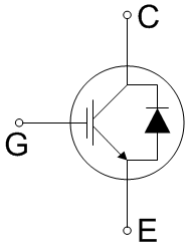
1350V, 15A, Trench NPT IGBT

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



General Description

Using advanced Trench NPT technology, WOS's 1350V IGBTs offers superior conduction and switching performances, and easy parallel operation with exceptional avalanche rugged-ness. This device is designed for 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°C	30	A
	Continuous Collector Current @T_C=100°C	15	A
I_{CM}(1)	Pulsed Collector Current	45	A
I_F	Diode Continuous Forward Current @T_C=100°C	15	
I_{FM}	Diode Maximum Forward Current	90	A
P_D	Maximum Power Dissipation @T_C=25°C	220	W
	Maximum Power Dissipation @T_C=100°C	88	W
T_J	Operating Junction Temperature	-55 to +150	°C
T_{stg}	Storage Temperature Range	-55 to +150	°C
T_L	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5seconds	300	°C

Notes:

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

Thermal Characteristics

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

Electrical Characteristics of the IGBT T_C=25°C

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{CES}	Collector to Emitter Breakdown Voltage	V_{GE}=0V, Ic=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°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

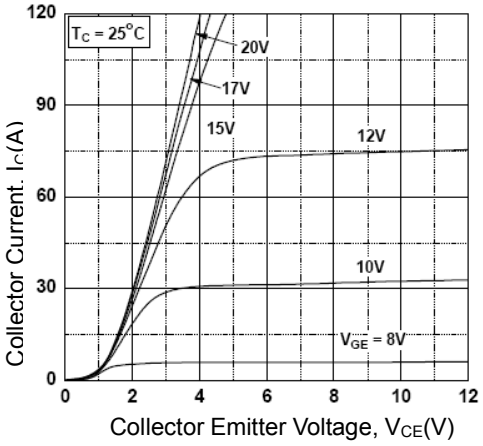


Figure 2. Typical Saturation Voltage Characteristics

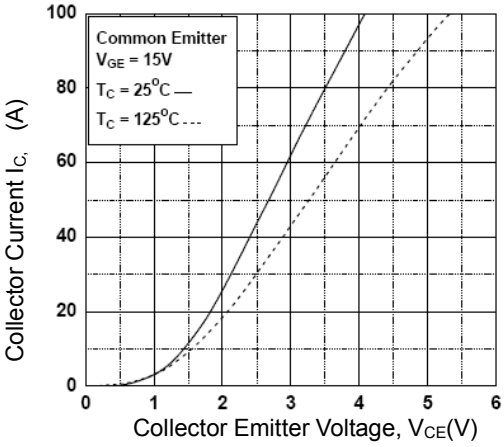


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

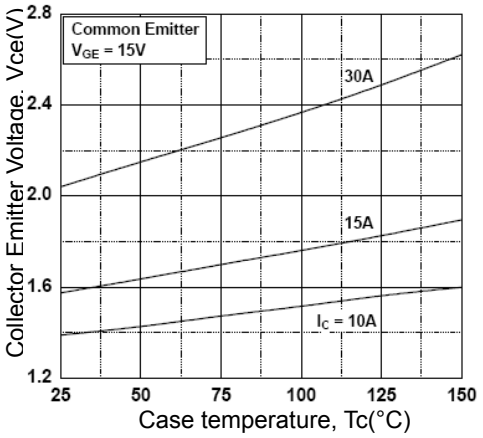


Figure 4. Saturation Voltage vs. V_{GE}

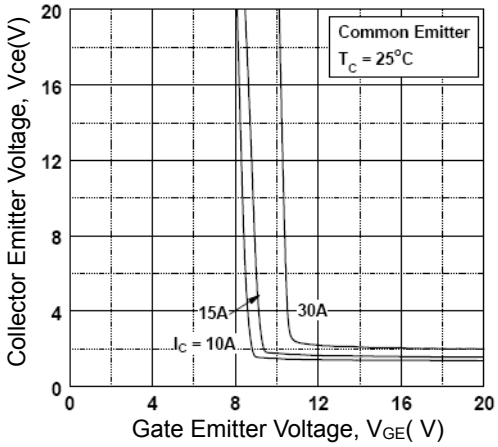


Figure 5. Saturation Voltage vs. V_{GE}

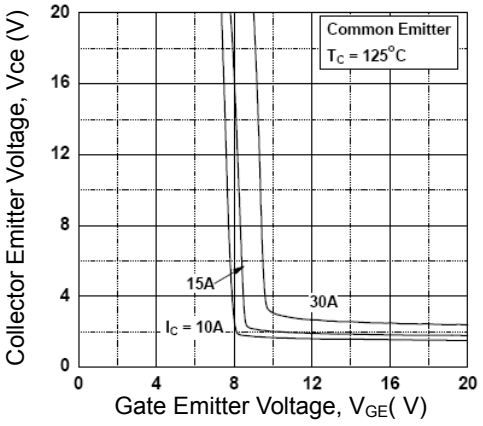
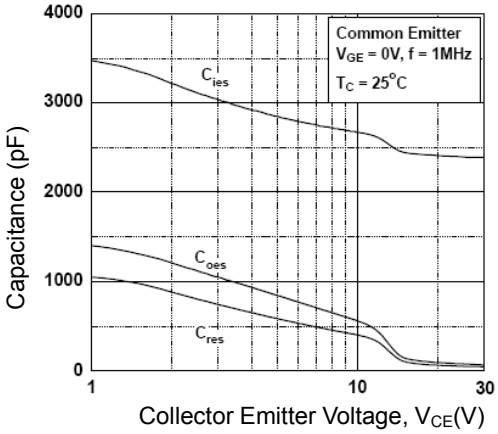


Figure 6. Capacitance Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Turn-on Characteristics vs. Gate Resistance

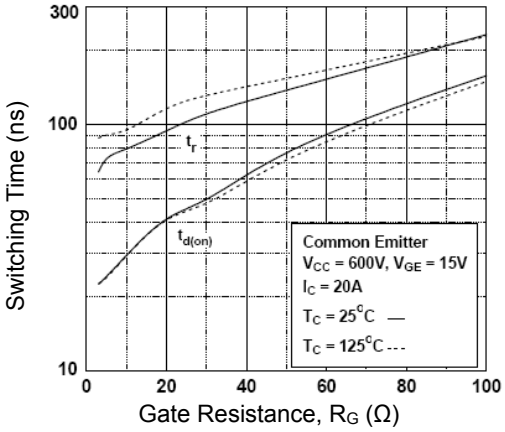


Figure 8. Turn-off Characteristics vs. Gate Resistance

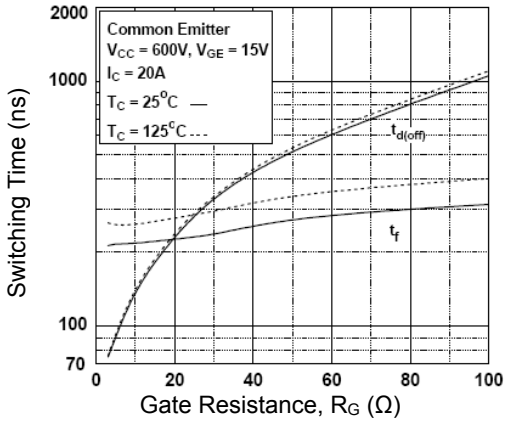


Figure 9. Switching Loss vs. Gate Resistance

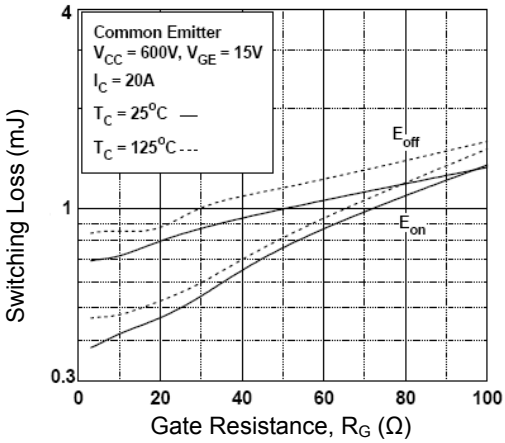


Figure 10. Turn-on Characteristics vs. Collector Current

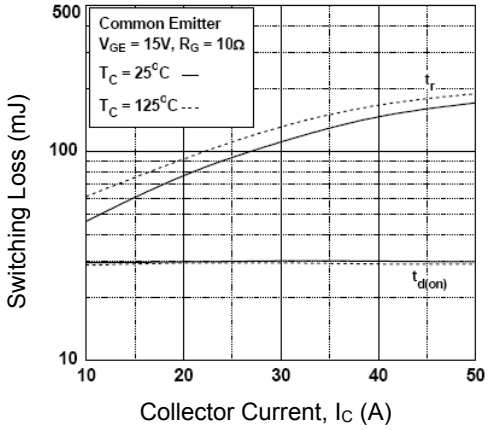


Figure 11. Turn-Off Characteristics vs. Collector Current

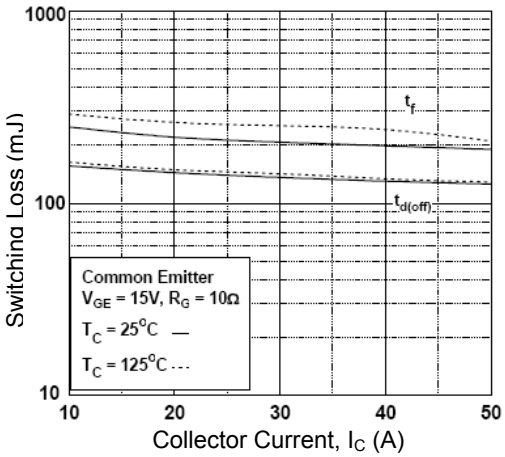
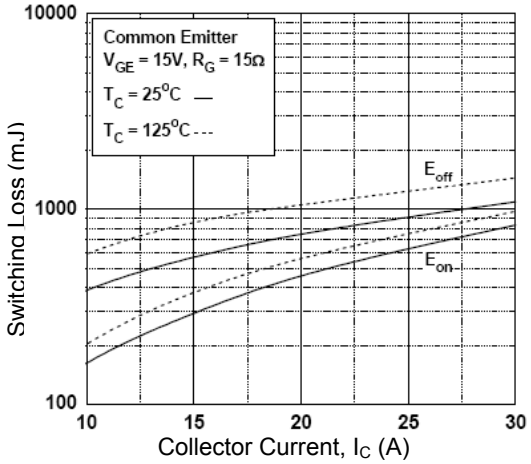


Figure 12. Switching Loss vs. Collector Current



Typical Performance Characteristics (Continued)

Figure13. Gate Charge Characteristics

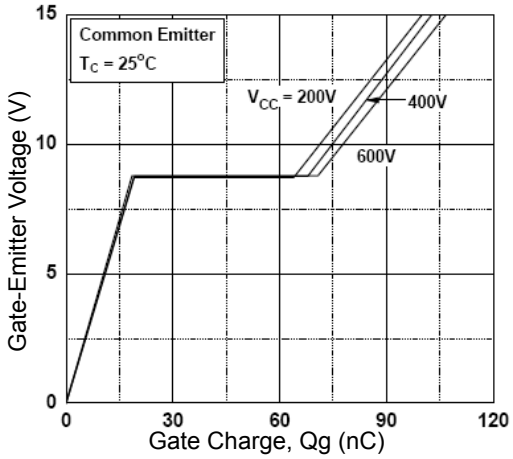


Figure 14. SOA Characteristics

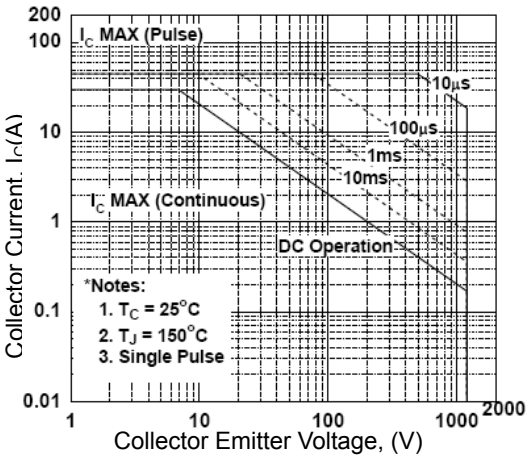


Figure 15. Turn-Off SOA

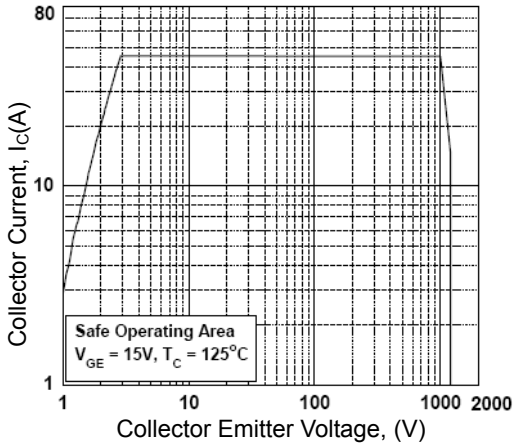


Figure 16. Transient Thermal Impedance of IGBT