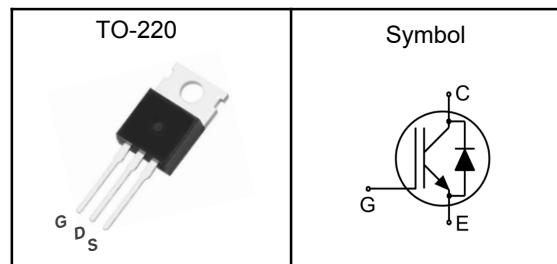


**600V/30A Field Stop Trench IGBT**
**Features**

- Trench FS II Technology
- Very low  $V_{CE(sat)}$
- High speed switching
- ROHS Compliant

**Applications**

- Inverter welding machine
- Motor drives
- UPS

**Pin Description**


$V_{CES}$	600	V
$V_{CE(sat)-Typ}$	1.7	V
$I_C$	30	A

**Absolute Maximum Ratings** ( $T_C=25^{\circ}C$ , Unless Otherwise Noted)

Parameter	Symbol	Rating	Units
Collector-Emitter Voltage	$V_{CES}$	600	V
Gate- Emitter Voltage	$V_{GES}$	$\pm 30$	V
Collector Current <sup>1</sup>	$I_C$	60	A
Collector Current <sup>1</sup>	$I_C$	30	A
Pulsed Collector Current <sup>2</sup>	$I_{CM}$	90	A
Diode Continuous Forward Current	$I_F$	60	A
Diode Continuous Forward Current	$I_F$	30	A
Diode Pulsed Forward Current	$I_{FM}$	90	A
Power Dissipation	$P_D$	230	W
Power Dissipation	$P_D$	115	W
Storage Temperature Range	$T_{STG}$	-55 to 175	$^{\circ}C$
Operating Junction Temperature Range	$T_J$	-55 to 175	$^{\circ}C$

**Thermal Characteristics**

Parameter	Symbol	Typ	Max	Unit
Thermal Resistance Junction-Ambient	$R_{\theta JA}$	---	40	$^{\circ}C/W$
Thermal Resistance Junction to case for IGBT	$R_{\theta JC}$	---	0.65	$^{\circ}C/W$
Thermal Resistance Junction to case for Diode	$R_{\theta JCD}$	---	0.79	$^{\circ}C/W$



**600V/30A Field Stop Trench IGBT**

**Electrical Characteristics** ( $T_J=25^{\circ}\text{C}$ , Unless Otherwise Noted)

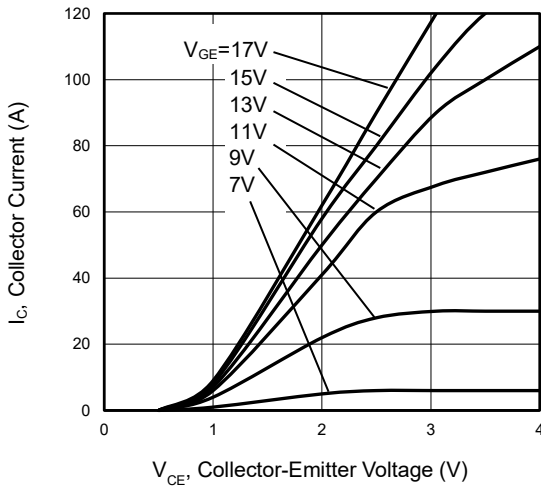
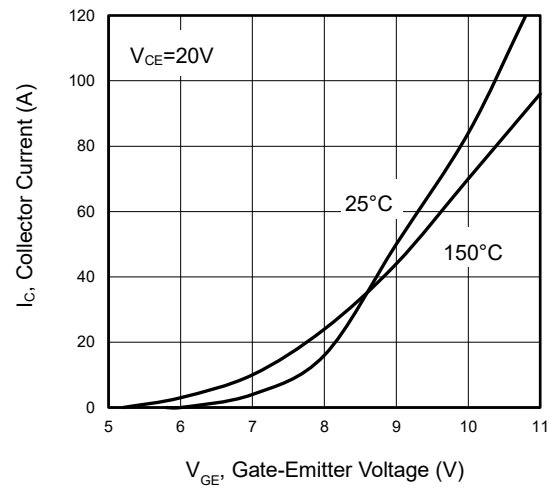
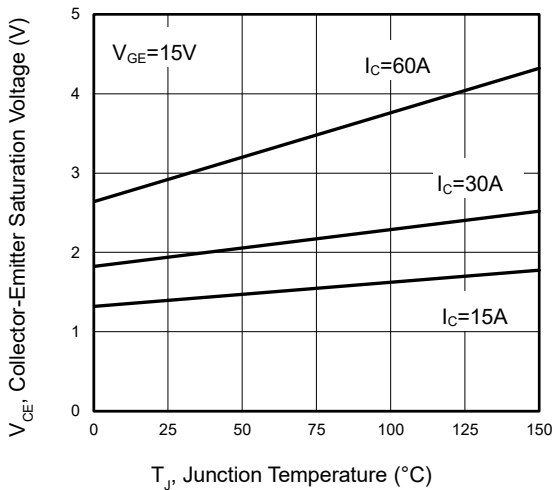
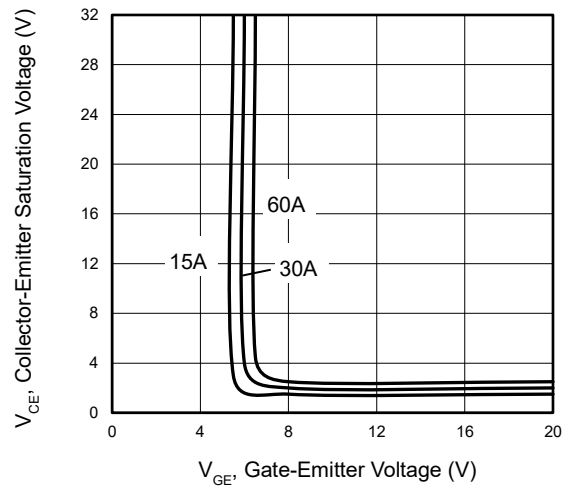
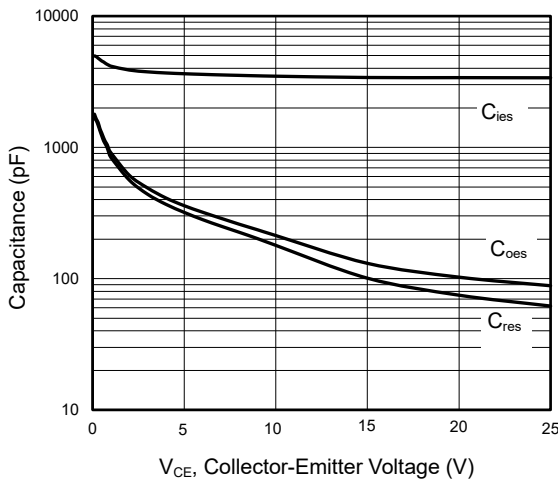
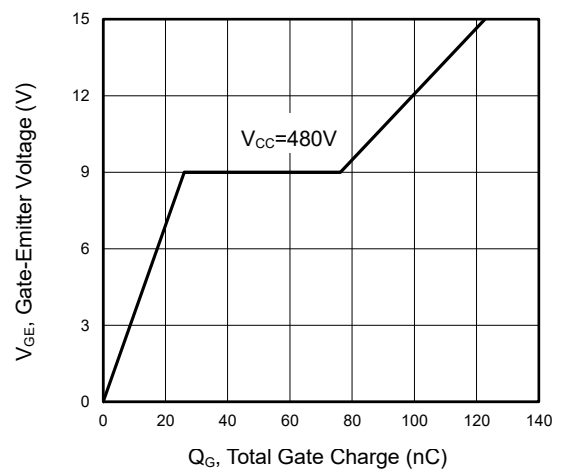
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	$V_{GE}=0V, I_D=1mA$	600	---	---	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=30A, T_J=25^{\circ}\text{C}$	---	1.7	2.0	V
		$V_{GE}=15V, I_C=30A, T_J=150^{\circ}\text{C}$	---	1.9	---	V
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}, I_C=1mA$	4	5.5	6.5	V
Collector-Emitter Leakage Current	$I_{CES}$	$V_{CE}=600V, V_{GE}=0V, T_J=25^{\circ}\text{C}$	---	---	0.01	mA
		$V_{CE}=600V, V_{GE}=0V, T_J=150^{\circ}\text{C}$	---	---	1	mA
Gate to Emitter Leakage Current	$I_{GES}$	$V_{GE}=\pm 30V, V_{CE}=0V$	---	---	$\pm 250$	nA
Total Gate Charge	$Q_g$	$V_{CC}=480V, V_{GE}=15V, I_C=30A$	---	122	---	nC
Gate to Emitter Charge	$Q_{ge}$		---	31	---	nC
Gate to Collector Charge	$Q_{gc}$		---	54	---	nC
Turn-On Delay Time	$t_{d(ON)}$	$V_{CE}=400V, V_{GE}=0/15V, R_G=5\Omega, I_C=30A, T_J=25^{\circ}\text{C}$ Inductive Load	---	20	---	ns
Rise Time	$t_r$		---	16	---	
Turn-Off Delay Time	$t_{d(off)}$		---	160	---	
Fall Time	$t_f$		---	15	---	mJ
Turn-On Switching Loss	$E_{on}$		---	0.35	---	
Turn-Off Switching Loss	$E_{off}$		---	0.32	---	
Total Switching Loss	$E_{ts}$	---	0.67	---		
Input Capacitance	$C_{ies}$	$V_{CE}=25V, V_{GE}=0V, f=1MHz$	---	3450	---	pF
Output Capacitance	$C_{oes}$		---	92	---	
Reverse Transfer Capacitance	$C_{res}$		---	55	---	

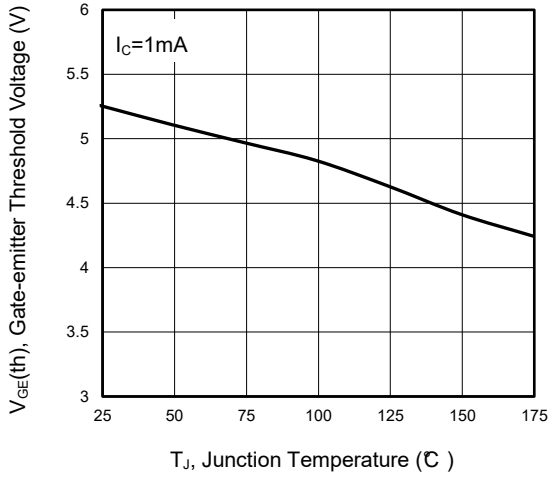
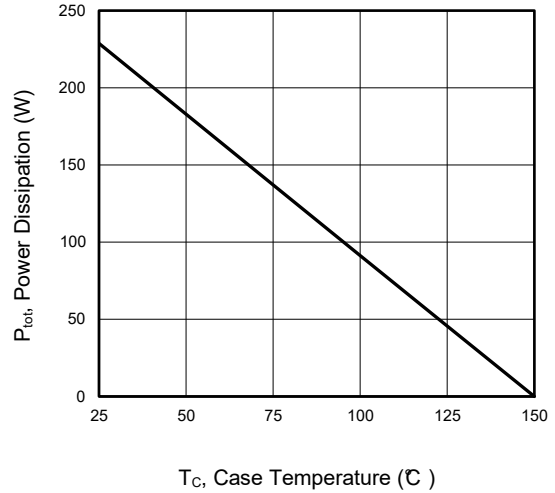
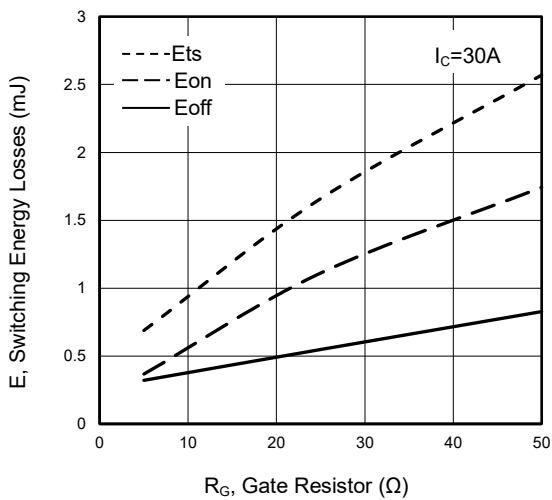
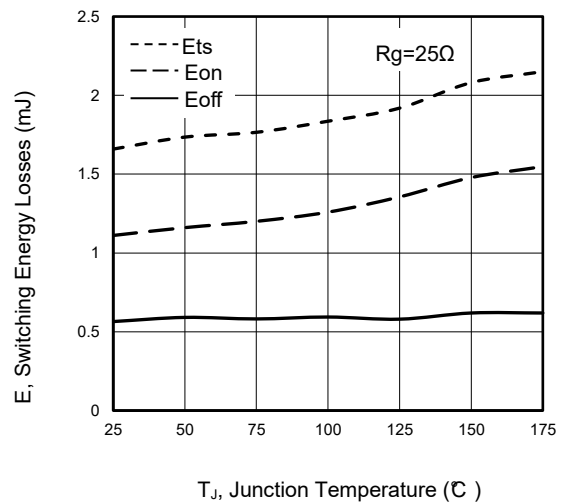
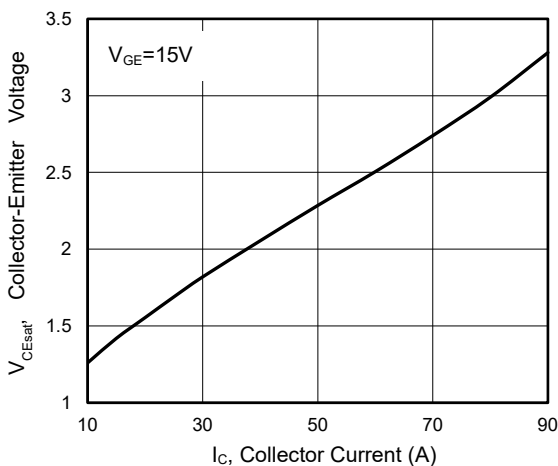
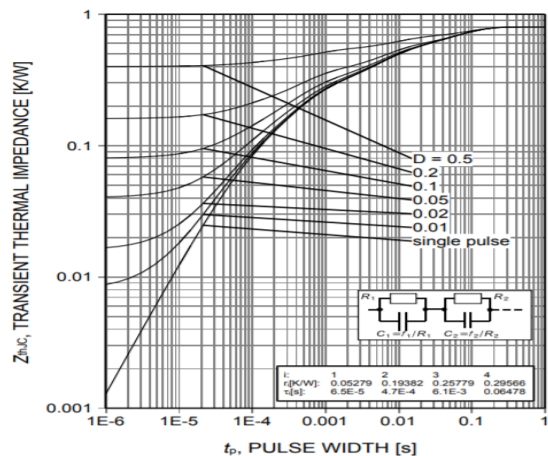
**Drain-Source Diode Characteristics**

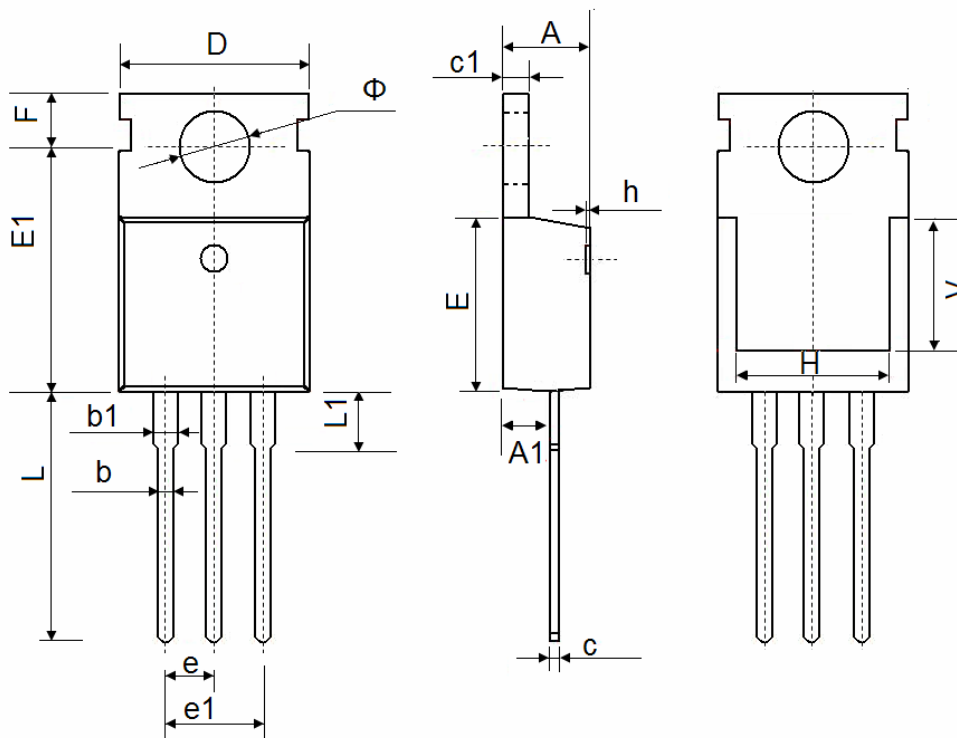
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	$V_F$	$V_{GE}=0V, I_F=30A, T_J=25^{\circ}\text{C}$	---	1.7	---	V
Reverse Recovery Time	$t_{rr}$	$I_F=30A, di/dt=200A/\mu s, T_J=25^{\circ}\text{C}$	---	170	---	nS
Reverse Recovery Charge	$Q_{rr}$		---	0.5	---	uC
Diode Peak Reverse Recovery Current	$I_{rrm}$		---	4.2	---	A

**Note:**

1. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
2. The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$

**600V/30A Field Stop Trench IGBT**
**Typical Characteristics**
**Figure 1 Output Characteristics**

**Figure 2 Transfer Characteristics**

**Figure 3  $V_{CEsat}$  vs. Case Temperature**

**Figure 4 Saturation Voltage vs.  $V_{GE}$** 

**Figure 5 Capacitance Characteristics**

**Figure 6 Gate charge waveform**


**600V/30A Field Stop Trench IGBT**
**Figure 7 Gate-emitter Threshold Voltage as a Function of Junction Temperature**

**Figure 8 Power Dissipation as a Function of Case Temperature**

**Figure 9 Typical Switching Times as a Function of Gate Resistor**

**Figure 10 Typical Switching Times as a Function of Junction Temperature**

**Figure 11 Typical Collector-emitter Saturation Voltage as a function of Collector Current**

**Figure 12 Transient Thermal Impedance**


**600V/30A Field Stop Trench IGBT**
**TO-220 Package Outline Data**


Symbol	Dimensions In Millimeters	
	Min.	Max.
A	4.350	4.650
A1	2.250	2.550
b	0.710	0.910
b1	1.170	1.400
c	0.330	0.650
c1	1.200	1.400
D	9.910	10.250
E	8.9500	9.750
E1	12.650	12.950
e	2.540 TYP.	
e1	4.980	5.180
F	2.650	2.950
H	7.900	8.100
h	0.000	0.300
L	12.700	13.500
L1	2.850	3.250
V	7.500 REF.	
Φ	3.400	3.800