650V 10A 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.

TO-263

TYPICAL APPLICATIONS：
- Home appliances
- Motor drives

IGBT

MAXIMUM RATINGS (Tvj=25℃ unless otherwise specified)

Characteristic	Condition	Symbol	Value	Unit
Collector-Emitter Voltage		V_{CES}	650	V
Continuous collector current	Tc=25℃ Tc=100℃	$I_{C\ nom}$	20 10	A
Pulsed collector current	t_P limited by Tvjmax	I_{CM}	40	A
Gate emitter voltage		V_{GE}	±20	V
Short circuit withstand time		t_{SC}	10	us
Power dissipation	Tc=25℃ Tc=100℃	P_{tot}	100 50	W
Temperature under switching conditions		Tvj op	-40~+175	℃
Storage temperature		T_{STG}	-55~+150	℃

THERMAL CHARACTERISTICS

Characteristic	Condition	Symbol	Max.	Unit
IGBT thermal resistance, junction - case		$R_{th(j-C)}$	1.5	K/W
Diode thermal resistance, junction - case		$R_{th(j-C)}$	1.8	K/W
Thermal resistance, junction - ambient		$R_{th(j-A)}$	50	K/W

ELECTRICAL CHARATERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Collector-emitter cut-off current VCE=650V, VGE=0V Tvj=25℃	I_{CES}			50	uA
Gate-emitter leakage current VCE=0V, VGE=20V Tvj=25℃	I_{GES}			100	nA
Gate-Emitter threshold voltage IC=0.25mA, VGE= VCE Tvj=25℃	$V_{GE(th)}$	5.5	5.8	6.2	V
Collector-Emitter saturation voltage VGE=15V, IC=10A Tvj=25℃ VGE=15V, IC=10A Tvj=150℃	$V_{CE(SAT)}$		1.8 2.1		V
Input capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25℃	C_{ies}		670		pF
Output capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25℃	C_{oes}		37		pF
Reverse transfer capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25℃	C_{res}		10		pF
Gate charge IC = 10A, VGE = 15 V,VCC =520V Tvj=25℃	Q_G		28		nC
Turn-on delay time IC=10A, VCC=400 V Tvj=25℃ VGE=0/15 V, RG=10Ω Tvj=150℃ (inductive load)	$td_{(ON)}$		12 10		ns
Rise time IC=10A, VCC=400 V Tvj=25℃ VGE=0/15 V, RG=10Ω Tvj=150℃ (inductive load)	tr		11 12		ns
Turn-off delay time IC=10A, VCC=400 V Tvj=25℃ VGE=0/15 V, RG=10Ω Tvj=150℃ (inductive load)	$td_{(OFF)}$		71 86		ns
Fall time IC=10A, VCC=400 V Tvj=25℃ VGE=0/15 V, RG=10Ω Tvj=150℃ (inductive load)	tf		74 112		ns
Turn-on energy IC=10A, VCC=400 V Tvj=25℃ VGE=0/15 V, RG=10Ω Tvj=150℃ (inductive load)	$E_{(ON)}$		0.18 0.21		mJ

Turn-off energy loss per pulse IC=10A, VCC=400 V Tvj=25℃ VGE=0/15 V, RG=10Ω Tvj=150℃ (inductive load)	$E_{(OFF)}$		0.17 0.25		mJ

Diode

MAXIMUM RATINGS (Tvj=25℃ unless otherwise specified)

Characteristic	Condition	Symbol	Value	Unit
Repetitive peak reverse voltage	Tvj=25℃	V_{RRM}	650	V
Continuous forward current	Tc=100℃	I_F	10	A
Diode maximum current	t_P limited by Tvj max	I_{FM}	40	A

ELECTRICAL CHARATERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Forward voltage IF=10A, VGE=0 V Tvj=25℃ IF=10A, VGE=0 V Tvj=150℃	V_F		1.4 1.2		V
Reverse Recovered Time IF=10 A, Tvj=25℃ -diF/dt =750A/μs Tvj=150℃ VR=400 V	T_{rr}		57 118		ns
Peak reverse recovery current IF=10 A, Tvj=25℃ -diF/dt =750A/μs Tvj=150℃ VR=400 V	I_{RRM}		12 13		A
Reverse Recovered charge IF=10 A, Tvj=25℃ -diF/dt =750A/μs Tvj=150℃ VR=400 V	Q_{rr}		411 728		nC

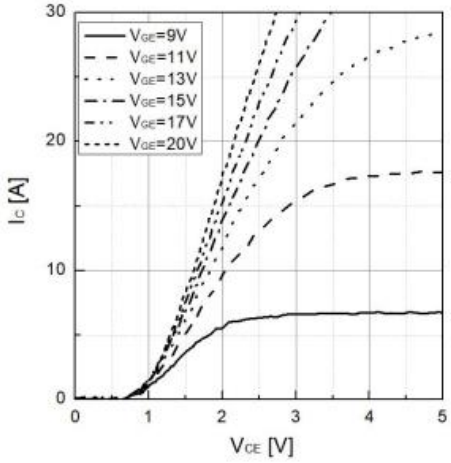


Figure 1. Typical output characteristics (Tvj=25℃)

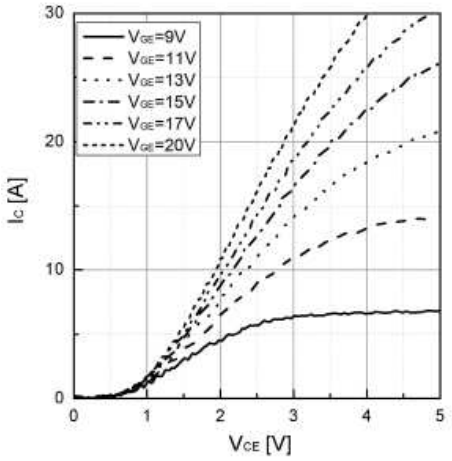


Figure 2. Typical output characteristics (Tvj=150℃)

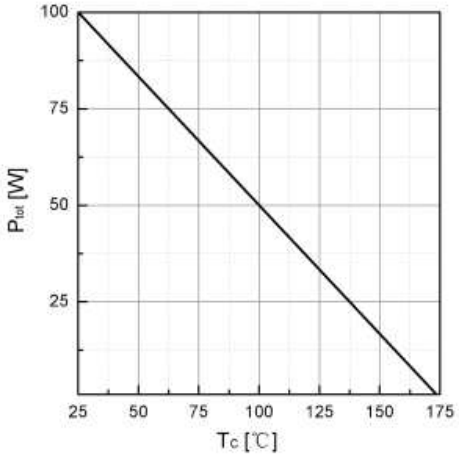


Figure 3. Power dissipation as a function of TC

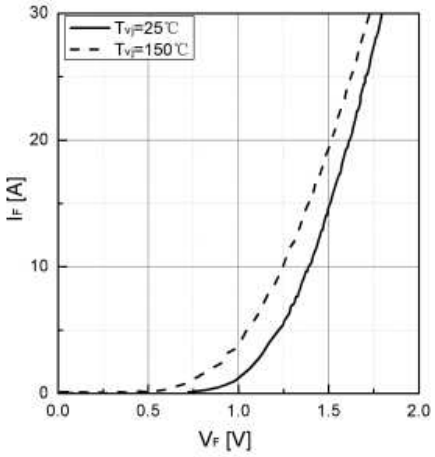


Figure 4. Typical IF as a function of VF

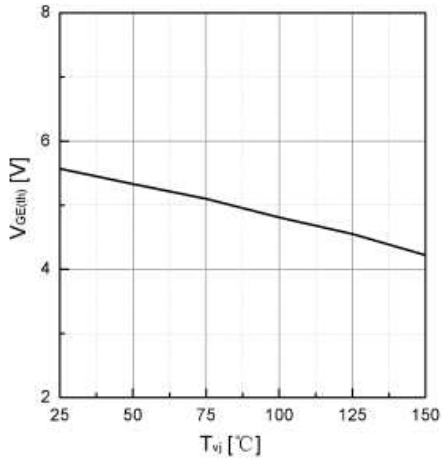


Figure 5. Typical VGE(th) as a function of Tvj (I_C=1mA)

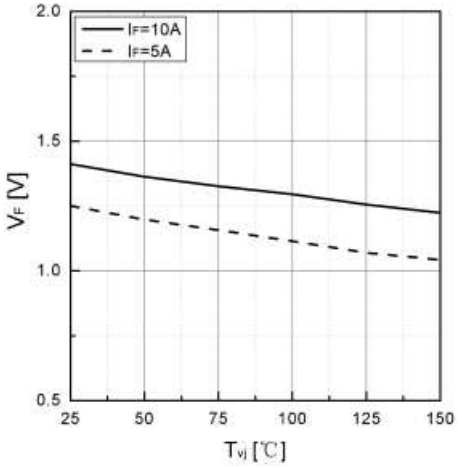


Figure 6. Typical VF as a function of Tvj

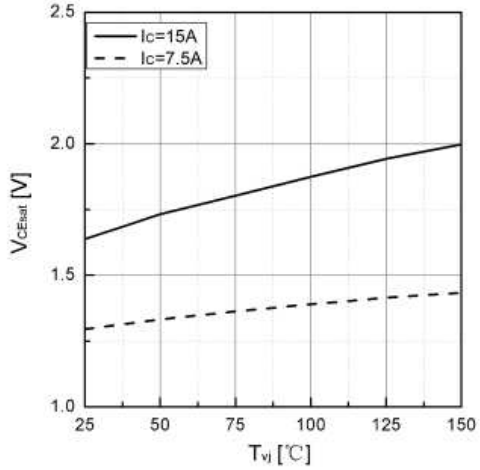


Figure 7. Typical VCEsat as a function of Tvj

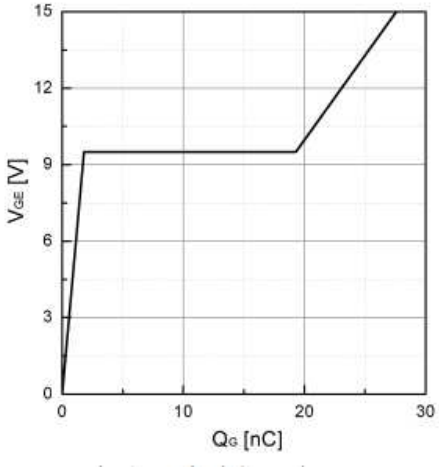


Figure 8. Typical Gate charge

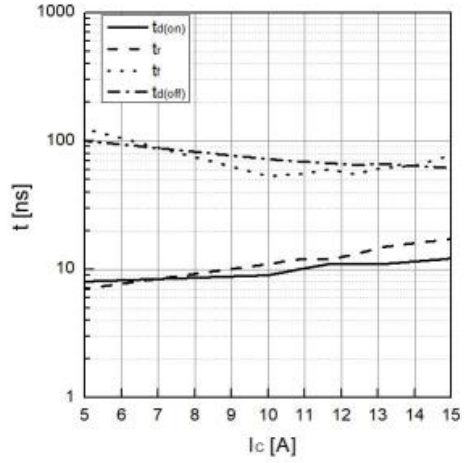


Figure 9. Typical switching times as a function of IC

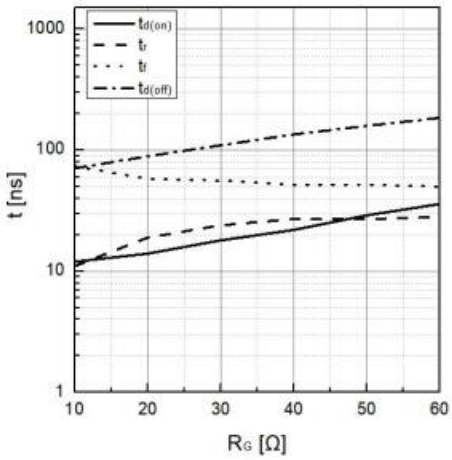


Figure 10. Typical switching times as a function of RG

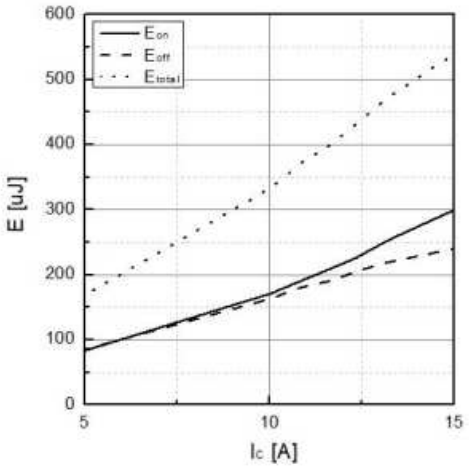


Figure 11. Typical switching energy losses as a function of IC

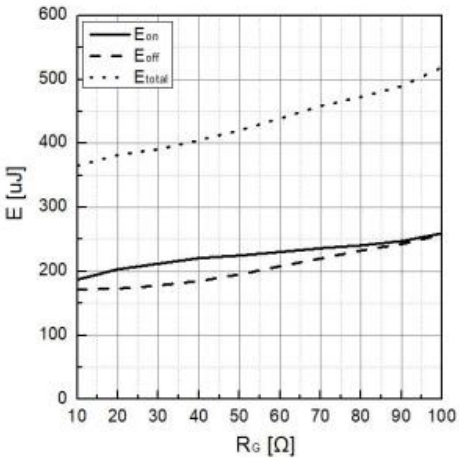


Figure 12. Typical switching energy losses as a function of RG

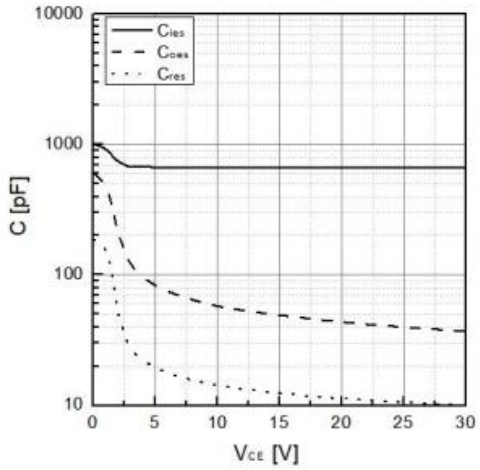
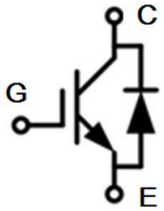
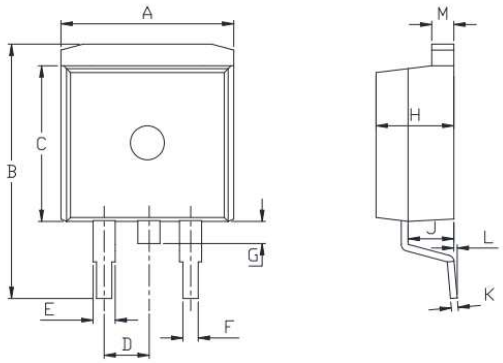


Figure 13. Typical capacitance as a function of VCE
(f=1Mhz, VGE=0V)

• 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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