	pF
<b>Switching Characteristics</b>						
$t_{d(off)}$	Turn-Off Delay Time	$V_{CC}=600V, I_C=20A,$ $R_G=10\Omega, V_{GE}=15V,$ Inductive Load, $T_C=25^{\circ}C$	-	190	-	ns
$t_f$	Fall Time		-	100		ns
$E_{off}$	Turn-Off Switching Loss		-	0.9		mJ
$t_{d(off)}$	Turn-Off Delay Time	$V_{CC}=600V, I_C=20A,$ $R_G=10\Omega, V_{GE}=15V,$ Inductive Load, $T_C=125^{\circ}C$	-	200		ns
$t_f$	Fall Time		-	154		ns
$E_{off}$	Turn-Off Switching Loss		-	1.4		mJ
$Q_g$	Total Gate Charge	$V_{CC}=600V, I_C=20A,$ $V_{GE}=15V$	-	190	240	nC
$Q_{ge}$	Gate to Emitter Charge		-	15	23	nC
$Q_{gc}$	Gate to Collector Charge		-	80	120	nC
<b>Diode Characteristics</b>						
$V_{FM}$	Forward Voltage	$I_F=20A, T_C=25^{\circ}C$	-	1.8	2	V
$t_{rr}$	Reverse Recovery Time	$I_F=20A, di/dt=200A/us$ $T_C=25^{\circ}C$	-	235	350	ns
$I_{rr}$	Peak Reverse Recovery Current		-	27	40	A
$Q_{rr}$	Reverse Recovery Charge		-	3130	4700	$\mu C$

## Typical Performance Characteristics

Figure 1. Typical Output Characteristics

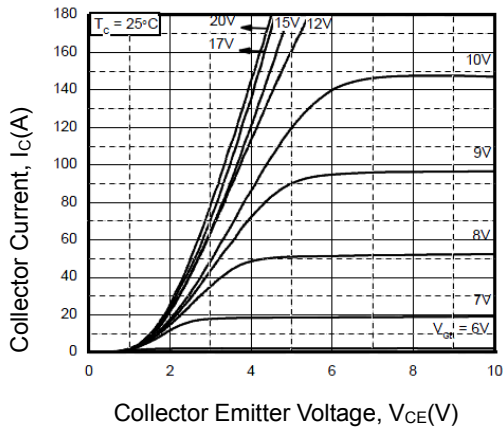


Figure 2. Typical Saturation Voltage Characteristics

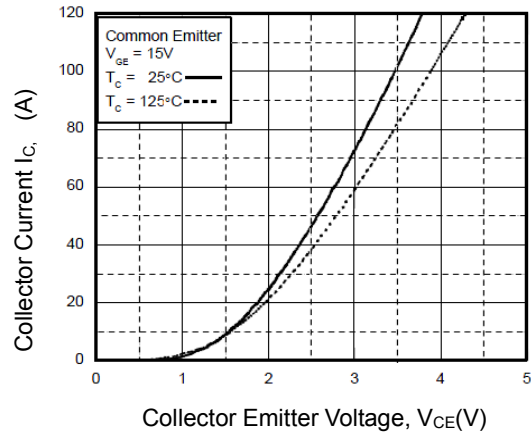


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

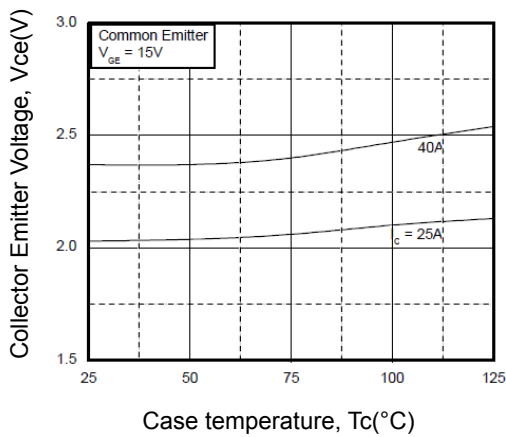


Figure 4. Saturation Voltage vs. Vge

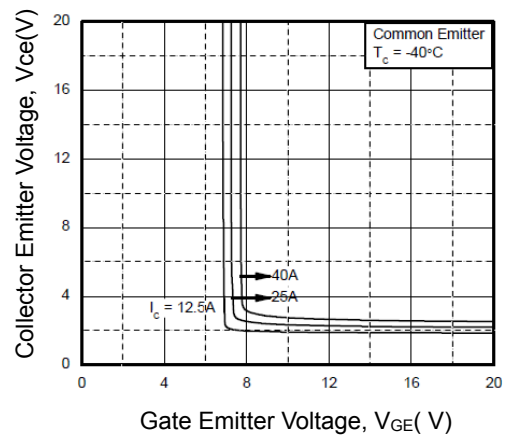


Figure 5. Saturation Voltage vs. Vge

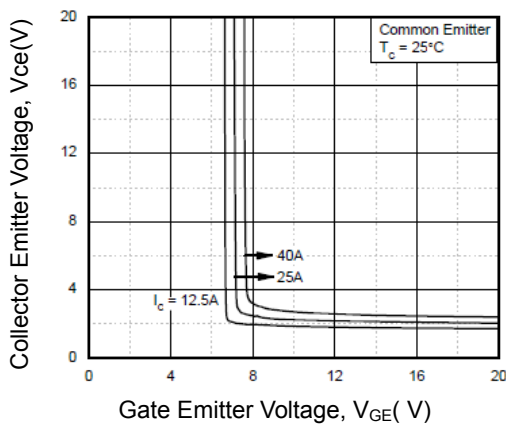
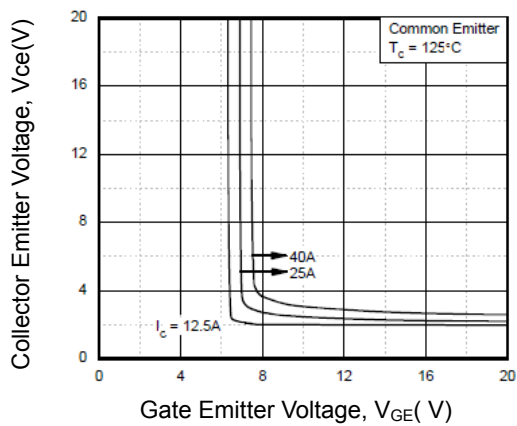


Figure 6. Saturation Voltage vs. Vge



## Typical Performance Characteristics (Continued)

Figure 7. Capacitance Characteristics

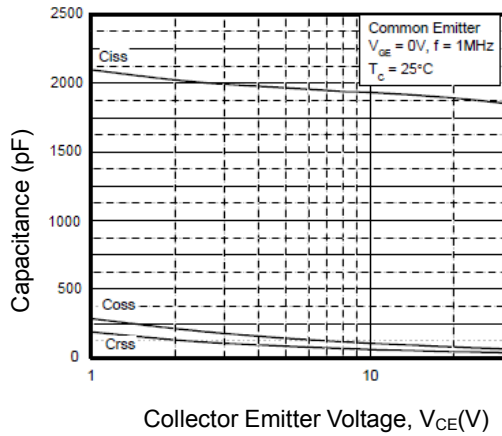


Figure 9. Turn-off Characteristics vs. Gate Resistance

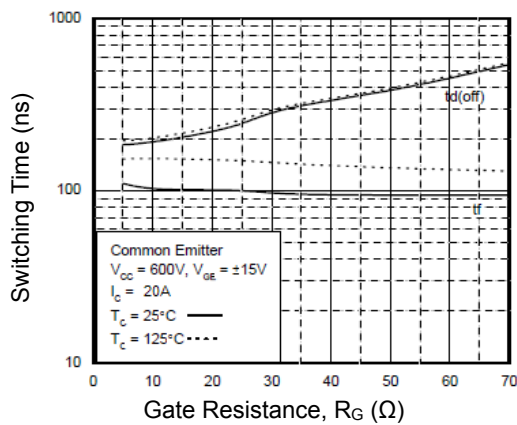


Figure 11. Turn-on Characteristics vs. Collector Current

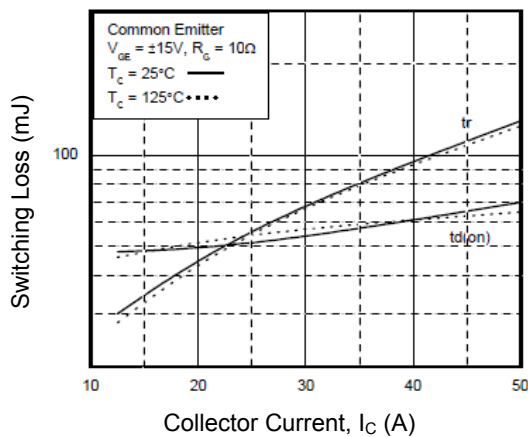


Figure 8. Turn-on Characteristics vs. Gate Resistance

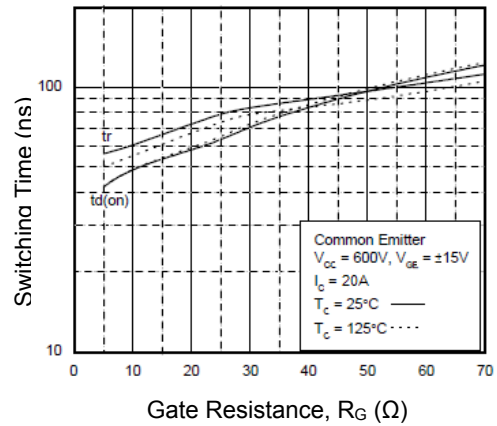


Figure 10. Switching Loss vs. Gate Resistance

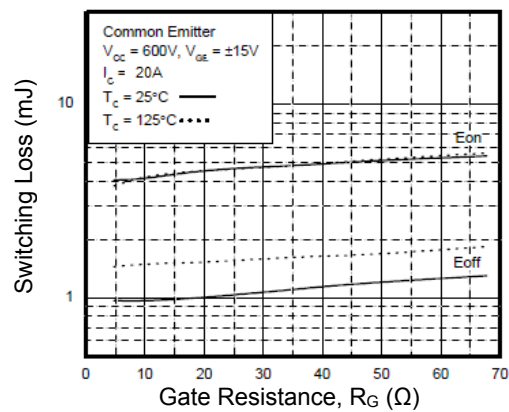
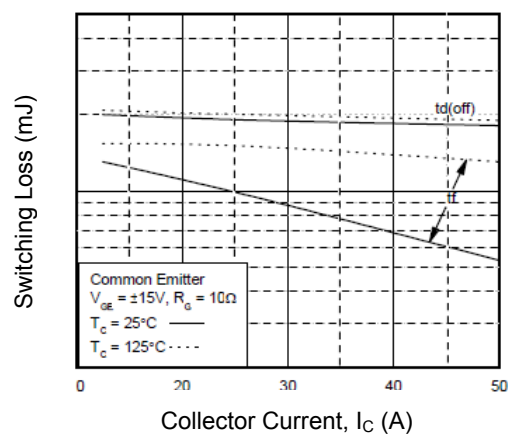


Figure 12. Turn-Off Characteristics vs. Collector Current



## Typical Performance Characteristics (Continued)

Figure 13. Switching Loss vs. Collector Current

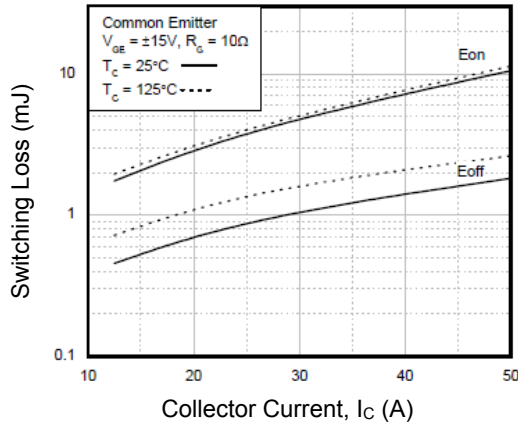


Figure 14. Gate Charge Characteristics

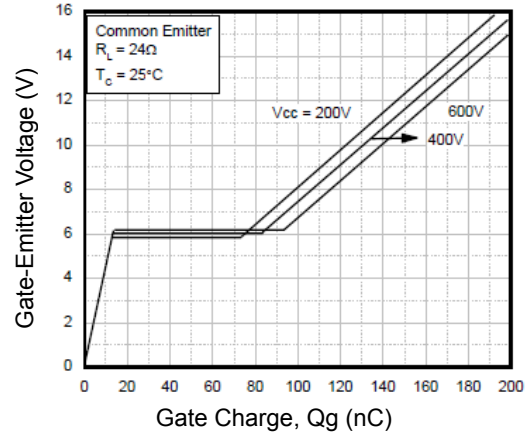


Figure 15. SOA Characteristics

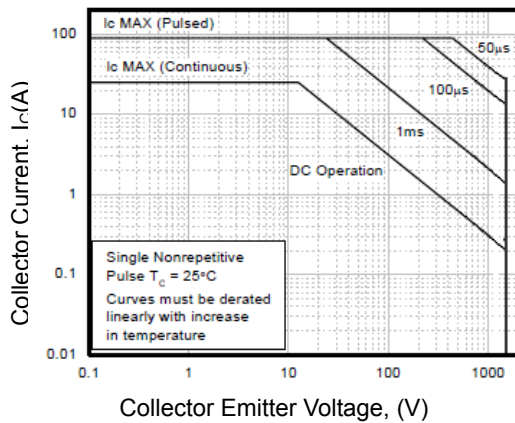


Figure 16. Turn-Off SOA

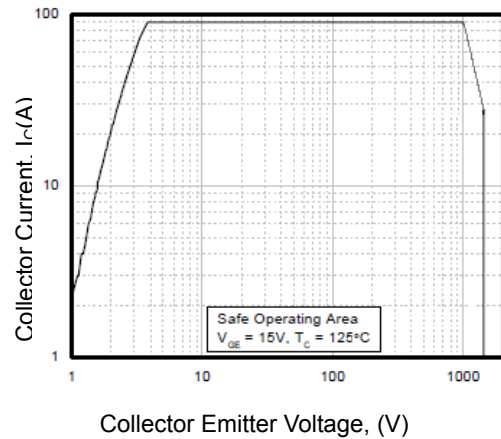
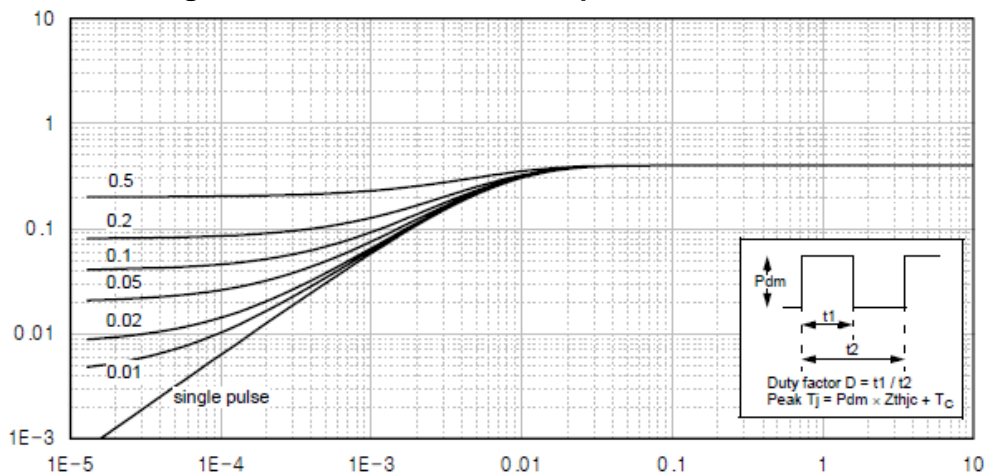
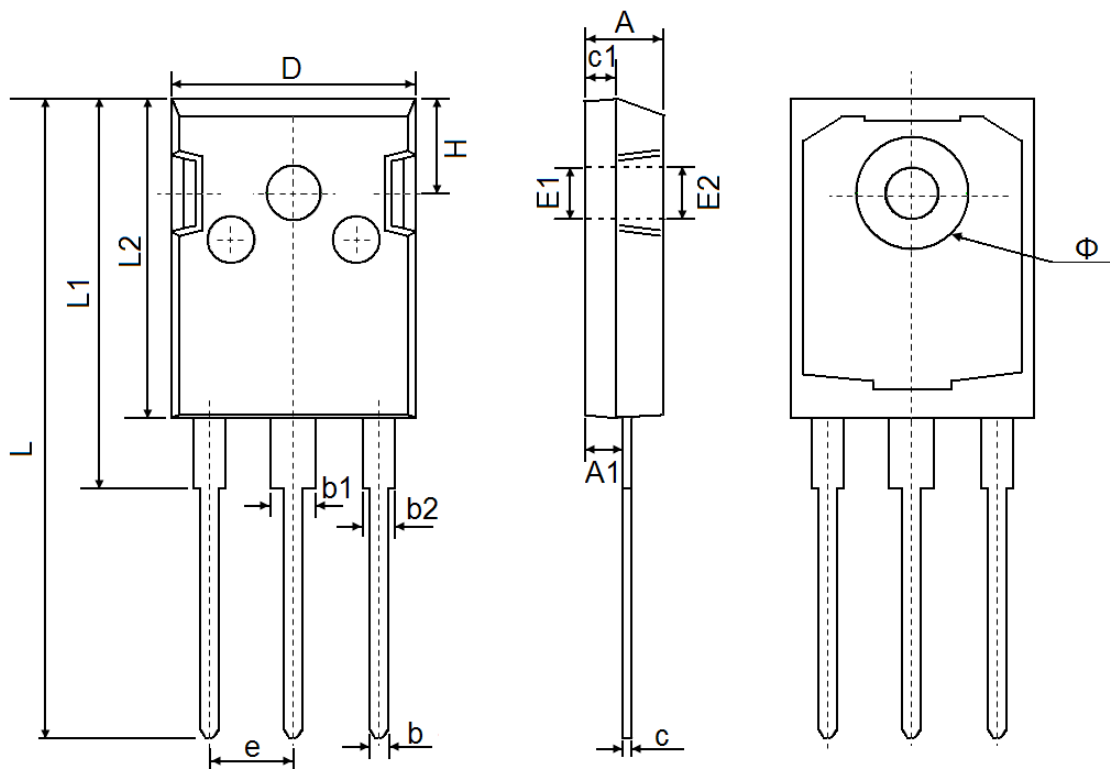


Figure 17. Transient Thermal Impedance of IGBT



## 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
$\Phi$	7.100	7.300	0.280	0.287
e	5.450 TYP		0.215 TYP	
H	5.980 REF		0.235 REF	