

650V 30A Trench and Field Stop IGBT

DESCRIPTION :

- High ruggedness performance
- Easy parallel switching capability
- Trench and field-stop technology
- High efficiency for inverters
- RoHS compliant.

TYPICAL APPLICATIONS :

- PFC applications
- Welding machines



TO-247

IGBT

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

Characteristic	Condition	Symbol	Value	Unit
Collector-Emitter Voltage		V_{CES}	650	V
Gate emitter voltage		V_{GES}	±20	V
Continuous collector current	Tc=25°C Tc=100°C	I_C	60 30	A
Pulsed collector current	t _p limited by Tvjmax	I_{CM}	120	A
Power dissipation	Tc=25°C Tc=100°C	P_{tot}	300 150	W
Temperature under switching conditions		Tvj op	-40~+175	°C
Storage temperature Range		T _{STG}	-55~+150	°C

THERMAL CHARACTERISTICS

Characteristic	Condition	Symbol	Max.	Unit
IGBT thermal resistance, junction - case		$R_{th(j-C)}$	0.5	K/W
Diode thermal resistance, junction - case		$R_{th(j-C)}$	0.9	K/W
Thermal resistance, junction - ambient		$R_{th(j-A)}$	40	K/W

**ELECTRICAL CHARACTERISTICS**

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Collector-emitter breakdown voltage VGE=0V, IC=250uA Tvj=25°C	BV _{CES}	650			V
Collector-emitter cut-off current VCE=650V, VGE=0V Tvj=25°C	I _{CES}			50	uA
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)}	4.0	5.0	6.0	V
Collector-Emitter saturation voltage VGE=15V, IC=30A Tvj=25°C VGE=15V, IC=30A Tvj=150°C	V _{CE(SAT)}		1.8 2.2		V
Input capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25°C	C _{ies}		2480		pF
Output capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25°C	C _{oes}		95		pF
Reverse transfer capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25°C	C _{res}		21		pF
Gate charge IC = 30A, VGE = 15 V, VCC =520V Tvj=25°C	Q _G		78		nC
Turn-on delay time IC=30A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω □ Tvj=150°C (inductive load)	td _(ON)		29 29		ns
Rise time IC=30A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω □ Tvj=150°C (inductive load)	tr		39 40		ns
Turn-off delay time IC=30A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω □ Tvj=150°C (inductive load)	td _(OFF)		110 120		ns
Fall time IC=30A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω □ Tvj=150°C (inductive load)	tf		25 34		ns



Turn-on energy IC=30A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω □ Tvj=150°C (inductive load)	E _(ON)		0.60 0.80		mJ
Turn-off energy loss per pulse IC=30A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω □ Tvj=150°C (inductive load)	E _(OFF)		0.30 0.50		mJ

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	30	A
Diode maximum current	t _p limited by Tvj max	I _{FM}	120	A

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Forward voltage IF=30A, VGE=0 V Tvj=25°C IF=30A, VGE=0 V Tvj=150°C	V _F		2.2 1.7		V
Reverse Recovered Time IF=30 A, Tvj=25°C -diF/dt =1000A/μs Tvj=150°C VR=400 V	T _{rr}		55 97		ns
Peak reverse recovery current IF=30 A, Tvj=25°C -diF/dt =1000A/μs Tvj=150°C VR=400 V	I _{RRM}		17 25		A
Reverse Recovered charge IF=30 A, Tvj=25°C -diF/dt =1000A/μs Tvj=150°C VR=400 V	Q _{rr}		560 1460		nC

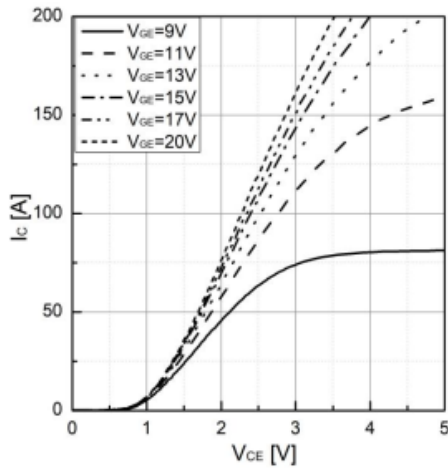


Figure 1. Typical output characteristics ($T_{vj}=25^\circ\text{C}$)

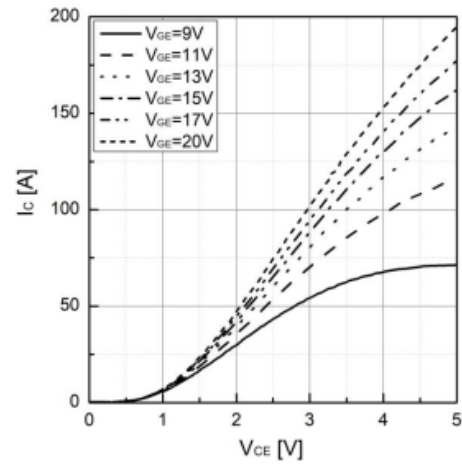


Figure 2. Typical output characteristics ($T_{vj}=175^\circ\text{C}$)

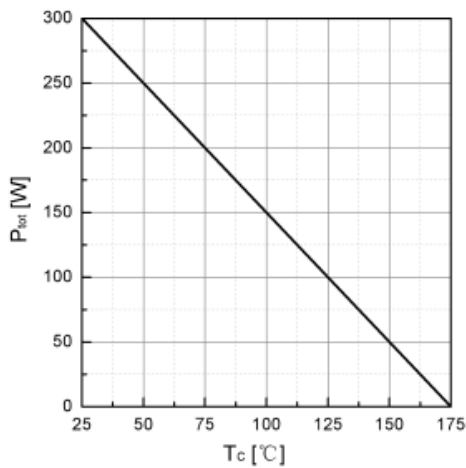


Figure 3. Power dissipation as a function of TC

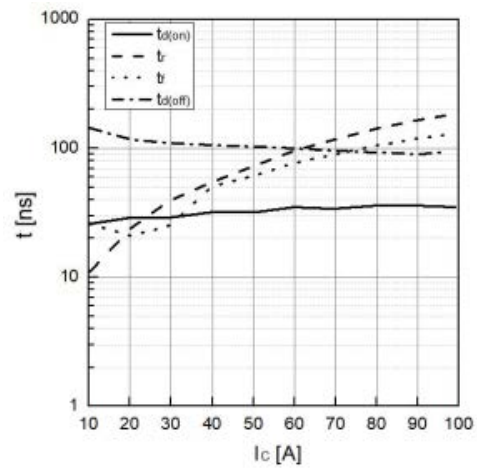


Figure 4. Typical switching times as a function of I_c

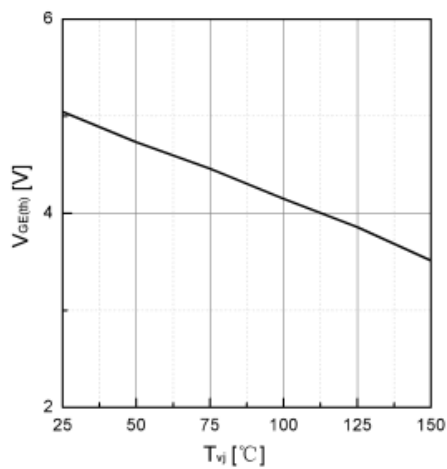


Figure 5. Typical $V_{GE(th)}$ as a function of T_{vj}

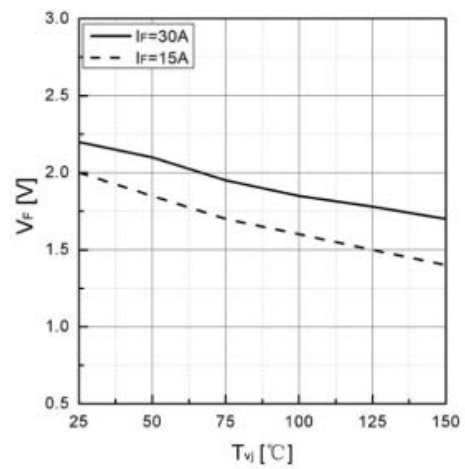


Figure 6. Typical V_F as a function of T_{vj}

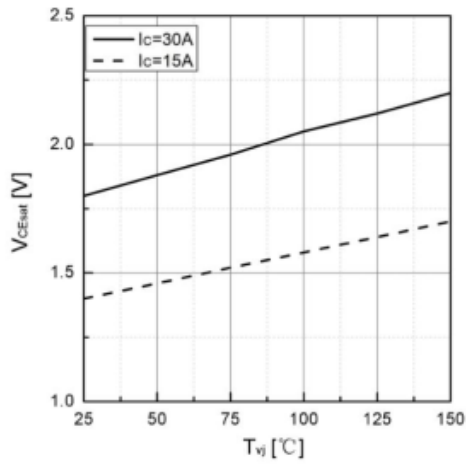


Figure 7. Typical VCEsat as a function of Tvj

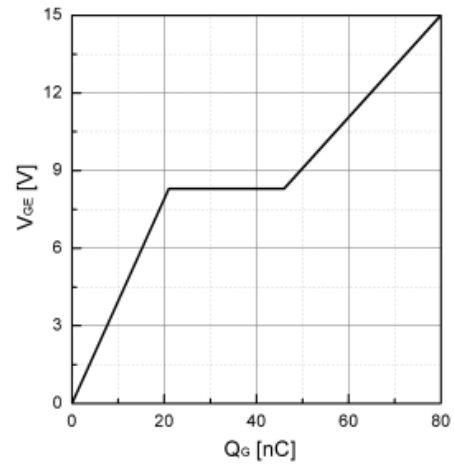


Figure 8. Typical Gate charge

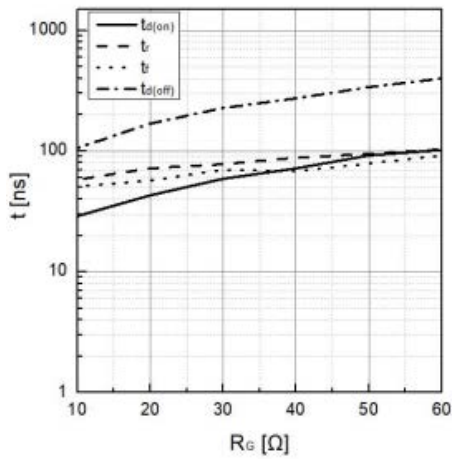


Figure 9. Typical switching times as a function of RG

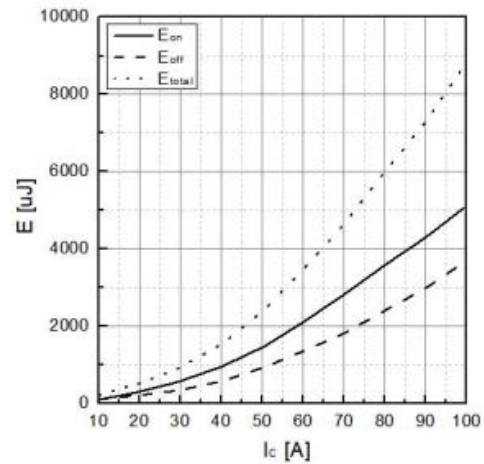


Figure 10. Typical switching energy losses as a function of IC

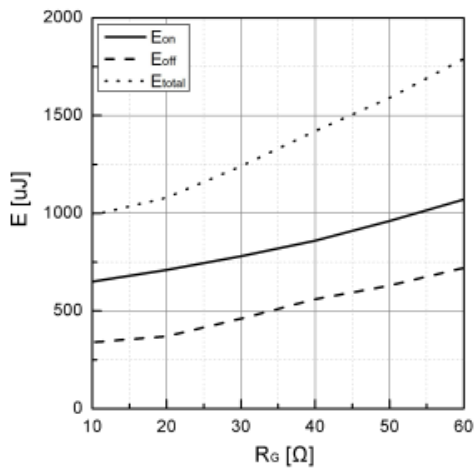


Figure 11. Typical switching energy losses as a function of RG

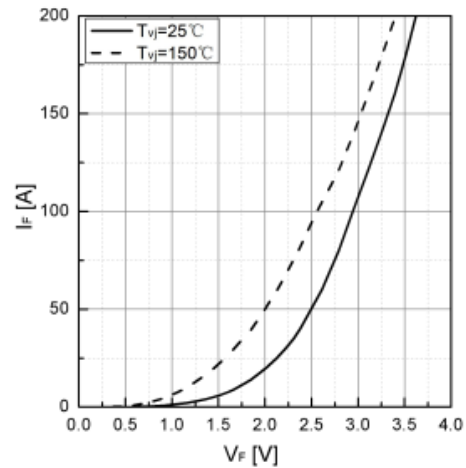


Figure 12. Typical IF as a function of VF

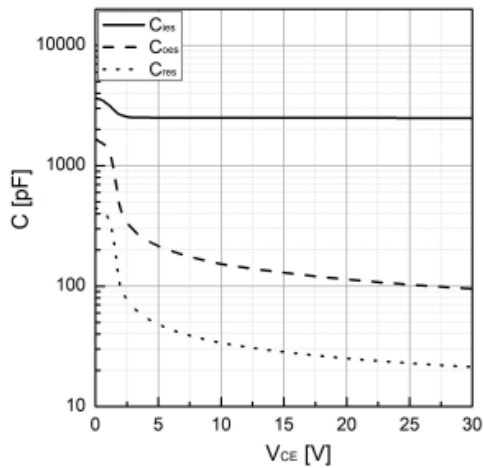


Figure 13. Typical capacitance as a function of VCE
(f=1Mhz, VGE=0V)

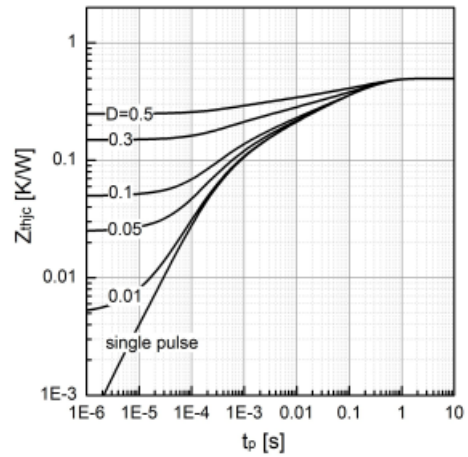
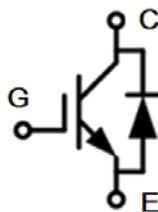
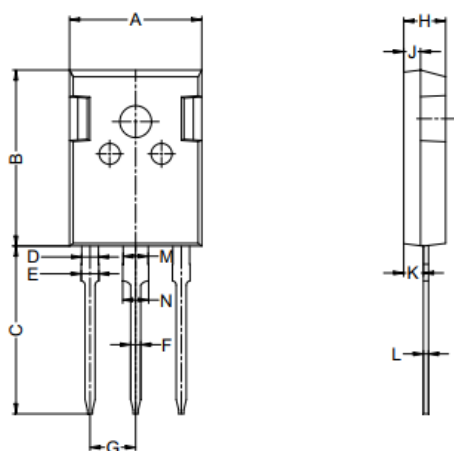


Figure 14. Transient thermal impedance, IGBT

• Circuit diagram



• Package outlines : Dimensions in (mm)



Dimensions	Millimeters	
	Min	Max
A	15.50	16.10
B	20.80	21.20
C	19.70	20.30
D	1.80	2.20
E	1.90	2.30
F	1.00	1.40
G	5.25	5.65
H	4.80	5.20
J	1.90	2.10
K	2.20	2.50
L	0.41	0.79
M	2.80	3.20
N	2.90	3.30