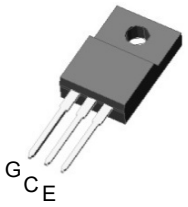
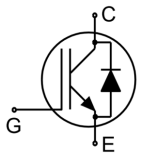
650V/15A Field Stop Trench IGBT

Features

- Trench FS II Technology
- Very low VCE(sat)
- High speed switching
- ROHS Compliant

Pin Description

TO-220F	Symbol
	

Applications

- Inverter welding machine
- Motor drives
- UPS

V_{CES}	650	V
$V_{CE(sat)-Typ}$	1.7	V
I_C	15	A

Absolute Maximum Ratings(T_C=25℃, Unless Otherwise Noted)

Parameter		Symbol	Rating	Units
Collector-Emitter Voltage		V_{CES}	650	V
Gate- Emitter Voltage		V_{GES}	±30	V
Collector Current[1]	T_C=25℃	I_C	30	A
Collector Current[1]	T_C=100℃	I_C	15	A
Pulsed Collector Current[2]		I_{CM}	45	A
Diode Continuous Forward Current	T_C=25℃	I_F	30	A
Diode Continuous Forward Current	T_C=100℃	I_F	15	A
Diode Pulsed Forward Current		I_{FM}	60	A
Power Dissipation	T_C=25℃	P_D	40	W
Power Dissipation	T_C=100℃	P_D	20	W
Storage Temperature Range		T_{STG}	-55 to 150	℃
Operating Junction Temperature Range		T_J	-55 to 150	℃

Thermal Characteristics

Parameter	Symbol	Typ	Max	Unit
Thermal Resistance Junction-Ambient	$R_{\theta JA}$	---	62	℃/W
Thermal Resistance Junction to case for IGBT	$R_{\theta JC}$	---	3.75	℃/W

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Electrical Characteristics (T_J=25℃, unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	V_{GE}=0V , I_D=1mA	650	---	---	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=15A,T_J=25℃	---	1.7	2.4	V
		V_{GE}=15V, I_C=15A,T_J=100℃	---	1.9	---	V
Gate Threshold Voltage	$V_{GE(th)}$	V_{CE}=V_{GE} , I_C =1mA	4	---	7	V
Collector-Emitter Leakage Current	I_{CES}	V_{CE}=650V, V_{GE}=0V,T_J=25℃	---	---	0.04	mA
		V_{CE}=650V, V_{GE}=0V,T_J=150℃	---	---	1	mA
Gate to Emitter Leakage Current	I_{GES}	V_{GE}=±30V , V_{CE}=0V	---	---	±100	nA
Total Gate Charge	Q_g	V_{CC}=480V , V_{GE}=15V , I_C=15A	---	48	---	nC
Gate to Emitter Charge	Q_{ge}		---	11	---	nC
Gate to Collector Charge	Q_{gc}		---	20	---	nC
Turn-On Delay Time	$t_{d(ON)}$	V_{CC}=400V , V_{GE}=0/15V ,R_G=5Ω, I_C=10A, Inductive Load	---	16	---	ns
Rise Time	t_r		---	12	---	
Turn-Off Delay Time	$t_{d(off)}$		---	110	---	
Fall Time	t_f		---	12	---	
Turn-On Switching Loss	E_{on}		---	0.25	---	mJ
Turn-Off Switching Loss	E_{off}		---	0.12	---	
Total Switching Loss	E_{ts}		---	0.37	---	
Input Capacitance	C_{ies}	V_{CE}=25V , V_{GE}=0V , f=1MHz	---	1035	---	pF
Output Capacitance	C_{oes}		---	50	---	
Reverse Transfer Capacitance	C_{res}		---	30	---	

Drain-Source Diode Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	V_{GE}=0V, I_F=15A,T_J=25℃	---	1.4	1.7	V
Reverse Recovery Time	trr	I_F=15A , di/dt=200A/μs，T_J=25℃	---	132	---	nS
Reverse Recovery Charge	Qrr		---	520	---	nC
Diode Peak Reverse Recovery Current	I_{rrm}		---	6.5	---	A

Note:

1.The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper.

2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

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Typical Characteristics

Figure 1 Output Characteristics

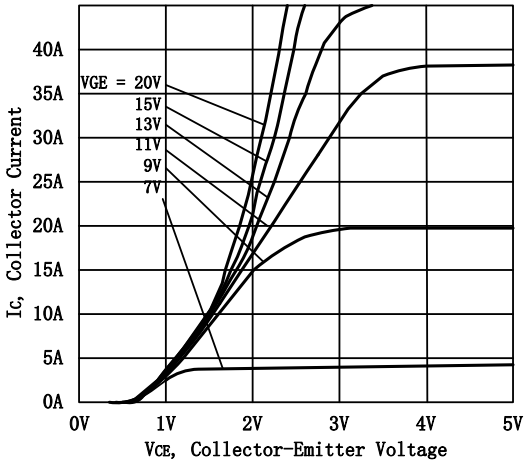

Figure 2 Transfer Characteristics

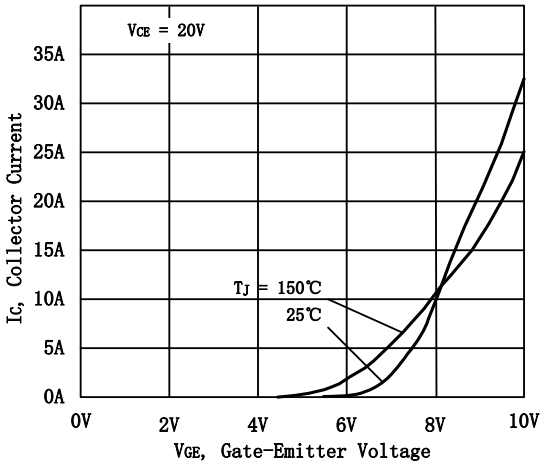

Figure 3 V_{CEsat} vs. Case Temperature

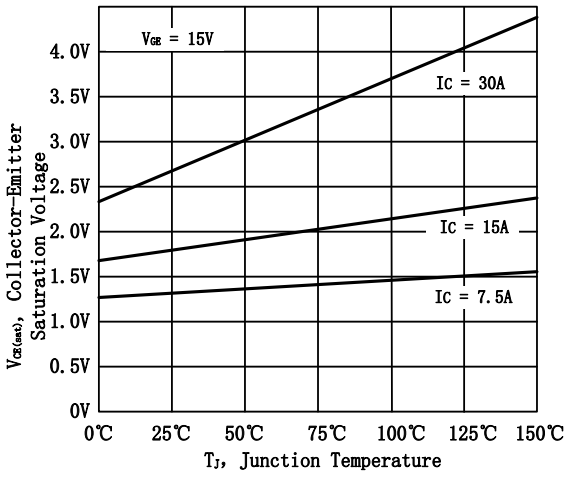

Figure 4 Saturation Voltage vs. VGE

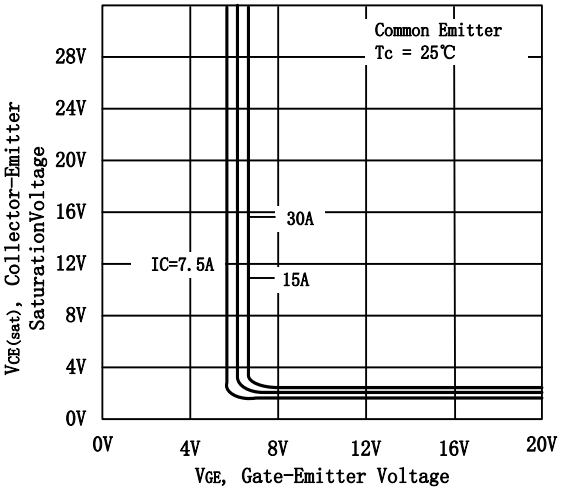

Figure 5 Capacitance Characteristics

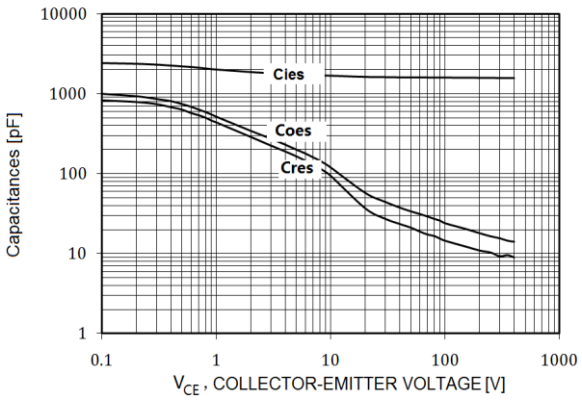

Figure 6 Gate charge waveform

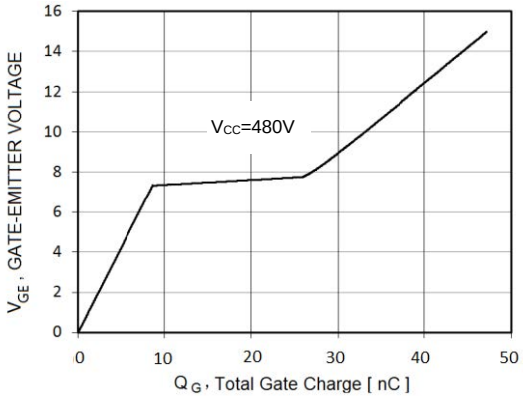

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Figure 7 Gate-emitter Threshold Voltage as a Function of Junction Temperature

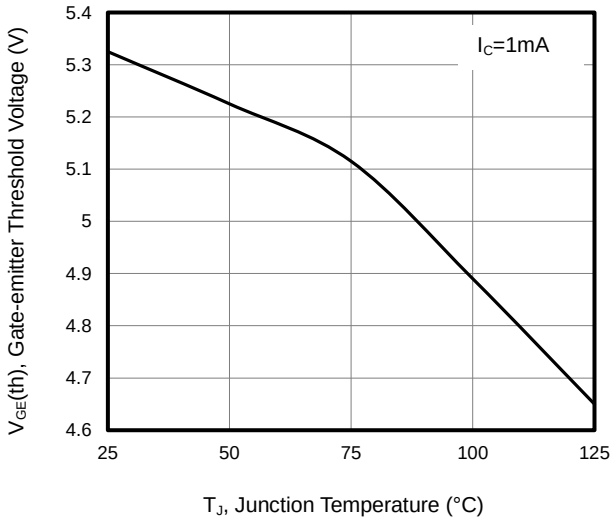


Figure 8 Typical Switching Times as a Function of Gate Resistor

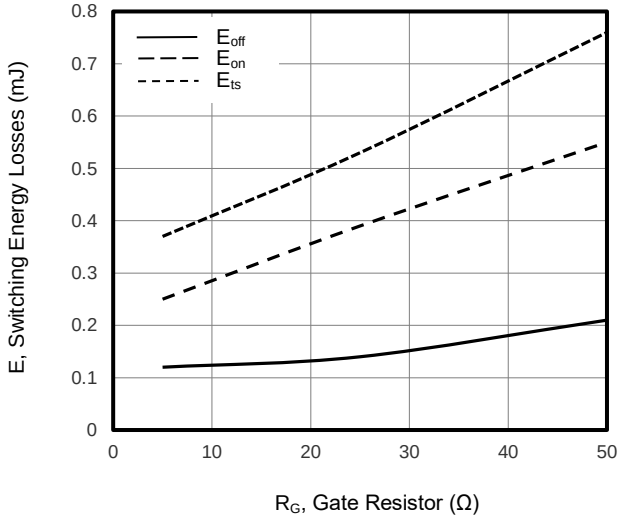


Figure 9 Typical Switching Times as a Function of Junction Temperature

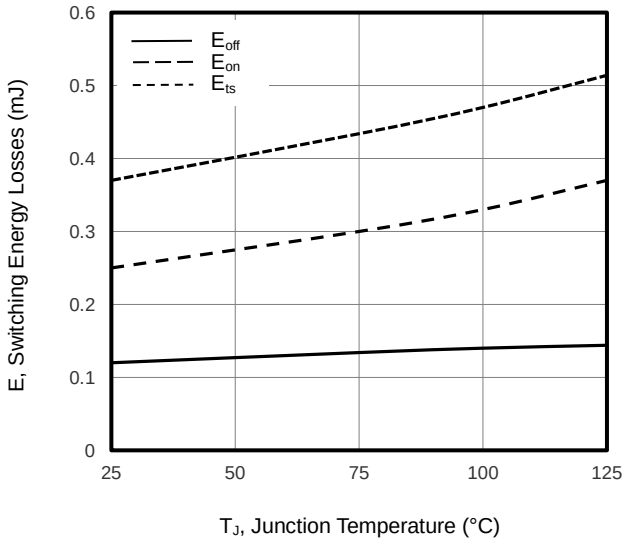
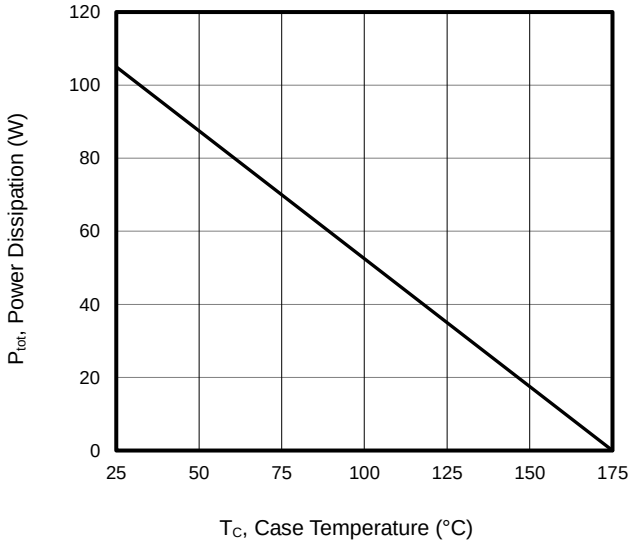


Figure10 Power Dissipation as a Function of Case Temperature



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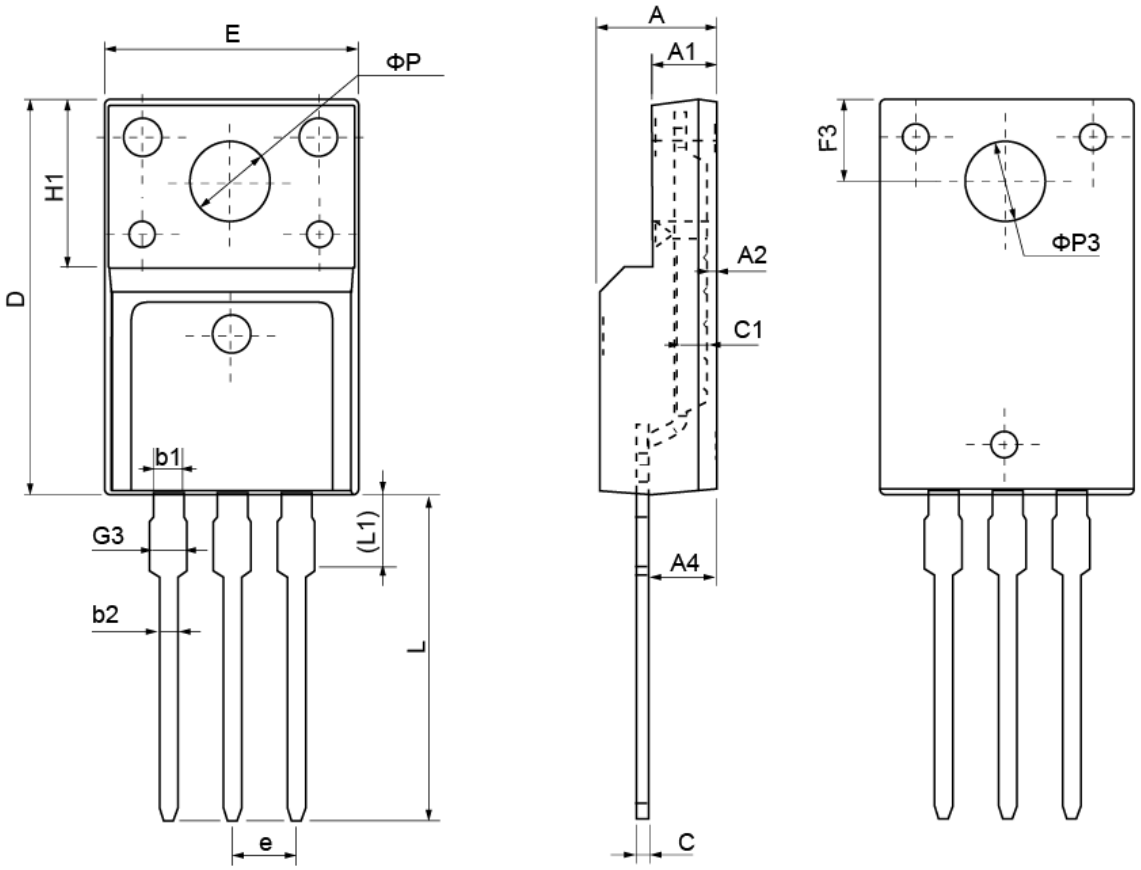
TO-220F Package Outline Dimensions



Symbol	Dimensions (unit:mm)			Symbol	Dimensions (unit:mm)		
	Min	Typ	Max		Min	Typ	Max
A	4.40	4.70	5.00	**H1**	6.70 REF		
A1	2.30	2.55	2.80	**L**	12.30	12.98	13.30
A2	0.30	0.50	0.70	**L1**	2.95	3.10	3.50
A4	2.45	2.80	3.05	**ϕP**	3.03	3.20	3.50
c	0.30	0.50	0.70	**ϕP3**	3.15	3.45	3.65
c1	1.20	1.30	1.40	**b1**	1.10	1.30	1.45
D	15.40	15.90	16.40	**b2**	0.60	0.80	1.00
E	9.86	10.16	10.46	**F3**	3.05	3.30	3.55
e	2.54 BSC			**G3**	1.15	1.35	1.55