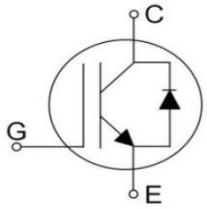
Trench Field-stop IGBT Discretes

Product Summary

Parameter	Value	Unit
V_{CE}	1200	V
IC	40	A
$V_{CE(sat)}$	1.9	V



Features

- Trench and field-stop technology
- High speed switching
- Low collector to emitter saturation voltage
- Easy parallel switching capability
- High ruggedness performance
- RoHS compliant

Applications

- Welding machines
- UPS
- Solar inverters

Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
V_{CES}	Collector-Emitter Voltage		1200	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
IF	Diode Continuous Forward Current TC = 100°C		40	A
I_{FM}	Diode Maximum Current,tp limited by Tvjmax		160	A
Ptot	Power Dissipation (TC=25°C)		681	W
	Power Dissipation (TC=100°C)		340	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	0.22	K /W
Rth(j-c)	Thermal Resistance, Junction to Case for Diode	0.48	
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		1200	-	-	V
ICES	Collector-Emitter Leakage Current	VCE=1200V,VGE=0V		-	-	100	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		5	6	7	V
VCE(sat)	Collector-Emitter Saturation Voltage	VGE=15V,IC=40A	TJ = 25°C	-	1.9	-	V
			TJ = 175°C	-	2.2	-	
Dynamic Characteristic							
Cies	Input Capacitance	VCE=30V, VGE=0V, f=1MHz		-	9900	-	pF
Coes	Output Capacitance			-	189	-	pF
Cres	Reverse Transfer Capacitance			-	40	-	pF
QG	Gate Charge	VCC=960V, IC=40A, VGE=15V		-	263	-	nC
Switching Characteristics							
tD(on)	Turn-On DelayTime	VCC=600V VGE=0/15V IC = 40A, Rg = 10Ω Inductive load		-	85	-	ns
tr	Turn-On Rise Time			-	76	-	ns
tD(off)	Turn-Off DelayTime			-	307	-	ns
tf	Turn-Off Fall Time			-	69	-	ns
Eon	Turn-on Energy			-	2.5	-	mJ
Eoff	Turn-off Energy			-	1.4	-	mJ
Ets	Total switching energy			-	3.9	-	mJ
tD(on)	Turn-On DelayTime	VCC=600V, VGE=0/15V IC = 40A Rg = 10Ω Inductive load Tvj=175°C		-	76	-	ns
tr	Turn-On Rise Time			-	75	-	ns
tD(off)	Turn-Off DelayTime			-	360	-	ns
tf	Turn-Off Fall Time			-	149	-	ns
Eon	Turn-on Energy			-	2.9	-	mJ
Eoff	Turn-off Energy			-	2.6	-	mJ
Ets	Total switching energy			-	5.5	-	mJ
Diode Characteristics							
VF	Diode Forward Voltage	IF= 40A	TJ = 25°C	-	2	-	V
			TJ = 175°C	-	1.6	-	V
Trr	Diode Reverse Recovery Time	VR=400V IF=40A diF/dt=-750A/μs		-	175	-	ns
Irrm	Diode peak reverse recovery current			-	24	-	A
Qrr	Diode Reverse Recovery Charge			-	2000	-	nC
Trr	Diode Reverse Recovery Time	VR=400V IF=40A diF/dt=-750A/μs Tvj=175°C		-	285	-	ns
Irrm	Diode peak reverse recovery current			-	37	-	A
Qrr	Diode Reverse Recovery Charge			-	5500	-	nC

Characteristics Diagrams

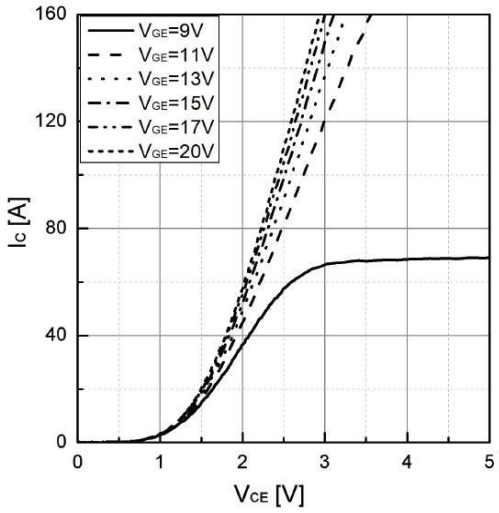


Fig 1. Typical output characteristic (T_{vj}=25℃)

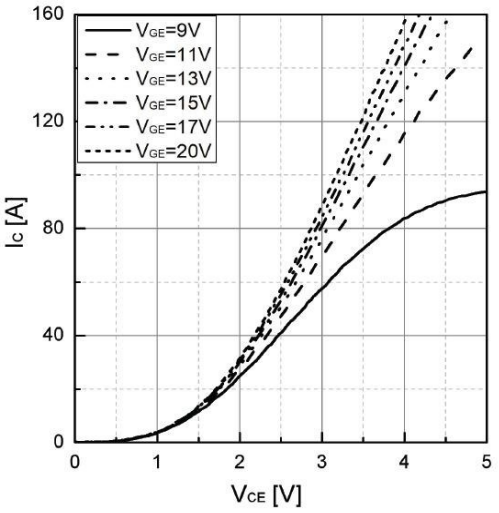


Fig 2. Typical output characteristic(T_{vj}=175℃)

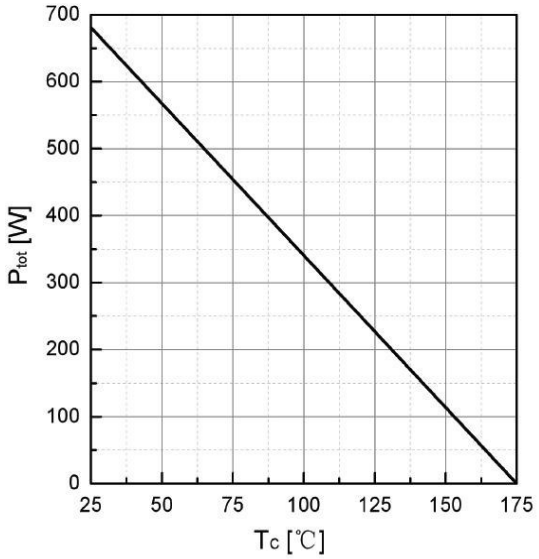


Fig 3. Power dissipation as a function of T_C

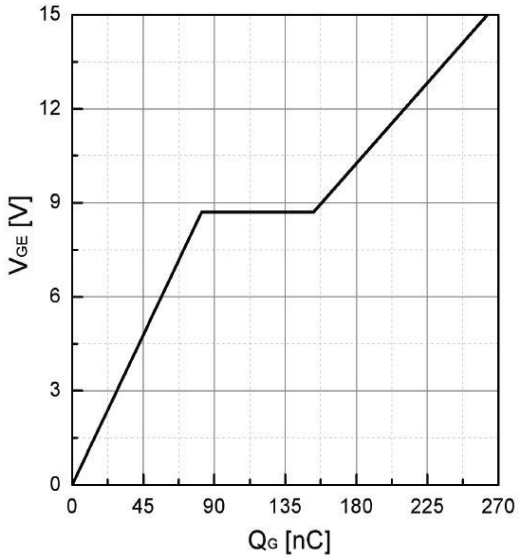


Fig 4. Typical Gate charge

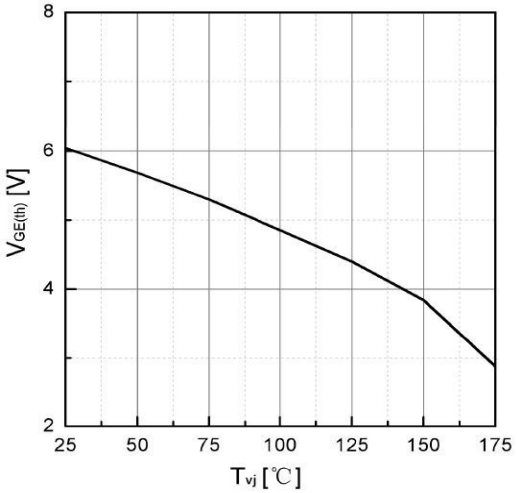


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj} (I_C=1mA)

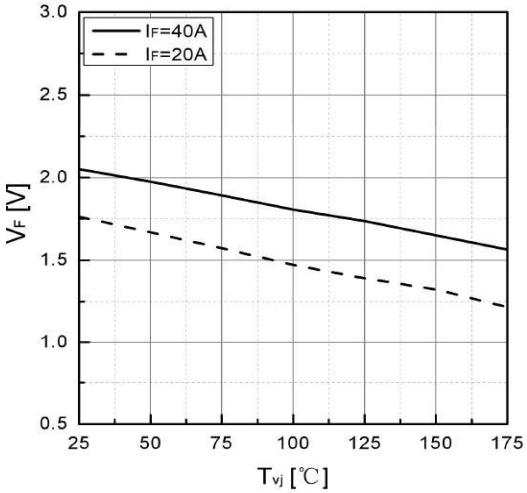


Fig 6. Typical V_F as a function of T_{vj}

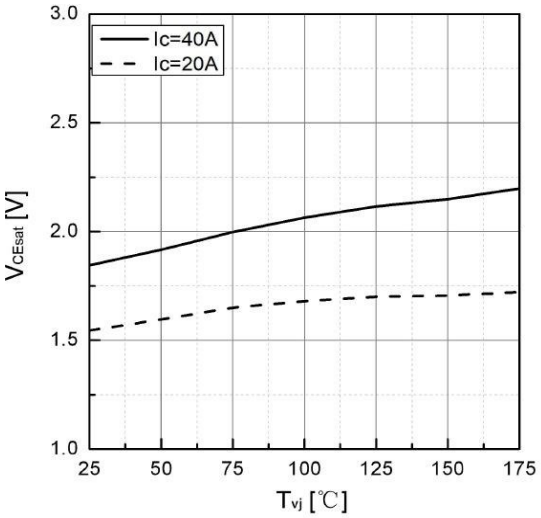


Fig 7. Typical V_{CEsat} as a function of T_{vj}

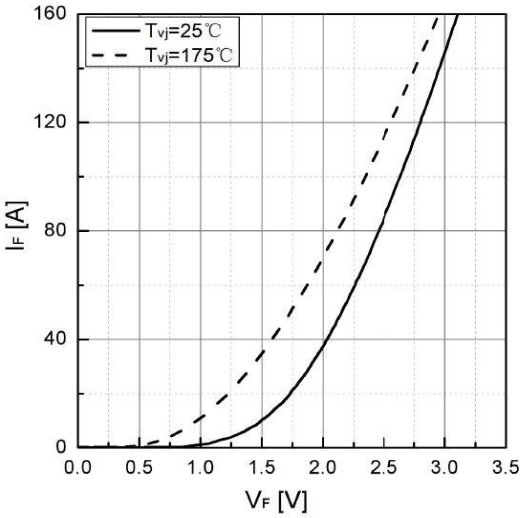


Fig 8. Typical I_F as a function of V_F

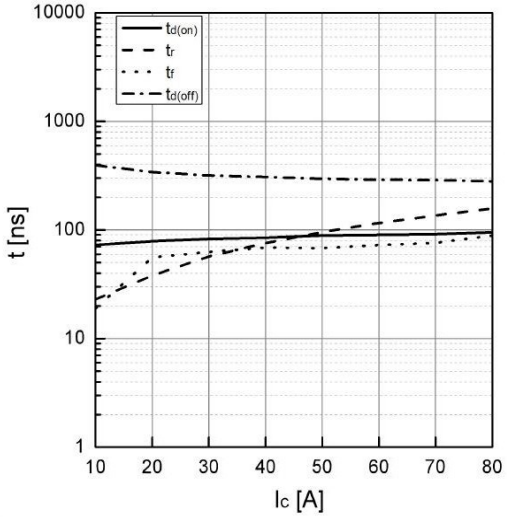


Fig 9. Typical switching time as a function of I_C

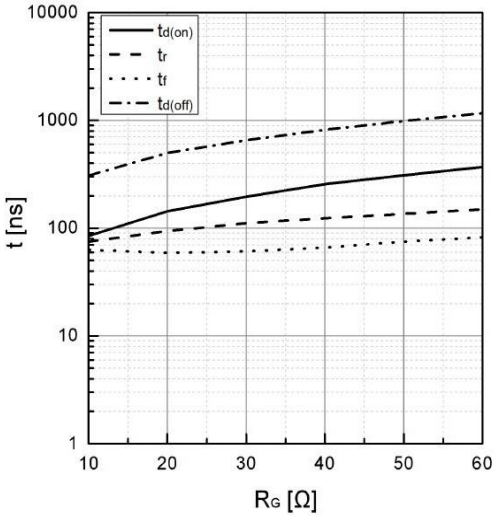


Fig 10. Typical switching times as a function of R_G

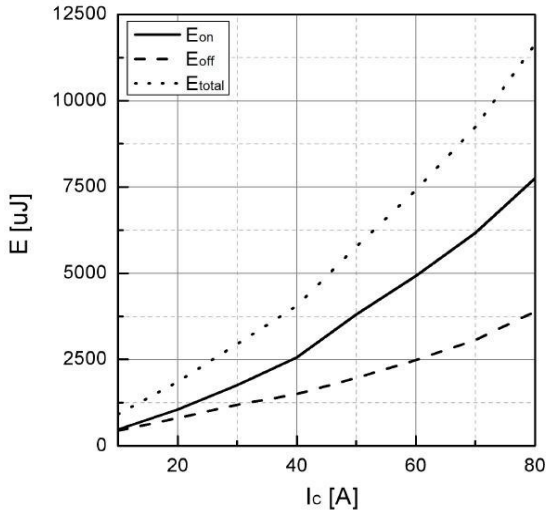


Fig 11. Typical switching energy losses as a function of I_C

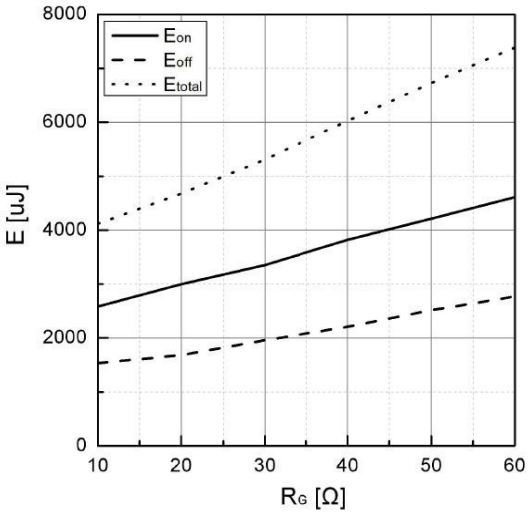


Fig 12. Typical switching energy losses as a function of R_G

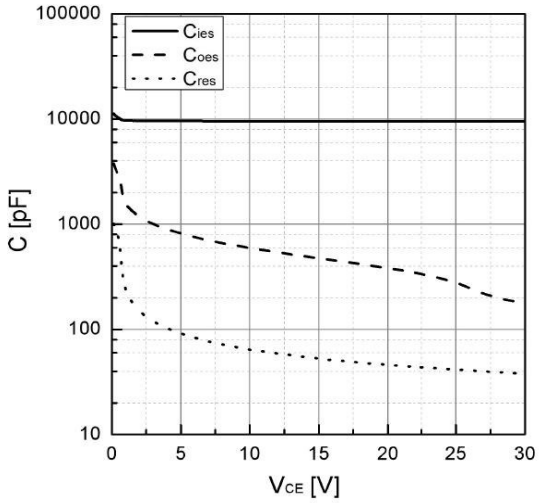


Fig 13. Typical capacitance as a function of V_{CE} (f=1Mhz, V_{GE}=0V)

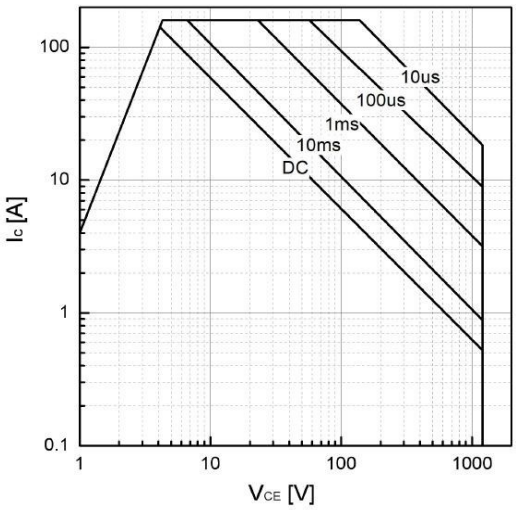


Fig 14. Safe operating area

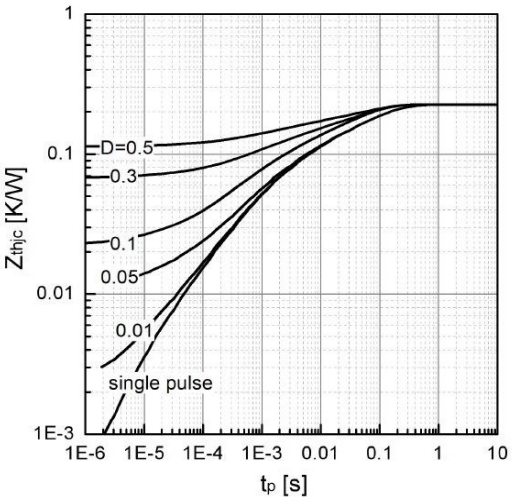
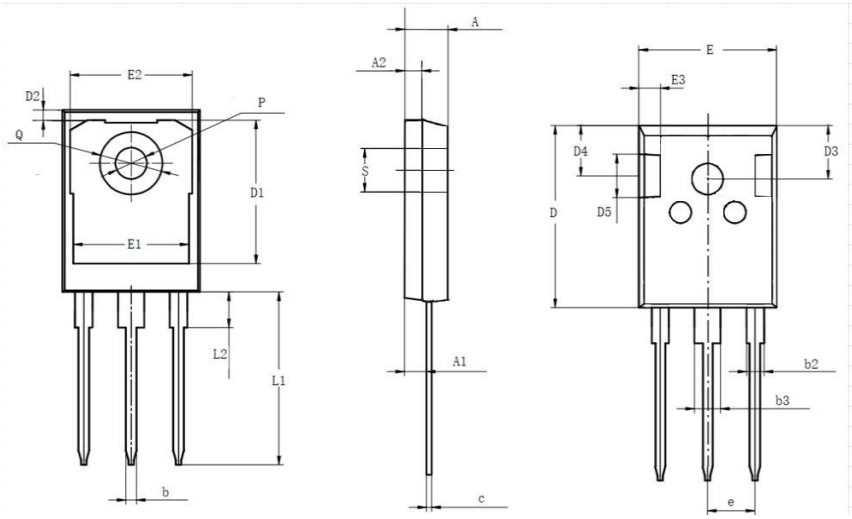


Fig 15. Transient thermal impedance of IGBT

Package Outline



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

TO-247-3L

NOTICE

Zhuhai Hypersemi Co., Ltd. (hereinafter "Hypersemi") reserves the right to modify, enhance, improve, correct, or otherwise change any product described herein without further notice. Hypersemi shall not be held liable for any consequences arising from the application or use of its products.

While Hypersemi exerts maximum efforts to ensure product quality and reliability, semiconductor devices may malfunction or fail due to inherent electrical sensitivity and susceptibility to physical stress. When utilizing Hypersemi products, the Buyer is obligated to:

1) Comply with applicable safety standards in designing a secure system architecture;
2) Implement redundancy, fire-prevention measures, and malfunction prevention protocols;
3) Mitigate risks of accidents, fires, or societal damages resulting from product use.
4) Designers must ensure Hypersemi products operate strictly within specified parameters defined in the latest product specifications.