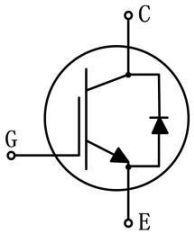
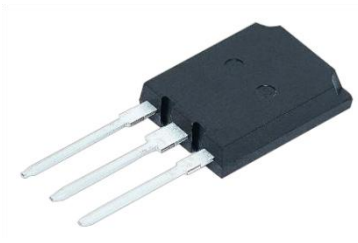
Trench Field-stop IGBT Discrete

Parameter	Value	Unit
V_{CE}	1200	V
I_C	180	A
$V_{CE(sat)}$	1.77	V





TO-247PLUS-3L

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	Conditions	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	Conditions	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	Conditions		Value			Unit
				Min.	Typ.	Max.	
Collector-Emitter saturation voltage	V_{CEsat}	V_{GE}=15V,I_C=180A V_{GE}=15V,I_C=180A	Tvj=25℃ Tvj=175℃		1.77 2.27	2.2	V
Gate-Emitter threshold voltage	$V_{GE(th)}$	I_C=2.4mA,V_{GE}=V_{CE}	Tvj=25℃	4.3	4.9	5.5	V
Transconductance	G_{fs}	V_{CE}=20V ,I_C= 180A	Tvj=25℃		225		S
Input capacitance	C_{ies}	f=100kHz,V_{CE}=25V,V_{GE}=0V	Tvj=25℃		21.7		nF
Output capacitance	C_{oes}				0.42		
Reverse transfer capacitance	C_{res}				0.09		

Gate charge	Q_G	I_C=180A,V_{GE}=15V,V_{CE}=960V	Tvj=25℃		1.34		μC
Internal gate resistor	R_{Gint}				3.3		Ω
Collector-emitter cut-off current	I_{CES}	V_{CE}=1200V,V_{GE}=0V	Tvj=25℃			100	μA
Gate-emitter leakage current	I_{GES}	V_{CE}=0V,V_{GE}=20V	Tvj=25℃			100	nA
Turn-on delay time	$t_{d(on)}$	I_C=180A,V_{CE}=600V V_{GE}=±15V,R_G=5Ω,R_{Goff}=15Ω (inductive load)	Tvj=25℃ Tvj=175℃		121 141		ns
Rise time	t_r	I_C=180A,V_{CE}=600V V_{GE}=±15V,R_G=5Ω,R_{Goff} =15Ω (inductive load)	Tvj=25℃ Tvj=175℃		238 226		ns
Turn-off delay time	$t_{d(off)}$	I_C=180A,V_{CE}=600V V_{GE}=±15V,R_G=5Ω,R_{Goff} =15Ω (inductive load)	Tvj=25℃ Tvj=175℃		448 511		ns
Fall time	t_f	I_C=180A,V_{CE}=600V V_{GE}=±15V,R_G=5Ω,R_{Goff} =15Ω (inductive load)	Tvj=25℃ Tvj=175℃		113 211		ns
Turn-on energy loss per pulse	E_{on}	I_C=180A,V_{CE}=600V V_{GE}=±15V,R_G=5Ω di/dt=630A/us(T_{vj}=175℃) (inductive load)	Tvj=25℃ Tvj=175℃		24.80 31.5		mJ
Turn-off energy loss per pulse	E_{off}	I_C=180A,V_{CE}=600V V_{GE}=±15V,R_{Goff} =15Ω dv/dt=7600V/us(T_{vj}=175℃) (inductive load)	Tvj=25℃ Tvj=175℃		8.63 13.8		mJ

Diode

Maximum Ratings

Parameter	Symbol	Conditions	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	Conditions		Value			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F=180A,V_{GE}=0V I_F=180A,V_{GE}=0V	Tvj=25℃ Tvj= 75℃		2.87 2.63	3.40	V
Peak reverse recovery current	I_{RM}	I_F=180A, -diF/dt=550A/μs(T_{vj}=175℃) V_R=600V,V_{GE}=-15V	Tvj=25℃ Tvj=175℃		38 64		A
Reverse Recovered charge	Q_{rr}	I_F=180A, -diF/dt=550A/μs(T_{vj}=175℃) V_R=600V,V_{GE}=-15V	Tvj=25℃ Tvj=175℃		6.60 19.3		μC
Reverse Recovery Time	t_{rr}	I_F=180A, -diF/dt=550A/μs(T_{vj}=175℃) V_R=600V,V_{GE}=-15V	Tvj=25℃ Tvj=175℃		505 658		ns
Reverse recovered energy	E_{rec}	I_F=180A, -diF/dt=550A/μs(T_{vj}=175℃) V_R=600V,V_{GE}=-15V	Tvj=25℃ Tvj=175℃		2.8 8.24		mJ

Typical Characteristics

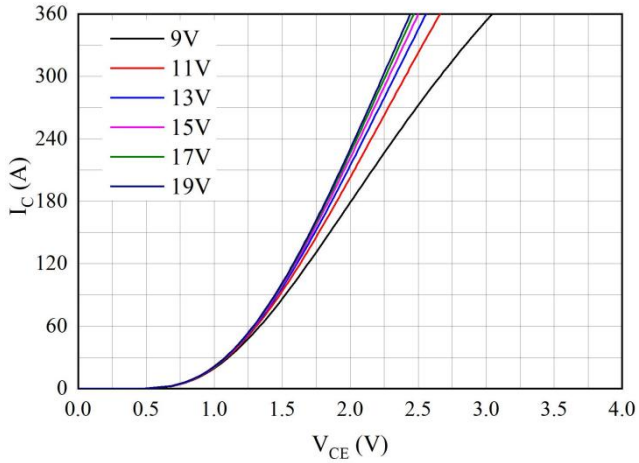


Fig 1.Typical output characteristics(T_{vj}=25℃)

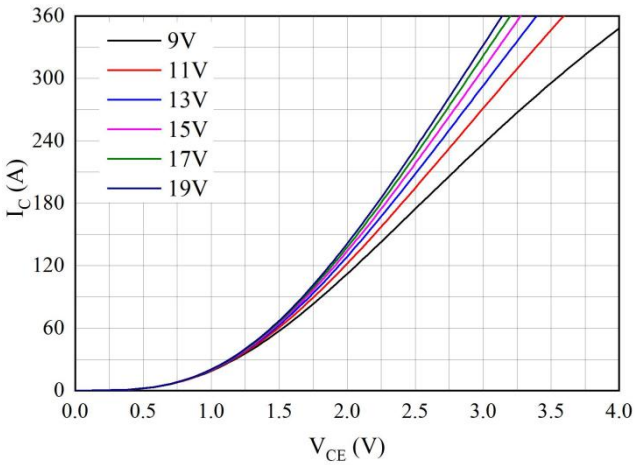


Fig 2.Typical output characteristics(T_{vj}=175℃)

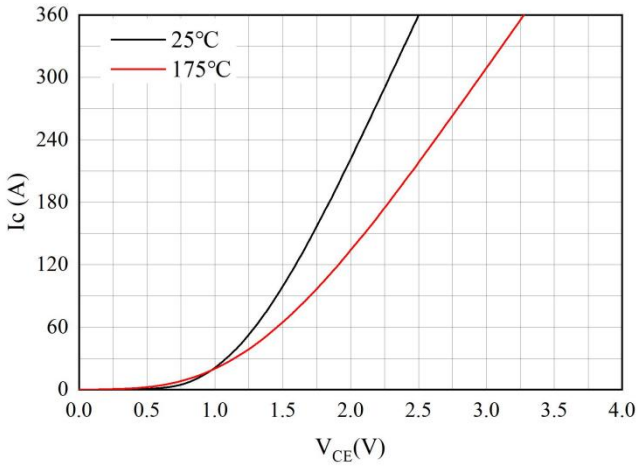


Fig 3.Typical output characteristics(V_{GE}=15V)

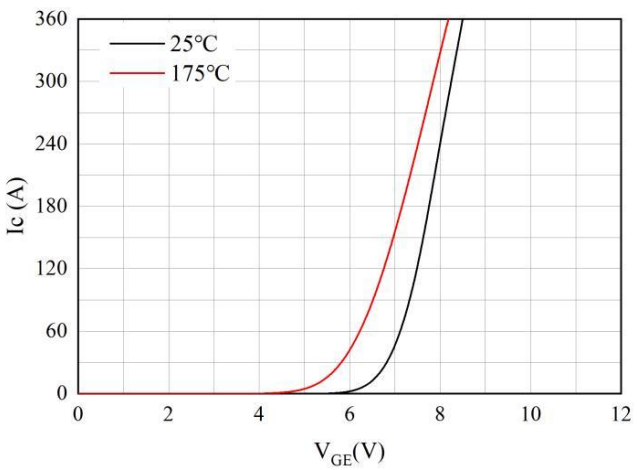


Fig 4.Typical transfer characteristic(V_{CE}=20V)

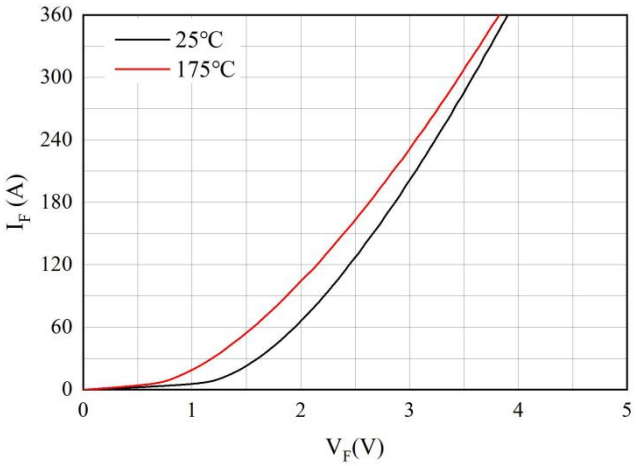


Fig 5.Forward characteristic of Diode

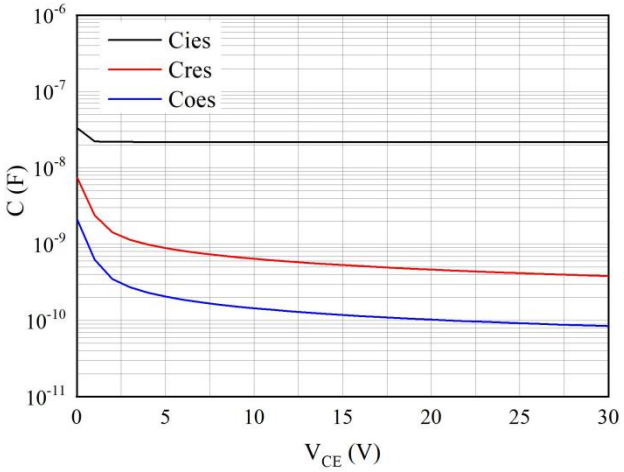


Fig 6.Capacitance characteristic

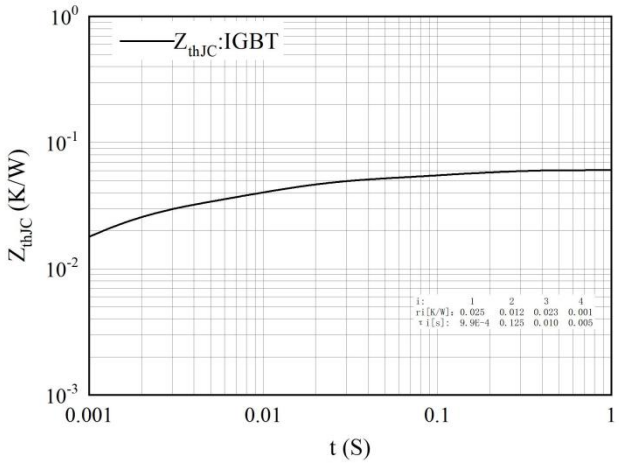


Fig 7.Transient thermal impedance IGBT, $Z_{thJC}=f(t)$

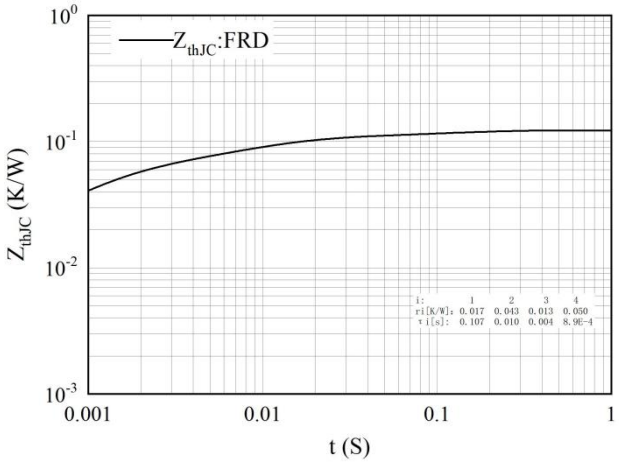


Fig 8.Transient thermal impedance FRD, $Z_{thJC}=f(t)$

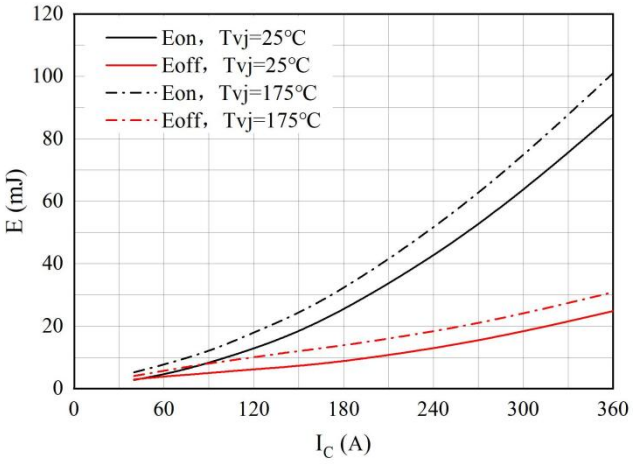


Fig 9.Switching losses of IGBT
V_{GE}=±15V,R_{gon}=5Ω,R_{goff}=15Ω,V_{CE}=600V

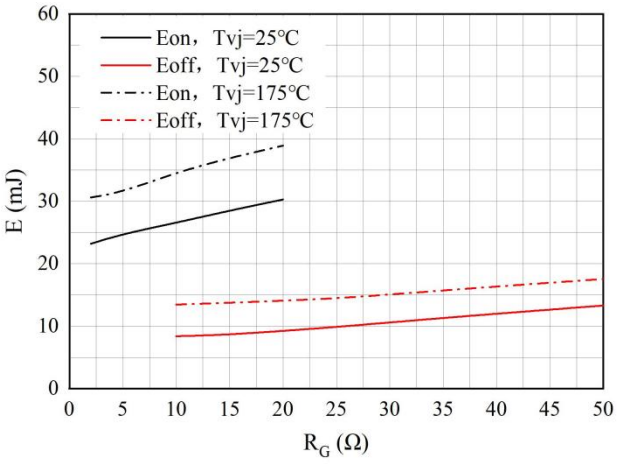


Fig 10.Switching losses of IGBT
V_{GE}=±15V,I_C=180A,V_{CE}=600V

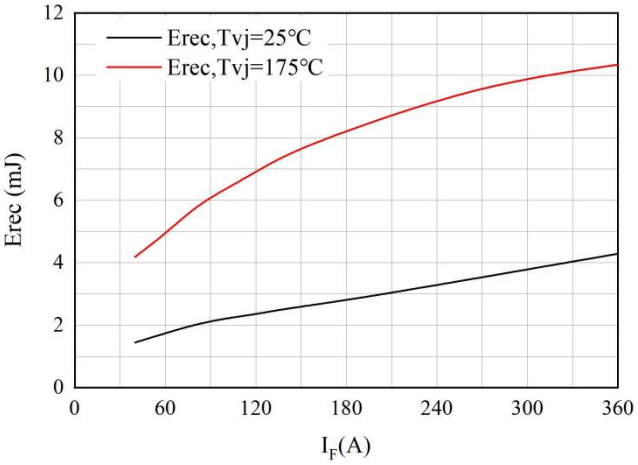


Fig 11.Switching losses of Diode
R_{gon}=5Ω,V_{CE}=600V

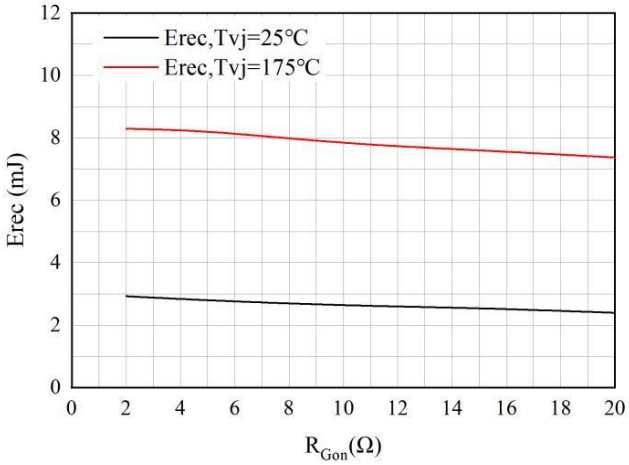
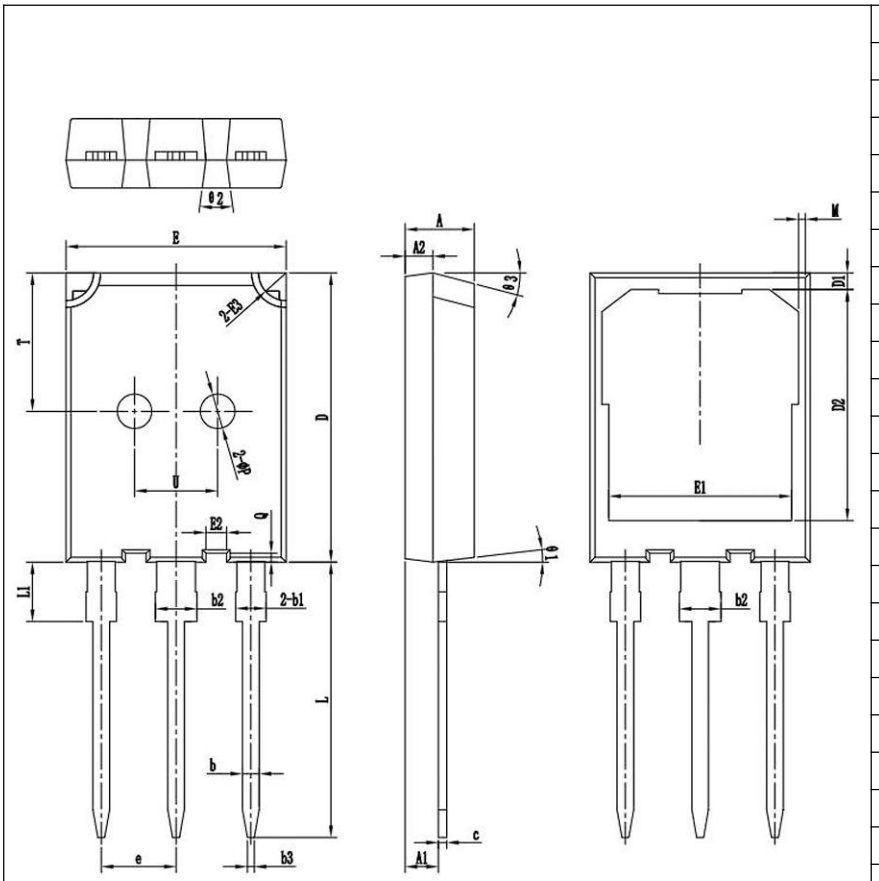


Fig 12.Switching losses of Diode
I_F=180A,V_{CE}=600V

Package Outlines (Unit：mm)

TO-247PLUS-3L



Dim.	Min	Nom	Max
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
b	1.15	1.20	1.25
b1	1.95	2.10	2.25
b2	2.95	3.10	3.25
b3	0.45	0.60	0.75
c	0.55	0.60	0.68
D	20.90	21.00	21.10
D1	1.00	1.20	1.40
D2	15.25	16.55	16.85
D3	0.58	0.68	0.78
E	15.70	15.80	15.90
E1	13.10	13.30	13.50
E2	1.25	1.45	1.65
E3	1.80	2.00	2.20
e	5.40	5.44	5.48
L	19.80	19.92	20.10
L1	-	-	4.30
ΦP	2.30	2.50	2.70
Q	0.50	0.68	0.80
T	9.80	10.00	10.20
U	5.80	6.00	6.20
θ1	5°	7°	9°
θ2	13°	16°	19°
θ3	13°	15°	17°
All Dimensions in millimeter			

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