# JMG300HF12G3S1

## Trench FS IGBT

### Features

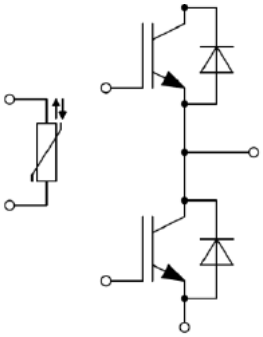
- Short Circuit Rated 10μs
- Low Stray Inductance
- Low Saturation Voltage
- Ultra Low loss
- HI-REL Power Terminals
- Lead Free, Compliant with RoHS Requirement

### Product Summary

| Parameter | Value | Unit |
|---|---|---|
| $V_{CES}$ | 1200 | V |
| $I_C$(@ $T_C$= 100℃) | 300 | A |
| $I_{CRM}$(@ $t_P$= 1ms) | 600 | A |
| $V_{CE(sat)}$(Typ) | 1.85 | V |

### Applications

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



### 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 | $I_{C\ nom}$ | 300 | A |
| Repetitive peak collector current | $t_P$ = 1ms | $I_{CRM}$ | 600 | A |
| Total power dissipation | $T_C$ = 25°C, Tvj max = 175°C | $P_{tot}$ | 1666 | 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 | $I_C$ = 300A, $V_{GE}$ = 15V | $T_{vj}$ = 25°C | $V_{CE(sat)}$ | | 1.85 | 2.20 | V |
| | | $T_{vj}$ = 125°C | | | 2.20 | | |
| | | $T_{vj}$ = 150°C | | | 2.30 | | |
| Gate threshold voltage | $V_{CE}$ = $V_{GE}$, $I_C$ = 12mA | | $V_{GE(th)}$ | 5.4 | 6.0 | 6.6 | V |
| Collector leakage current | $V_{GE}$ = 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 | | $C_{ies}$ | | 26.4 | | nF |
| Reverse transfer capacitance | | | $C_{res}$ | | 0.81 | | nF |
| Gate charge | $V_{GE}$=-15…+15V | | $Q_G$ | | 2.65 | | uC |
| Internal gate resistor | | | $R_{Gint}$ | | 1.25 | | Ω |
| Turn-on delay time, inductive load | $V_{CC}$ = 600V, $I_C$ = 300A, $R_G$ = 5.9Ω, $V_{GE}$ = ±15V, $T_{vj}$ = 25℃ | | $t_{d(on)}$ | | 241 | | ns |
| Rise time, inductive load | | | $t_r$ | | 211 | | ns |
| Turn-off delay time, inductive load | | | $t_{d(off)}$ | | 488 | | ns |
| Fall time, inductive load | | | $t_f$ | | 45 | | ns |
| Turn-on energy loss per pulse | | | $E_{on}$ | | 64.1 | | mJ |
| Turn-off energy loss per pulse | | | $E_{off}$ | | 17.5 | | mJ |
| Turn-on delay time, inductive load | $V_{CC}$ = 600V, $I_C$ = 300A, $R_G$ = 5.9Ω, $V_{GE}$ = ±15V, $T_{vj}$ = 125℃ | | $t_{d(on)}$ | | 249 | | ns |
| Rise time, inductive load | | | $t_r$ | | 216 | | ns |
| Turn-off delay time, inductive load | | | $t_{d(off)}$ | | 537 | | ns |
| Fall time, inductive load | | | $t_f$ | | 42 | | ns |
| Turn-on energy loss per pulse | | | $E_{on}$ | | 80.7 | | mJ |
| Turn-off energy loss per pulse | | | $E_{off}$ | | 20.0 | | mJ |
| SC data | tp≤10us，VGE=15V，VCC=900V, VCEM≤1200V, Tvj =125℃ | | Isc | | 1200 | | A |
| Thermal resistance, junction to case | per IGBT | | $R_{th(j-c)}$ | | | 0.09 | 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 | | $I_{F(AV)}$ | 300 | A |
| Repetitive peak forward current | $t_P$ = 1ms | $I_{FRM}$ | 600 | A |
| $I^2t$ value for fusing | $T_{vj}$ =150°C, $t_P$ = 10ms, $V_R$ = 0V | $I^2t$ | 15500 | $A^2s$ |

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

| Parameter | Conditions | | Symbol | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Forward voltage | $I_F$ = 300A | $T_{vj}$ = 25°C | $V_F$ | | 1.90 | 2.20 | V |
| | | $T_{vj}$ = 125°C | | | 1.70 | | |
| | | $T_{vj}$ = 150°C | | | 1.60 | | |
| Peak reverse recovery current | $I_F$ = 300A, di/dt = 1100A/µs, $V_R$ = 600V, $V_{GE}$ = -15V | $T_{vj}$ = 25°C | $I_{RM}$ | | 48.8 | | A |
| | | $T_{vj}$ = 125°C | | | 82.1 | | |
| Recovered charge | | $T_{vj}$ = 25°C | $Q_{rr}$ | | 8.39 | | µC |
| | | $T_{vj}$ = 125°C | | | 24.27 | | |
| Reverse Recovery energy | | $T_{vj}$ = 25°C | Erec | | 1.96 | | mJ |
| | | $T_{vj}$ = 125°C | | | 5.70 | | |
| Thermal resistance, junction to case | per diode | | $R_{th(j-c)}$ | | | 0.16 | 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 for heatsink | 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 |
|---|---|---|---|---|---|
| JMG300HF12G3S1 | JMG300HF12G3S1 | G3 | 350g/PCS | 8PCS | 40PCS |


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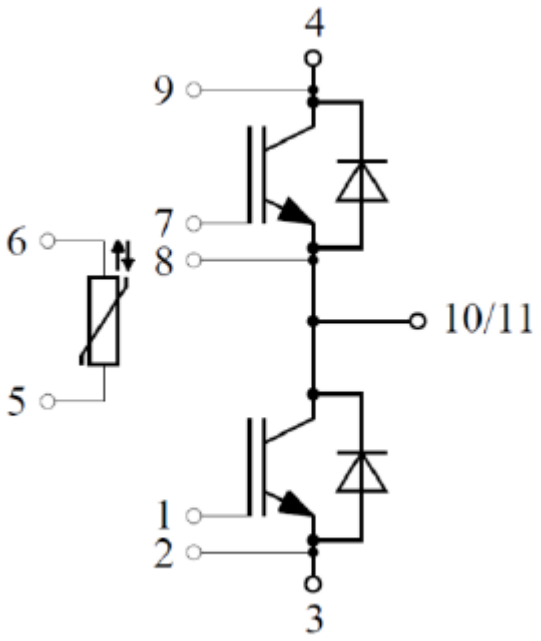
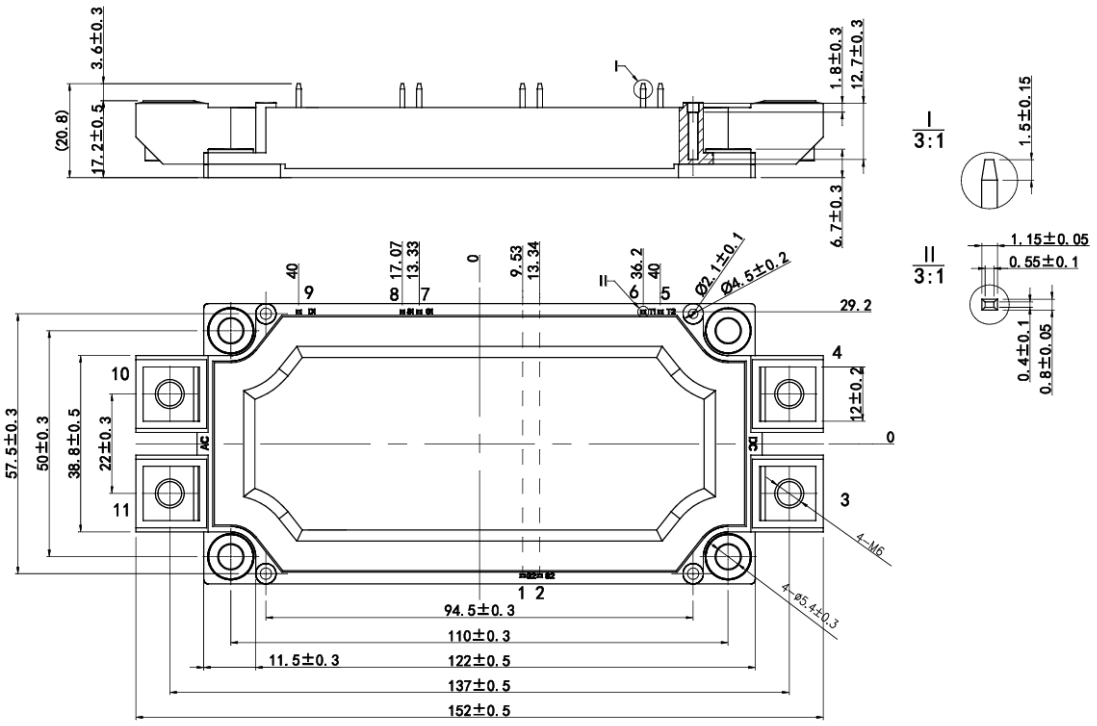
## Circuit Diagram




## 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

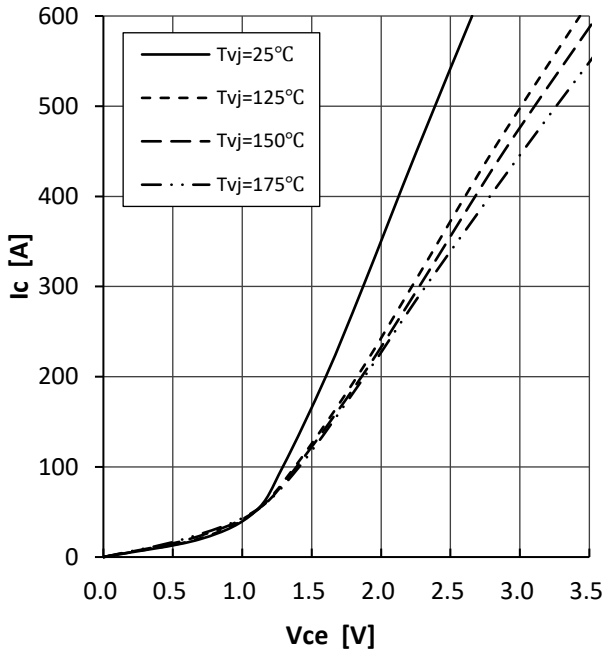


Fig 2. IGBT Output Characteristics
Inverter (typical)

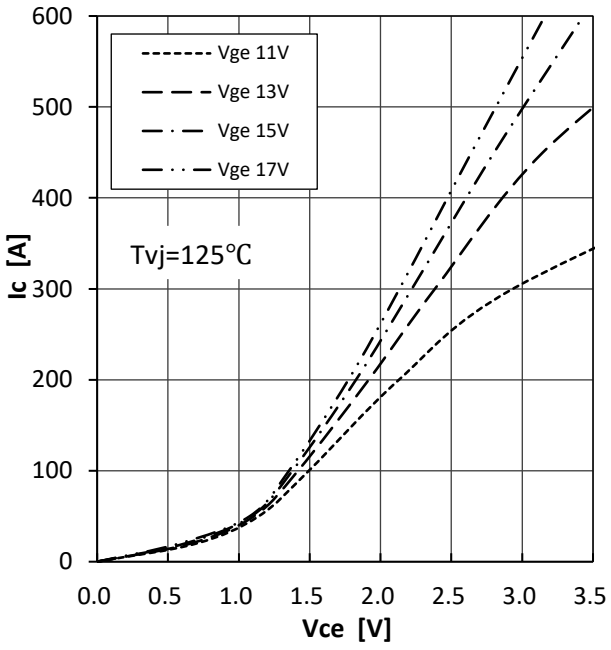


Fig 3. IGBT Transfer Characteristics
Inverter (typical) VCE=20 V

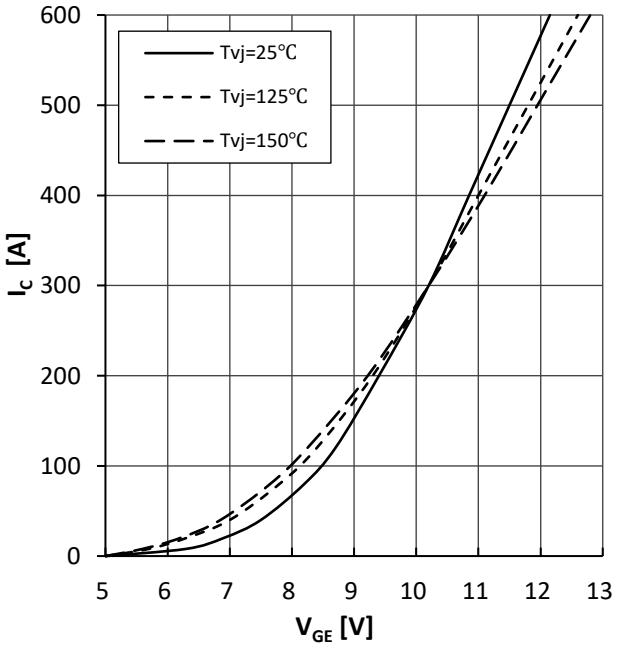


Fig 4. IGBT Switching Loss vs Ic
Inverter (typical)
Rg=5.9 Ω, VCE=600 V, VGE=±15 V

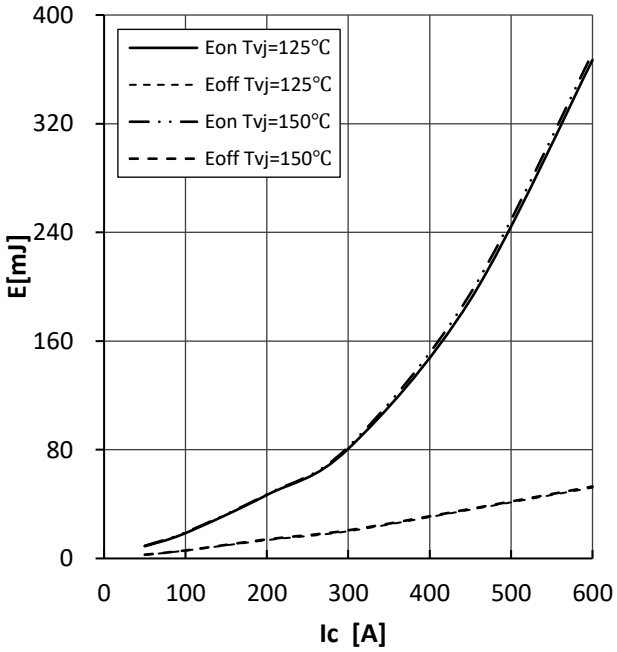



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Fig 5. IGBT Switching Loss vs. Rg,
Inverter (typical）
Ic=300 A, VCE=600 V, VGE=±15 V

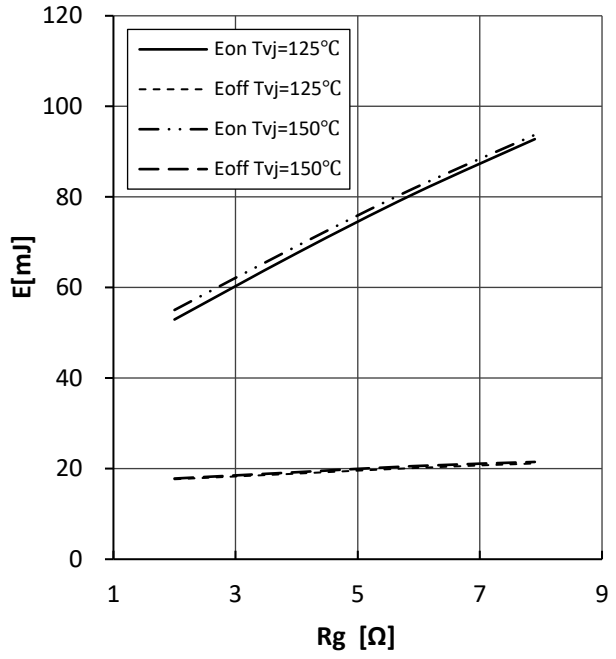


Fig 6. IGBT Transient Thermal Impedance

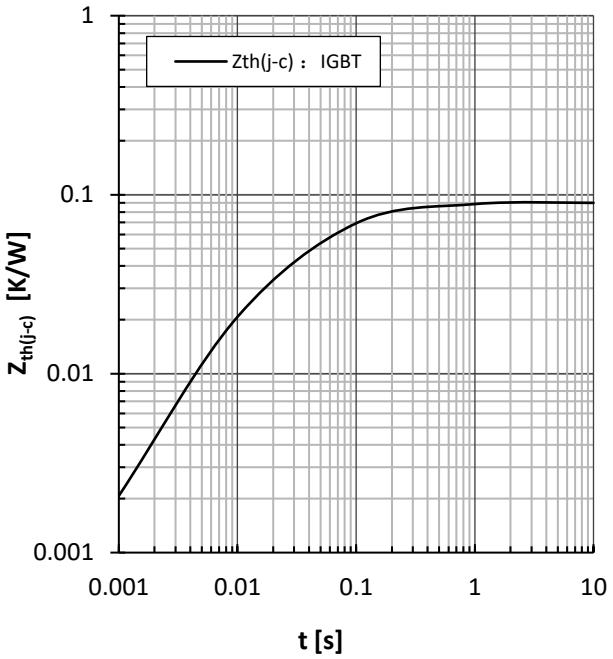


Fig 7. Reverse bias safe operating area
IGBT, Inverter (RBSOA)

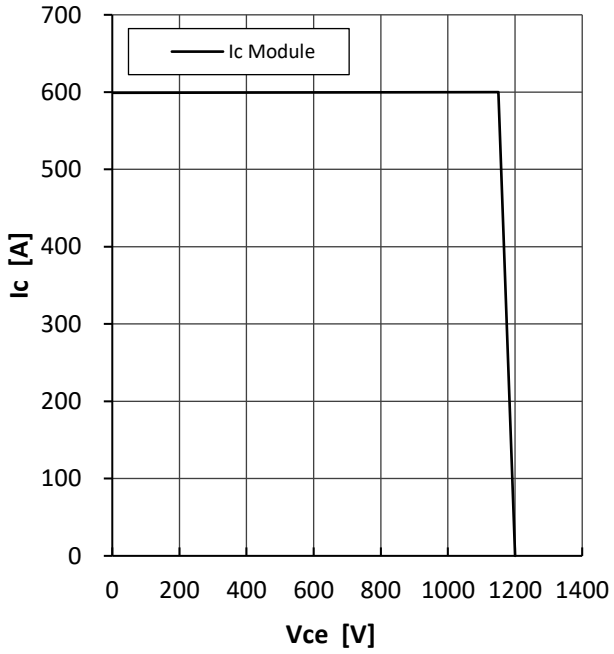


Fig 8. FRED Forward Characteristics,
Inverter (typical)

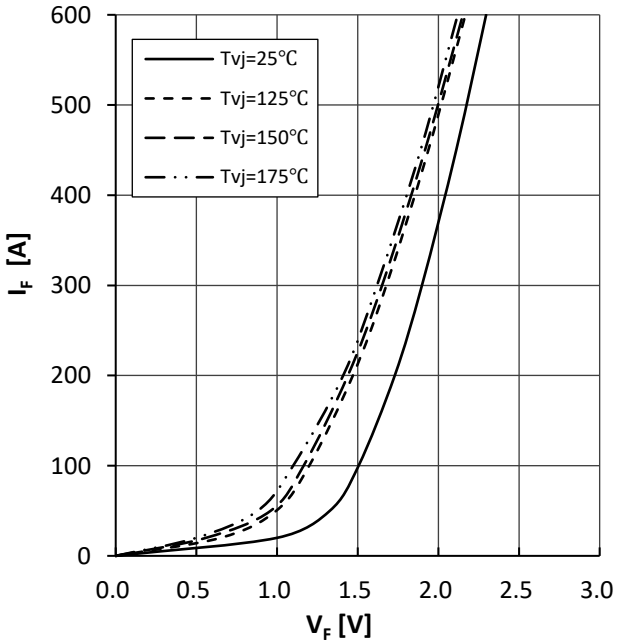



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Fig 9. FRED Switching Loss vs. Ic,
Inverter (typical)
Rg=5.9 Ω, VCE=600 V

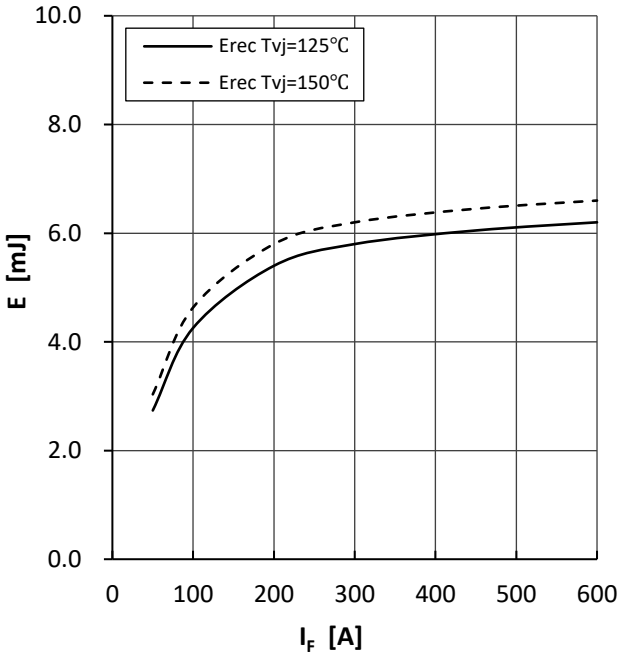



Fig 10. FRED Switching Loss vs. Rg,
Inverter (typical)
Ic=300 A, VCE=600 V

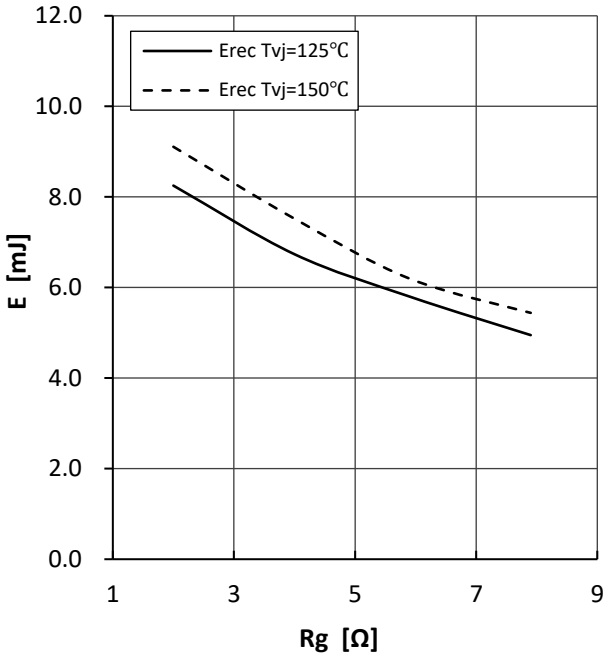



Fig 11. FRED Transient Thermal Impedance

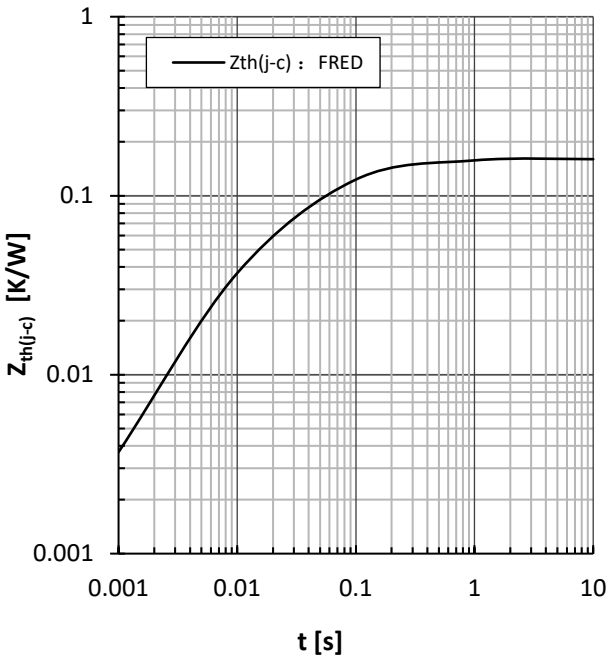
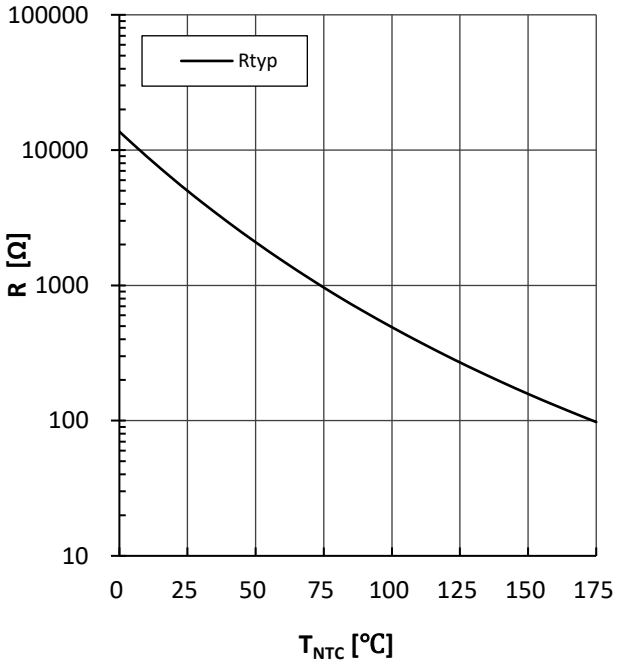



Fig 12. Temperature characteristics,
NTC thermistor (typical)





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