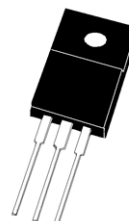


## 650V 15A Trench and Field Stop IGBT

### DESCRIPTION :

- High ruggedness performance
- 10 $\mu$ s 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

ITO-220AB

## 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	$I_{C\ nom}$	30 15	A
Pulsed collector current	t <sub>p</sub> limited by Tvjmax	$I_{CM}$	60	A
Gate emitter voltage		$V_{GE}$	±20	V
Short circuit withstand time		t <sub>SC</sub>	10	us
Power dissipation	Tc=25°C Tc=100°C	$P_{tot}$	39 19	W
Temperature under switching conditions		Tvj op	-40~+175	°C
Storage temperature		T <sub>STG</sub>	-55~+150	°C

## THERMAL CHARACTERISTICS

Characteristic	Condition	Symbol	Max.	Unit
IGBT thermal resistance, junction - case		$R_{th(j-C)}$	3.8	K/W
Diode thermal resistance, junction - case		$R_{th(j-C)}$	4.2	K/W
Thermal resistance, junction - ambient		$R_{th(j-A)}$	50	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	$V_{GE(th)}$	5.4	5.6	5.9	V
Collector-Emitter saturation voltage VGE=15V, IC=15A Tvj=25°C VGE=15V, IC=15A Tvj=150°C	$V_{CE(SAT)}$		1.6 1.9		V
Input capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25°C	$C_{ies}$		1055		pF
Output capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25°C	$C_{oes}$		57		pF
Reverse transfer capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25°C	$C_{res}$		15		pF
Gate charge IC = 15A, VGE = 15 V, VCC = 520V Tvj=25°C	$Q_G$		55		nC
Turn-on delay time IC=15A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=150°C (inductive load)	$t_{d(ON)}$		17 16		ns
Rise time IC=15A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=150°C (inductive load)	$t_r$		14 15		ns
Turn-off delay time IC=15A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=150°C (inductive load)	$t_{d(OFF)}$		104 119		ns
Fall time IC=15A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=150°C (inductive load)	$t_f$		46 81		ns
Turn-on energy IC=15A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=150°C (inductive load)	$E_{(ON)}$		0.30 0.38		mJ

Turn-off energy loss per pulse IC=15A, VCC=400 V      Tvj=25°C VGE=0/15 V, RG=10Ω      Tvj=150°C (inductive load)	E <sub>(OFF)</sub>		0.27 0.40		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 <sub>RRM</sub>	650	V
Continuous forward current	Tc=100°C	I <sub>F</sub>	15	A
Diode maximum current	t <sub>p</sub> limited by Tvj max	I <sub>FM</sub>	60	A

## ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Forward voltage IF=15A, VGE=0 V      Tvj=25°C IF=15A, VGE=0 V      Tvj=150°C	V <sub>F</sub>		1.4 1.2		V
Reverse Recovered Time IF=15 A,      Tvj=25°C -diF/dt =600A/μs      Tvj=150°C VR=400 V	T <sub>rr</sub>		55 75		ns
Peak reverse recovery current IF=15 A,      Tvj=25°C -diF/dt =600A/μs      Tvj=150°C VR=400 V	I <sub>RRM</sub>		9.5 15		A
Reverse Recovered charge IF=15 A,      Tvj=25°C -diF/dt =600A/μs      Tvj=150°C VR=400 V	Q <sub>rr</sub>		220 450		nC

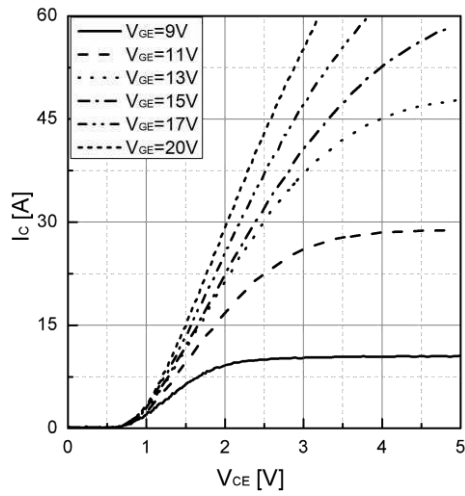


Figure 1. Typical output characteristics ( $T_{vj}=25^{\circ}\text{C}$ )

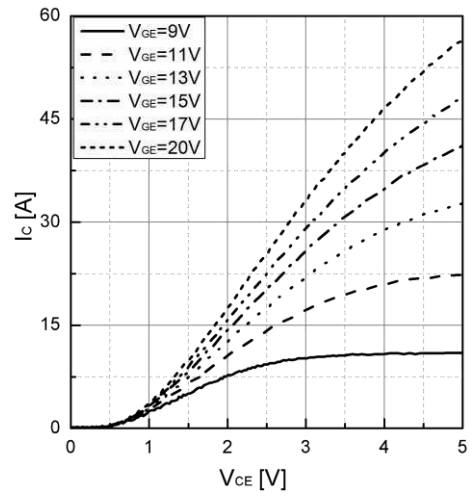


Figure 2. Typical output characteristics ( $T_{vj}=175^{\circ}\text{C}$ )

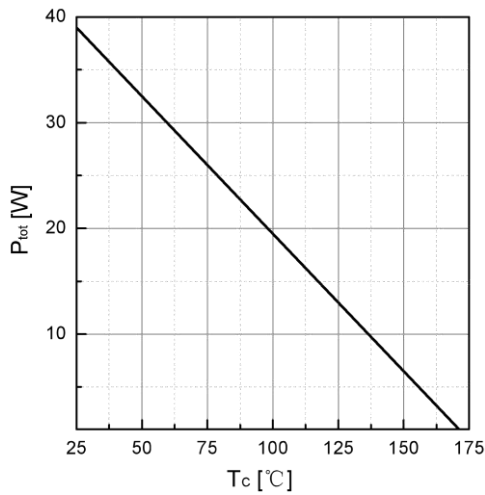


Figure 3. Power dissipation as a function of TC

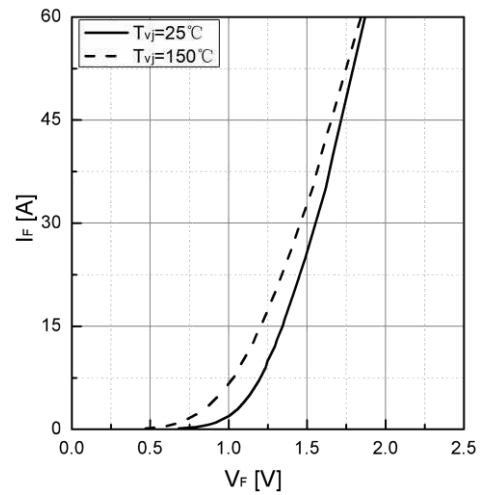


Figure 4. Typical  $I_F$  as a function of  $V_F$

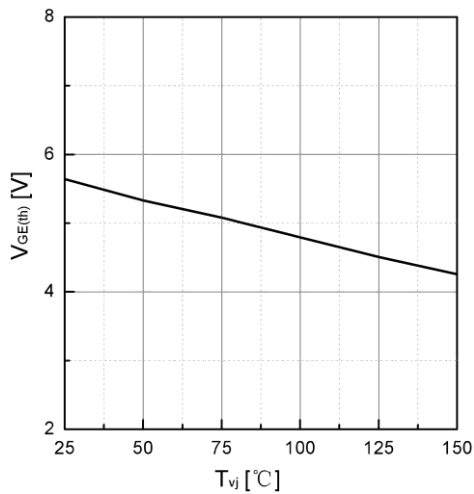


Figure 5. Typical  $V_{GE(th)}$  as a function of  $T_{vj}$  ( $I_c=1\text{mA}$ )

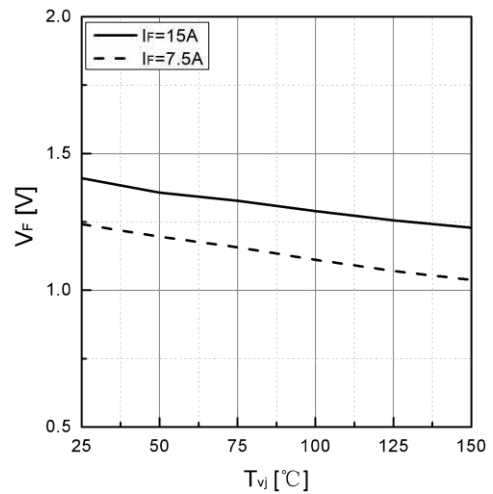


Figure 6. Typical  $V_F$  as a function of  $T_{vj}$

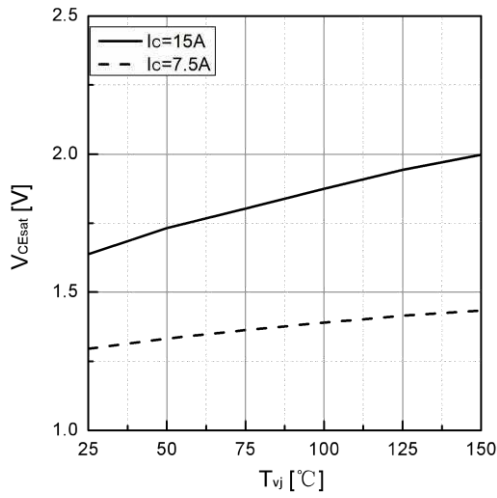


Figure 7. Typical VCEsat as a function of Tvj

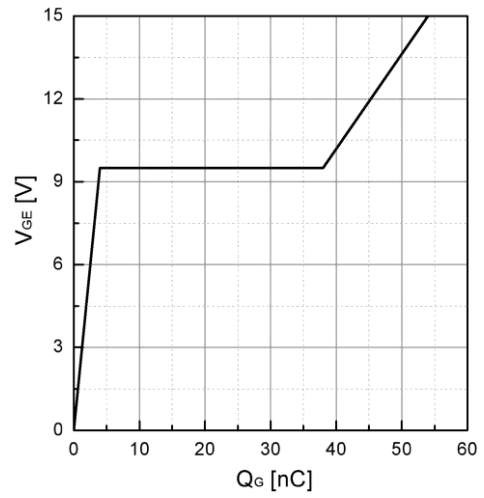


Figure 8. Typical Gate charge

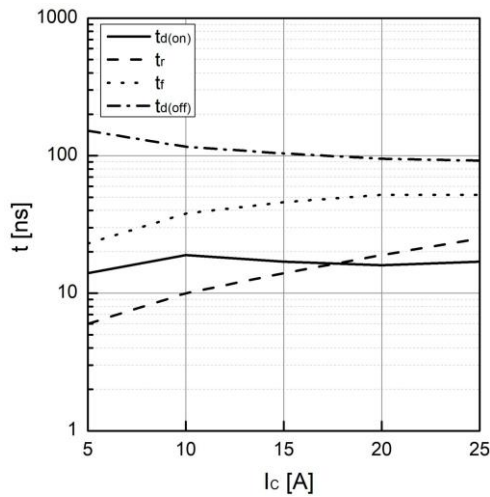


Figure 9. Typical switching times as a function of IC

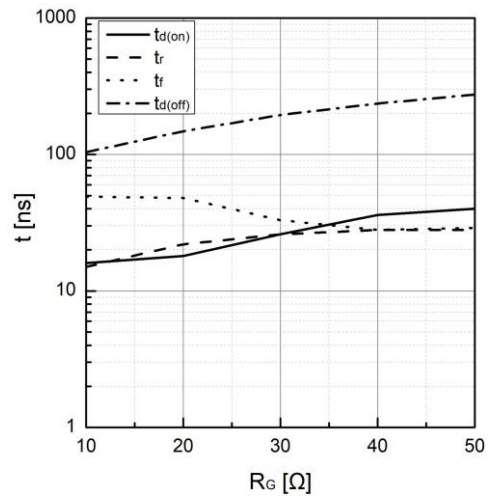


Figure 10. Typical switching times as a function of RG

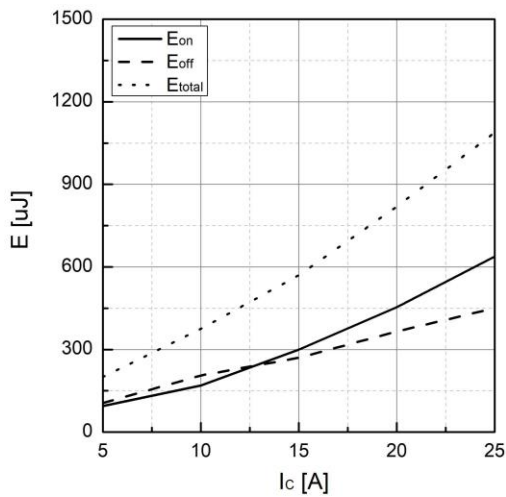


Figure 11. Typical switching energy losses as a function of IC

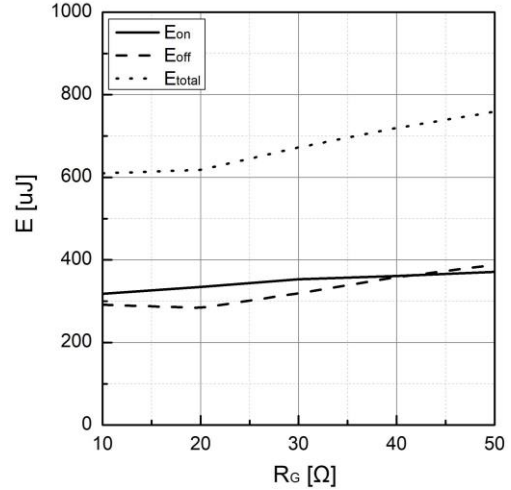


Figure 12. Typical switching energy losses as a function of RG

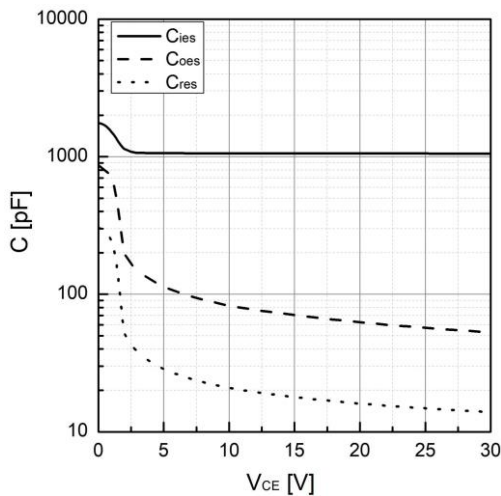


Figure 13. Typical capacitance as a function of VCE (f=1Mhz, VGE=0V)

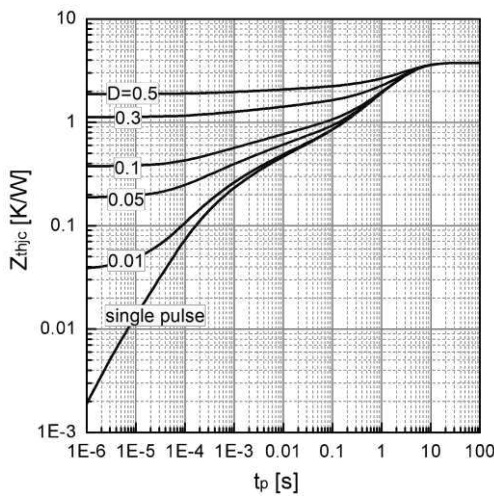
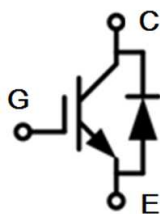
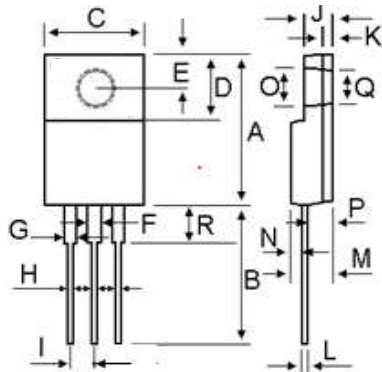


Figure 14. Transient thermal impedance, IGBT

• Circuit diagram



• Package outlines : Dimensions in (mm)



DIM	MILLIMETERS	
	MIN	MAX
A	14.80	16.10
B	12.65	14.40
C	9.70	10.36
D	4.60	6.80
E	2.50	3.50
F	0.90	1.55
G	0.90	1.55
H	0.50	0.90
I	2.40	2.70
J	2.34	3.30
K	0.55	1.30
L	0.36	0.80
M	4.20	4.90
N	1.10	1.80
O	2.90	3.50
P	2.30	3.15
Q	2.90	3.50
R	2.80	4.85

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