

650V 20A Trench and Field Stop IGBT

DESCRIPTION :

- High ruggedness performance
- 10μs short circuit capability
- Positive $V_{CE(SAT)}$ temperature coefficient
- High efficiency for motor control
- Excellent current sharing in parallel operation
- RoHS compliant.



TYPICAL APPLICATIONS :

- Home appliances
- Motor drives
- General inverter

TO-263

IGBT

MAXIMUM RATINGS (Tvj=25°C unless otherwise specified)

Characteristic	Condition	Symbol	Value	Unit
Collector-Emitter Voltage		V_{CES}	650	V
Continuous collector current	Tc=25°C Tc=100°C	$I_{C\ nom}$	40 20	A
Pulsed collector current	t _p limited by Tvjmax	I_{CM}	80	A
Gate emitter voltage		V_{GE}	±20	V
Short circuit withstand time		t _{SC}	10	us
Power dissipation	Tc=25°C Tc=100°C	P_{tot}	150 75	W
Temperature under switching conditions		Tvj op	-40~+175	°C
Storage temperature		T _{STG}	-55~+150	°C

THERMAL CHARACTERISTICS

Characteristic	Condition	Symbol	Max.	Unit
IGBT thermal resistance, junction - case		$R_{th(j-C)}$	1.0	K/W
Diode thermal resistance, junction - case		$R_{th(j-C)}$	1.8	K/W
Thermal resistance, junction - ambient		$R_{th(j-A)}$	40	K/W

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Collector-emitter cut-off current VCE=650V, VGE=0V Tvj=25°C	I_{CES}			50	μA
Gate-emitter leakage current VCE=0V, VGE=20V Tvj=25°C	I_{GES}			100	nA
Gate-Emitter threshold voltage IC=1.0mA, VGE= VCE Tvj=25°C	$V_{GE(th)}$	5.2	5.7	6.2	V
Collector-Emitter saturation voltage VGE=15V, IC=20A Tvj=25°C VGE=15V, IC=20A Tvj=175°C	$V_{CE(SAT)}$		1.6 1.9		V
Input capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25°C	C_{ies}		1700		pF
Output capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25°C	C_{oes}		72		pF
Reverse transfer capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25°C	C_{res}		13		pF
Gate charge IC = 20A, VGE = 15 V, VCC = 520V Tvj=25°C	Q_G		71		nC
Turn-on delay time IC=20A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=175°C (inductive load)	$t_{d(ON)}$		21 21		ns
Rise time IC=20A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=175°C (inductive load)	t_r		23 23		ns
Turn-off delay time IC=20A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=175°C (inductive load)	$t_{d(OFF)}$		120 141		ns
Fall time IC=20A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=175°C (inductive load)	t_f		63 108		ns
Turn-on energy IC=20A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=175°C (inductive load)	$E_{(ON)}$		0.37 0.59		mJ

Turn-off energy loss per pulse IC=20A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=175°C (inductive load)	$E_{(OFF)}$		0.46 0.67		mJ
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Diode

MAXIMUM RATINGS (Tvj=25°C unless otherwise specified)

Characteristic	Condition	Symbol	Value	Unit
Repetitive peak reverse voltage	Tvj=25°C	V_{RRM}	650	V
Continuous forward current	Tc=100°C	I_F	20	A
Diode maximum current	tp limited by Tvj max	I_{FM}	80	A

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Forward voltage IF=20A, VGE=0 V Tvj=25°C IF=20A, VGE=0 V Tvj=175°C	V_F		1.5 1.2		V
Reverse Recovered Time IF=20 A, Tvj=25°C -diF/dt =500A/μs Tvj=175°C VR=400 V	T_{rr}		62 90		ns
Peak reverse recovery current IF=20 A, Tvj=25°C -diF/dt =500A/μs Tvj=175°C VR=400 V	I_{RRM}		12 19		A
Reverse Recovered charge IF=20 A, Tvj=25°C -diF/dt =500A/μs Tvj=175°C VR=400 V	Q_{rr}		472 1130		nC

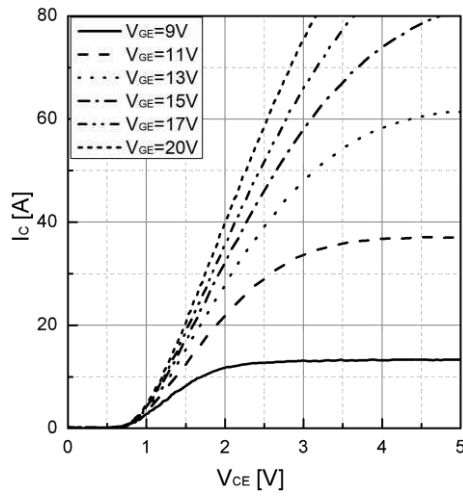


Figure 1. Typical output characteristics ($T_{vj}=25^{\circ}\text{C}$)

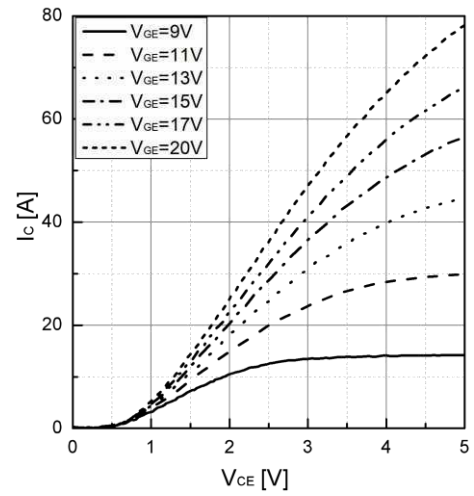


Figure 2. Typical output characteristics ($T_{vj}=175^{\circ}\text{C}$)

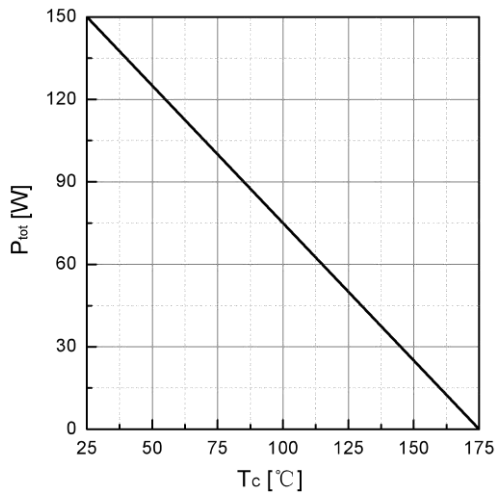


Figure 3. Power dissipation as a function of T_C

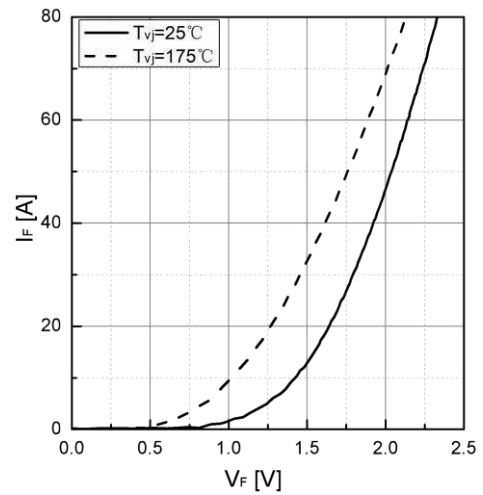


Figure 4. Typical I_F as a function of V_F

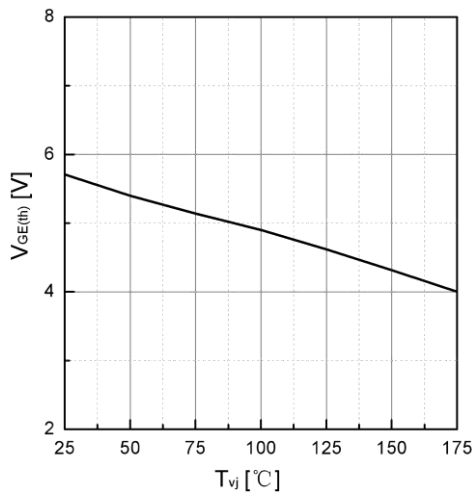


Figure 5. Typical $V_{GE(th)}$ as a function of T_{vj} ($I_C=1\text{mA}$)

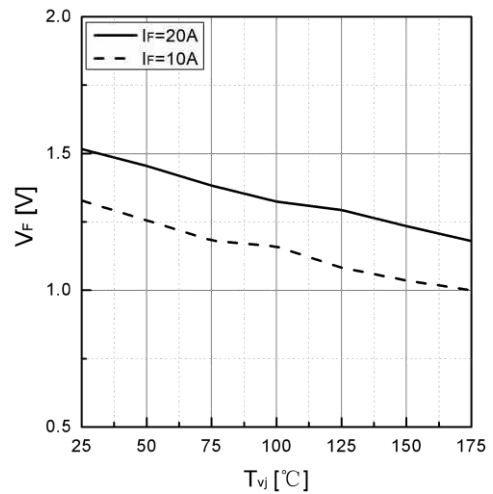


Figure 6. Typical V_F as a function of T_{vj}

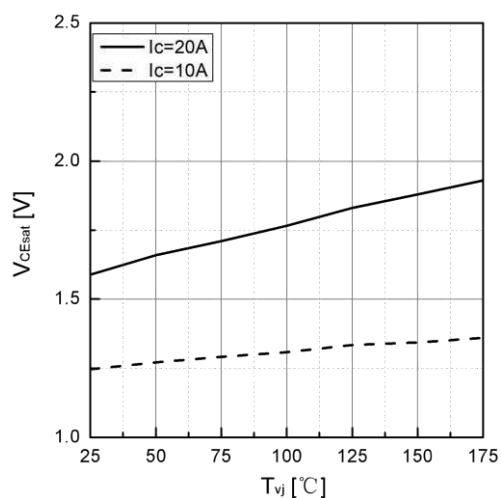


Figure 7. Typical V_{CEsat} as a function of T_{vj}

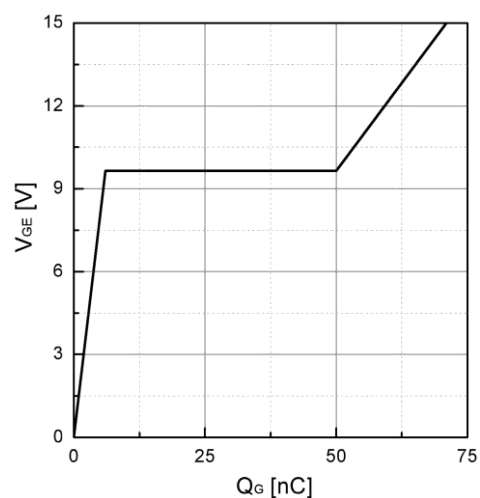


Figure 8. Typical Gate charge

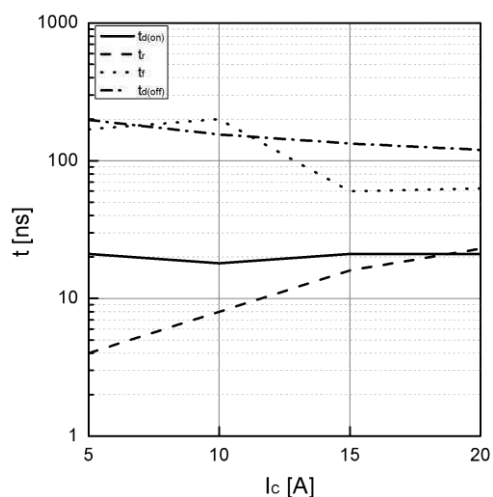


Figure 9. Typical switching times as a function of I_C

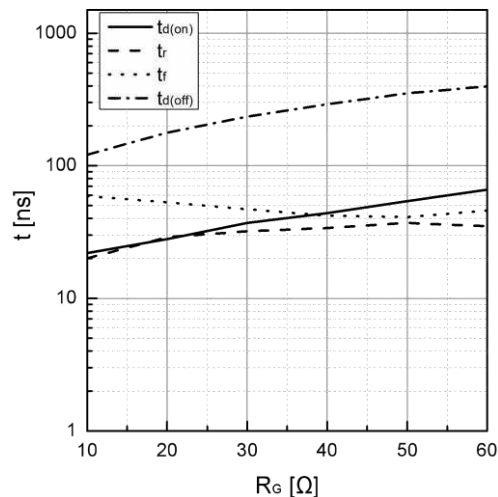


Figure 10. Typical switching times as a function of R_G

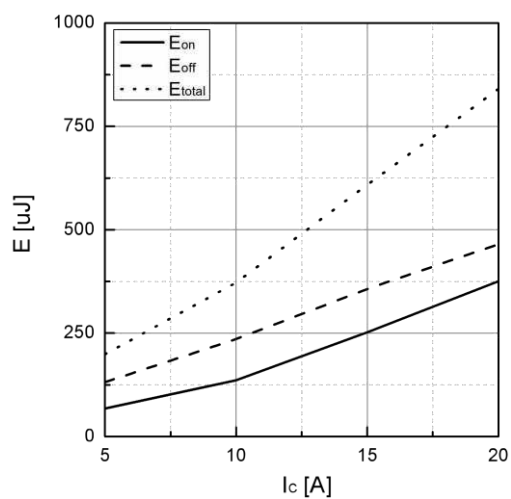


Figure 11. Typical switching energy losses as a function of I_C

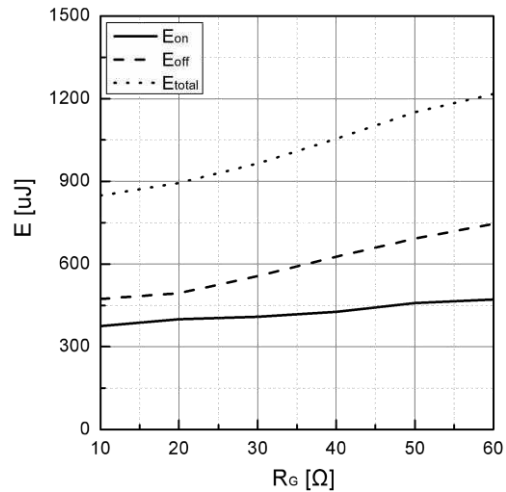


Figure 12. Typical switching energy losses as a function of R_G

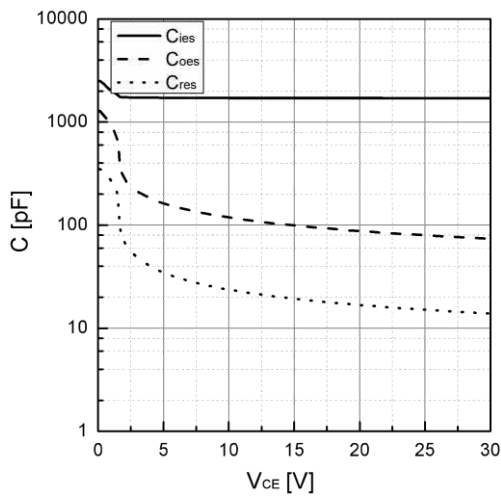
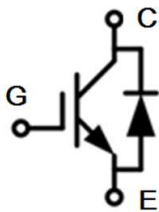
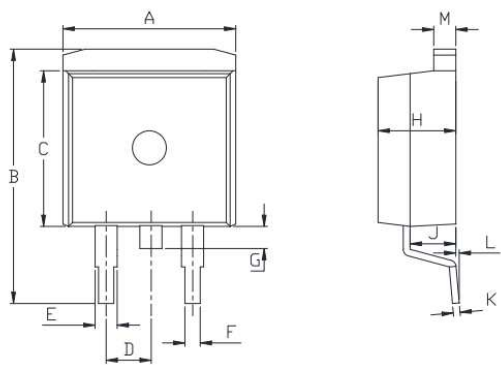


Figure 13. Typical capacitance as a function of VCE
(f=1Mhz, VGE=0V)

• Circuit diagram



• Package outlines : Dimensions in (mm)



DIM	MILLIMETERS	
	MIN	MAX
A	9.90	10.20
B	14.70	15.80
C	9.40	9.60
D	Typ. 2.54	
E	1.20	1.40
F	0.75	0.85
G	---	1.75
H	4.40	4.70
J	2.30	2.70
K	0.38	0.55
L	0.00	0.25
M	1.25	1.35

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