JMG600HF12G3S1

Trench FS IGBT

Features

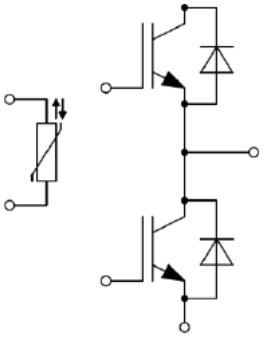
- Short Circuit Rated 10μs
- Low Stray Inductance
- Low Saturation Voltage
- Ultra Low loss
- HI-REL Power Terminals
- Lead Free, Compliant with RoHS Requirement

Product Summary

Parameter	Value	Unit
V_{CES}	1200	V
I_C(@ T_C= 100℃)	600	A
I_{CRM}(@ t_P= 1ms)	1200	A
$V_{CE(sat)}$(Typ)	1.80	V

Applications

- Industrial Inverters
- Servo Applications
- SMPS UPS
- Induction Heating
- Welde



IGBT, Absolute Maximum Ratings (@ T_C = 25°C unless otherwise specified)

Parameter	Conditions	Symbol	Values	Unit
Collector-emitter voltage	Tvj = 25°C	V_{CES}	1200	V
Gate-emitter peak voltage	Tvj = 25°C	V_{GES}	±20	V
Continuous collector current	T_C = 100°C	$I_{C\ nom}$	600	A
Repetitive peak collector current	t_P = 1ms	I_{CRM}	1200	A
Total power dissipation	T_C = 25°C, Tvj max = 175	P_{tot}	2027	W

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IGBT, Electrical Characteristics (@ T_C = 25°C unless otherwise specified)

Parameter	Conditions		Symbol	Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	I_C = 600A, V_{GE} = 15V	T_{vj} = 25°C	$V_{CE(sat)}$		1.80	2.10	V
		T_{vj} = 125°C			2.15		
Gate threshold voltage	V_{CE} = V_{GE}, I_C = 24mA		$V_{GE(th)}$	5.20	5.80	6.40	V
Collector leakage current	V_{CE} = 0V, V_{CE} =1200V		I_{CES}			1	mA
Gate-emitter leakage current	V_{CE} = 0V, V_{GE} = 20V		I_{GES}			400	nA
Input capacitance	f = 1MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0V		C_{ies}		37		nF
Reverse transfer capacitance			C_{res}		2.05		nF
Gate charge	V_{GE}=-15…+15V		Q_G		4.4		uC
Internal gate resistor			R_{Gint}		1.2		Ω
Turn-on delay time, inductive load	V_{CC} = 600V, I_C = 600A , R_G = 4Ω, V_{GE} = ±15V, T_{vj} = 25℃		$t_{d(on)}$		451		ns
Rise time, inductive load			t_r		331		ns
Turn-off delay time, inductive load			$t_{d(off)}$		790		ns
Fall time, inductive load			t_f		88		ns
Turn-on energy loss per pulse			E_{on}		187.5		mJ
Turn-off energy loss per pulse			E_{off}		55.1		mJ
Turn-on delay time, inductive load	V_{CC} = 600V, I_C = 600A , R_G =4Ω, V_{GE} = ±15V, T_{vj} = 125℃		$t_{d(on)}$		504		ns
Rise time, inductive load			t_r		350		ns
Turn-off delay time, inductive load			$t_{d(off)}$		885		ns
Fall time, inductive load			t_f		74		ns
Turn-on energy loss per pulse			E_{on}		222.8		mJ
Turn-off energy loss per pulse			E_{off}		62.0		mJ
SC data	tp≤10us，V_{GE}=15V，V_{CC}=900V, V_{CEM}≤1200V, T_{vj}=125℃		Isc		2400		A
Thermal resistance, junction to case	per IGBT		$R_{th(j-c)}$			0.074	K/W
Temperature under switching conditions			$T_{vj\ op}$	-40		150	℃

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FRED, Absolute Maximum Ratings (@ T_C = 25°C unless otherwise specified)

Parameter	Conditions	Symbol	Values	Unit
Repetitive peak reverse voltage	T_{vj} = 25°C	V_{RRM}	1200	V
Continuous DC forward current		$I_{F(AV)}$	600	A
Repetitive peak forward current	t_P = 1ms	I_{FRM}	1200	A
I^2t value for fusing	T_{vj} =150°C, t_P = 10ms, V_R = 0V	I^2t	37500	A^2s

FRED, Electrical Characteristics (@ T_C = 25°C unless otherwise specified)

Parameter	Conditions		Symbol	Values			Unit
				Min.	Typ.	Max.	
Forward voltage	I_F = 600A	T_{vj} = 25°C	V_F		2.15	2.40	V
		T_{vj} = 125°C			1.80		
Peak reverse recovery current	I_F = 600A, di/dt = 1300A/μs, V_R = 600V, V_{GE} = -15V	T_{vj} = 25°C	I_{RM}		64		A
		T_{vj} = 125°C			113		
Recovered charge		T_{vj} = 25°C	Q_{rr}		4.0		μC
		T_{vj} = 125°C			30.3		
Reverse Recovery energy		T_{vj} = 25°C	Erec		0.44		mJ
		T_{vj} = 125°C			5.39		
Thermal resistance, junction to case	per diode		$R_{th(j-c)}$			0.123	K/W
Temperature under switching conditions			$T_{vj\ op}$	-40		150	℃

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NTC-Thermistor Characteristics (@ T_C = 25°C unless otherwise specified)

Parameter	Conditions	Symbol	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	TC=25℃	R_{25}		5		KΩ
Deviation of R100	TC = 100°C, R100 = 493 Ω	△R/R	-5		5	%
Power dissipation	TC = 25°C	P_{25}			20	mW
B-value	R2 = R25 exp [B25/50(1/T2 - 1/(298,15 K))]	$B_{25/50}$		3375		K
B-value	R2 = R25 exp [B25/80(1/T2 - 1/(298,15 K))]	$B_{25/80}$		3411		K
B-value	R2 = R25 exp [B25/100(1/T2 - 1/(298,15 K))]	$B_{25/100}$		3433		K

Module Characteristics

Parameter	Conditions	Symbol	Values			Unit
			Min.	Typ.	Max.	
Isolation voltage (All terminals shorted)	f = 50Hz,1minute	V_{iso}	2.5			kV
Maximum junction temperature		T_J			175	℃
Thermal resistance, case to heatsink	per module	$R_{th(c-s)}$		0.009		K/W
Storage temperature		T_{stg}	-40		125	℃
Comparative Tracking Index		CTI	200			
Stray inductance module		L_{SCE}		20		nH
Module lead resistance, terminals to chip	per switch	$R_{CC'+EE}$		1		mΩ
Mounting torque	M5	M	3		6	N·m
Terminal connection torque	M6	M	3		6	N·m

Ordering Information

Device	Marking	Package	Weight	Inner Box	Per Carton
JMG600HF12G3S1	JMG600HF12G3S1	G3	350g/PCS	8PCS	40PCS

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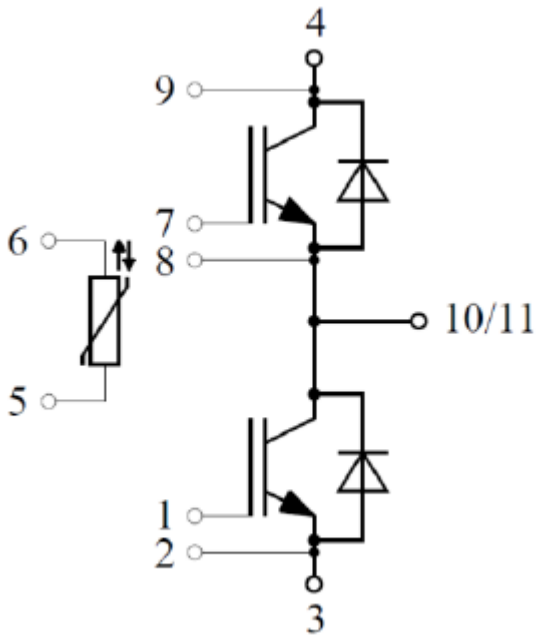
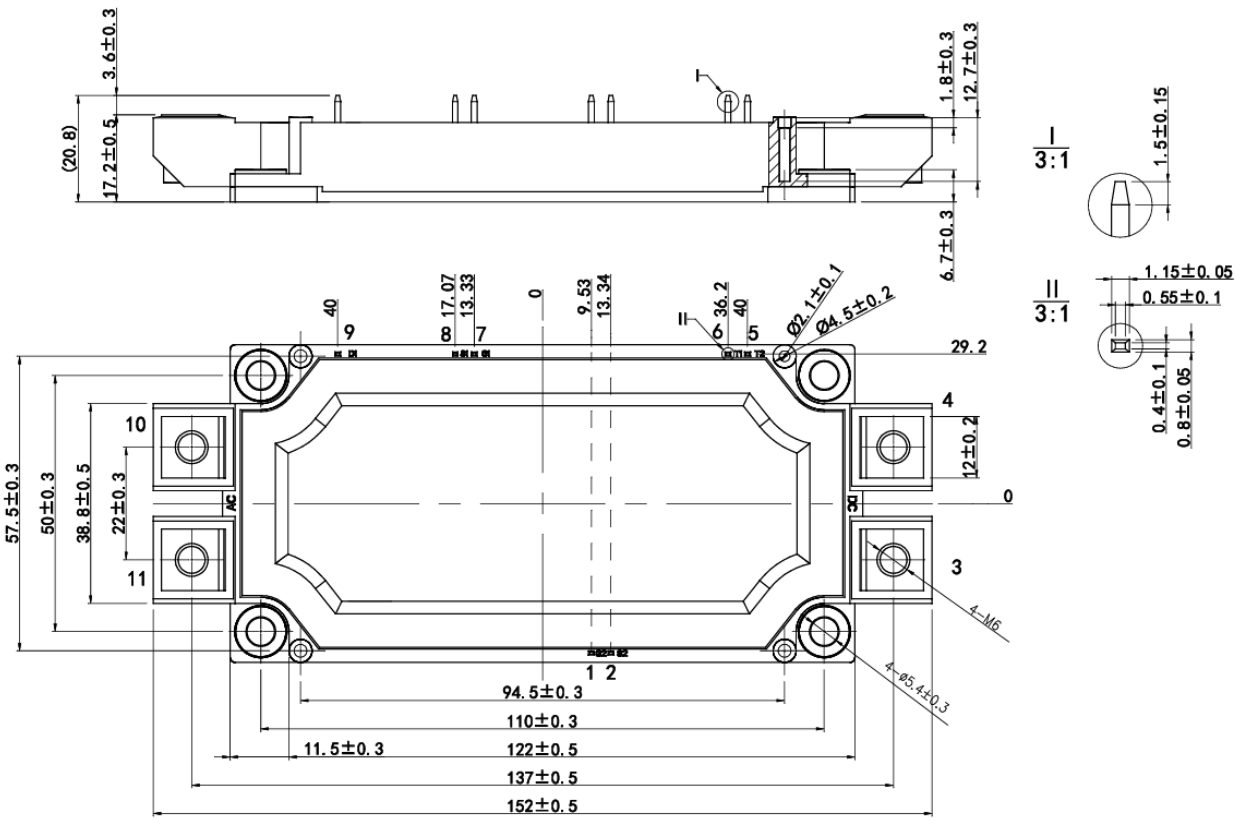
Circuit Diagram



Package Outlines (mm)



Unit of measurement: mm

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Typical Electrical & Thermal Characteristics

Fig 1. IGBT Output Characteristics
Inverter (typical) VGE=15 V

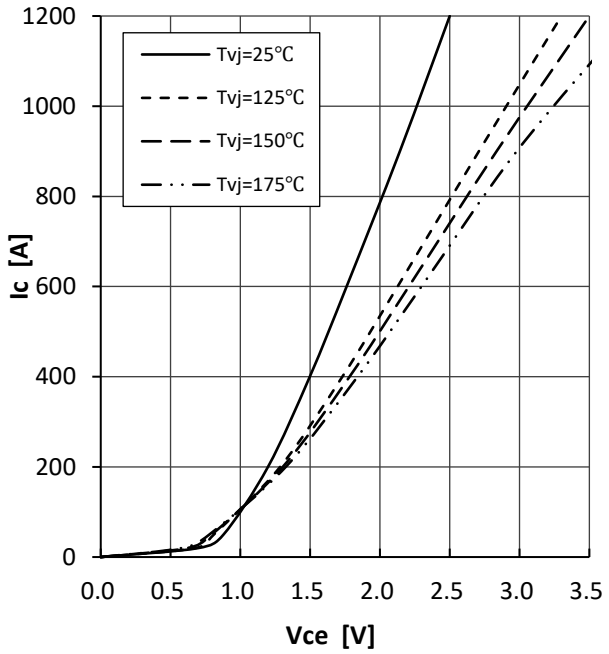

Fig 2. IGBT Output Characteristics
Inverter (typical)

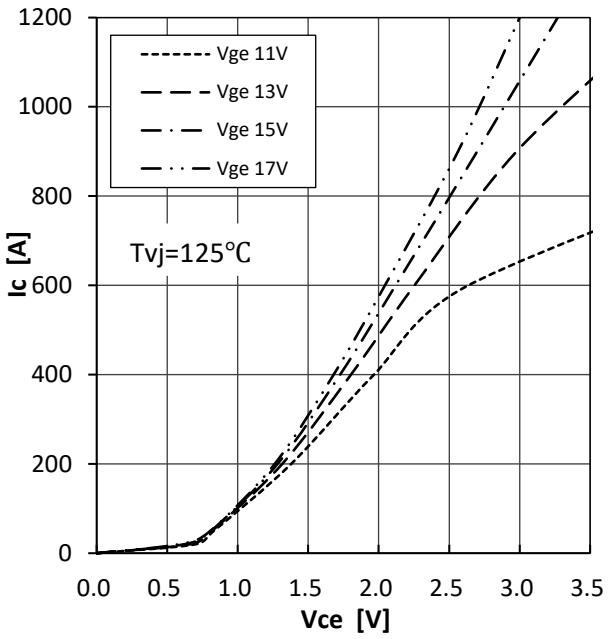

Fig 3. IGBT Transfer Characteristics
Inverter (typical) VCE=20 V

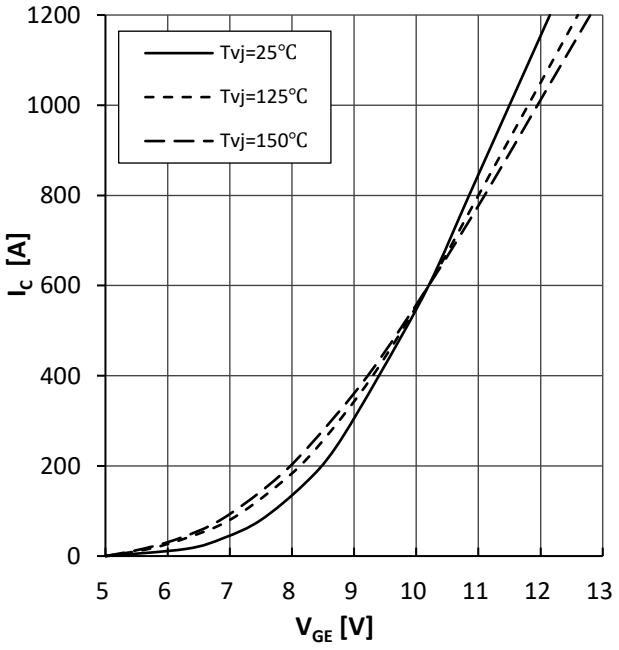

Fig 4. IGBT Switching Loss vs Ic
Inverter (typical)
Rg=4 Ω, VCE=600 V, VGE=±15 V

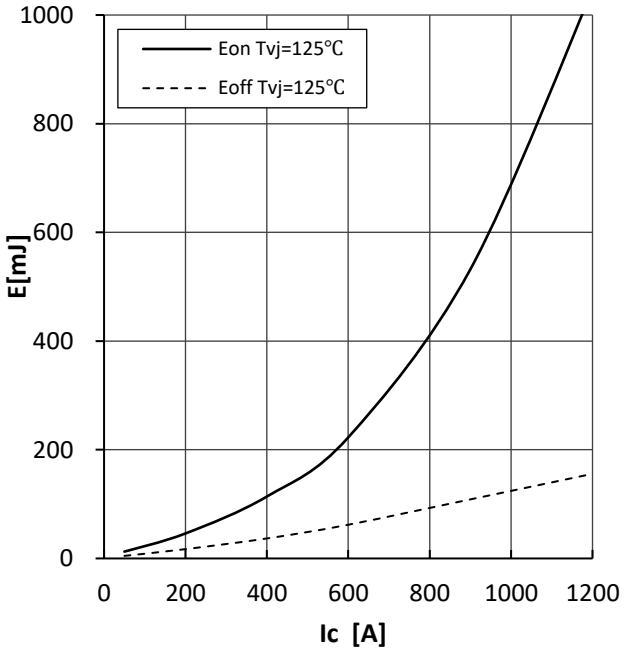

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Fig 5. IGBT Switching Loss vs. Rg,
Inverter (typical）
Ic=600 A, VCE=600 V, VGE=±15 V

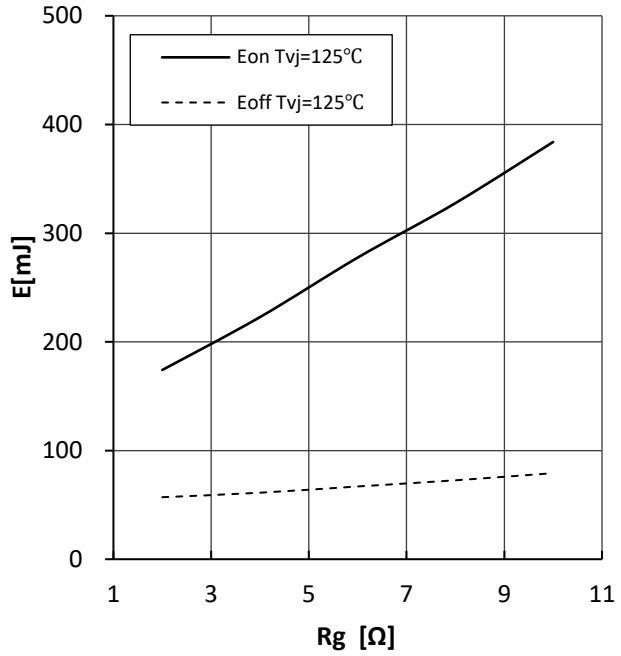

Fig 6. Reverse bias safe operating area
IGBT, Inverter (RBSOA)

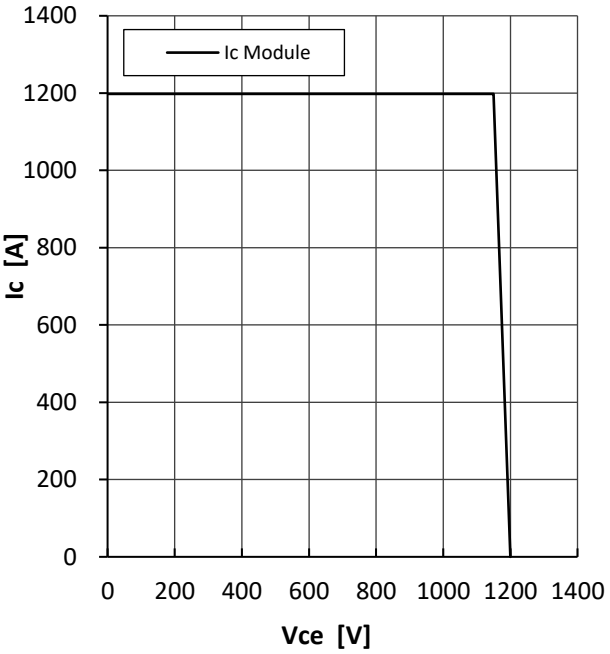

Fig 7. FRED Forward Characteristics,
Inverter (typical)

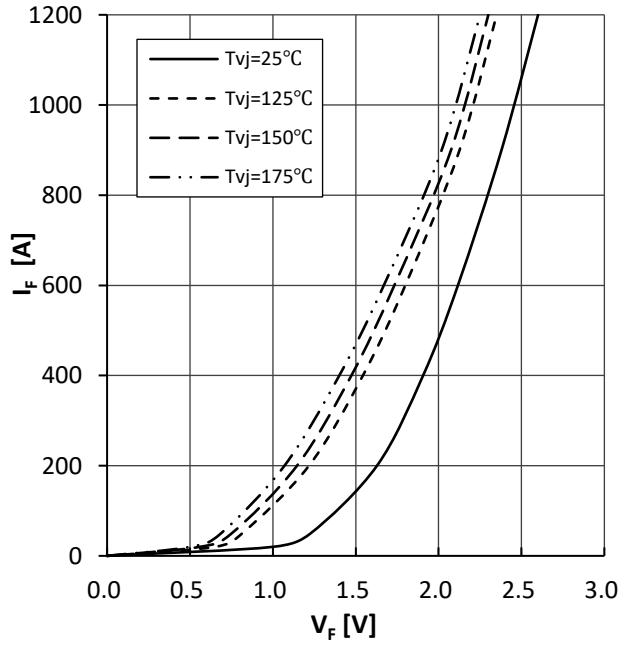

Fig 8. FRED Switching Loss vs. Ic,
Inverter (typical)
Rg=4 Ω, VCE=600 V

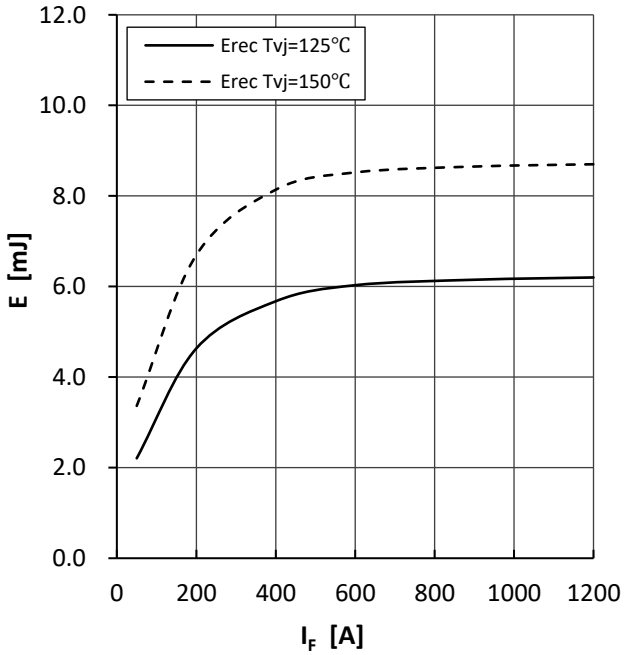

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Fig 9. FRED Switching Loss vs. Rg,
Inverter (typical)
Ic=600 A, VCE=600 V

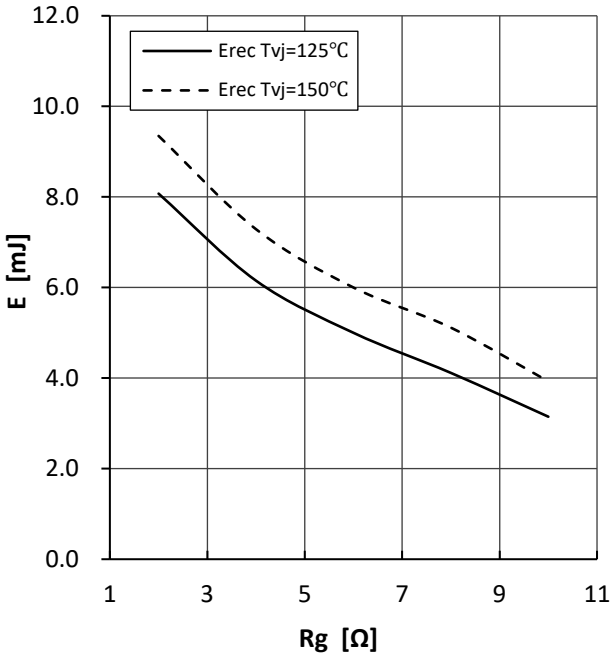
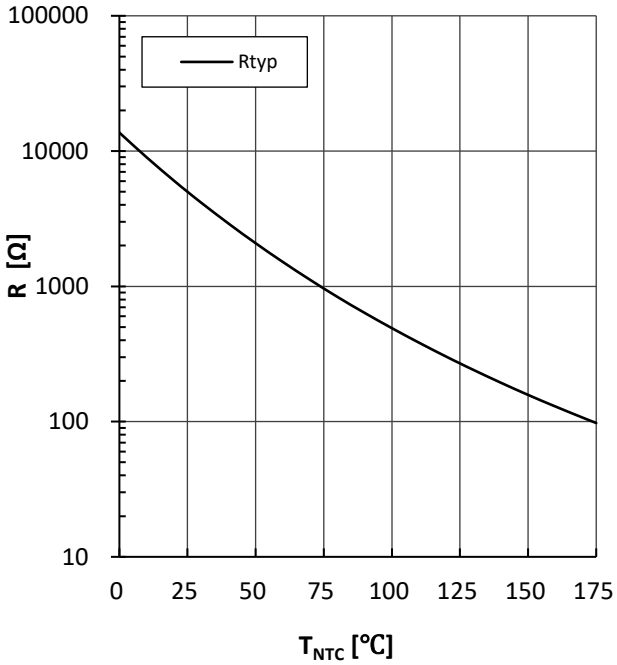


Fig 10. Temperature characteristics,
NTC thermistor (typical)



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