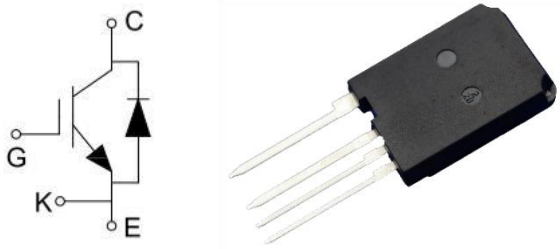
Trench Field-stop IGBT Discrete

Parameter	Value	Unit
V_{CE}	1200	V
I_C	180	A
$V_{CE(sat)}$	1.66	V



TO-247PLUS-4L

Features

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

Applications

- Energy storage inverter
- Uninterruptible power supplies
- Solar inverters

IGBT

Maximum Ratings

Parameter	Symbol	Test condition	Value	Unit
Collector-Emitter voltage	V_{CES}	T_{vj}=25℃	1200	V
Continuous DC collector current	$I_{C\ nom}$	T_C=100℃,$T_{vj\ max}$=175℃	180	A
Repetitive peak collector current	I_{CRM}	t_P=1ms	540	A
Gate-emitter voltage	V_{GE}		±20	V
Transient gate-emitter voltage	V_{GE}	t_P≤0.5μs,D<0.001	±25	V
Power dissipation	P_{tot}	T_C=100℃	1200	W
Temperature under switching conditions	$T_{vj\ op}$		-40…+175	℃
Storage temperature	T_{stg}		-40…+150	℃

Thermal Characteristics

Parameter	Symbol	Test condition	Value	Unit
IGBT thermal resistance, junction - case	$R_{th(j-C)}$		0.061	℃/W
Diode thermal resistance, junction - case	$R_{th(j-C)}$		0.123	℃/W

Characteristic Values

Parameter	Symbol	Test condition	Value			Unit
			Min.	Typ.	Max.	
Collector-Emitter saturation voltage	V_{CEsat}	V_{GE}=15V,I_C=180A T_{vj}=25℃ V_{GE}=15V,I_C=180A T_{vj}=175℃		1.66 2.10	2.10	V
Gate-Emitter threshold voltage	$V_{GE(th)}$	I_C=2.4mA,V_{GE}=V_{CE} T_{vj}=25℃	4.3	4.9	5.5	V
Transconductance	G_{fs}	V_{CE}=20V ,I_C=180A		270		S
Internal gate resistor	R_{Gint}			3.3		Ω
Input capacitance	C_{ies}	f=100kHz,V_{CE}=25V,V_{GE}=0V T_{vj}=25℃		21.7		nF
Output capacitance	C_{oes}			0.42		nF

Reverse transfer capacitance	C_{res}			0.09		nF
Gate charge	Q_G	I_C=180A,V_{GE}=15V, V_{CE}=960V	T_{vj}=25℃	1.34		μC
Collector-emitter cut-off current	I_{CES}	V_{CE}=1200V,V_{GE}=0V	T_{vj}=25℃		100	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= 180A,V_{CE}=600V V_{GE}=±15V, R_{Gon}=5Ω,R_{Goff}=25Ω (inductive load)	T_{vj}=25℃ T_{vj}=175℃	116 143		ns
Rise time	t_r	I_C=180A,V_{CE}=600V V_{GE}=±15V, R_{Gon}=5Ω,R_{Goff}=25Ω (inductive load)	T_{vj}=25℃ T_{vj}=175℃	86 84		ns
Turn-off delay time	$t_{d(off)}$	I_C=180A,V_{CE}=600V V_{GE}=±15V, R_{Gon}=5Ω,R_{Goff}=25Ω (inductive load)	T_{vj}=25℃ T_{vj}=175℃	680 740		ns
Fall time	t_f	I_C=180A,V_{CE}=600V V_{GE}=±15V, R_{Gon}=5Ω,R_{Goff}=25Ω (inductive load)	T_{vj}=25℃ T_{vj}=175℃	93 190		ns
Turn-on energy loss per pulse	E_{on}	I_C=180A,V_{CE}=600V V_{GE}=±15V,R_{Gon}=5Ω di/dt=1700A/us(T_{vj}=175℃) (inductive load)	T_{vj}=25℃ T_{vj}=175℃	12.3 17.5		mJ
Turn-off energy loss per pulse	E_{off}	I_C=180A,V_{CE}=600V V_{GE}=±15V,R_{Goff}=25Ω dv/dt=6400V/us(T_{vj}=175℃) (inductive load)	T_{vj}=25℃ T_{vj}=175℃	9.22 13.7		mJ

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℃	180	A
Repetitive peak forward current	I_{FRM}	t_p=1ms	540	A

Characteristic Values

Parameter	Symbol	Test condition		Value			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F=180A,V_{GE}=0V I_F=180A,V_{GE}=0V	T_{vj}=25℃ T_{vj}=175℃		2.87 2.63	3.40	V
Peak reverse recovery current	I_{RM}	I_F=180A, -di_F/dt=1460A/μs(T_{vj}=175℃) V_R=600V,V_{GE}=-15V	T_{vj}=25℃ T_{vj}=175℃		49 88		A
Reverse Recovered charge	Q_{rr}	I_F=180A, -di_F/dt=1460A/μs(T_{vj}=175℃) V_R=600V,V_{GE}=-15V	T_{vj}=25℃ T_{vj}=175℃		8.30 22.6		μC
Reverse Recovery Time	t_{rr}	I_F=180A, -di_F/dt=1460A/μs(T_{vj}=175℃) V_R=600V,V_{GE}=-15V	T_{vj}=25℃ T_{vj}=175℃		387 634		ns
Reverse recovered energy	E_{rec}	I_F=180A, -di_F/dt=1460A/μs(T_{vj}=175℃) V_R=600V,V_{GE}=-15V	T_{vj}=25℃ T_{vj}=175℃		3.74 10.2		mJ

Typical Characteristics

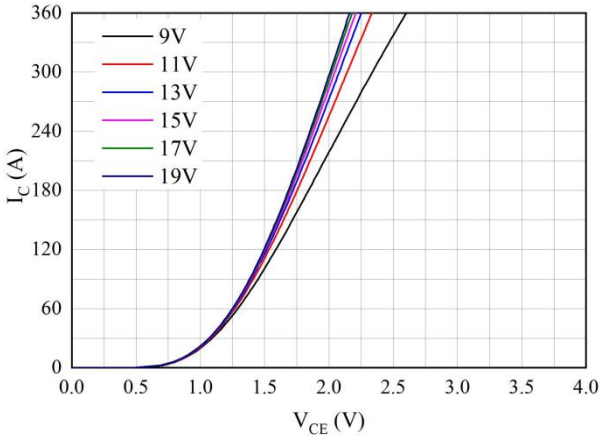


Fig 1.Typical output characteristics(T_{vj}=25℃)

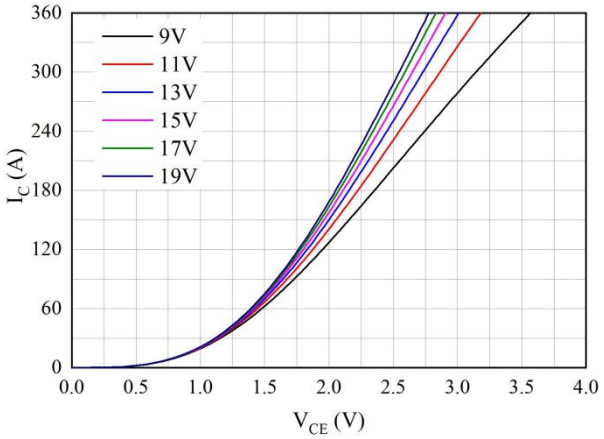


Fig 2.Typical output characteristics(T_{vj}=175℃)

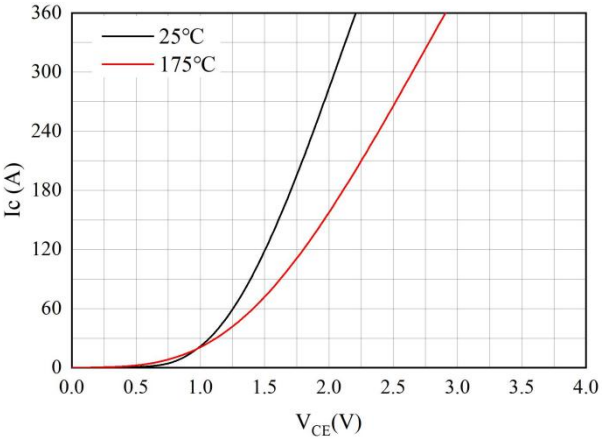


Fig 3.Typical output characteristics(V_{GE}=15V)

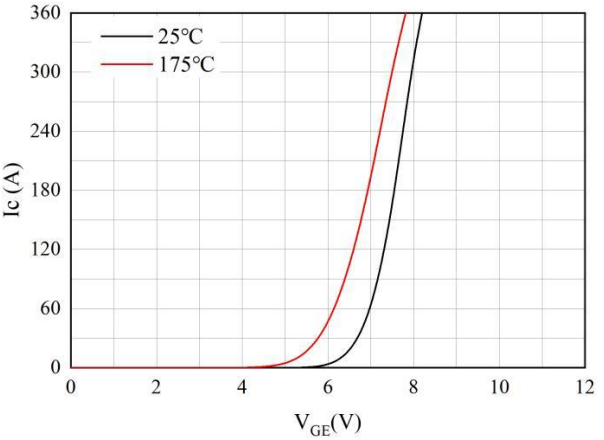


Fig 4.Typical transfer characteristic(V_{CE}=20V)

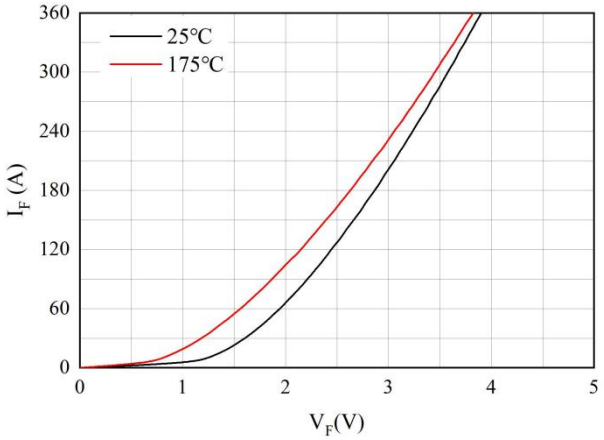


Fig 5.Forward characteristic of Diode

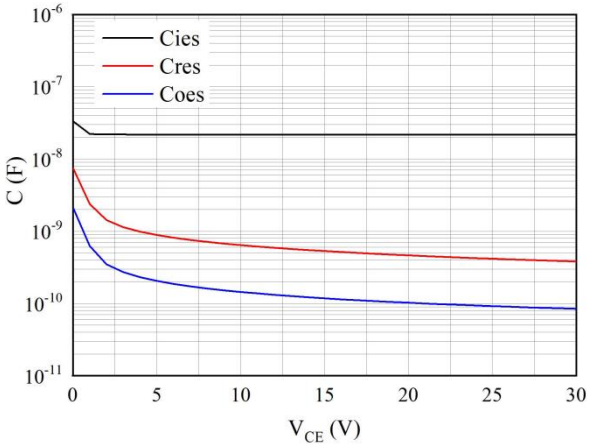


Fig 6.Capacitance characteristic

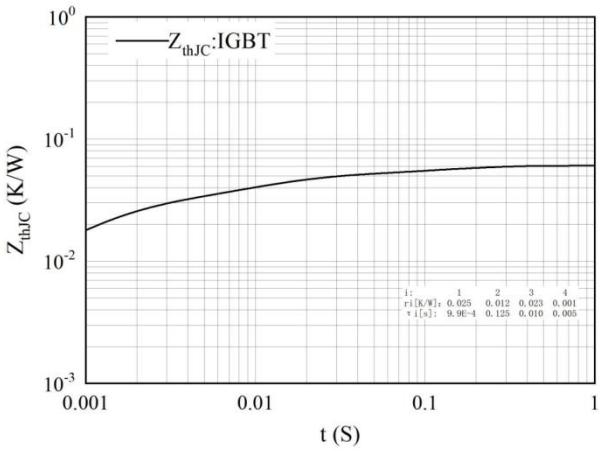


Fig 7.Transient thermal impedance IGBT, $Z_{thJC}=f(t)$

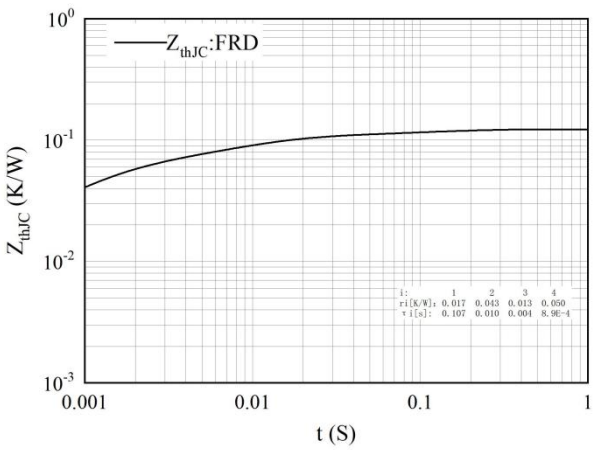


Fig 8.Transient thermal impedance FRD, $Z_{thJC}=f(t)$

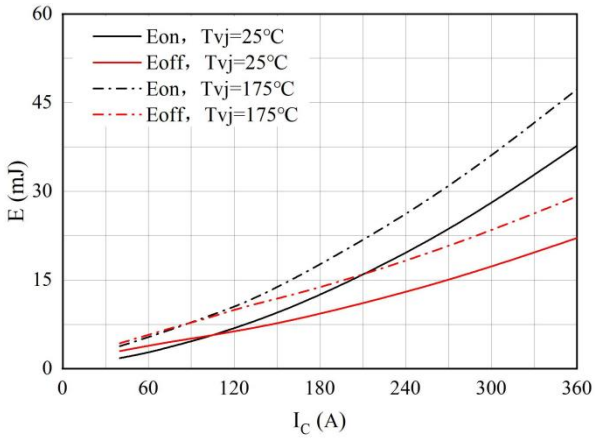


Fig 9.Switching losses of IGBT
V_{GE}=±15V,R_{gon}=5Ω,R_{goff}=25Ω,V_{CE}=600V

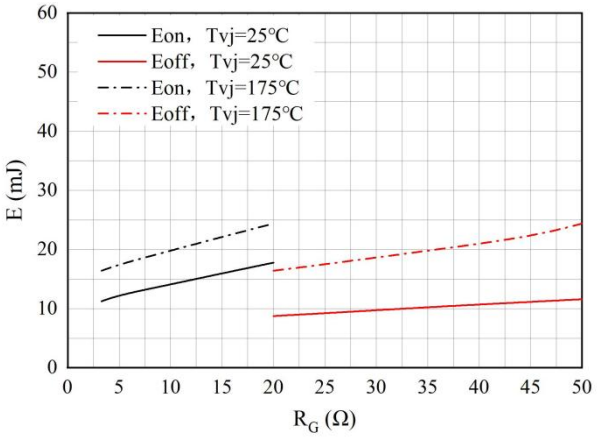


Fig 10.Switching losses of IGBT
V_{GE}=±15V,I_C=180A,V_{CE}=600V

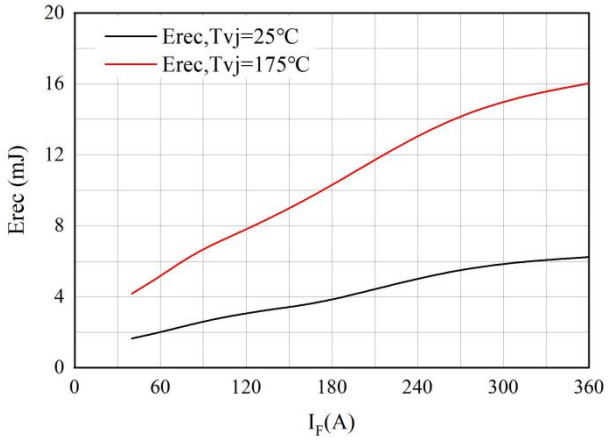


Fig 11. Switching losses of Diode
R_{gon}=5Ω,V_{CE}=600V

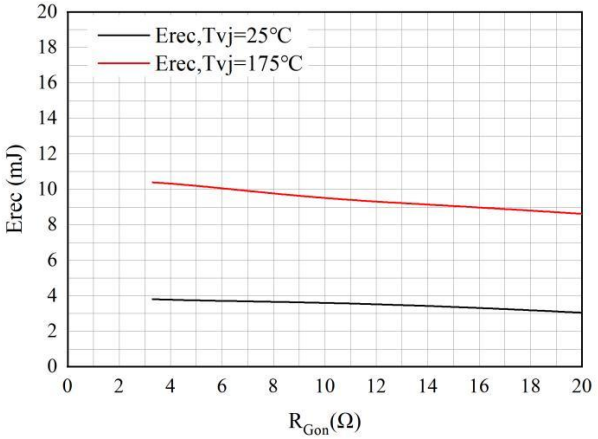
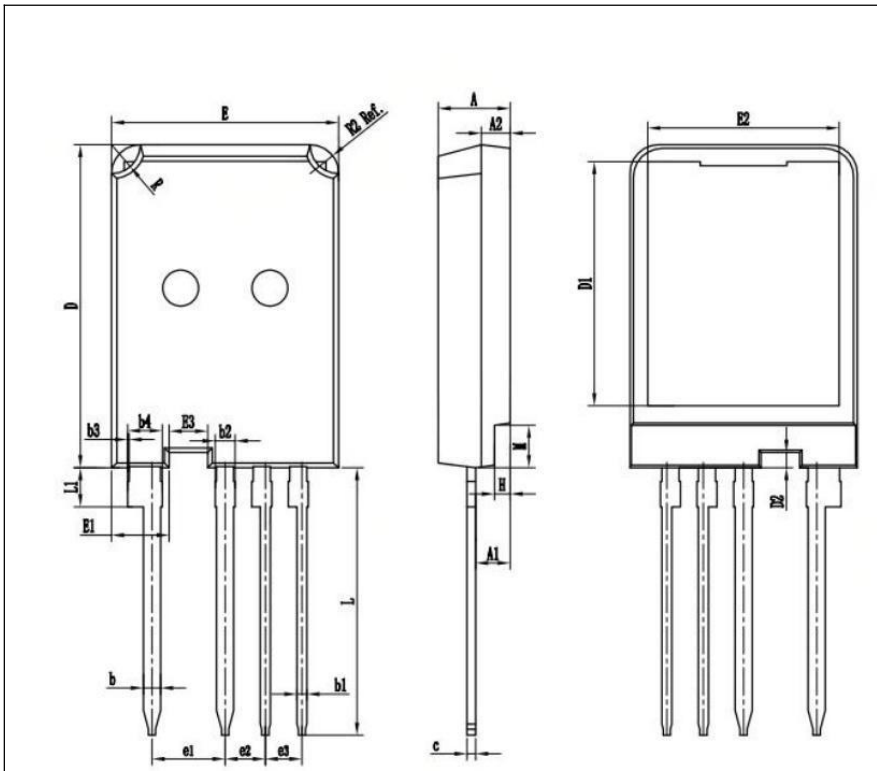


Fig 12.Switching losses of Diode
I_F=180A,V_{CE}=600V

Package Outline (Unit：mm)

TO-247PLUS-4L



Dim	Min	Max
A	4.9	5.1
A1	2.31	2.51
A2	1.9	2.1
b	1.16	1.29
b1	0.65	0.79
b2	1.36	1.49
b3	-	0.2
b4	2.16	2.29
C	0.59	0.66
D	22.3	22.5
D1	16.65	17.25
D2	1	1.1
E	15.7	15.9
E1	3.9	4.1
E2	13.1	13.5
E3	2.58	2.78
e1	5.08 BSC	
e2	2.79 BSC	
e3	2.54 BSC	
H	1	1.2
L	18.46	18.66
L1	2.62	2.82
M	2.85	3.05
R	1.9	2.1
All Dimensions in millimeter		

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