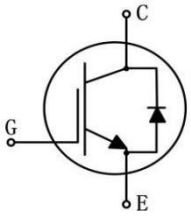
Trench Field-stop IGBT Discrete

Parameter	Value	Unit
V_{CE}	650	V
I_C	50	A
$V_{CE(sat)}$	1.58	V



---Marking
---Tracking code

TO-247-3L

Features

- 650V trench gate/field termination process
- Low switching losses
- Vcesat has a positive temperature coefficient

Applications

- Charging station
- On board charger
- Uninterruptible power supplies
- Inverters

IGBT

Maximum Ratings

Parameter	Symbol	Test condition	Value	Unit
Collector-Emitter Voltage	V_{CES}	T_{vj}=25℃	650	V
Continuous DC collector current	I_C	T_C=25℃,T_{vjmax}=175℃ T_C=100℃, T_{vjmax}=175℃	80 50	A
Pulsed collector current,tp limited by $T_{vj\ max}$	I_{Cpuls}		200	A
Total power dissipation	P_{tot}	T_C=25℃, T_{vjmax}=175℃ T_C=100℃, T_{vjmax}=175℃	295 150	W
Gate emitter Voltage	V_{GE}	t_p≤10μs,D<0.010	±20 ±30	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.	
Thermal resistance, junction-ambient	$R_{th(j-a)}$				40	℃/W
IGBT thermal resistance, junction - case	$R_{th(j-C)}$			0.51		℃/W
Diode thermal resistance, junction - case	$R_{th(j-C)}$			0.43		℃/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		650			V
Collector-Emitter saturation Voltage	V_{CEsat}	V_{GE}=15V,I_C=50A V_{GE}=15V,I_C=50A V_{GE}=15V,I_C=50A	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃		1.58 1.87 1.95	2.10	V
Gate-Emitter threshold Voltage	$V_{GE(th)}$	I_C=0.5mA,V_{GE}=V_{CE}	T_{vj}=25℃	4.2	5.0	5.8	
Transconductance	G_{fs}	V_{CE}=20V,I_C=50A			77		S
Input capacitance	C_{ies}	f=100kHz,V_{CE}=25V V_{GE}=0V	T_{vj}=25℃		5.46		nF
Output capacitance	C_{oes}				0.20		
Reverse transfer capacitance	C_{res}				0.10		
Gate charge	Q_G	I_C=50A,V_{GE}=15V V_{CE}=520V	T_{vj}=25℃		0.53		μC
Collector-emitter cut-off current	I_{CES}	V_{CE}=650V,V_{GE}=0V	T_{vj}=25℃ T_{vj}=175℃		 2000	50	uA
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=50A,V_{CE}=400V V_{GE}=±15V,R_G=8Ω (inductive load)	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃		33 21 19		ns
Rise time	t_r	I_C=50A,V_{CE}=400V V_{GE}=±15V,R_G=8Ω (inductive load)	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃		75 67 65		
Turn-off delay time	$t_{d\ off}$	I_C=50A,V_{CE}=400V V_{GE}=±15V,R_G=8Ω (inductive load)	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃		21 32 38		
Fall time	t_f	I_C=50A,V_{CE}=400V V_{GE}=±15V,R_G=8Ω (inductive load)	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃		41 62 62		
Turn-on energy loss per pulse	E_{on}	I_C=50A,V_{CE}=400V V_{GE}=±15V,R_G=8Ω (inductive load)	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃		2.37 2.88 3.10		mJ
Turn-off energy loss per pulse	E_{off}	I_C=50A,V_{CE}=400V V_{GE}=±15V,R_G=8Ω (inductive load)	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃		0.60 0.73 0.76		
Total switching energy	E_{ts}	I_C=50A,V_{CE}=400V V_{GE}=±15V,R_G=8Ω (inductive load)	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃		2.97 3.61 3.86		

Diode

Maximum Ratings

Parameter	Symbol	Test condition	Value	Unit
Repetitive peak reverse Voltage	V_{RRM}	T_{vj}=25℃	650	V
Continuous DC forward current	I_F	T_C=25℃,$T_{vj\ max}$=175℃ T_C= 100℃,$T_{vj\ max}$=175℃	100 50	A
Diode pulsed current,tp limited by $T_{vj\ max}$	I_{Fpuls}		150	A

Characteristic Values

Parameter	Symbol	Test condition		Value			Unit
				Min.	Typ.	Max.	
Forward Voltage	V_F	I_F=50A,V_{GE}=0V I_F=50A,V_{GE}=0V I_F=50A,V_{GE}=0V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃		1.63 1.42 1.37	2.1	V
Peak reverse recovery current	I_{RM}	I_F=50A, -di$_F$/dt=400A/μs (T_{vj}=150℃) V_R=400V,V_{GE}=-15V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃		21 29 32		A
Reverse Recovered charge	Q_{rr}	I_F=50A, -di$_F$/dt=400A/μs (T_{vj}=150℃) V_R=400V,V_{GE}=-15V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃		1.48 3.26 3.95		μC
Reverse Recovery Time	t_{rr}	I_F=50A, -di$_F$/dt=400A/μs (T_{vj}=150℃) V_R=400V,V_{GE}=-15V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃		133 199 218		ns
Reverse recovered energy	E_{rec}	I_F=50A, -di$_F$/dt=400A/μs (T_{vj}=150℃) V_R=400V,V_{GE}=-15V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃		0.34 0.66 0.78		mJ

Typical Characteristics

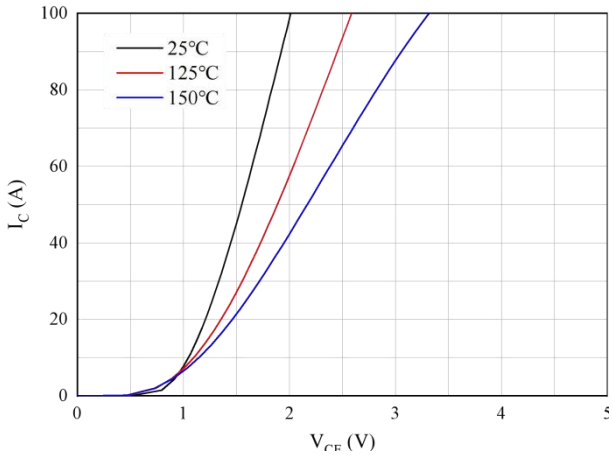


Fig 1. Typical output characteristics (V_{GE}= 15V)

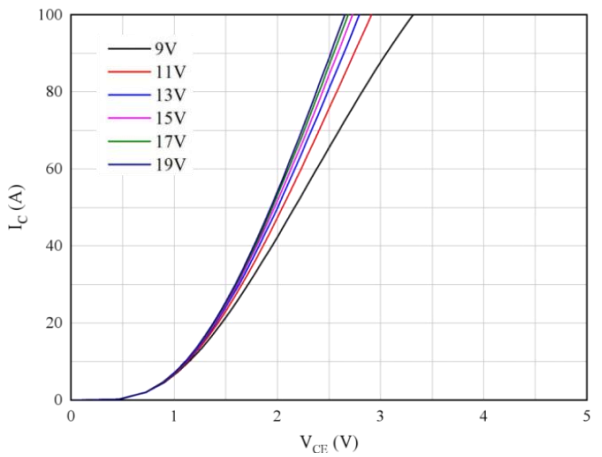


Fig 2. Typical output characteristics (T_{vj}= 150℃)

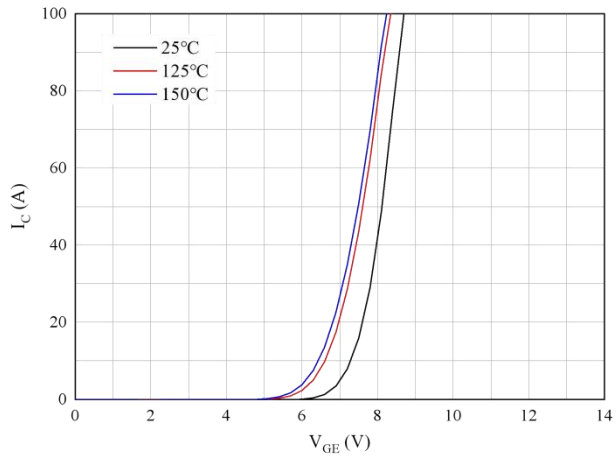


Fig 3. Typical transfer characteristic(V_{CE}=20V)

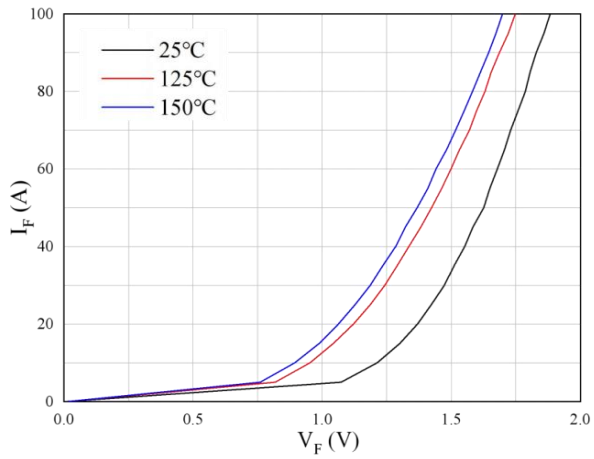


Fig 4. Forward characteristic of Diode

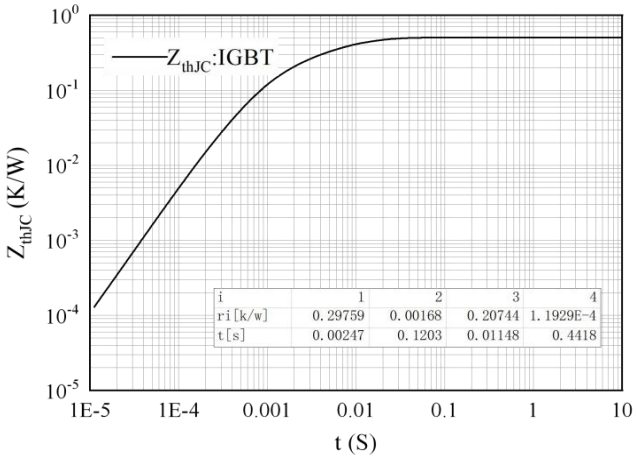


Fig 5.Transient thermal impedance IGBT, $Z_{thJC}=f(t)$

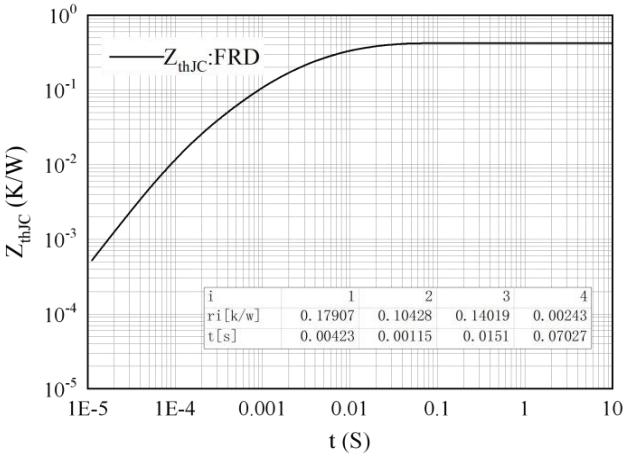


Fig 6.Transient thermal impedance FRD, $Z_{thJC}=f(t)$

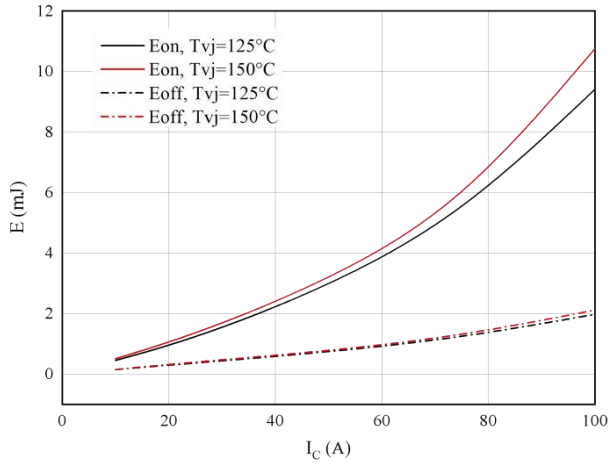


Fig 7.Switching losses of IGBT
V_{GE}=±15V, R_{Gon}=8Ω, R_{goff}=8Ω,V_{CE}=400V

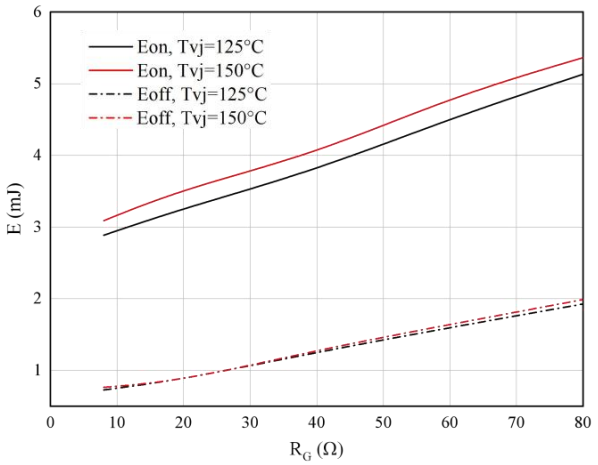


Fig 8.Switching losses of IGBT
V_{GE}=±15V, I_C=50A,V_{CE}=400V

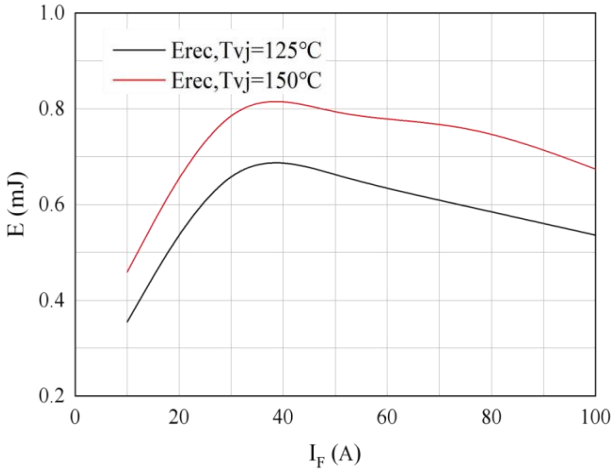


Fig 9.Switching losses of Diode
R_{gon}=8Ω,V_{CE}=400V

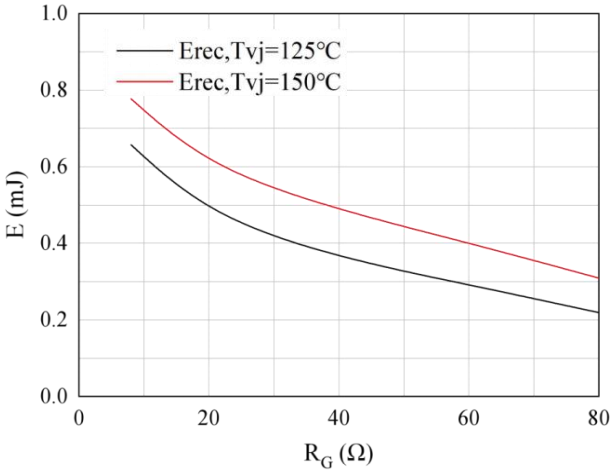


Fig 10.Switching losses of Diode
I_F=50A,V_{CE}=400V

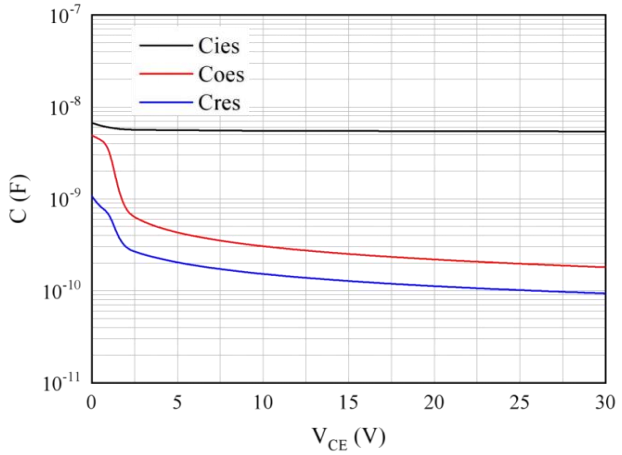
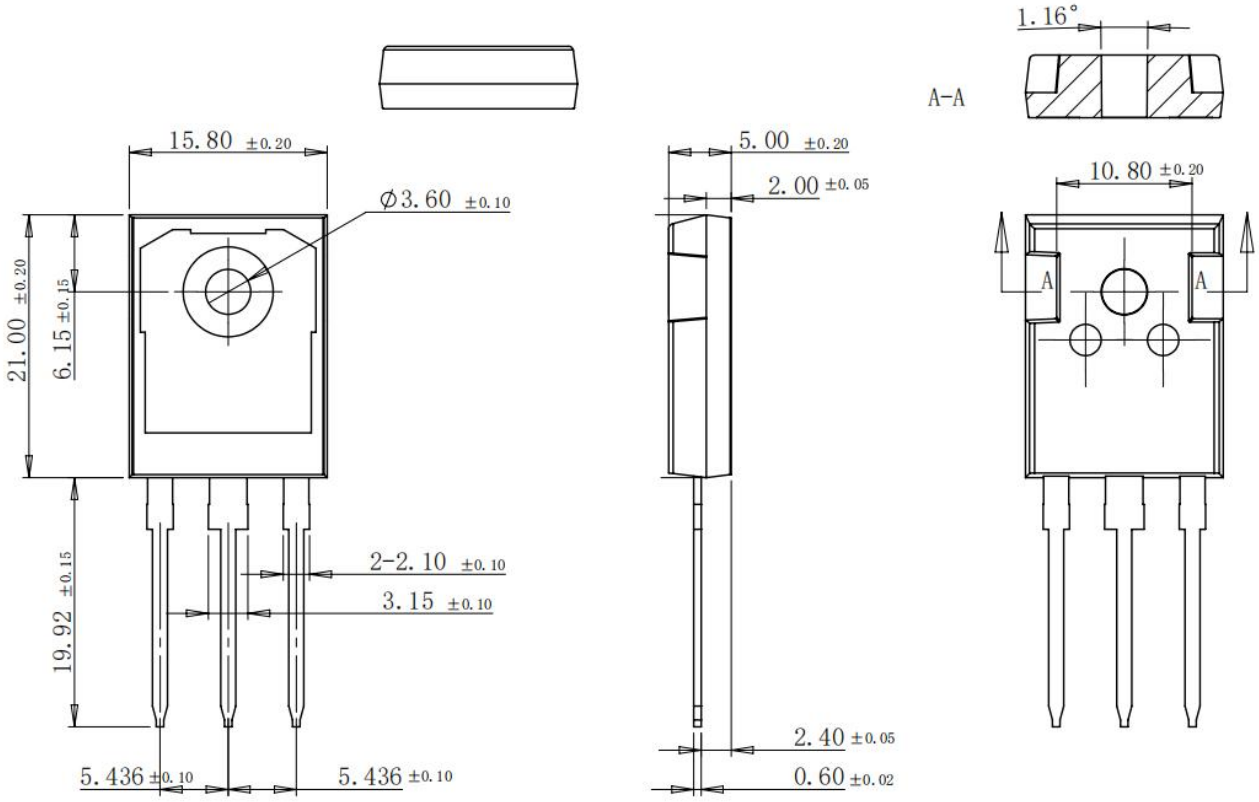


Fig 11. Capacitance characteristic

Package Outlines (Unit：mm)

TO-247-3L



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