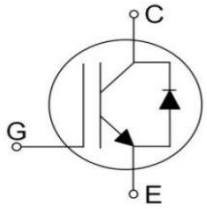
Trench Field-stop IGBT Discretes

Product Summary

Parameter	Value	Unit
V_{CE}	650	V
IC	40	A
$V_{CE(sat)}$	1.7	V



Features

- Trench and field-stop technology
- Easy parallel switching capability

Applications

- PFC applications
- Uninterruptible power supplies
- Solar inverters

Benefits

- High efficiency for inverters
- High ruggedness performance
- RoHS compliant

Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
V_{CES}	Collector-Emitter Voltage		650	V
V_{GES}	Gate-Emitter voltage		±20	V
I_C	Continuous Collector Current	TC = 25°C	80	A
		TC = 100°C	40	
I_{CM}	Pulsed Collector Current, tp limited by Tvjmax		160	A
I_F	Diode Continuous Forward Current TC = 100°C		40	A
I_{FM}	Diode Maximum Current,tp limited by Tvjmax		160	A
P_{TOT}	Power Dissipation (TC=25°C)		300	W
	Power Dissipation (TC=100°C)		150	W
Tvj	Operating Junction Temperature		-40 to 175	°C
Tstg	Storage Temperature		-55 to 150	°C

Thermal Resistance

Symbol	Parameter	Typ	Unit
Rth(j-c)	Thermal Resistance, Junction to Case for IGBT	0.5	K /W
Rth(j-c)	Thermal Resistance, Junction to Case for Diode	0.9	
Rth(j-a)	Thermal Resistance, Junction-Ambient	40	

Electrical Characteristics of IGBT (@ TJ = 25°C unless otherwise specified)

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Unit
Static Characteristic							
BVCES	Collector-Emitter Breakdown Voltage	VGE=0V , IC=250uA		650	-	-	V
ICES	Collector-Emitter Leakage Current	VCE=650V,VGE=0V		-	-	50	uA
IGES	Gate Leakage Current, Forward	VCE = 0V, VGE = 20V		-	-	100	nA
	Gate Leakage Current, Reverse	VCE = 0V, VGE = -20V		-	-	-100	nA
VGE(th)	Gate-Emitter Threshold Voltage	VGE = VCE, IC = 1mA		4	5	6	V
VCE(sat)	Collector-Emitter Saturation Voltage	VGE=15V, IC=40A	TJ = 25°C	-	1.7	-	V
			TJ = 150°C	-	2.2	-	
Dynamic Characteristic							
Cies	Input Capacitance	VCE=30V, VGE=0V, f=1MHz			2480		pF
Coes	Output Capacitance				95		pF
Cres	Reverse Transfer Capacitance				21		pF
QG	Gate Charge	VCC=520V, IC=40A, VGE=15V		-	78	-	nC
Switching Characteristics							
tD(on)	Turn-On DelayTime	VCC=400V VGE=0/15V IC = 40A Rg = 10Ω Inductive load		-	32	-	ns
tr	Turn-On Rise Time			-	59	-	ns
tD(off)	Turn-Off DelayTime			-	110	-	ns
tf	Turn-Off Fall Time			-	52	-	ns
Eon	Turn-on Energy			-	1.2	-	mJ
Eoff	Turn-off Energy			-	0.6	-	mJ
Ets	Total switching energy			-	1.8	-	mJ
tD(on)	Turn-On DelayTime	VCC=400V VGE=0/15V IC = 40A, Rg = 10Ω Inductive load Tvj=150°C		-	28	-	ns
tr	Turn-On Rise Time			-	52	-	ns
tD(off)	Turn-Off DelayTime			-	128	-	ns
tf	Turn-Off Fall Time			-	75	-	ns
Eon	Turn-on Energy			-	1.6	-	mJ
Eoff	Turn-off Energy			-	0.9	-	mJ
Ets	Total switching energy			-	2.5	-	mJ
Diode Characteristics							
VF	Diode Forward Voltage	IF= 40A	TJ = 25°C	-	1.5	-	V
			TJ = 150°C	-	1.3	-	V
Trr	Diode Reverse Recovery Time	VR=400V IF=40A diF/dt=-1200A/μs			82		ns
Irrm	Diode peak reverse recovery current				15		A
Qrr	Diode Reverse Recovery Charge			-	1620	-	nC
Trr	Diode Reverse Recovery Time	VR=400V IF=40A diF/dt=-1200A/μs Tvj=150°C			130		ns
Irrm	Diode peak reverse recovery current				42		A
Qrr	Diode Reverse Recovery Charge			-	3520	-	nC

Characteristics Diagrams

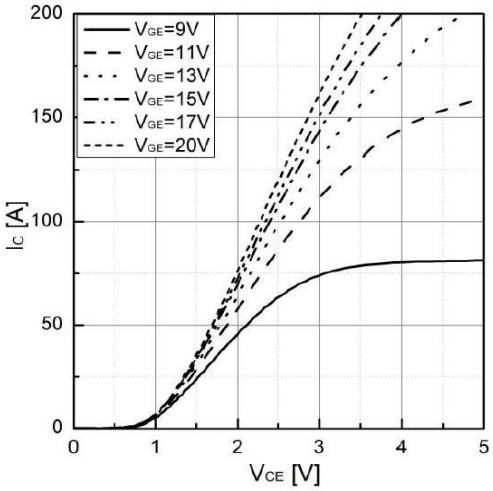


Fig 1. Typical output characteristic (T_{vj}=25℃)

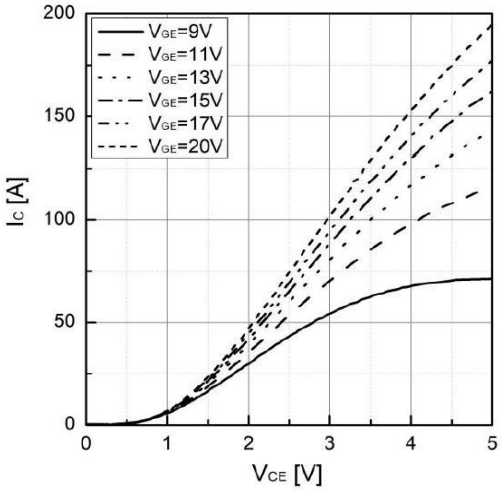


Fig 2. Typical output characteristic(T_{vj}=150℃)

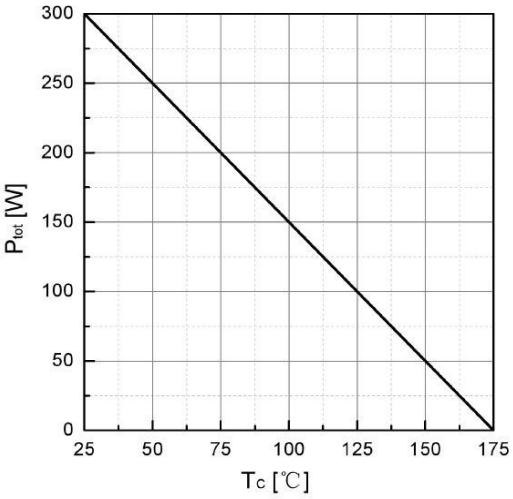


Fig 3. Power dissipation as a function of T_C

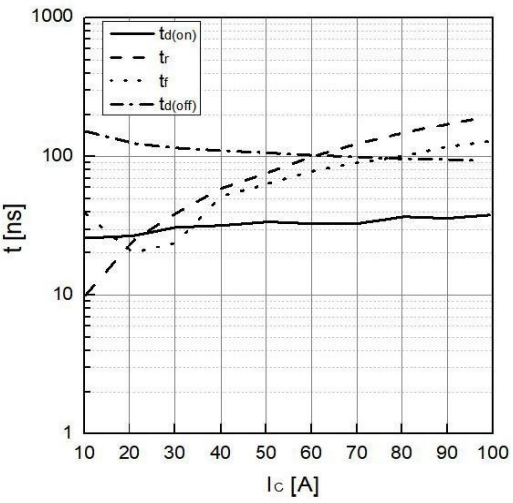


Fig 4. Typical switching time as a function of I_C

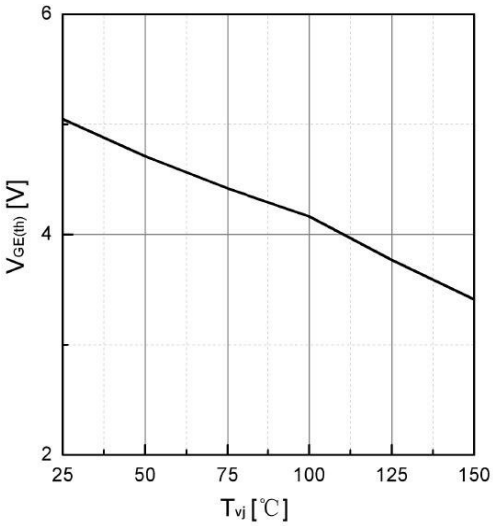


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj} (I_C=1mA)

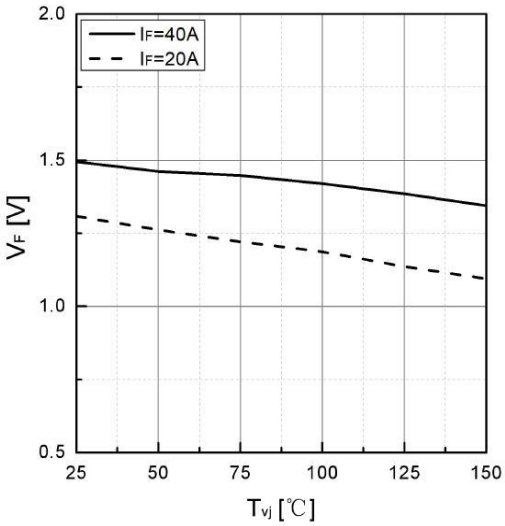


Fig 6. Typical V_F as a function of T_{vj}

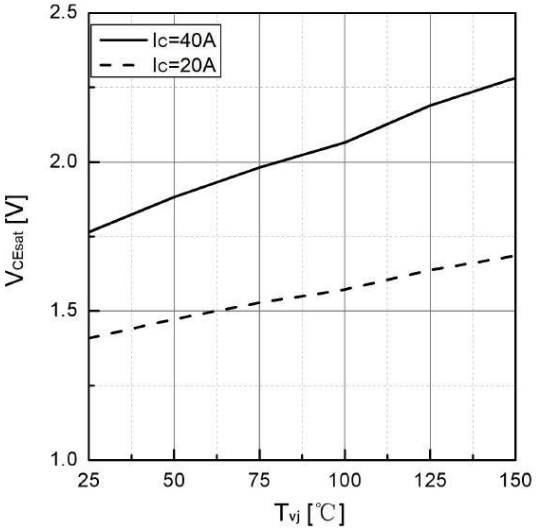


Fig 7. Typical V_{CEsat} as a function of T_{vj}

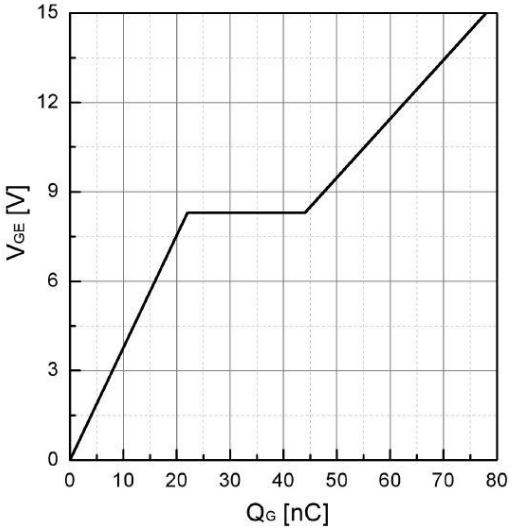


Fig 8. Typical Gate charge

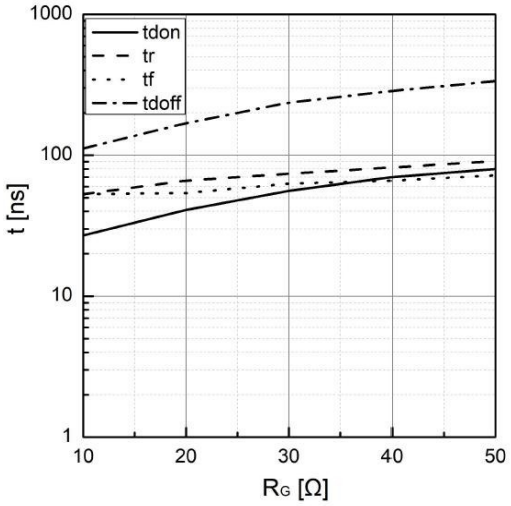


Fig 9. Typical switching times as a function of R_G

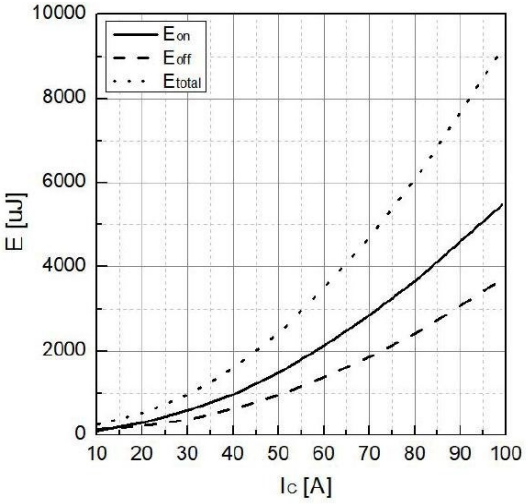


Fig 10. Typical switching energy losses as a function of I_C

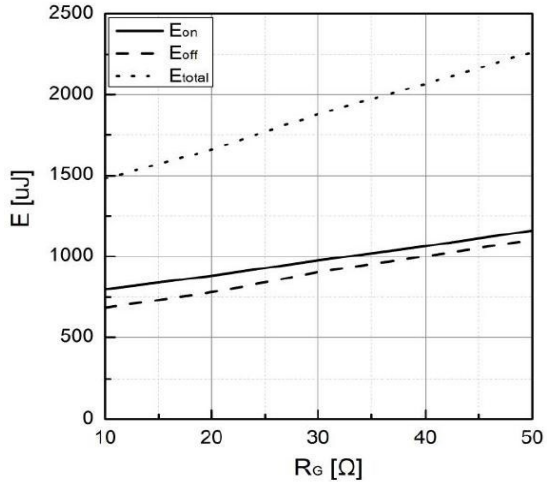


Fig 11. Typical switching energy losses as a function of R_G

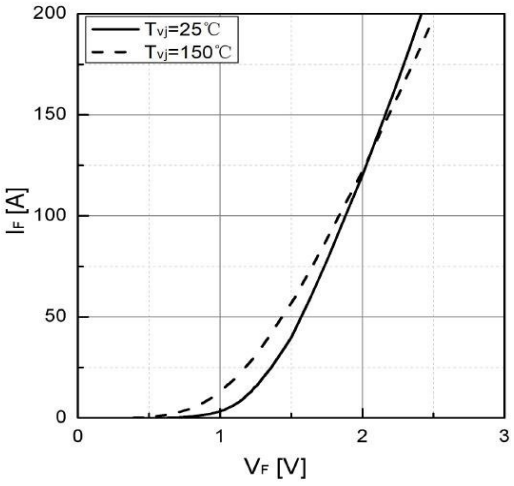


Fig 12. Typical I_F as a function of V_F

Characteristics Diagrams

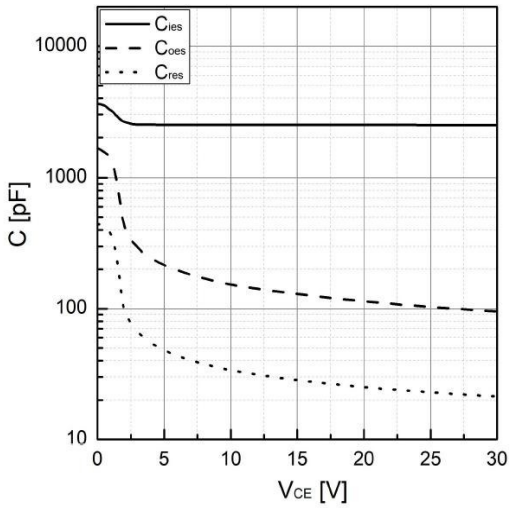


Fig 13. Typical capacitance as a function of V_{CE} (f=1Mhz, V_{GE}=0V)

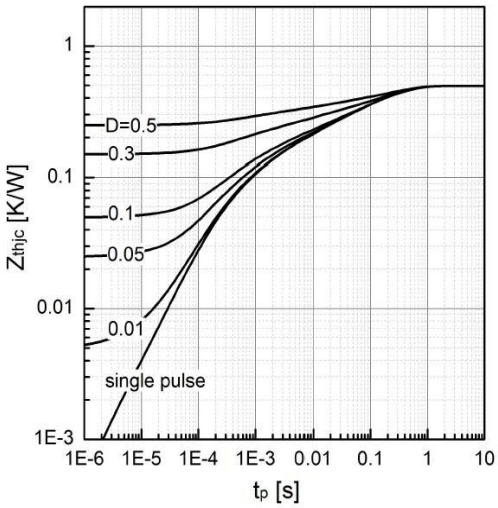
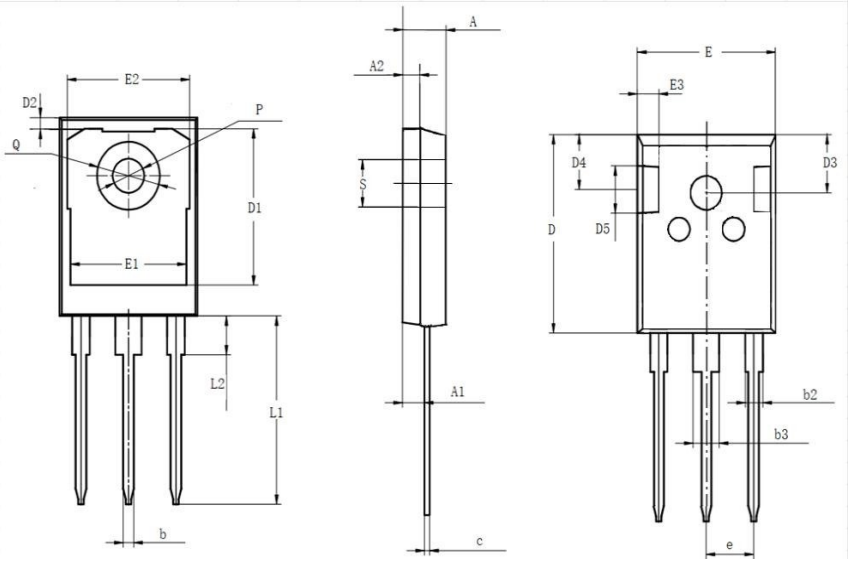


Fig 14. Transient thermal impedance of IGBT

Package Outline



TO-247-3L

Symbol	Dimensions(Unit: mm)		
	Min.	Typ.	Max.
A	4.95	5.00	5.05
A1	2.30	2.40	2.50
A2	1.95	2.00	2.05
b	1.15	1.20	1.25
b2	1.80	2.00	2.20
b3	2.80	3.00	3.20
c	0.55	0.60	0.65
D	19.90	21.10	21.30
D1	16.25	16.45	17.65
D2	1.20	1.30	1.40
D3	6.00	6.15	6.30
D4	5.70	5.85	6.00
D5	4.85	5.00	5.15
e		5.44BSC	
E	15.63	15.83	16.03
E1	13.06	13.26	13.46
E2	13.75	13.95	14.15
E3	2.40	2.50	2.60
L1	19.50	19.90	20.30
L2	3.85	4.05	4.25
Q	7.10	7.20	7.30
P	3.45	3.55	3.65
S	4.90	5.00	5.10

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2) Implement redundancy, fire-prevention measures, and malfunction prevention protocols;
3) Mitigate risks of accidents, fires, or societal damages resulting from product use.
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