

**Trench FS IGBT****Features**

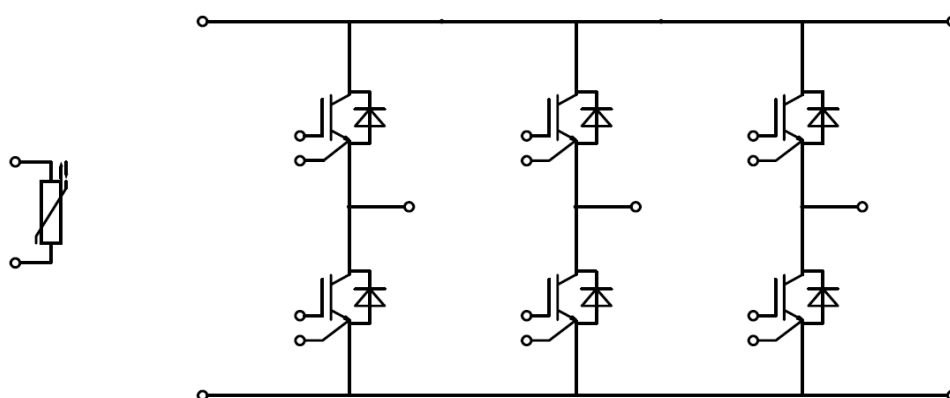
- High Power Density
- High mechanical robustness
- Compact design
- Isolated heatsink using DBC technology
- Very low forward voltage drops
- Fast & soft reverse recovery anti-parallel FWD

Product Summary

Parameter	Value	Unit
V_{CES}	1200	V
$I_C(@ T_C = 100^{\circ}\text{C})$	150	A
$I_{CRM}(@ t_P = 1\text{ms})$	300	A
$V_{CE(sat)}(\text{Typ})$	1.90	V

Applications

- AC and DC servo drive amplifier
- UPS (Uninterruptible Power Supplies)
- Motor Drives

**IGBT, Inverter Absolute Maximum Ratings (@ $T_C = 25^{\circ}\text{C}$ unless otherwise specified)**

Parameter	Conditions	Symbol	Values	Unit
Collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{CES}	1200	V
Gate-emitter peak voltage		V_{GES}	± 20	V
Continuous collector current	$T_C = 100^{\circ}\text{C}$	I_C	150	A
Repetitive peak collector current	$t_P = 1\text{ms}$	I_{CRM}	300	A
Total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$	P_{tot}	714	W

**IGBT, Inverter Electrical Characteristics (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)**

Parameter	Conditions		Symbol	Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	$I_C = 150\text{A}$, $V_{GE} = 15\text{V}$	$T_{vj} = 25^\circ\text{C}$	$V_{CE(sat)}$		1.90	2.25	V
		$T_{vj} = 125^\circ\text{C}$			2.25		
		$T_{vj} = 150^\circ\text{C}$			2.35		
Gate threshold voltage	$V_{CE}=V_{GE}$, $I_C=4.0\text{mA}$		$V_{GE(th)}$	5.4	6.0	6.6	V
Gate-emitter leakage current	$V_{CE} = 0\text{V}$, $V_{GE} = 20\text{V}$		I_{GES}			400	nA
Collector leakage current	$V_{CE}=1200\text{V}$, $V_{GE}=0\text{V}$		I_{CES}			1	mA
Input capacitance	$f = 1\text{MHz}$, $T_{vj} = 25^\circ\text{C}$, $V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$		C_{ies}		10.4		nF
Reverse transfer capacitance			C_{res}		0.29		nF
Gate charge	$V_{GE} = -15\text{V} \dots +15\text{V}$		Q_G		0.78		μC
Internal gate resistor			R_{Gint}		7.5		Ω
Turn-on delay time, inductive load	$V_{CE} = 600\text{V}$, $I_C = 150\text{A}$, $R_G = 6.9\Omega$, $V_{GE} = \pm 15\text{V}$, $T_{vj} = 25^\circ\text{C}$		$t_{d(on)}$		240		ns
Rise time, inductive load			t_r		126		ns
Turn-off delay time, inductive load			$t_{d(off)}$		350		ns
Fall time, inductive load			t_f		25		ns
Turn-on energy loss per pulse			E_{on}		26.27		mJ
Turn-off energy loss per pulse			E_{off}		7.51		mJ
Turn-on delay time, inductive load	$V_{CE} = 600\text{V}$, $I_C = 150\text{A}$, $R_G = 6.9\Omega$, $V_{GE} = \pm 15\text{V}$, $T_{vj} = 125^\circ\text{C}$		$t_{d(on)}$		244		ns
Rise time, inductive load			t_r		145		ns
Turn-off delay time, inductive load			$t_{d(off)}$		374		ns
Fall time, inductive load			t_f		51		ns
Turn-on energy loss per pulse			E_{on}		36.93		mJ
Turn-off energy loss per pulse			E_{off}		8.73		mJ
SC Data	$t_p \leq 10\mu\text{s}$, $V_{GE} \leq 15\text{V}$, $V_{CC} = 900\text{V}$, $V_{CEM} \leq 1200\text{V}$, $T_{vj} = 125^\circ\text{C}$		I_{SC}		770		A
Thermal resistance, junction to case	per IGBT		$R_{th(j-c)}$			0.21	K/W
Temperature under switching conditions			$T_{vj\ op}$	-40		150	$^\circ\text{C}$

**FRED, Inverter Absolute Maximum Ratings (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)**

Parameter	Conditions	Symbol	Values	Unit
Repetitive peak reverse voltage	$T_{vj} = 25^\circ\text{C}$	V_{RRM}	1200	V
Continuous DC forward current		I_F	150	A
Repetitive peak forward current	$t_P = 1\text{ms}$	I_{FRM}	300	A
I^2t value for fusing	$T_{vj} = 150^\circ\text{C}$, $t_P = 10\text{ms}$, $V_R = 0\text{V}$	I^2t	2950	A^2s

FRED, Inverter Electrical Characteristics (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Conditions		Symbol	Values			Unit
				Min.	Typ.	Max.	
Forward voltage	I _F = 150A, V _{GE} = 0V	T _{vj} = 25°C	V _F		1.80	2.20	V
		T _{vj} = 125°C			1.60		
		T _{vj} = 150°C			1.55		
Peak reverse recovery current	I _F =150A, V _R =600V, V _{GE} =-15V, di/dt=900A/μs	T _{vj} = 25°C	I _{RM}		39.1		A
		T _{vj} = 125°C			58.4		
Recovery charge		T _{vj} = 25°C	Q _{rr}		6.92		μC
		T _{vj} = 125°C			18.34		
Peak reverse recovery energy		T _{vj} = 25°C	E _{rec}		1.65		mJ
		T _{vj} = 125°C			4.29		
Thermal resistance, junction to case	per diode		R _{th(j-c)}			0.32	K/W
Temperature under switching conditions			T _{vj op}	-40		150	°C

**NTC-Thermistor Characteristics (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)**

Parameter	Conditions	Symbol	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	$T_C = 25^\circ\text{C}$	R_{25}		5		K Ω
Deviation of R100	$T_C = 100^\circ\text{C}$, $R_{100} = 493 \Omega$	$\Delta R/R$	-5		5	%
Power dissipation	$T_C = 25^\circ\text{C}$	P_{25}			20	mW
B-value	$R_2 = R_{25} \exp [B_{25}/50(1/T_2 - 1/(298,15 \text{ K}))]$	$B_{25}/50$		3375		K
B-value	$R_2 = R_{25} \exp [B_{25}/80(1/T_2 - 1/(298,15 \text{ K}))]$	$B_{25}/80$		3411		K
B-value	$R_2 = R_{25} \exp [B_{25}/100(1/T_2 - 1/(298,15 \text{ K}))]$	$B_{25}/100$		3433		K

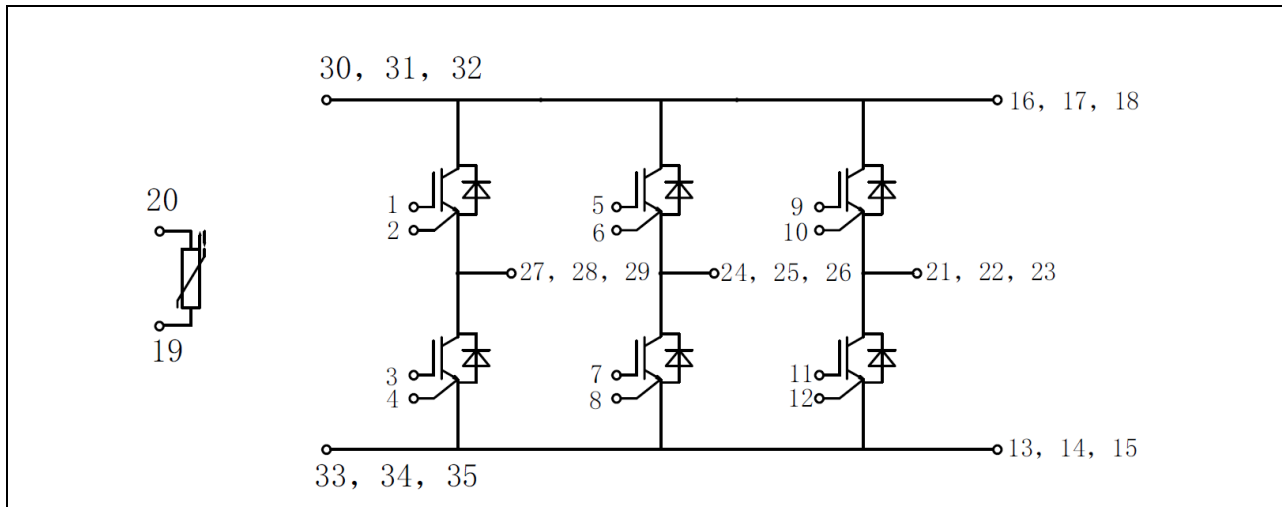
Module Characteristics

Parameter	Conditions	Symbol	Values			Unit
			Min.	Typ.	Max.	
Isolation Voltage (All Terminals Shorted)	RMS, $f = 50\text{Hz}$, 1minute	V_{iso}	2.5			KV
Thermal resistance, case to heatsink	per module	$R_{th(c-s)}$		0.009		K/W
Maximum Junction Temperature	Inverter, brake-chopper	$T_{vj \max}$			175	$^\circ\text{C}$
Stray inductance module		L_{SCE}		60		nH
Module lead resistance, terminals - chip	per switch	$R_{CC'+EE'}$		4		m Ω
		$R_{AA'+CC'}$		2		m Ω
Storage Temperature		T_{stg}	-40		125	$^\circ\text{C}$
Mounting torque	Module and heatsink fixed torque M5	M	3.0		6.0	N m

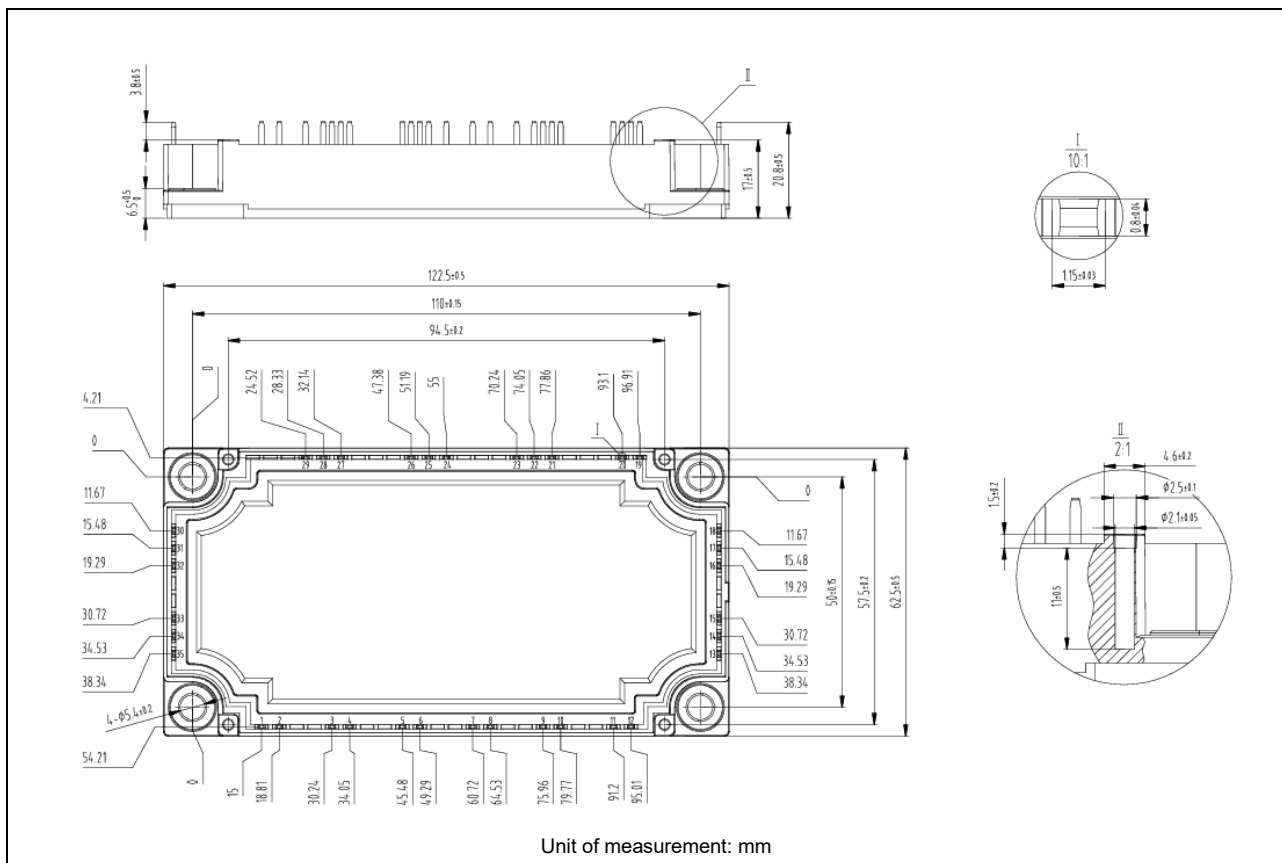
Ordering Information

Device	Marking	Package	Weight	Inner Box	Per Carton
JMG150TF12P3S1	JMG150TF12P3S1	P3	300g/PCS	10PCS	50PCS

Circuit Diagram



Package Outlines (mm)



Typical Electrical & Thermal Characteristics

Fig 1. IGBT Output Characteristics
Inverter (typical) $V_{GE}=15\text{ V}$

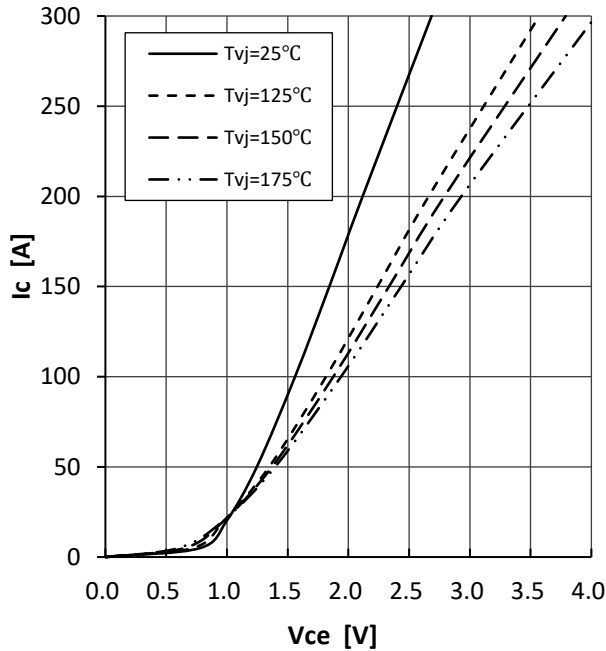


Fig 2. IGBT Output Characteristics
Inverter (typical)

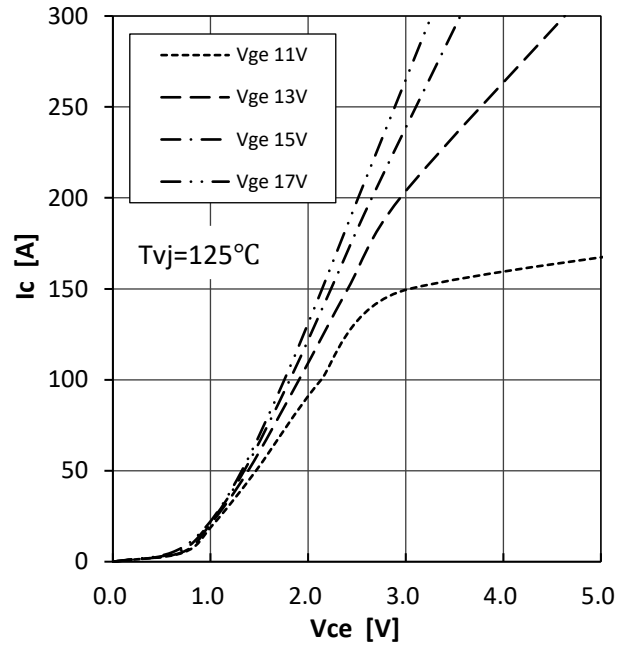


Fig 3. IGBT Transfer Characteristics
Inverter (typical) $V_{CE}=20\text{ V}$

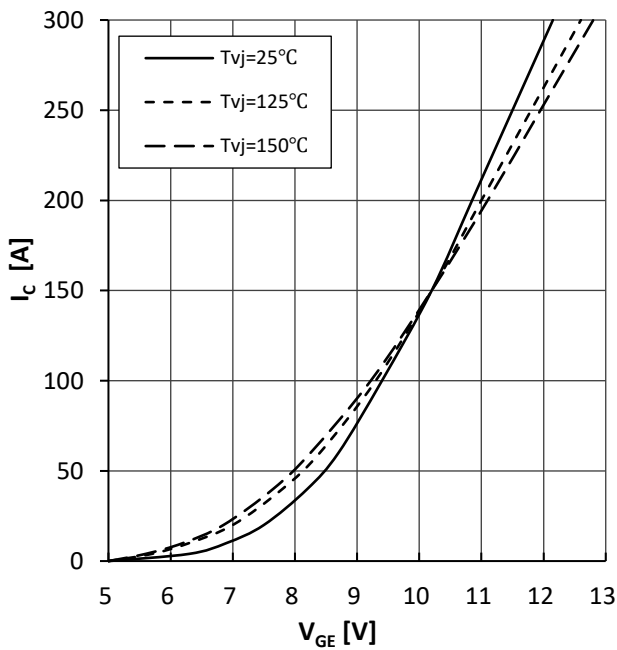


Fig 4. IGBT Switching Loss vs I_c
Inverter (typical)
 $R_g=6.9\ \Omega$, $V_{CE}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$

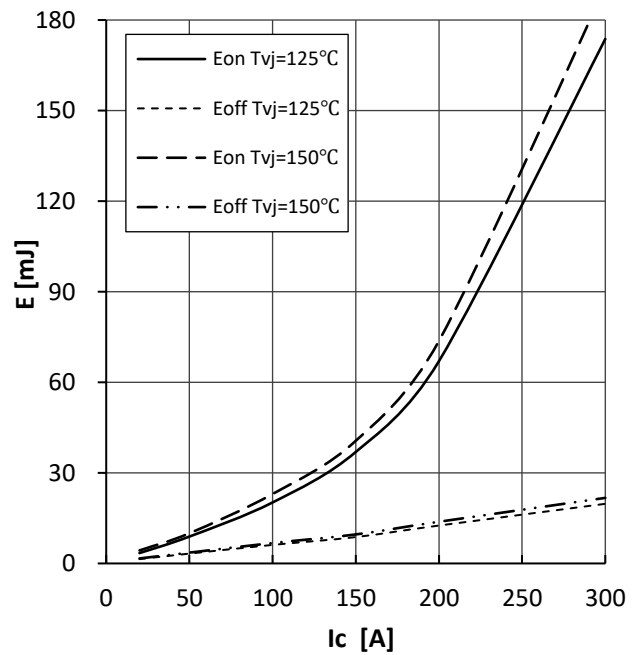


Fig 5. IGBT Switching Loss vs. R_g ,
Inverter (typical)
 $I_c=150\text{ A}$, $V_{CE}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$

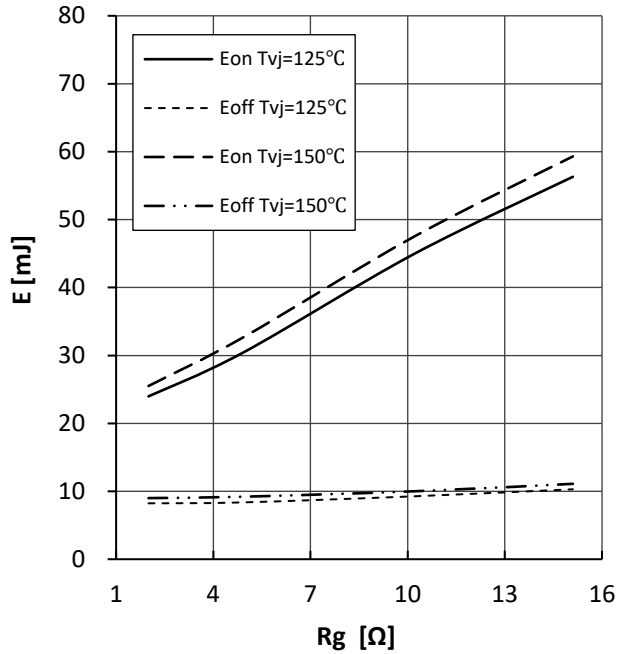


Fig 6. IGBT Transient Thermal Impedance
Inverter

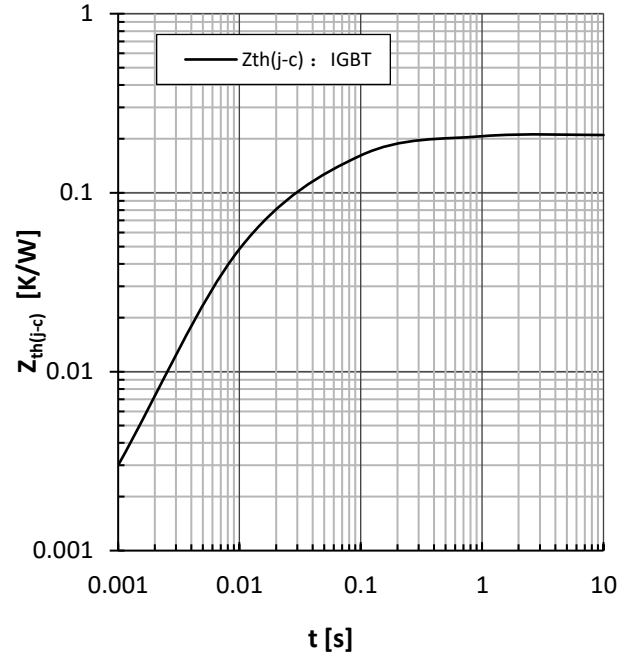


Fig 7. Reverse bias safe operating area
IGBT, Inverter (RBSOA)

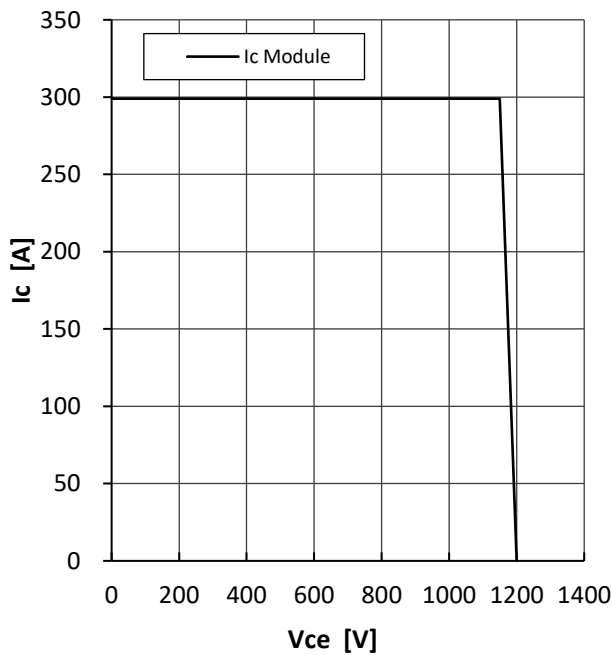


Fig 8. FRED Forward Characteristics,
Inverter (typical)

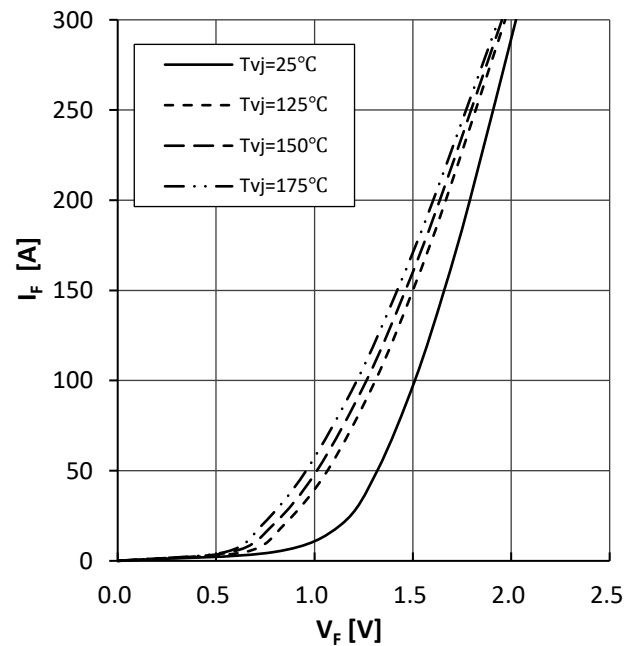


Fig 9. FRED Switching Loss vs. I_c ,
Inverter (typical)
 $R_g=6.9\ \Omega$, $V_{CE}=600\ V$

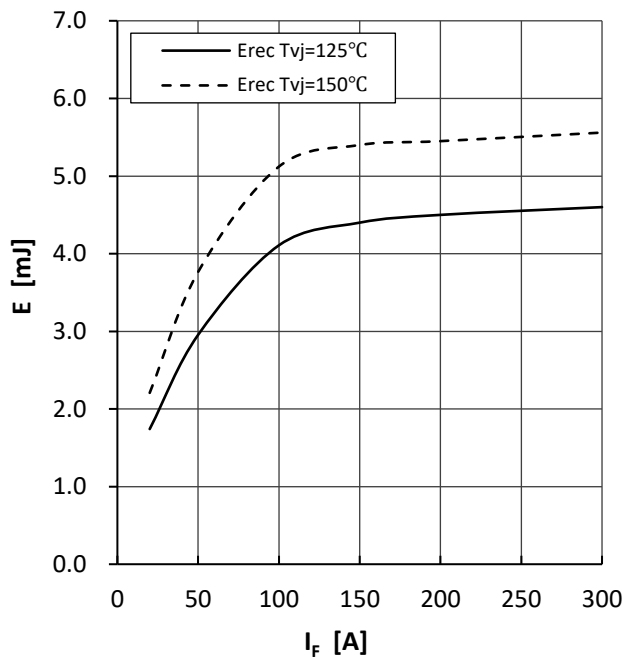


Fig 10. FRED Switching Loss vs. R_g ,
Inverter (typical)
 $I_c=150\ A$, $V_{CE}=600\ V$

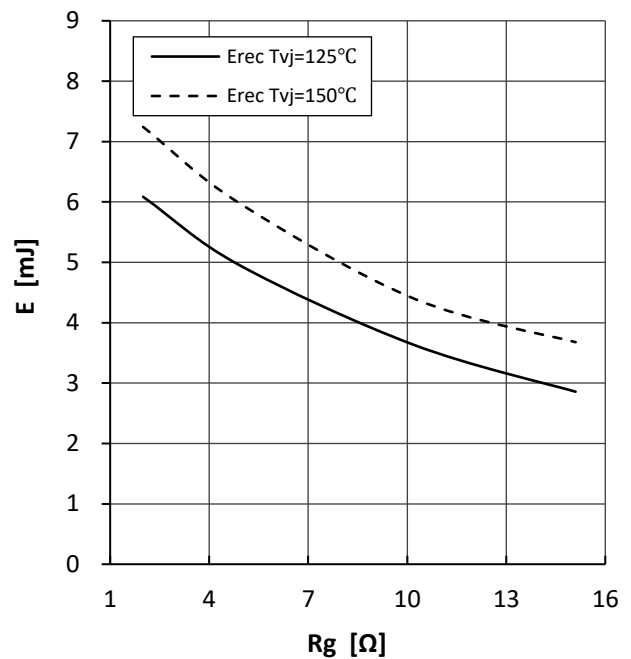


Fig 11. FRED Transient Thermal Impedance
Inverter

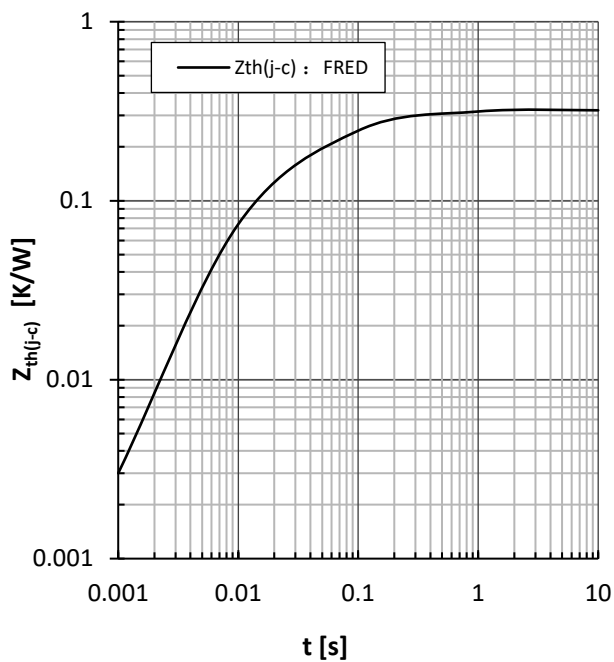
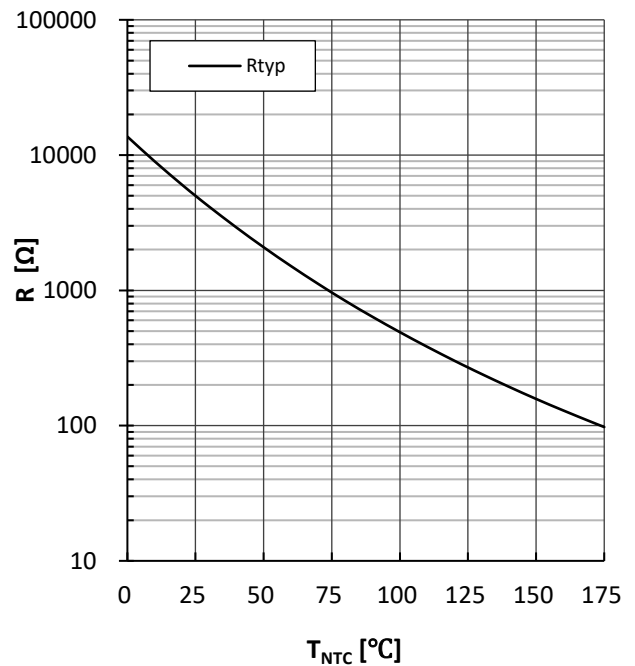


Fig 12. Temperature characteristics,
NTC thermistor (typical)





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