

650V 40A FieldStop Trench IGBT

Features

- FieldStop Trench Technology, Positive temperature coefficient
- $V_{CE(sat)}=2.0V@I_C=40A$
- High Speed Switching & Low Power Loss
- High Input Impedance
- SiC Schottky Barrier Diode

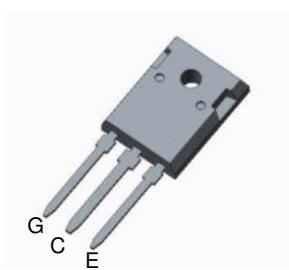
Description

The device is designed by advanced FieldStop Trench technology process. This IGBT offer low $V_{CE(sat)}$, high speed switching performance and excellent quality for application such as PFC,UPS, Welder, PV Inverter and other switching applications.

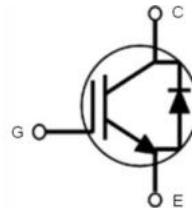
Applications

- PFC, UPS, Welder, PV Inverter

Package Type & Internal Circuit



TO-247



Absolute Maximum Ratings

Symbol	Parameter	Ratings	Unit
V_{CES}	Collector to Emitter Voltage	650	V
V_{GES}	Gate to Emitter Voltage	± 20	V
I_C	Collector Current	$T_C=25^\circ C$	80
		$T_C=100^\circ C$	40
I_{CM}	Pulsed Collector Current	120	A
I_F	Diode Continuous Forward Current	$T_C=100^\circ C$	10
I_{FSM}	Non-repetitive Peak Surge Current	$T_p=10ms$, half sine wave	60
		$T_p=200\mu s$, square wave	240
P_D	Maximum Power Dissipation	$T_C=25^\circ C$	167
		$T_C=100^\circ C$	83
T_J	Operating Junction Temperature Range	-40~+175	°C
T_{STG}	Storage Temperature Range	-55~+150	°C

Thermal Characteristics

Symbol	Parameter	Ratings	Unit
$R_{th(J-C)}$ (IGBT)	Thermal Resistance, Junction to case for IGBT	0.9	°C/W
$R_{th(J-C)}$ (Diode)	Thermal Resistance, Junction to case for Diode	1.2	°C/W
$R_{th(J-A)}$	Thermal Resistance, Junction to Ambient	40	°C/W

Electrical Characteristics of IGBT @ $T_C=25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{CES}	Collector to Emitter Breakdown Voltage	$V_{GE}=0\text{V}, I_C=250\mu\text{A}$	650	-	-	V
$V_{CE(\text{sat})}$	Collector to Emitter Saturation Voltage	$I_C=40\text{A}, V_{GE}=15\text{V}$	-	2.0	2.6	V
		$I_C=40\text{A}, V_{GE}=15\text{V}, T_C=150\text{ }^\circ\text{C}$	-	2.3	-	V
$V_{GE(\text{th})}$	Gate Threshold Voltage	$V_{CE}=V_{GE}, I_C=250\mu\text{A}$	4.0	5.3	6.0	V
I_{CES}	Zero Gate Voltage Collector Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}$	-	-	1	μA
I_{GES}	Gate to Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V}$	-	-	± 250	nA

Electrical Characteristics of Diode @ $T_C=25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=10\text{A}$	-	1.5	1.80	V
		$I_F=10\text{A}, T_C=150\text{ }^\circ\text{C}$	-	1.8	2.2	V
I_R	Reverse Leakage Current	$V_R=650\text{V}$	-	20	100	μA
		$V_R=0\text{V}, f=1\text{MHz}$	-	490	-	pF
		$V_R=200\text{V}, f=1\text{MHz}$	-	50	-	
C	Total Capacitance	$V_R=400\text{V}, f=1\text{MHz}$	-	45	-	pF
		$V_R=325\text{V}, I_F=10\text{A}, \frac{dI}{dt}=-200\text{A/us}$	-	28	-	
		t_c	-	25	-	ns

Switching Characteristics @ $T_C=25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$I_C=40\text{A}, V_{CC}=325\text{V}, V_{GE}=15\text{V}, R_G=10\Omega, \text{Inductive Load, } T_C=25\text{ }^\circ\text{C}$	-	25.0	-	ns
t_r	Rising Time		-	23.0	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	86.1	-	ns
t_f	Falling Time		-	18.1	-	ns
E_{on}	Turn-on Switching Loss		-	1.30	-	mJ
E_{off}	Turn-off Switching Loss		-	0.55	-	mJ
E_{ts}	Total Switching Loss		-	1.84	-	mJ
$t_{d(on)}$	Turn-on Delay Time	$I_C=40\text{A}, V_{CC}=325\text{V}, V_{GE}=15\text{V}, R_G=10\Omega, \text{Inductive Load, } T_C=125\text{ }^\circ\text{C}$	-	24.4	-	ns
t_r	Rising Time		-	24.6	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	96.7	-	ns
t_f	Falling Time		-	21.5	-	ns
E_{on}	Turn-on Switching Loss		-	1.74	-	mJ
E_{off}	Turn-off Switching Loss		-	0.71	-	mJ
E_{ts}	Total Switching Loss		-	2.56	-	mJ
C_{ies}	Input Capacitance	$V_{GE}=0\text{V}, V_{CE}=25\text{V}, f=1.0\text{MHz}$	-	1685	-	pF
C_{res}	Reverse Transfer Capacitance		-	74	-	pF
C_{oes}	Output Capacitance		-	48	-	pF
Q_g	Total Gate Charge	$I_C=40\text{A}, V_{CE}=325\text{V}$	-	161	-	nC
Q_{ge}	Gate to Emitter Charge		-	40	-	nC
Q_{gc}	Gate to Collector Charge		-	48	-	nC
tsc	Short Circuit With stand Time	$V_{CC}=325\text{V}, V_{GE}=15\text{V}$	-	10	-	us

Typical Performance Characteristics

Fig. 1. Typical Output Characteristics

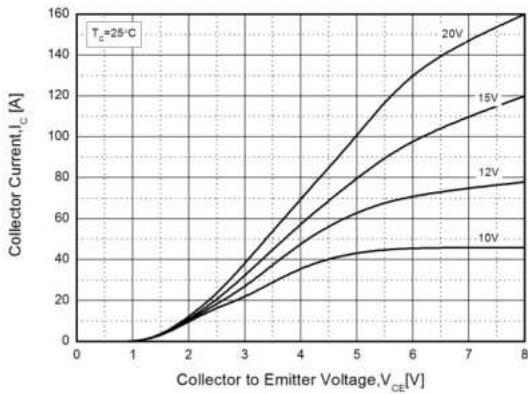


Fig. 2. Typical Saturation Voltage Characteristics

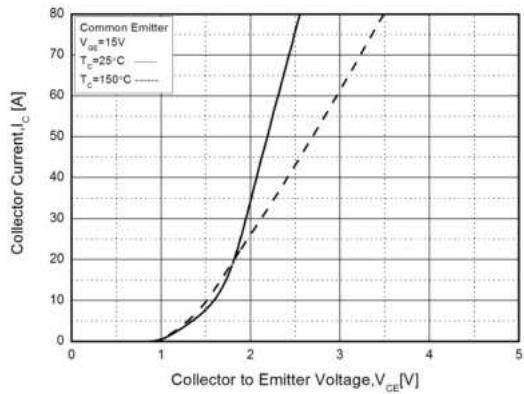


Fig. 3. Typical Saturation Voltage vs. T_c

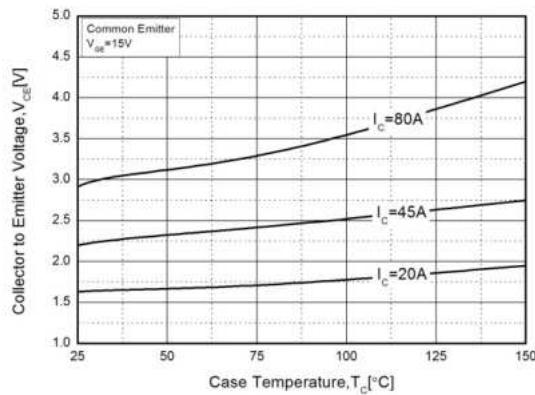


Fig. 4. Diode Forward Characteristics

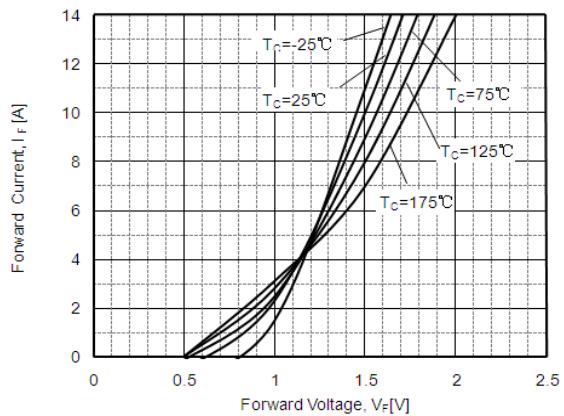


Fig. 5. Typical Capacitance Characteristics

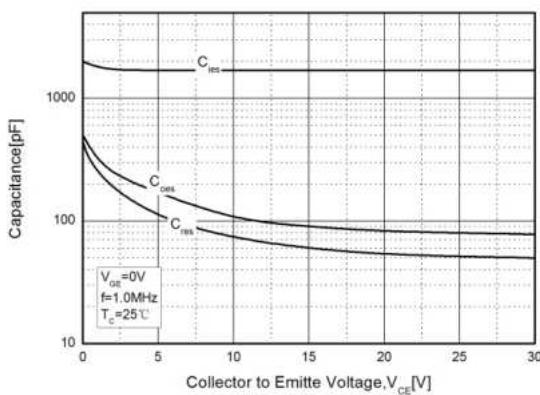
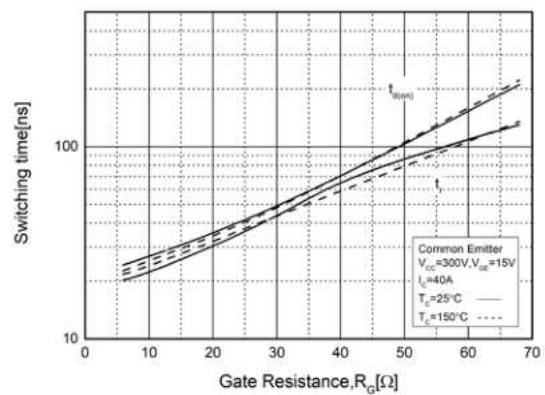


Fig. 6. Turn-on Characteristics vs. R_G



Typical Performance Characteristics

Fig. 7. Turn-off Characteristics vs. R_G

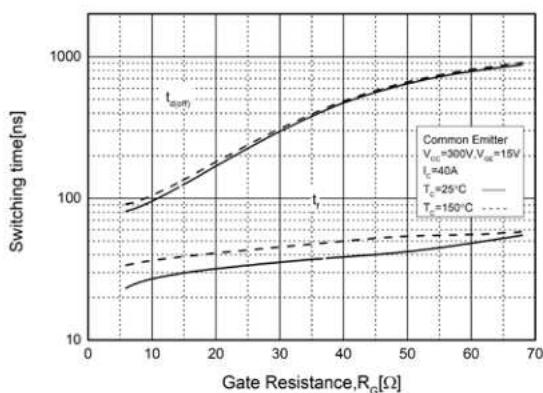


Fig. 9. Turn-on Characteristics vs. I_C

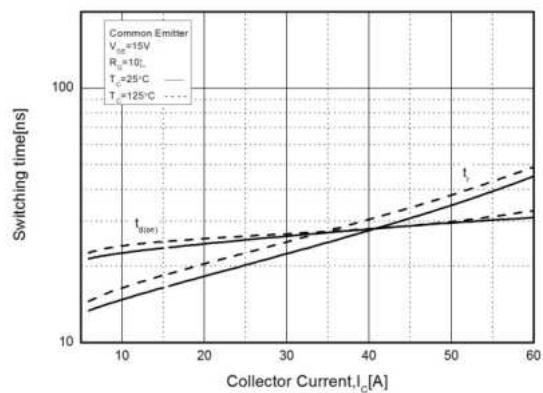


Fig. 11. Switching Loss vs. I_C

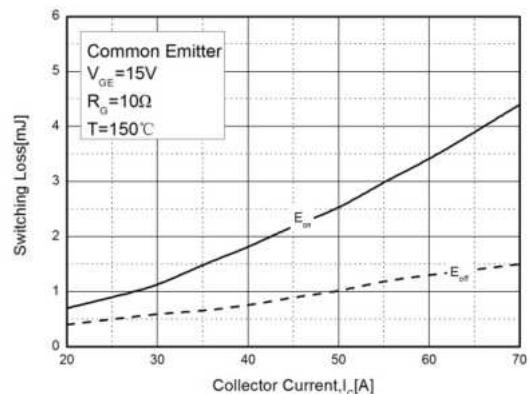


Fig. 8. Switching Loss vs. R_G

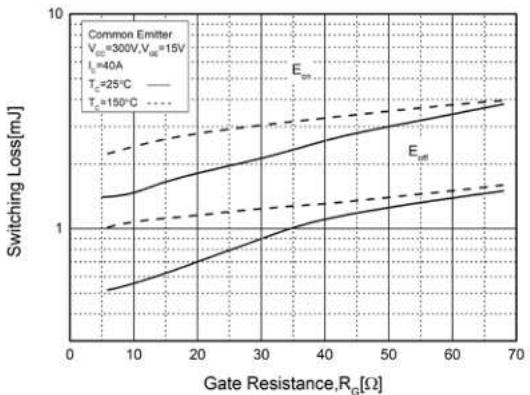
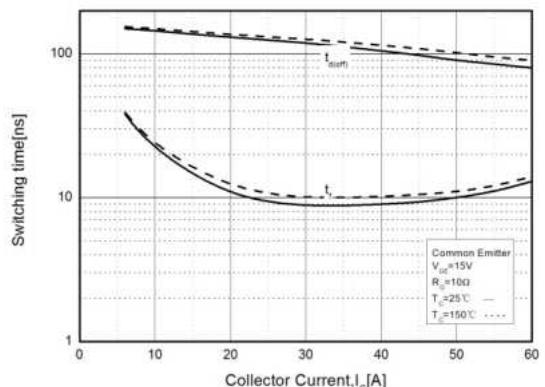


Fig. 10. Turn-off Characteristics vs. I_C



Package Dimensions

TO-247

(Dimensions in Millimeters)

