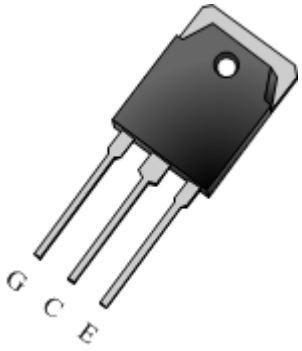
1200V, 25A, Trench NPT IGBT

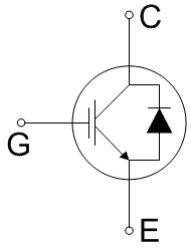


Features

- Trench NPT(Non Punch Through) IGBT
- High speed switching
- Low saturation voltage: $V_{CE(sat)}$=2.0V@I_C=25A
- High input impedance

Applications

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



General Description

Using advanced Trench NPT technology, WOS's 1200V 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	1200	V
V_{GES}	Gate to Emitter Voltage	+/-30	V
I_C	Continuous Collector Current @T_C=25°C	50	A
	Continuous Collector Current @T_C=100°C	25	A
I_{CM}(1)	Pulsed Collector Current	90	A
I_F	Diode Continuous Forward Current @T_C=100°C	25	
I_{FM}	Diode Maximum Forward Current	150	A
P_D	Maximum Power Dissipation @T_C=25°C	312	W
	Maximum Power Dissipation @T_C=100°C	125	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	-	0.4	°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	1200	-	-	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=25mA, V_{CE}=V_{GE}	4.0	5.5	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=25A, V_{GE}=15V T_C=25°C	-	2	2.5	V
		I_C=25A, V_{GE}=15V T_C=125°C	-	2.15	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE}=30V, V_{GE}=0V, f=1MHz	-	3700	-	pF
C_{oes}	Output Capacitance		-	130	-	pF
C_{res}	Reverse Transfer Capacitance		-	80	-	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=25A, R_G=10Ω,V_{GE}=15V, Inductive Load, T_C=25°C	-	50	-	ns
t_r	Rise Time		-	60	90	ns
$t_{d(off)}$	Turn-Off Delay Time		-	190	-	ns
t_f	Fall Time		-	100	180	ns
E_{on}	Turn-On Switching Loss		-	4.1	6.2	mJ
E_{off}	Turn-Off Switching Loss		-	0.96	1.5	mJ
E_{ts}	Total Switching Loss		-	5.06	7.7	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=25A, R_G=10Ω,V_{GE}=15V, Inductive Load, T_C=125°C	-	50	-	ns
t_r	Rise Time		-	60	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	200	-	ns
t_f	Fall Time		-	154	-	ns
E_{on}	Turn-On Switching Loss		-	4.3	6.9	mJ
E_{off}	Turn-Off Switching Loss		-	1.5	2.4	mJ
E_{ts}	Total Switching Loss		-	5.8	9.3	mJ
Q_g	Total Gate Charge	V_{CC}=600V,I_C=25A, V_{GE}=15V	-	200	300	nC
Q_{ge}	Gate to Emitter Charge		-	15	23	nC
Q_{gc}	Gate to Collector Charge		-	100	150	nC

Electrical Characteristics of Diode T_C=25°C

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_{FM}	Diode Forward Voltage	I_F=25A	T_C=25°C	-	2.0	3.0	V
			T_C=125°C	-	2.1		V
t_{rr}	Diode Reverse Recovery Time	I_F=25A, dI/dt=200A/us	T_C=25°C	-	235	350	ns
			T_C=125°C	-	300		ns
I_{rr}	Diode Peak Reverse Recovery Current		T_C=25°C	-	27	40	A
			T_C=125°C	-	31		A
Q_{rr}	Diode Reverse Recovery Charge		T_C=25°C	-	3130	4700	uC
			T_C=125°C	-	4650		uC

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

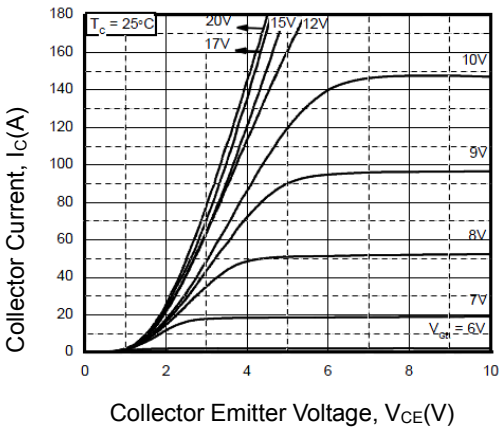


Figure 2. Typical Saturation Voltage Characteristics

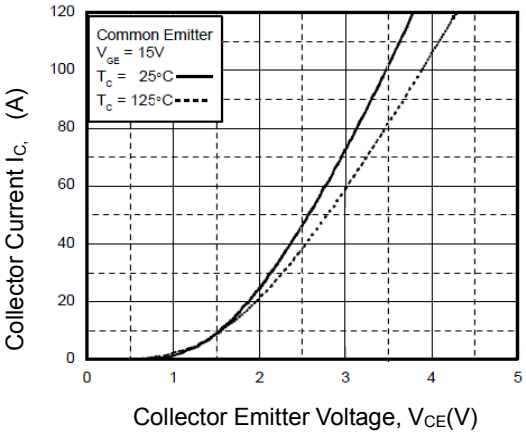


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

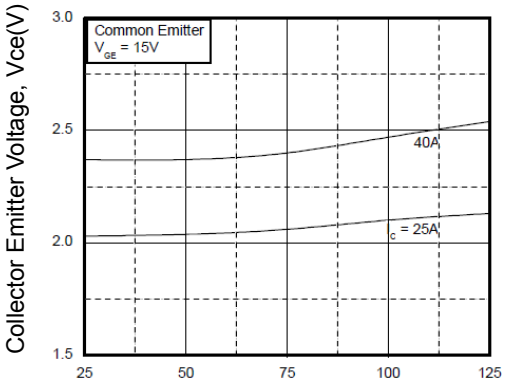


Figure 4. Saturation Voltage vs. V_{GE}

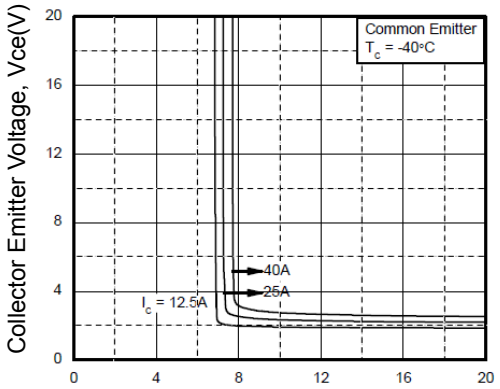


Figure 5. Saturation Voltage vs. V_{GE}

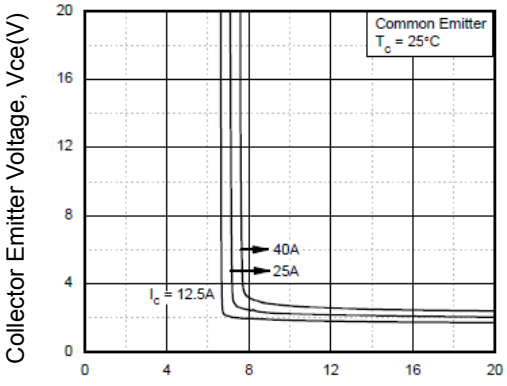
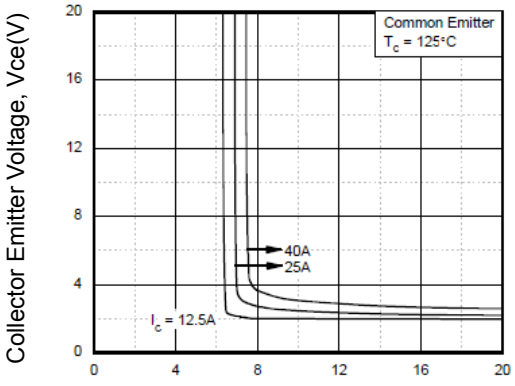


Figure 6. Saturation Voltage vs. V_{GE}



Typical Performance Characteristics (Continued)

Figure 7. Capacitance Characteristics

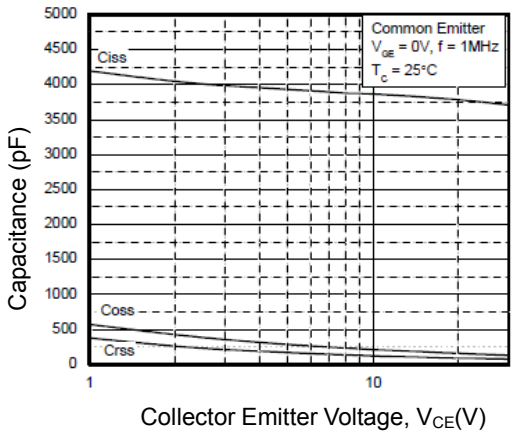


Figure 8. Turn-on Characteristics vs. Gate Resistance

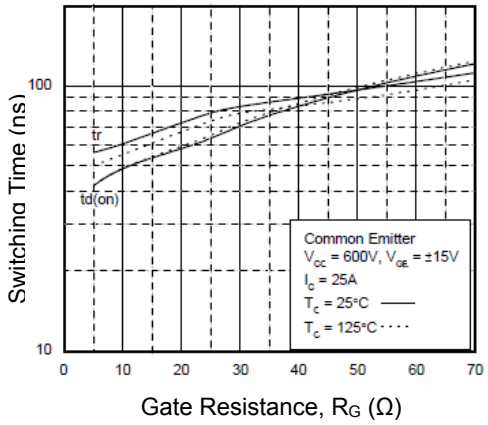


Figure 9. Turn-off Characteristics vs. Gate Resistance

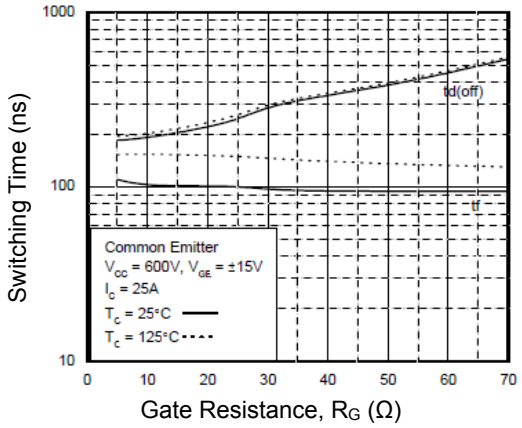


Figure 10. Switching Loss vs. Gate Resistance

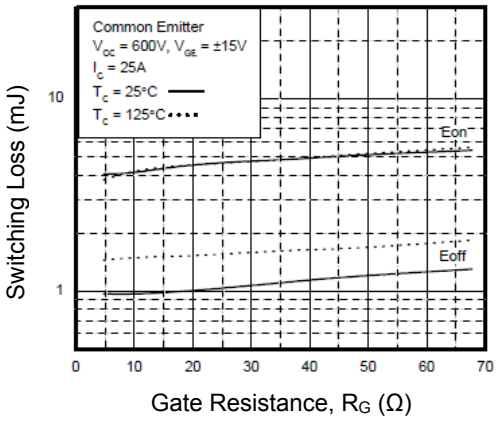


Figure 11. Turn-on Characteristics vs. Collector Current

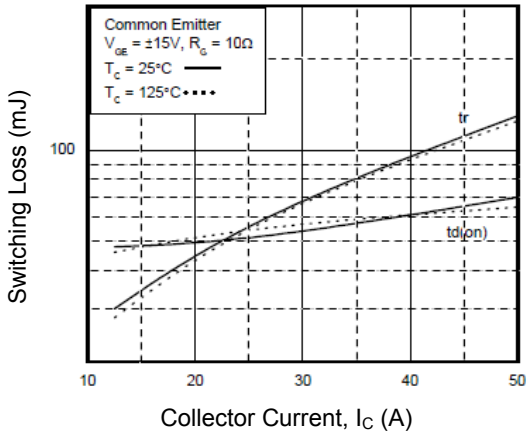
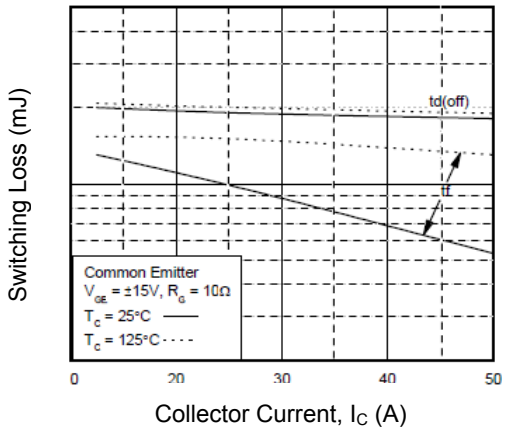


Figure 12. Turn-Off Characteristics vs. Collector Current



Typical Performance Characteristics (Continued)

Figure 13. Switching Loss vs. Collector Current

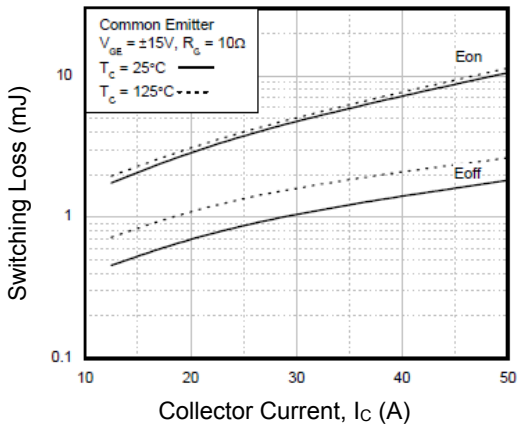


Figure14. Gate Charge Characteristics

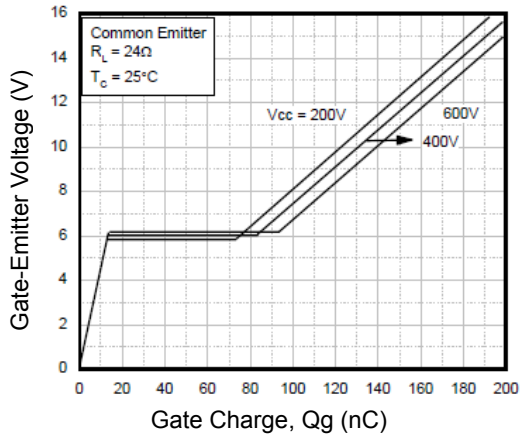


Figure 15. SOA Characteristics

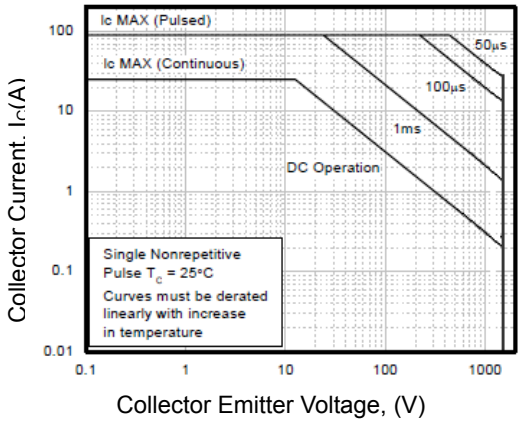


Figure 16. Turn-Off SOA

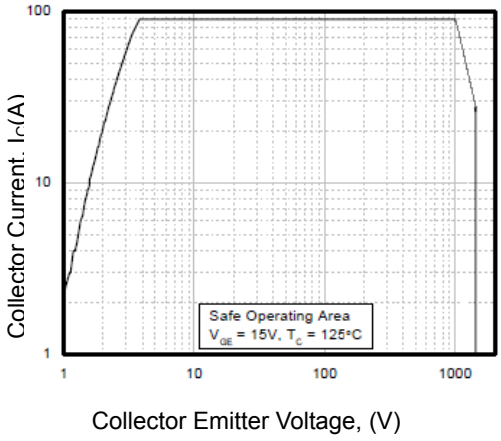


Figure 17. Transient Thermal Impedance of IGBT