

650V 30A 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-247

TYPICAL APPLICATIONS :

- Home appliances
- Motor drives
- General inverter

IGBT

MAXIMUM RATINGS ($T_{vj}=25^{\circ}\text{C}$ unless otherwise specified)

Characteristic	Condition	Symbol	Value	Unit
Collector-Emitter Voltage		V_{CES}	650	V
Continuous collector current	$T_c=25^{\circ}\text{C}$ $T_c=100^{\circ}\text{C}$	$I_{C\text{ nom}}$	60 30	A
Pulsed collector current	t_p limited by $T_{vj\text{ max}}$	I_{CM}	120	A
Gate emitter voltage		V_{GE}	± 20	V
Short circuit withstand time		t_{SC}	10	us
Power dissipation	$T_c=25^{\circ}\text{C}$ $T_c=100^{\circ}\text{C}$	P_{tot}	300 150	W
Temperature under switching conditions		$T_{vj\text{ op}}$	-40~+175	$^{\circ}\text{C}$
Storage temperature		T_{STG}	-55~+150	$^{\circ}\text{C}$

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 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	$V_{GE(th)}$	5.3	5.7	5.9	V
Collector-Emitter saturation voltage VGE=15V, IC=30A Tvj=25°C VGE=15V, IC=30A Tvj=175°C	$V_{CE(SAT)}$		1.7 2.2		V
Input capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25°C	C_{ies}		1978		pF
Output capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25°C	C_{oes}		100		pF
Reverse transfer capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25°C	C_{res}		23		pF
Gate charge IC = 30A, VGE = 15 V, VCC = 520V Tvj=25°C	Q_G		103		nC
Turn-on delay time IC=30A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=175°C (inductive load)	$t_{d(ON)}$		30 28		ns
Rise time IC=30A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=175°C (inductive load)	t_r		39 40		ns
Turn-off delay time IC=30A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=175°C (inductive load)	$t_{d(OFF)}$		151 169		ns
Fall time IC=30A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=175°C (inductive load)	t_f		29 71		ns
Turn-on energy IC=30A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=175°C (inductive load)	$E_{(ON)}$		0.95 1.50		mJ

Turn-off energy loss per pulse IC=30A, VCC=400 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=175°C (inductive load)	$E_{(OFF)}$		0.60 0.80		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	30	A
Diode maximum current	tp limited by Tvj max	I_{FM}	120	A

ELECTRICAL CHARATERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Forward voltage IF=30A, VGE=0 V Tvj=25°C IF=30A, VGE=0 V Tvj=175°C	V_F		1.4 1.2		V
Reverse Recovered Time IF=30 A, Tvj=25°C -diF/dt =550A/μs Tvj=175°C VR=400 V	T_{rr}		105 171		ns
Peak reverse recovery current IF=30 A, Tvj=25°C -diF/dt =550A/μs Tvj=175°C VR=400 V	I_{RRM}		16 26		A
Reverse Recovered charge IF=30 A, Tvj=25°C -diF/dt =550A/μs Tvj=175°C VR=400 V	Q_{rr}		876 2650		nC

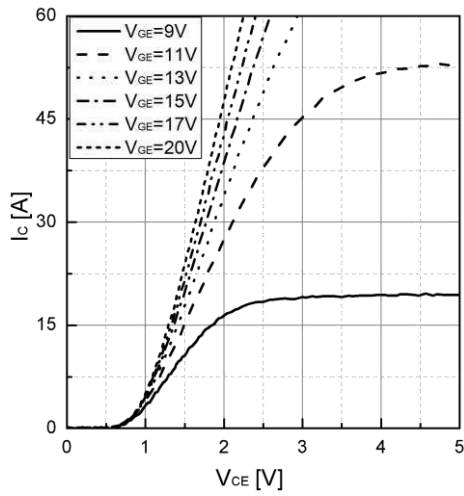


Figure 1. Typical output characteristics ($T_{vj}=25^{\circ}\text{C}$)

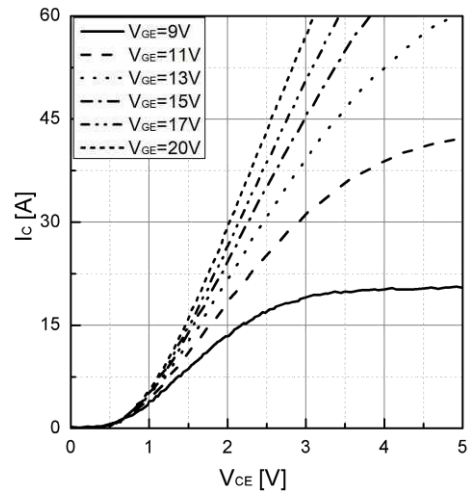


Figure 2. Typical output characteristics ($T_{vj}=175^{\circ}\text{C}$)

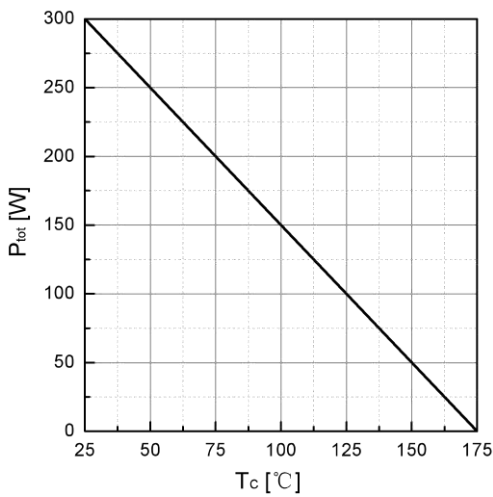


Figure 3. Power dissipation as a function of T_c

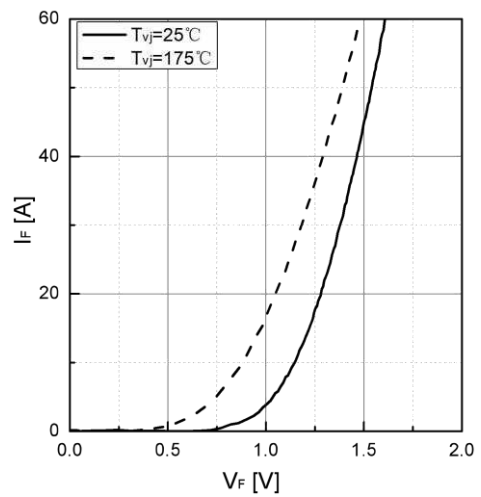


Figure 4. Typical I_F as a function of V_F

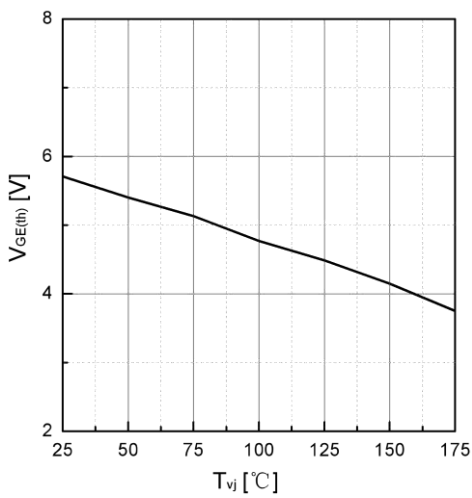


Figure 5. Typical $V_{GE(th)}$ as a function of T_{vj} ($I_c=1\text{mA}$)

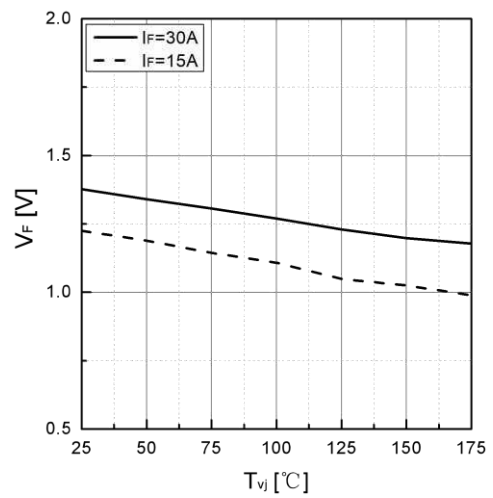


Figure 6. Typical V_F as a function of T_{vj}

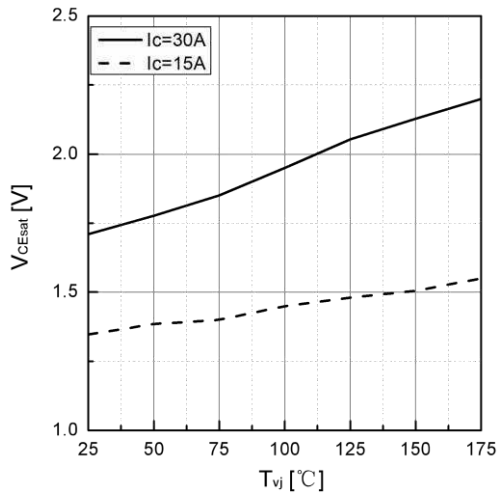


Figure 7. Typical VCEsat as a function of Tvj

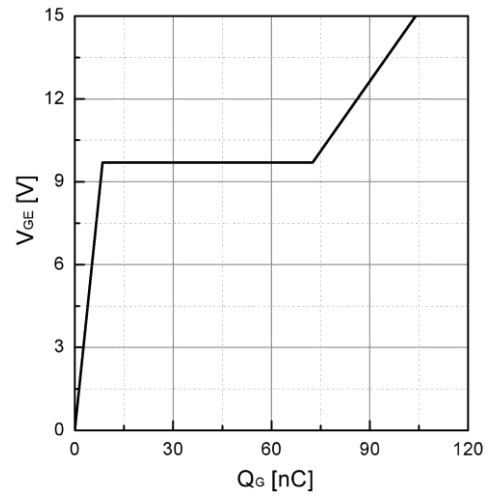


Figure 8. Typical Gate charge

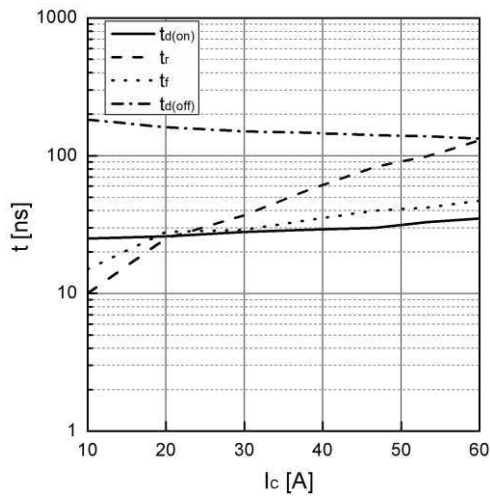


Figure 9. Typical switching times as a function of IC

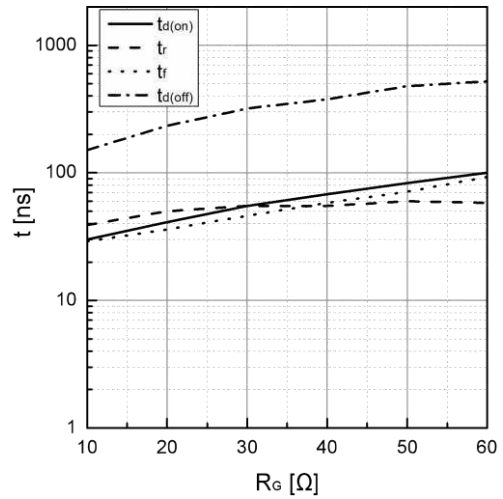


Figure 10. Typical switching times as a function of RG

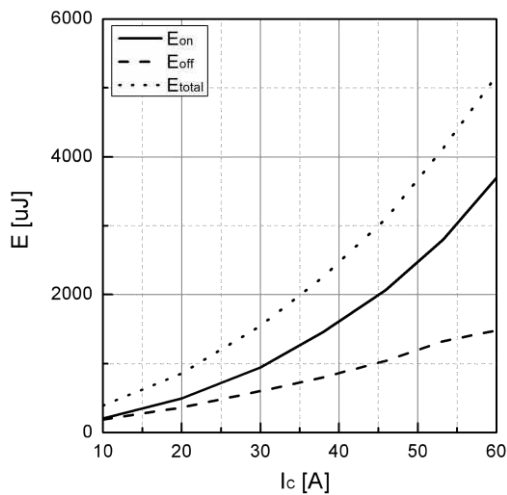


Figure 11. Typical switching energy losses as a function of IC

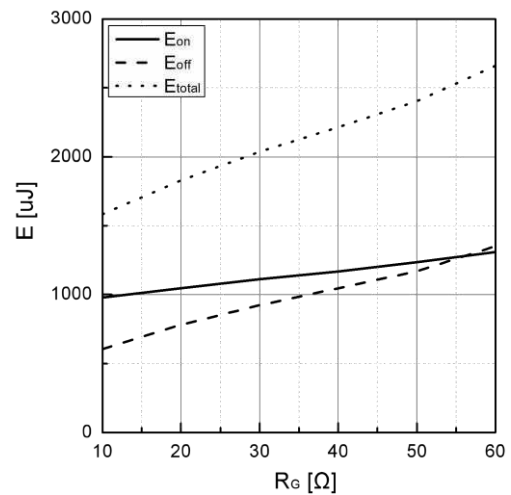


Figure 12. Typical switching energy losses as a function of RG

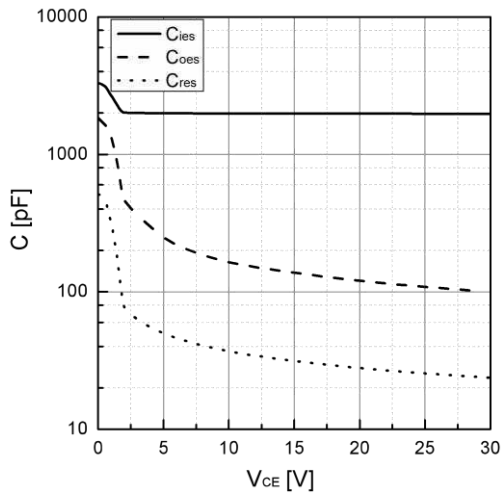


Figure 13. Typical capacitance as a function of VCE (f=1Mhz, VGE=0V)

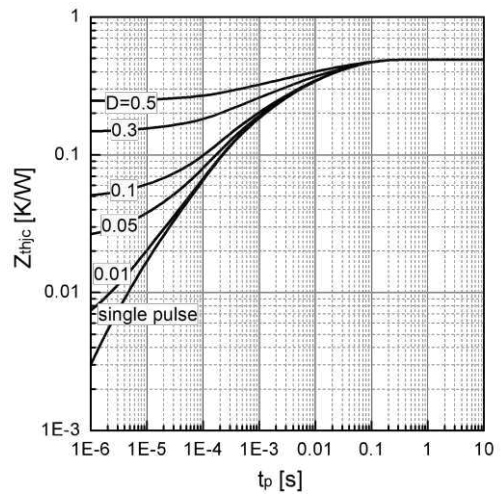
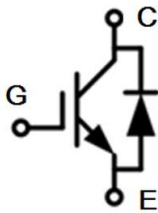
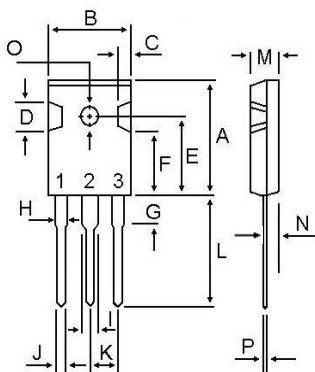


Figure 14. Transient thermal impedance, IGBT

• Circuit diagram



• Package outlines : Dimensions in (mm)



DIM	MILLIMETERS	
	MIN	MAX
A	20.80	21.80
B	15.38	16.20
C	1.90	2.70
D	5.10	6.10
E	14.50	15.50
F	11.20	13.20
G	3.75	4.35
H	1.90	2.30
I	2.90	3.30
J	1.00	1.40
K	5.26	5.66
L	19.50	20.50
M	4.68	5.36
N	2.30	2.60
O	3.45	3.85
P	0.48	0.72

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