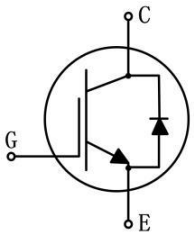
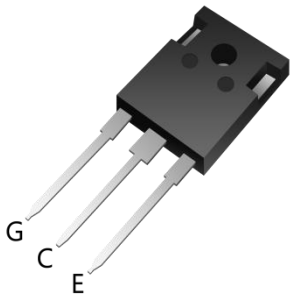
Trench Field-stop IGBT Discrete

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





TO-247-3L

Features

- 1200V trench gate/field termination process
- Low switching losses
- Vcesat has a positive temperature coefficient

Applications

- Charging station
- Uninterruptible power supplies
- Inverters

IGBT

Maximum Ratings

Parameter	Symbol	Test condition	Value	Unit
Collector-Emitter Voltage	V_{CES}	T_{vj}=25℃	1200	V
Continuous DC collector current	I_C	T_C=100℃,$T_{vj\,max}$=175℃	40	A
Repetitive peak collector current	I_{CRM}	t_P=1ms	120	A
Short-circuit withstand time	t_{SC}	V_{CC}≤600V,V_{GE}=15V, Allowed number of short circuits<1000, Time between short circuits≥1.0s, T_{vj}=150℃	10	μs
Total power dissipation	Pt_{ot}	T_C=25℃,$T_{vj\,max}$=175℃ T_C=100℃,$T_{vj\,max}$=175℃	900 500	W
Gate emitter voltage	V_{GE}		±20	V
Transient Gate-emitter voltage	V_{GE}	t_p≤10μs, D<0.010	±25	V
Temperature under switching conditions	$T_{vj\,op}$		-40…+175	℃
Storage temperature	T_{stg}		-40…+150	℃

Thermal Characteristics

Parameter	Symbol	Test condition	Value			Unit
			Min.	Typ.	Max.	
IGBT thermal resistance, junction - case	$R_{th(j-C)}$			0.138		℃/W
Diode thermal resistance, junction - case	$R_{th(j-C)}$			0.393		℃/W

Characteristic Values

Parameter	Symbol	Test condition	Value			Unit
			Min.	Typ.	Max.	
Collector-emitter breakdown voltage	$V_{(BR)CES}$	V_{GE}=0V,I_C=0.25mA	1200			V
Collector-Emitter saturation Voltage	V_{CEsat}	V_{GE}=15V,I_C=40A T_{vj}=25℃ V_{GE}=15V,I_C=40A T_{vj}=125℃ V_{GE}=15V,I_C=40A T_{vj}=150℃		1.90 2.47 2.57	2.40	
Gate-Emitter threshold Voltage	$V_{GE(th)}$	I_C=0.4mA,V_{GE}=V_{CE} ,T_{vj}=25℃	4.9	5.5	6.1	
Transconductance	G_{fs}	V_{CE}=20V , I_C=40A		28		S
Internal gate resistor	R_{Gint}	T_{vj}=25℃		2.3		Ω
Input capacitance	C_{ies}	f=100kHZ,V_{CE}=25V,V_{GE}=0V,T_{vj}=25℃		3.12		nF
Output capacitance	C_{oes}			0.24		
Reverse transfer capacitance	C_{res}			0.12		
Gate charge	Q_G	I_C=40A,V_{GE}=15V T_{vj}=25℃ V_{CE}=960V		255		μC
Collector-emitter cut-off current	I_{CES}	V_{CE}=1200V,V_{GE}=0V T_{vj}=25℃ T_{vj}=175℃		 3000	10	μA
Gate-emitter leakage current	I_{GES}	V_{CE}=0V,V_{GE}=20V T_{vj}=25℃			100	nA
Turn-on delay time	$t_{d\ on}$	I_C=40A,V_{CE}=600V T_{vj}=25℃ V_{GE}=±15V, R_G= 10Ω T_{vj}=175℃ (inductive load)		49 50		ns
Rise time	t_r	I_C=40A,V_{CE}=600V T_{vj}=25℃ V_{GE}=±15V,R_G=10Ω T_{vj}=175℃ (inductive load)		74 69		
Turn-off delay time	$t_{d\ off}$	I_C=40A,V_{CE}=600V T_{vj}=25℃ V_{GE}=±15V,R_G=10Ω T_{vj}=175℃ (inductive load)		162 237		
Fall time	t_f	I_C=40A,V_{CE}=600V T_{vj}=25℃ V_{GE}=±15V,R_G=10Ω T_{vj}=175℃ (inductive load)		136 160		
Turn-on energy loss per pulse	E_{on}	I_C=40A,V_{CE}=600V T_{vj}=25℃ V_{GE}=±15V, R_G= 10Ω T_{vj}=175℃ (inductive load)		3.51 6.78		mJ
Turn-off energy loss per pulse	E_{off}	I_C=40A,V_{CE}=600V T_{vj}=25℃ VGE=±15V,R_G=10Ω T_{vj}=175℃ di/dt =450A/μs (T_{vj}=175℃)		1.61 2.66		mJ
Total switching energy	E_{ts}	I_C=40A,V_{CE}=600V T_{vj}=25℃ V_{GE}=±15V, R_G= 10Ω T_{vj}=175℃ dv/dt=5500V/μs (T_{vj}=175℃)		5.12 9.44		

Diode
Maximum Ratings

Parameter	Symbol	Test condition	Value	Unit
Repetitive peak reverse Voltage	V_{RRM}	T_{vj}=25℃	1200	V
Continuous DC forward current	I_F	T_C= 100℃, $T_{vj\ max}$=175℃	40	A
Repetitive peak forward current	I_{FRM}	t_p=1ms	120	A
I^2t-value	I^2t	t_p= 10ms,sin180°,T_j= 125℃	310	A

Characteristics Values

Parameter	Symbol	Test condition		Value			Unit
				Min.	Typ.	Max.	
Forward Voltage	V_F	I_F=40A,V_{GE}=0V I_F=40A,V_{GE}=0V I_F=40A,V_{GE}=0V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃		1.82 1.60 1.54	2.40	V
Peak reverse recovery current	I_{RM}	I_F=40A, -di_F/dt=350A/μs(T_{vj}=175℃) V_R=600V,V_{GE}=-15V	T_{vj}=25℃ T_{vj}=175℃		12 29		A
Reverse Recovered charge	Q_{rr}	I_F=40A, -di_F/dt=350A/μs(T_{vj}=175℃) V_R=600V,V_{GE}=-15V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃		3.29 10.5		μC
Reverse Recovery Time	t_{rr}	I_F=40A, -di_F/dt=350A/μs(T_{vj}=175℃) V_R=600V,V_{GE}=-15V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃		558 870		ns
Reverse recovered energy	E_{rec}	I_F=40A, -di_F/dt=350A/μs(T_{vj}=175℃) V_R=600V,V_{GE}=-15V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃		1.40 4.21		mJ

Typical Characteristics

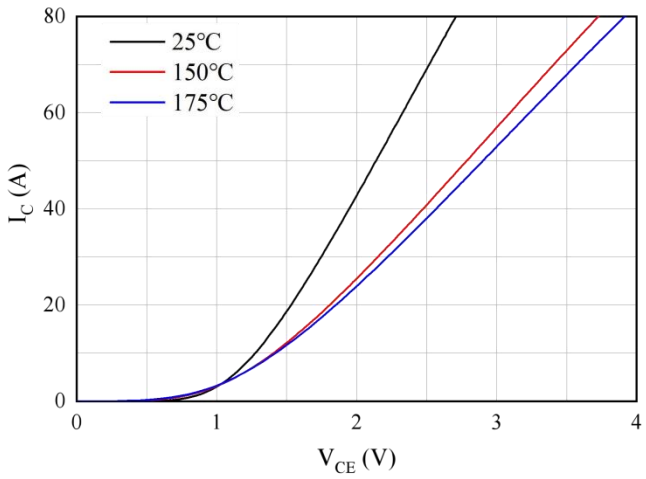


Fig 1. Typical output characteristics (V_{GE}= 15V)

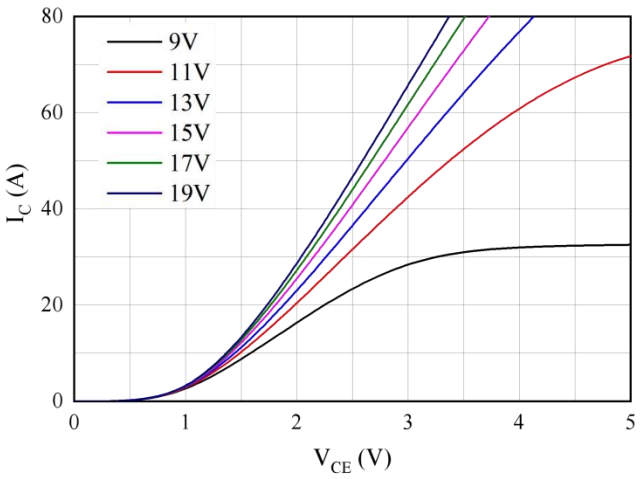


Fig 2. Typical output characteristics (T_{vj}= 150℃)

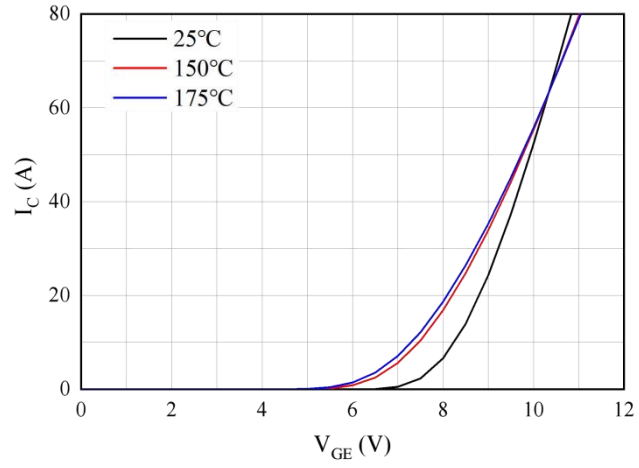


Fig 3. Typical transfer characteristic(V_{CE}=20V)

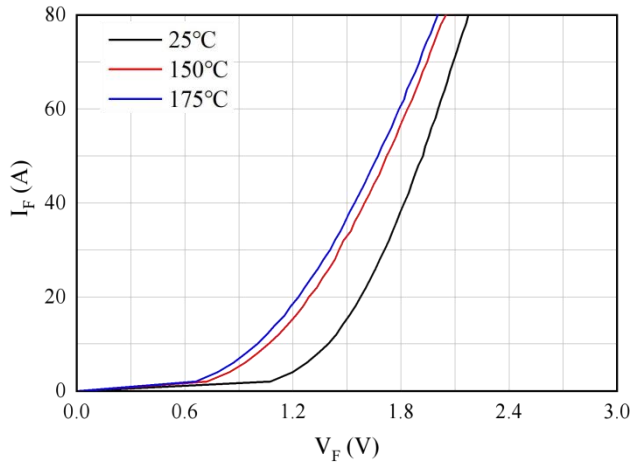


Fig 4. Forward characteristic of Diode

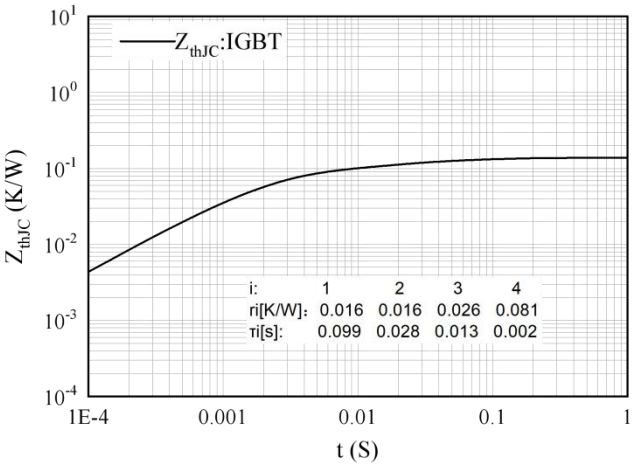


Fig 5.Transient thermal impedance IGBT, $Z_{thJC}=f(t)$

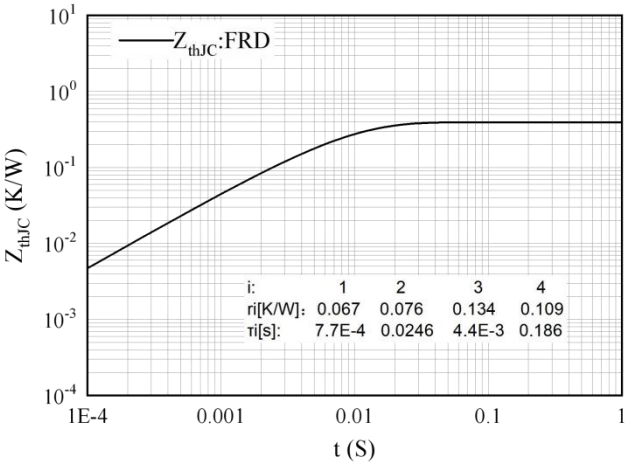


Fig 6.Transient thermal impedance FRD, $Z_{thJC}=f(t)$

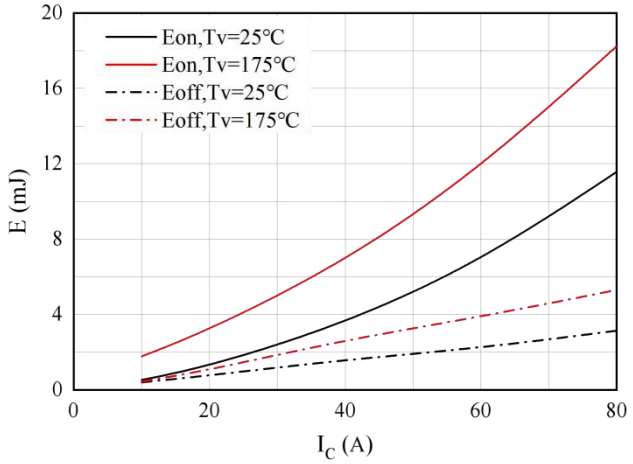


Fig 7.Switching losses of IGBT
V_{GE}=±15V, R_{Gon}=10Ω, R_{goff}=10Ω,V_{CE}=600V

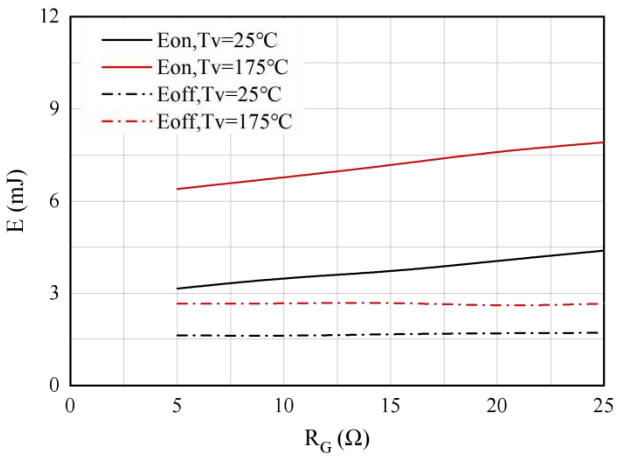


Fig 8.Switching losses of IGBT
V_{GE}=±15V, I_C=40A,V_{CE}=600V

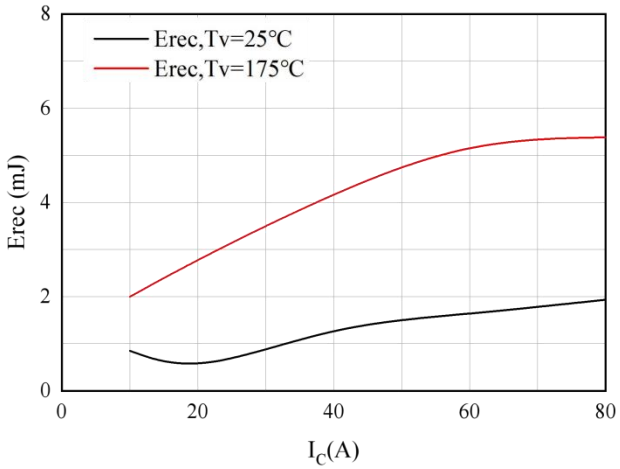


Fig 9.Switching losses of Diode
R_{gon}=10Ω,V_{CE}=600V

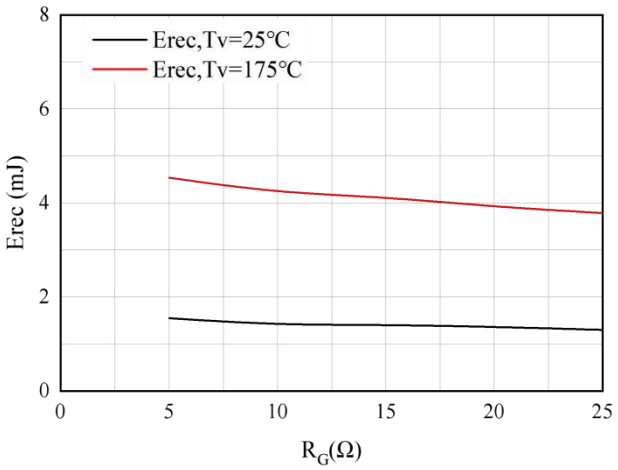


Fig 10.Switching losses of Diode
I_F=40A,V_{CE}=600V

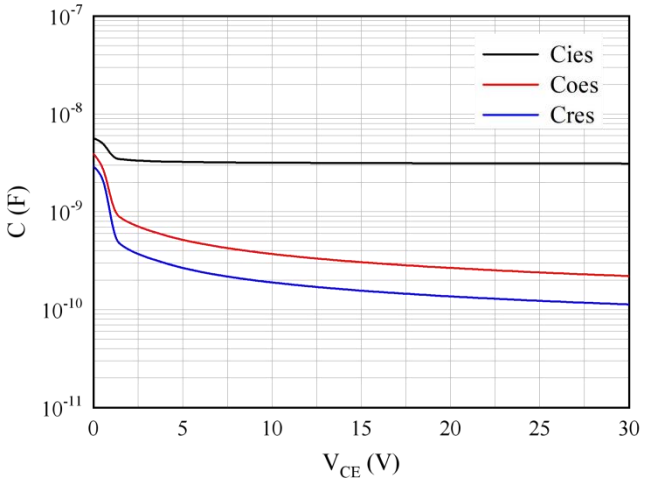
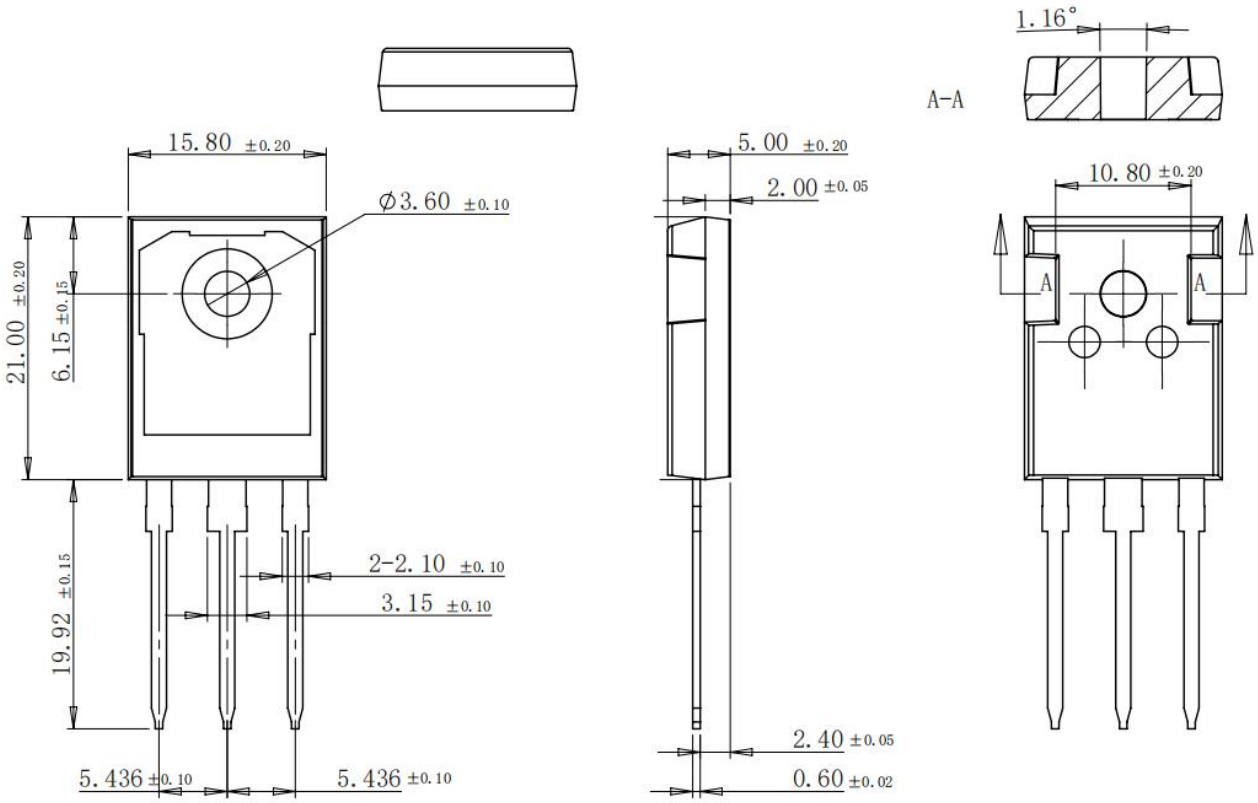


Fig 11. Capacitance characteristic

Package Outlines (Unit：mm)

TO-247-3L



***Important Usage Information and Disclaimer**

The specifications of Zhuhai Hypersemi Co., Ltd. products are not guarantees of product characteristics. They reflect typical performance expected in standard applications, which may vary with specific uses. Users must conduct prior testing for their applications and make necessary adjustments.Users are responsible for the safety of applications utilizing our products and must implement adequate safety measures to prevent physical injury, fire, or other risks in case of product failure. It is the user's duty to ensure that application designs comply with all applicable laws and standards. Our products must not be used in any applications where a product failure could reasonably result in personal injury, unless specifically authorized in a signed document by Zhuhai Hypersemi Co., Ltd.

No representations or warranties are made regarding the accuracy or completeness of this information, including any claims of non-infringement of third-party intellectual property rights. Zhuhai Hypersemi Co., Ltd. assumes no liability for any applications or uses of its products and does not grant any licenses to its intellectual property rights or those of others. We also make no claims regarding non-infringement of third-party intellectual property rights that may arise from applications.

Due to technical requirements, our products may contain hazardous substances. For details, please contact your nearest sales office. This document replaces all previous information and may be updated. We reserve the right to make changes.