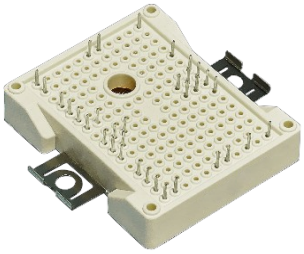
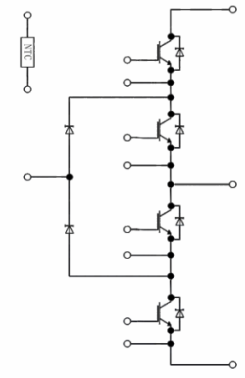
3-Level IGBT Module

V_{CES} =650V， $I_{C\ nom}$ =150A / I_{CRM} =300A



H6



Equivalent Circuit

Features：

- Trench /Field Stop process
- Low switching losses
- Vcesat has a positive temperature coefficient

Applications:

- 3-Level-Applications
- UPS
- Photovoltaic application

IGBT, Inverter

Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
Collector-Emitter voltage	T_{vj}=25°C	V_{CES}	650	V
Continuous DC collector current	T_C=100°C, $T_{vj\ max}$=175°C	$I_{C\ nom}$	150	A
Repetitive peak collector current	t_P=1 ms	I_{CRM}	300	A
Gate emitter voltage		V_{GE}	±20	V

Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
Collector-Emitter saturation voltage	V_{GE}=15V, I_C=150A V_{GE}=15V, I_C=150A V_{GE}=15V, I_C=150A	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	V_{CEsat}		1.57 1.82 1.86	1.95	V
Gate-Emitter threshold voltage	I_C=2.4mA, V_{GE}= V_{CE}	T_{vj}=25°C	$V_{GE(th)}$	4.7	5.3	5.9	
Gate charge	VGE = -15 V ... +15 V		Q_G		1.54		µC
Internal gate resistor	Tvj = 25°C		R_{Gint}		None		Ω
Input capacitance	f=1 MHz, V_{CE}=25 V, V_{GE}=0 V	T_{vj}=25°C	C_{ies}		16.47		nF
Reverse transfer capacitance			C_{res}		0.27		nF
Collector-emitter cut-off current	V_{CE}=650V , 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}			400	nA
Turn-on delay time	I_C=150A, V_{CE}=300 V V_{GE}=±15 V, R_G=3.3Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	$t_{d\ on}$		12 12 14		ns
Rise time	I_C=150A, V_{CE}=300 V V_{GE}=±15 V, R_G=3.3Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	t_r		28 29 31		
Turn-off delay time	I_C=150A, V_{CE}=300 V V_{GE}=±15 V, R_G=3.3Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	$t_{d\ off}$		167 180 182		
Fall time	I_C=150A, V_{CE}=300 V V_{GE}=±15 V, R_G=3.3Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	t_f		54 59 63		
Turn-on energy loss per pulse	I_C=150A, V_{CE}=300 V V_{GE}=±15 V, R_G=3.3Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{on}		0.66 0.83 0.91		mJ
Turn-off energy loss per pulse	I_C=150A, V_{CE}=300 V V_{GE}=±15 V, R_G=3.3Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{off}		1.28 1.66 1.80		
Temperature under switching conditions			$T_{vj\ op}$	-40		150	°C

Diode, Inverter

Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
Repetitive peak reverse voltage	T_{vj}=25°C	V_{RRM}	650	V
Continuous DC forward current		I_F	150	A
Repetitive peak forward current	t_p=1ms	I_{FRM}	300	A
I^2t-value	VR = 0 V, t_P = 10 ms, Tvj = 125°C	I^2t	1200	A^2s

Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
Forward voltage	I_F=150A, V_{GE}=0V I_F=150A, V_{GE}=0V I_F=150A, V_{GE}=0V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	V_F		1.62 1.71 1.69	2.00	V
Peak reverse recovery current	IF = 150 A, -diF/dt =4281A/µs(Tvj=150°C) VR = 300 V ,VGE = -15 V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	I_{RM}		83 102 112		A
Recovered charge	IF = 150 A, -diF/dt =4281A/µs(Tvj=150°C) VR = 300 V ,VGE = -15 V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	Q_r		3.05 5.32 6.17		µC
Reverse recovered energy	IF = 150 A, -diF/dt =4281A/µs(Tvj=150°C) VR = 300 V ,VGE = -15 V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{rec}		0.69 1.28 1.49		mJ
Temperature under switching conditions			$T_{vj\ op}$	-40		150	°C

Diode, D5-D6

Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
Repetitive peak reverse voltage	T_{vj}=25°C	V_{RRM}	650	V
Continuous DC forward current		I_F	150	A
Repetitive peak forward current	t_p=1ms	I_{FRM}	300	A
I^2t-value	t_p=10ms，sin180°，T_{vj}=125°C	I^2t	1200	A^2s

Characteristic Value

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
Forward voltage	I_F=150A, V_{GE}=0V I_F=150A, V_{GE}=0V I_F=150A, V_{GE}=0V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	V_F		1.65 1.76 1.73	2.00	V
Reverse current	IF = 150 A, - diF/dt=4281A/µs(Tvj=150°C) VR = 300 V	Tvj = 25°C Tvj=125°C Tvj=150°C	I_{RM}		83 102 112		A
Recovered charge	IF = 150 A, - diF/dt=4281A/µs(Tvj=150°C) VR = 300 V	Tvj = 25°C Tvj=125°C Tvj=150°C	Qr		3.05 5.32 6.17		µC
Reverse recovery energy	IF = 150 A, - diF/dt=4281A/µs(Tvj=150°C) VR = 300 V	Tvj = 25°C Tvj=125°C Tvj=150°C	Erec		0.69 1.28 1.49		mJ
Temperature under switching conditions			$T_{vj\ op}$	-40		150	°C

NTC-Thermistor

Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
Rated resistances	T_C=25°C，±5%	R_{25}		5		kΩ
B-value	±1%	$B_{25/50}$		3380		K

Module

Parameter	Conditions	Symbol	Value			Unit
Isolation test voltage	RMS, f=50Hz, t=60s	V_{ISOL}	2500			V
Internal isolation			Al_2O_3			
Storage temperature		T_{stg}	-40		125	°C
Mounting torque for modul mounting		M	3.0		6.0	Nm
Weight		W		41		g

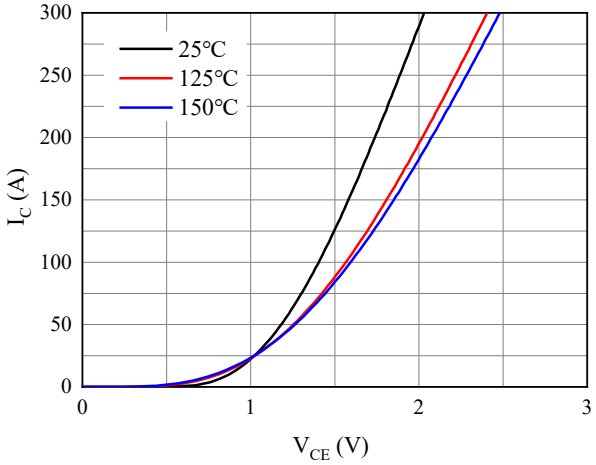


Fig 1. Typical output characteristics (V_{GE}=15V)

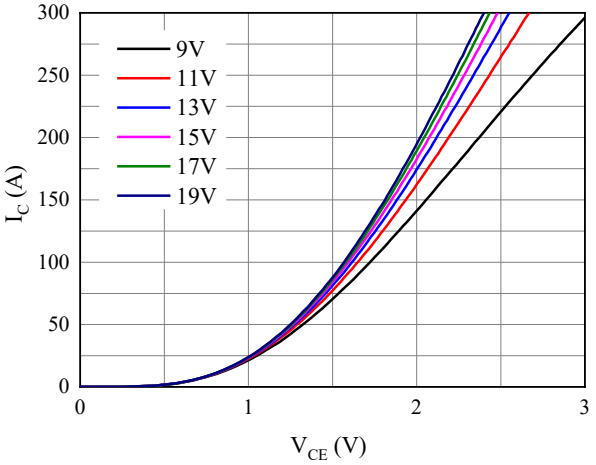


Fig 2. Typical output characteristics (T_{vj}=150℃)

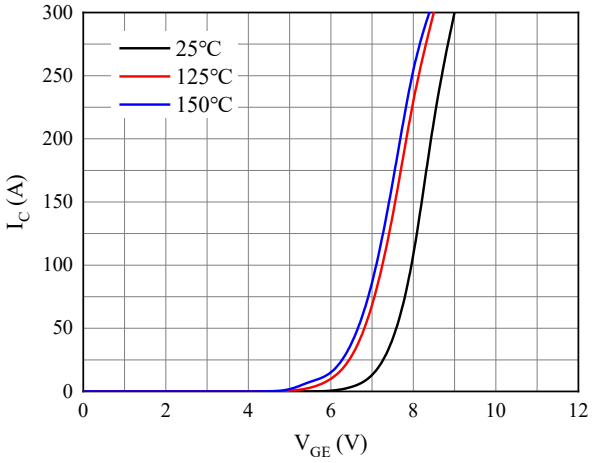


Fig 3. Typical transfer characteristic(V_{CE}=20V)

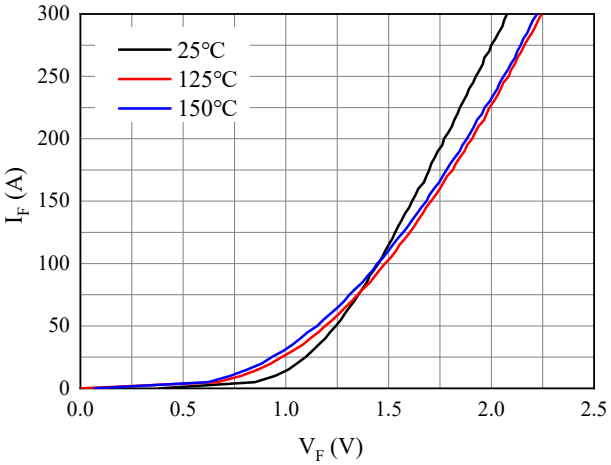


Fig 4. Forward characteristic of Diode

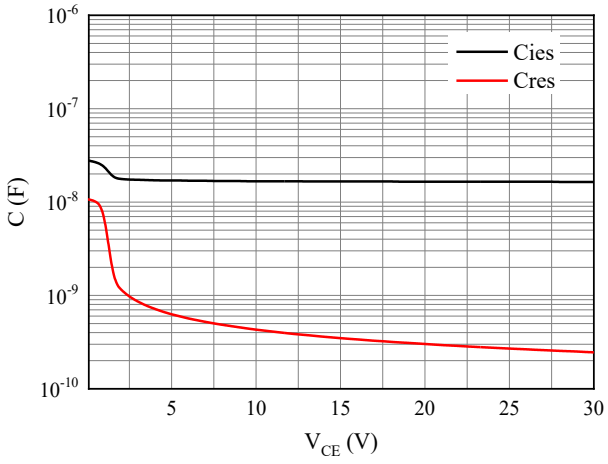


Fig 5. Capacitance characteristic

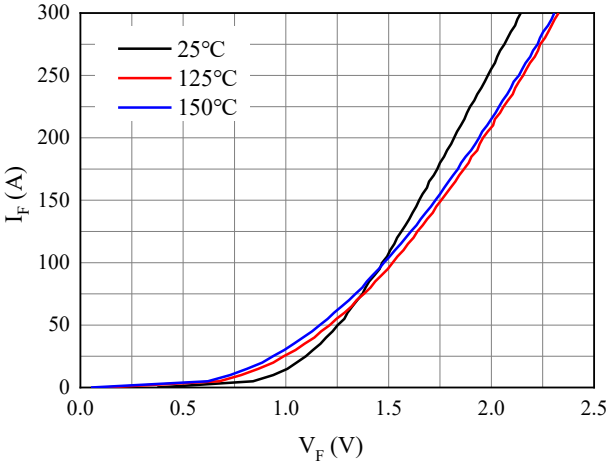


Fig 6. Forward characteristic of Diode,D5-D6

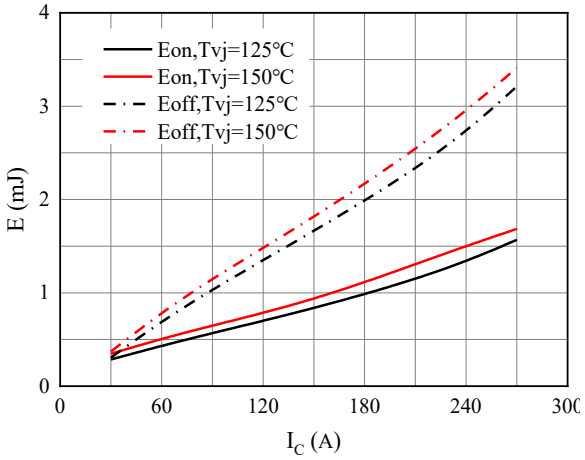


Fig 7. Switching losses of IGBT
VGE=±15V, RGon=3.3Ω, RGoff=3.3Ω, VCE=300V

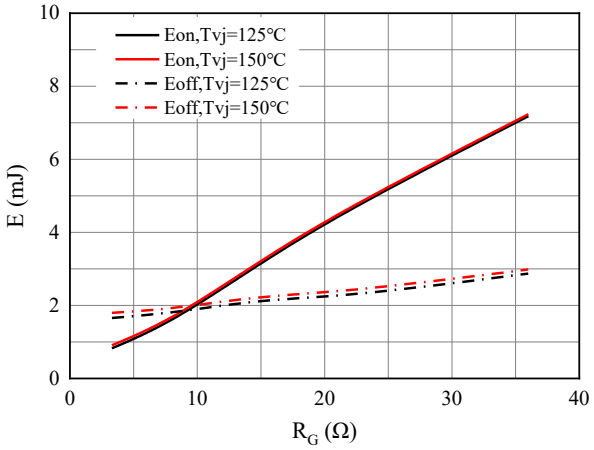


Fig 8. Switching losses of IGBT
VGE=±15V, IC=150A, VCE=300V

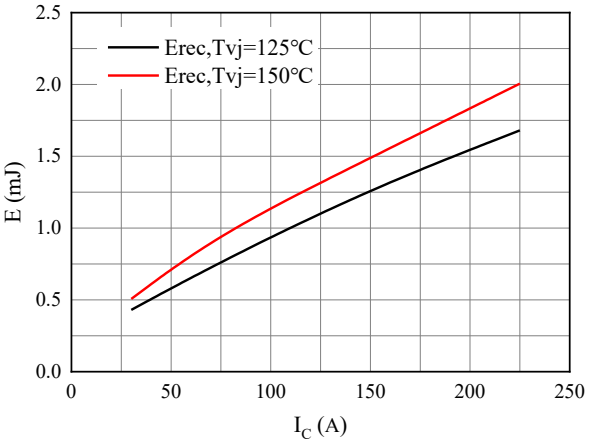


Fig 9. Switching losses of Diode
RGon=3.3Ω, VCE=300V

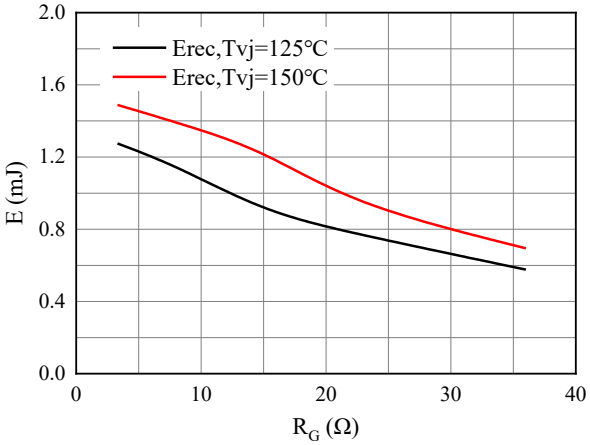


Fig 10. Switching losses of Diode
IF=150A, VCE=300V

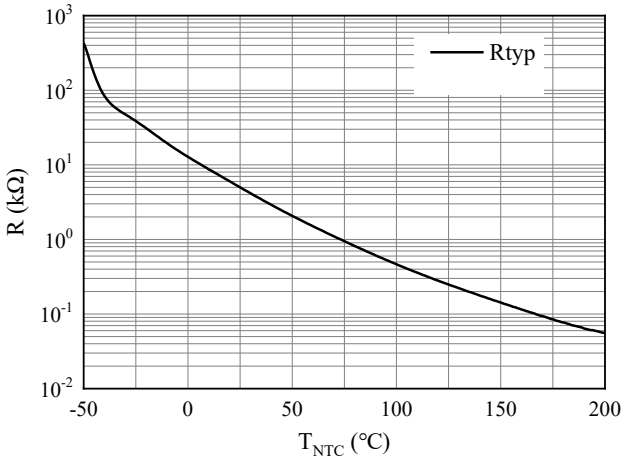
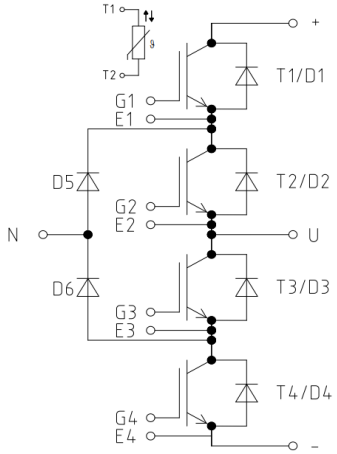


Fig 11.NTC-Themistor-temperature characteristic

Circuit diagram



Package outlines