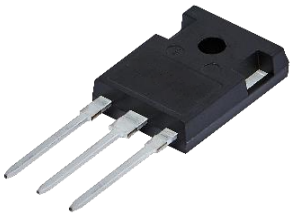
IGBT Discrete with Anti-Parallel Diode

V_{CES} =700V， $I_{C\ nom}$ =40A / I_{CRM} =120A



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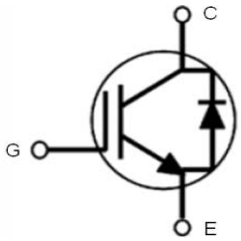


Features：

- 700V Trench /Field Stop type
- Low switching losses
- Vcesat has a positive temperature coefficient

Applications:

- Charging station
- OBC
- Uninterruptible power supplies
- Inverters

IGBT

Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
Collector-Emitter voltage	T_{vj}=25°C	V_{CES}	700	V
Continuous DC collector current	T_C=100°C, $T_{vj\ max}$=175°C	$I_{C\ nom}$	40	A
Repetitive peak collector current	t_P=1 ms	I_{CRM}	120	A
Gate emitter voltage	t_p ≤0.5μs, D<0.001	V_{GE}	±20 ±30	V

Power dissipation	T_C=25℃ T_C=100℃	P_{tot}	294 147	W
Temperature under switching conditions		$T_{vj\ op}$	-40…+175	℃
Storage temperature		T_{stg}	-40…+150	℃

Thermal Characteristics

Parameter	Conditions	Symbol	Value	Unit
IGBT thermal resistance, junction - case		$R_{th(j-C)}$	0.51	K/W
Diode thermal resistance, junction - case		$R_{th(j-C)}$	0.42	K/W

Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
Collector-Emitter saturation voltage	V_{GE}=15V, I_C=40A V_{GE}=15V, I_C=40A V_{GE}=15V, I_C=40A	T_{vj}=25°C T_{vj}=150°C T_{vj}=175°C	V_{CEsat}		1.42 1.70 1.73	1.80	V
Gate-Emitter threshold voltage	I_C=0.4mA, V_{GE}= V_{CE}	T_{vj}=25°C	$V_{GE(th)}$	4.3	4.9	5.5	V
Transconductance	V_{CE}=20V， I_C=40A		G_{fs}		67		S
Input capacitance	f=100kHz, V_{CE}=25 V, V_{GE}=0 V	T_{vj}=25°C	C_{ies}		5514		pF
Output capacitance			C_{oes}		202		pF
Reverse transfer capacitance			C_{res}		93		pF
Gate charge	I_C = 40A, V_{GE} = 15 V, V_{CE} =560V	T_{vj}=25°C	Q_G		533		nC
Collector-emitter cut-off current	V_{CE}=700V , V_{GE}= 0 V	T_{vj}=25°C	I_{CES}			1	mA
Gate-emitter leakage current	V_{CE}=0 V, V_{GE}= 20 V	T_{vj}=25°C	I_{GES}			200	nA
Turn-on delay time	I_C=40A, V_{CE}=400V V_{GE}=±15 V, R_G=8Ω (inductive load)	T_{vj}=25°C T_{vj}=175°C	$t_{d(on)}$		24 20		ns
Rise time	I_C=40A, V_{CE}=400V V_{GE}=±15 V, R_G=8Ω (inductive load)	T_{vj}=25°C T_{vj}=175°C	t_r		61 56		ns

Turn-off delay time	I_C=40A, V_{CE}=400V V_{GE}=±15 V, R_G=8Ω (inductive load)	T_{vj}=25°C T_{vj}=175°C	$t_{d(off)}$		148 172		ns
Fall time	I_C=40A, V_{CE}=400V V_{GE}=±15 V, R_G=8Ω (inductive load)	T_{vj}=25°C T_{vj}=175°C	t_f		41 77		ns
Turn-on energy loss per pulse	I_C=40A, V_{CE}=400V V_{GE}=±15 V, R_G=8Ω di/dt=600A/us(T_{vj}=175°C) (inductive load)	T_{vj}=25°C T_{vj}=175°C	E_{on}		1.31 2.83		mJ
Turn-off energy loss per pulse	I_C=40A, V_{CE}=400V V_{GE}=±15 V, R_G=8Ω dv/dt=9000V/us(T_{vj}=175°C) (inductive load)	T_{vj}=25°C T_{vj}=175°C	E_{off}		0.51 0.74		mJ

Diode

Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
Repetitive peak reverse voltage	T_{vj}=25°C	V_{RRM}	700	V
Continuous DC forward current	T_C=100°C, $T_{vj\ max}$=175°C	I_F	40	A
Repetitive peak forward current	t_p=1ms	I_{FRM}	120	A

Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
Forward voltage	I_F=40A, V_{GE}=0V I_F=40A, V_{GE}=0V I_F=40A, V_{GE}=0V	T_{vj}=25°C T_{vj}=150°C T_{vj}=175°C	V_F		1.52 1.23 1.19	2.00	V
Peak reverse recovery current	I_F=40A, -di$_F$/dt=600A/μs(T_{vj}=175°C) V_R=400V, V_{GE}=-15V	T_{vj}=25°C T_{vj}=175°C	I_{RM}		15.36 41.28		A
Reverse Recovered charge	I_F=40A, -di$_F$/dt=600A/μs(T_{vj}=175°C) V_R=400V, V_{GE}=-15V	T_{vj}=25°C T_{vj}=175°C	Q_{rr}		0.96 5.39		μC
Reverse Recovery Time	I_F=40A, -di$_F$/dt=600A/μs(T_{vj}=175°C) V_R=400V, V_{GE}=-15V	T_{vj}=25°C T_{vj}=175°C	t_{rr}		119 200		ns
Reverse recovered energy	I_F=40A, -di$_F$/dt=600A/μs(T_{vj}=175°C) V_R=400V, V_{GE}=-15V	T_{vj}=25°C T_{vj}=175°C	E_{rec}		0.22 1.13		mJ

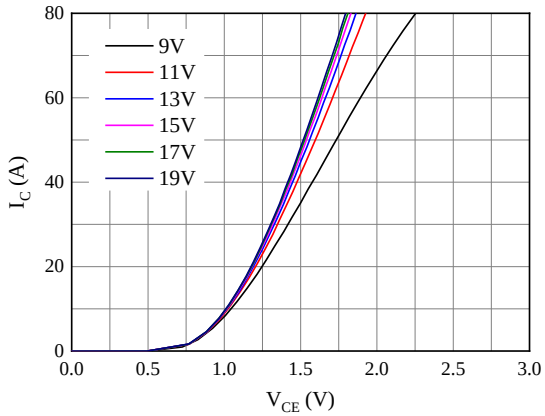


Fig 1. Typical output characteristics (T_{vj}=25℃)

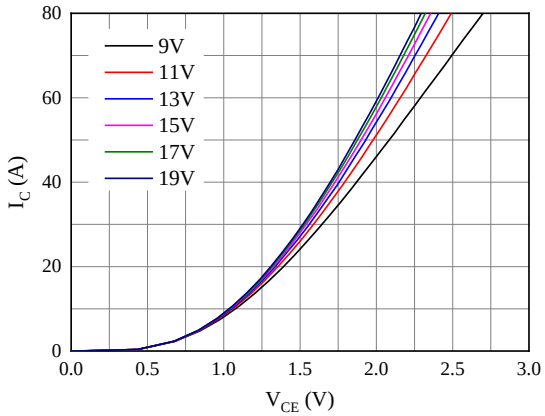


Fig 2. Typical output characteristics (T_{vj}=175℃)

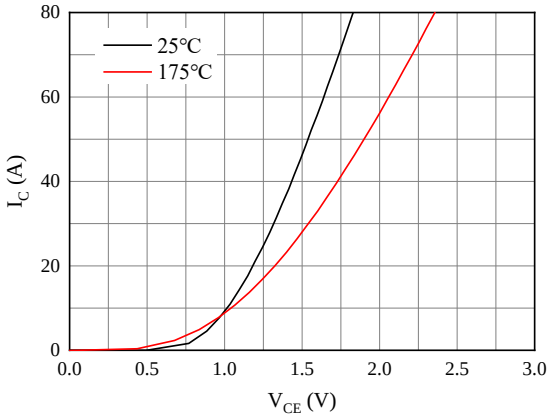


Fig 3. Typical output characteristics (V_{GE}=15V)

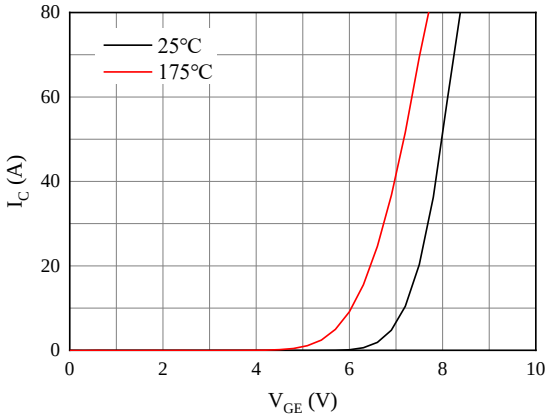


Fig 4. Typical transfer characteristic(V_{CE}=20V)

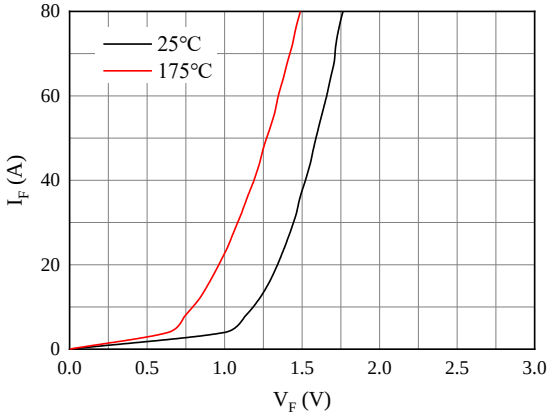


Fig 5. Forward characteristic of Diode

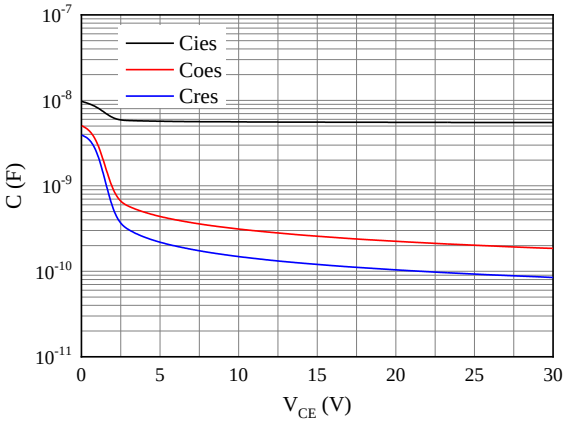


Fig 6. Capacitance characteristic

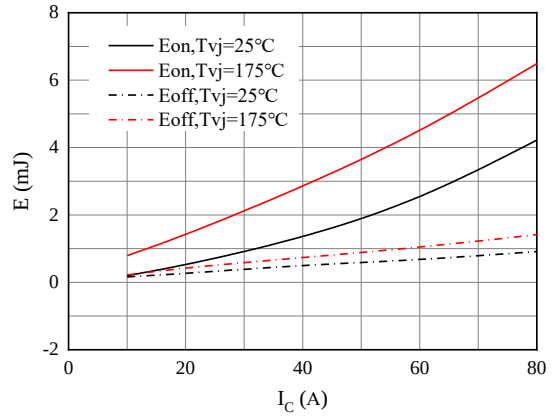


Fig 7. Switching losses of IGBT

V_{GE}=±15V, Rgon=8Ω, Rgoff=8Ω, V_{CE}=400V

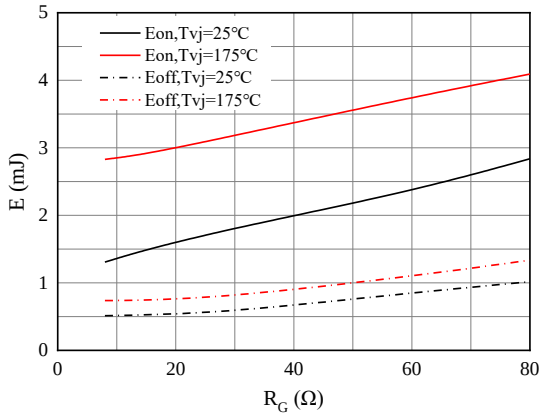


Fig 8. Switching losses of IGBT

V_{GE}=±15V, I_C=40A, V_{CE}=400V

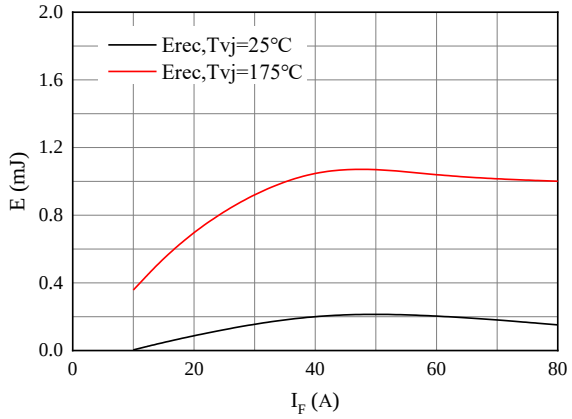


Fig 9. Switching losses of Diode

Rgon=8Ω, V_{CE}=400V

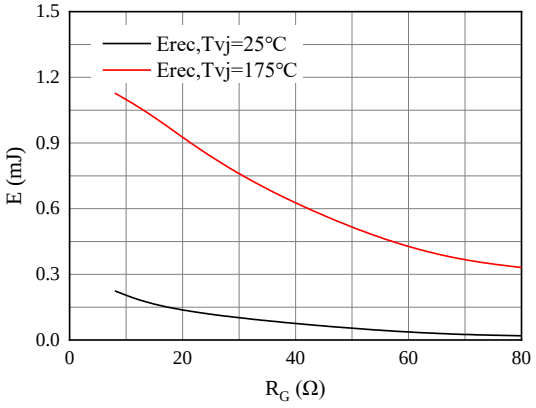


Fig 10. Switching losses of Diode

I_F=40A, V_{CE}=400V

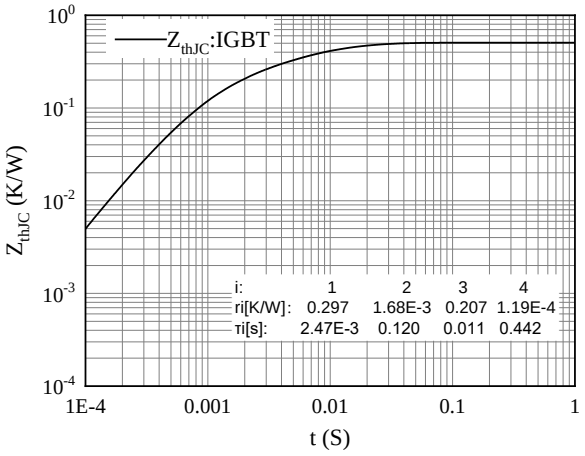


Fig 11. Transient thermal impedance IGBT, Z_{thJC}=f(t)

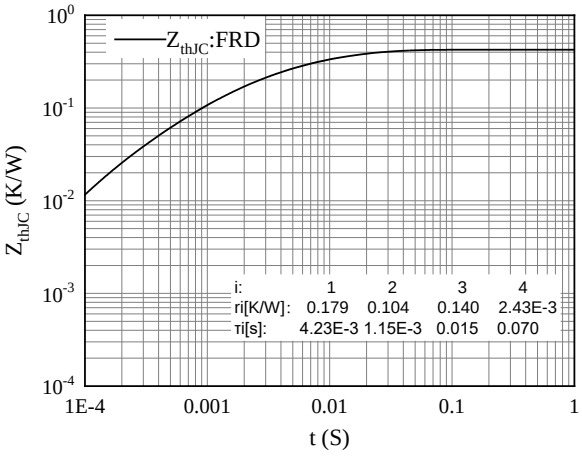
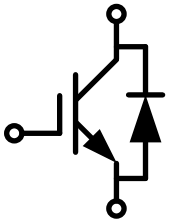
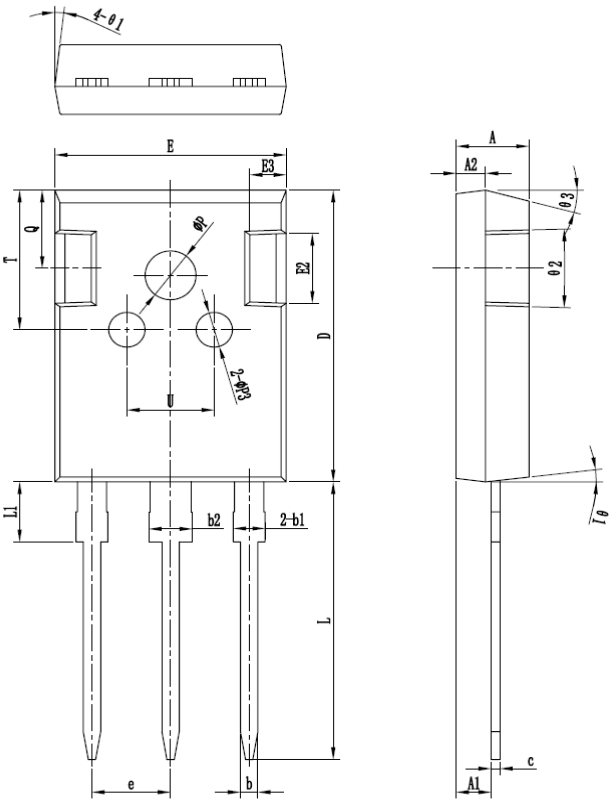


Fig 12. Transient thermal impedance FRD, Z_{thJC}=f(t)

Circuit diagram



Package outlines



symbol	unit: mm		
	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
*c	0.55	0.60	0.65
*D	20.90	21.00	21.10
D1	16.35	16.55	16.75
D2	1.05	1.20	1.35
*E	15.70	15.80	15.90
E1	13.10	13.25	13.40
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
*e	5.40	5.44	5.48
*L	19.80	19.92	20.10
*L1	–	–	4.30
*φP	3.70	3.80	3.90
*φP1	3.50	3.60	3.70
φP2	7.00	7.20	7.40
φP3	2.40	2.50	2.60
Q	5.60	5.80	6.00
*S	6.05	6.15	6.25
T	9.80	10.00	10.20
U	6.00	6.20	6.40
θ1	5°	7°	9°
θ2	1°	3°	5°
θ3	13°	15°	17°