

1200V 40A Trench and Field Stop IGBT

DESCRIPTION :

- High ruggedness performance
- High speed switching
- Low collector to emitter saturation voltage
- Easy parallel switching capability
- AEC-Q101
- RoHS compliant.



TO-247

TYPICAL APPLICATIONS :

- Welding machines
- UPS applications
- Solar inverters

IGBT

MAXIMUM RATINGS (T_{vj}=25°C unless otherwise specified)

Characteristic	Condition	Symbol	Value	Unit
Collector-Emitter Voltage		V _{CES}	1200	V
Continuous collector current	T _c =25°C T _c =100°C	I _C	80 40	A
Pulsed collector current	t _p limited by T _{vjmax}	I _{CM}	160	A
Gate emitter voltage		V _{GE}	±20	V
Power dissipation	T _c =25°C T _c =100°C	P _{tot}	681 340	W
Operating junction temperature range		T _{vj}	-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)}	0.22	K/W
Diode thermal resistance, junction - case		R _{th(j-C)}	0.48	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=1200V, VGE=0V Tvj=25°C	ICES			100	μA
Gate-emitter leakage current VCE=0V, VGE=±20V Tvj=25°C	IGES			±100	nA
Gate-Emitter threshold voltage IC=1.0mA, VGE= VCE Tvj=25°C	VGE(th)	5.0	6.0	7.0	V
Collector-Emitter saturation voltage VGE=15V, IC=40A Tvj=25°C VGE=15V, IC=40A Tvj=175°C	VCE(SAT)		1.9 2.2		V
Input capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25°C	Cies		9900		pF
Output capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25°C	Coes		189		pF
Reverse transfer capacitance f=1MHz, VCE=30 V, VGE=0 V Tvj=25°C	Cres		40		pF
Gate charge IC = 40A, VGE = 15 V, VCC = 960V Tvj=25°C	QG		263		nC
Turn-on delay time IC=40A, VCC=600 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=175°C (inductive load)	td (ON)		85 76		ns
Rise time IC=40A, VCC=600 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=175°C (inductive load)	tr		76 75		ns
Turn-off delay time IC=40A, VCC=600 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=175°C (inductive load)	td (OFF)		307 360		ns
Fall time IC=40A, VCC=600 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=175°C (inductive load)	tf		69 149		ns
Turn-on energy IC=40A, VCC=600 V Tvj=25°C VGE=0/15 V, RG=10Ω Tvj=175°C (inductive load)	E(ON)		2.5 2.9		mJ

Turn-off energy loss per pulse IC=40A, VCC=600 V VGE=0/15 V, RG=10Ω (inductive load)	$E_{(OFF)}$		1.4 2.6		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}	1200	V
Continuous forward current	Tc=100°C	I_F	40	A
Diode maximum current	tp limited by Tvj max	I_{FM}	160	A

ELECTRICAL CHARATERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Forward voltage IF=40A, Tvj=25°C IF=40A, Tvj=175°C	V_F		2.0 1.6		V
Reverse Recovered Time IF=40 A, -diF/dt =750A/μs VR=600 V	T_{rr}		175 285		ns
Peak reverse recovery current IF=40 A, -diF/dt =750A/μs VR=600 V	I_{RRM}		24 37		A
Reverse Recovered charge IF=40 A, -diF/dt =750A/μs VR=600 V	Q_{rr}		2000 5500		nC

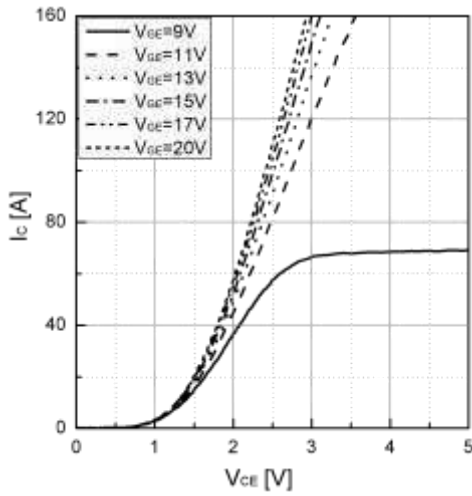


Figure 1. Typical output characteristics ($T_{vj}=25^{\circ}\text{C}$)

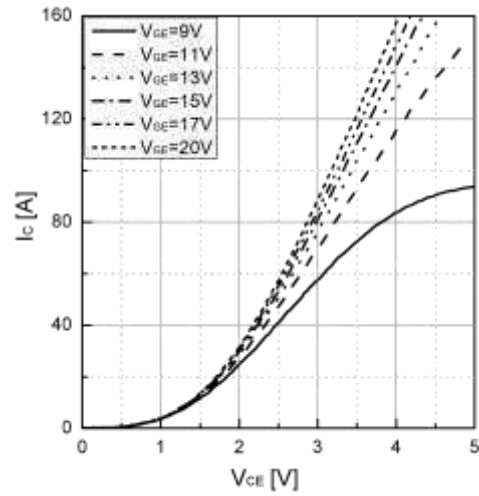


Figure 2. Typical output characteristics ($T_{vj}=175^{\circ}\text{C}$)

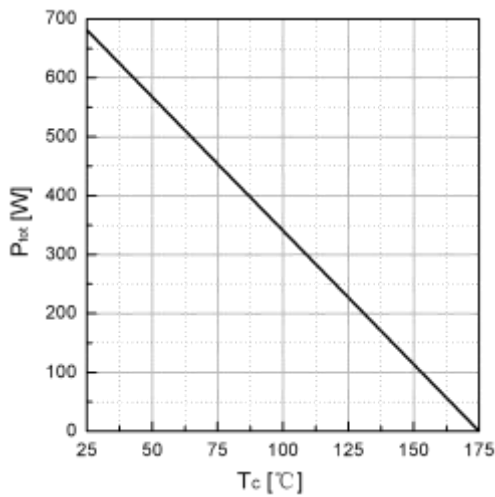


Figure 3. Power dissipation as a function of T_c

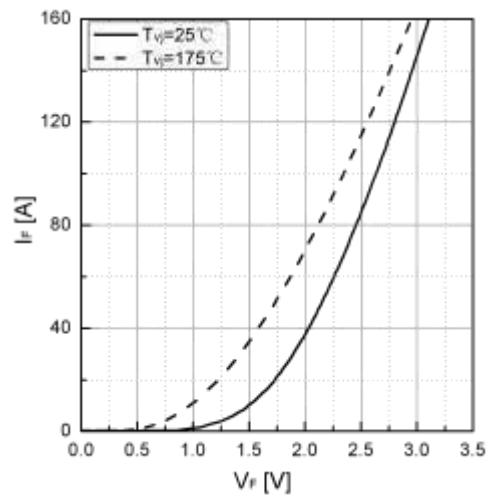


Figure 4. Typical I_F as a function of V_F

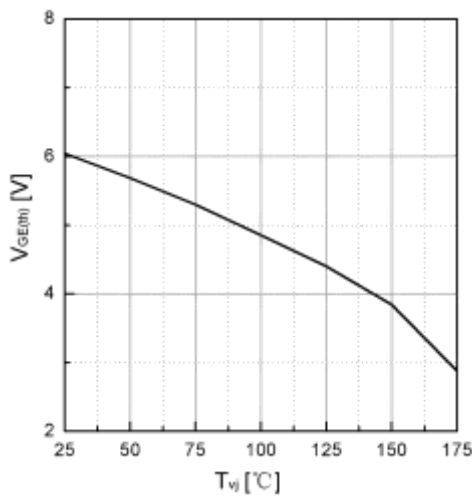


Figure 5. Typical $V_{GE(th)}$ as a function of T_{vj} ($I_c=1\text{mA}$)

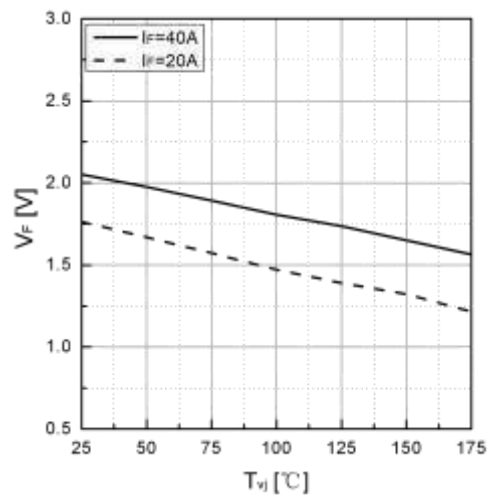


Figure 6. Typical V_F as a function of T_{vj}

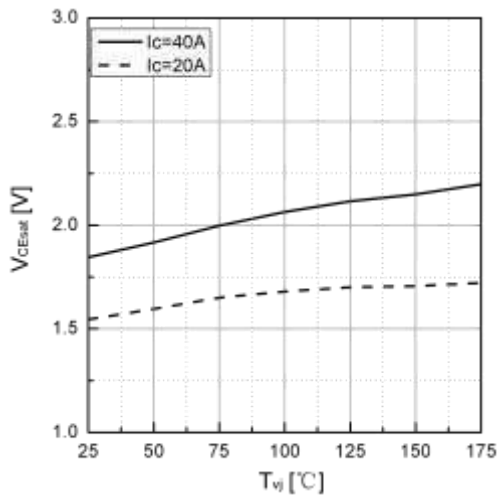


Figure 7. Typical VCEsat as a function of Tvj

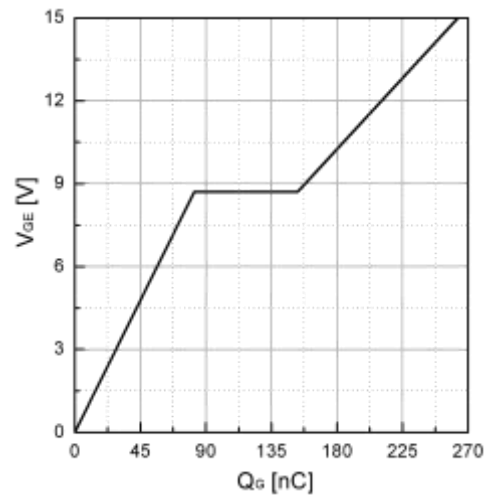


Figure 8. Typical Gate charge

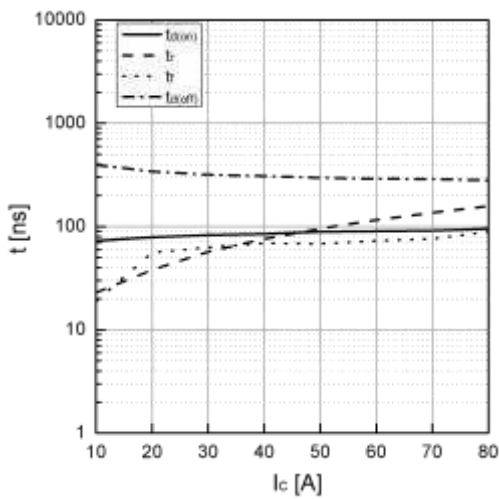


Figure 9. Typical switching times as a function of IC

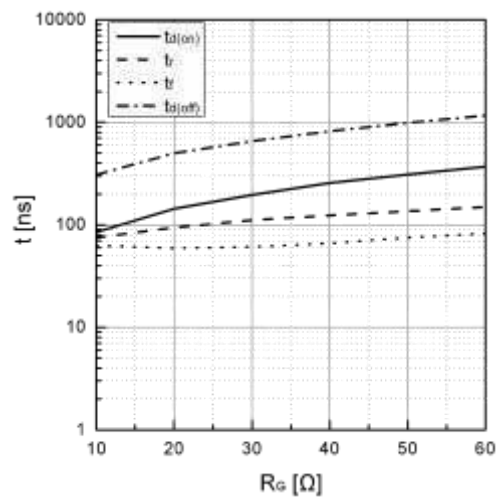


Figure 10. Typical switching times as a function of RG

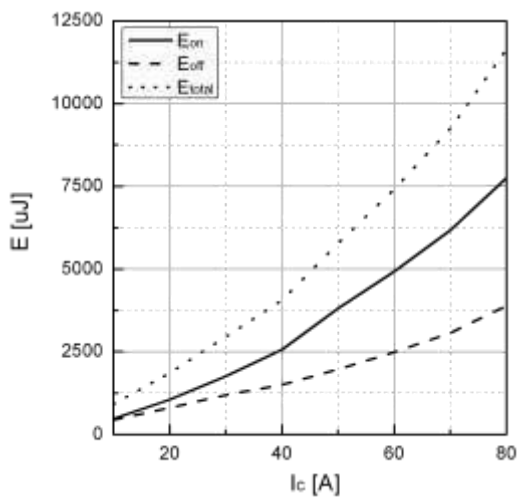


Figure 11. Typical switching energy losses as a function of IC

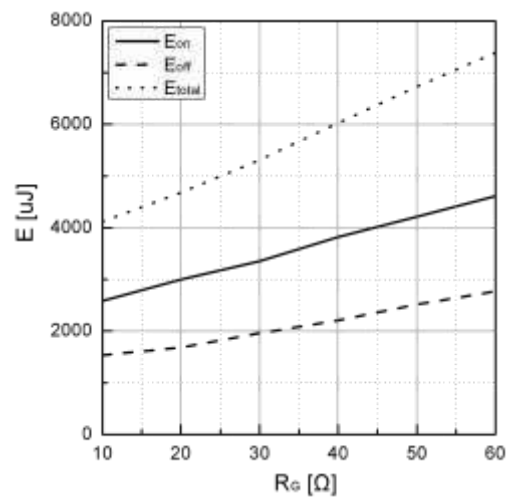


Figure 12. Typical switching energy losses as a function of RG

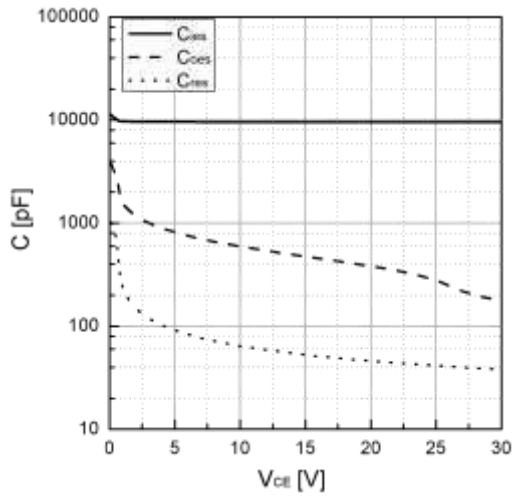


Figure 13. Typical capacitance as a function of VCE (f=1Mhz, VGE=0V)

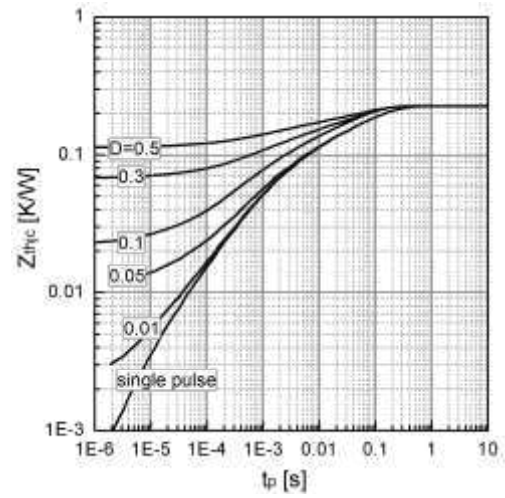


Figure 14. Transient thermal impedance, IGBT

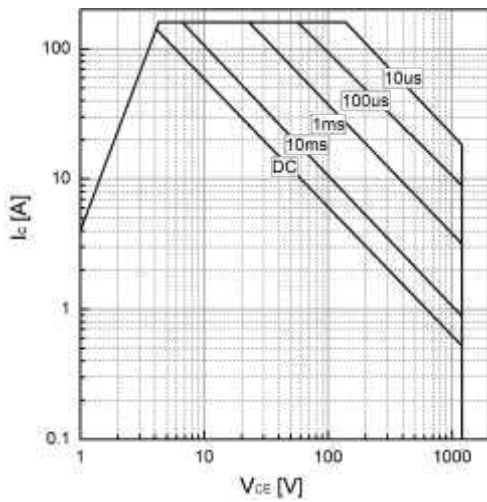
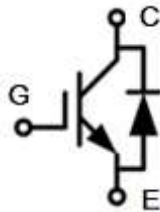
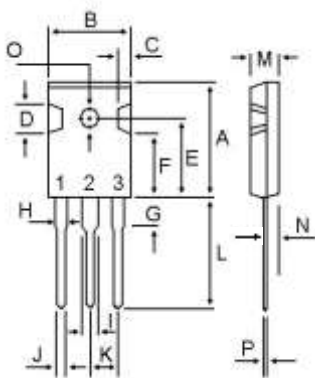


Figure 15. Safe operating area

- 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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