

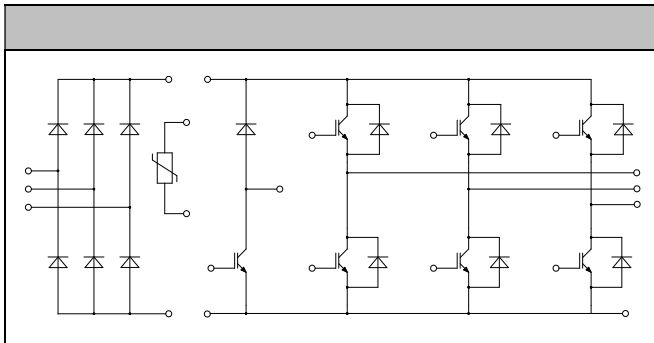


IGBT Modules

| | |
|------------------|-------|
| V _{CES} | 1200V |
| I _C | 75A |

Applications

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



Features

- Low switching losses
- Low V_{ce(sat)} with positive temperature coefficient
- Including fast & soft recovery anti-parallel FWD
- Low inductance case
- High short circuit capability(10us)
- Maximum junction temperature 175°C

IGBT- inverter

Absolute Maximum Ratings

| Parameter | Symbol | Conditions | Value | Unit |
|-----------------------------------|------------------|---|-------|------|
| Collector-Emitter Voltage | V _{CES} | V _{GE} =0V, I _C =1mA, T _{vj} =25 | 1200 | V |
| Continuous Collector Current | I _C | T _c =80 v _{ijmax} 8175 | 75 | A |
| Repetitive Peak Collector Current | I _{CRM} | t _p =1ms | 150 | A |
| Gate-Emitter Voltage | V _{GES} | T _{vj} =25 | 20 | V |
| Total Power Dissipation | P _{tot} | T _c =25 T _{vjmax} =175 | 476 | W |

IGBT- inverter

Characteristic values

| Parameter | Symbol | Conditions | Value | | | Unit | |
|---|---------------|---|---|------|------|------|----|
| | | | Min. | Typ. | Max. | | |
| Gate-emitter Threshold Voltage | $V_{GE(th)}$ | $V_{GE}=V_{CE}, I_C=3mA, T_{vj}=25$ | 5.0 | 5.8 | 6.5 | V | |
| Collector-Emitter Cut-off Current | I_{CES} | $V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$ | | | 1.0 | mA | |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C=75A, V_{GE}=15V, T_{vj}=25$ | | 1.85 | 2.15 | V | |
| | | $I_C=75A, V_{GE}=15V, T_{vj}=125$ | | 2.05 | | | |
| | | $I_C=75A, V_{GE}=15V, T_{vj}=150$ | | 2.10 | | | |
| Gate Charge | Q_G | | | 0.85 | | uC | |
| Input Capacitance | C_{ies} | $V_{CE}=25V, V_{GE}=0V,$ $f=1MHz, T_{vj}=25^{\circ}C$ | | 4.20 | | nF | |
| Reverse Transfer Capacitance | C_{res} | | | 0.32 | | nF | |
| Gate-Emitter leakage current | I_{GES} | $V_{CE}=0V, V_{GE}=20V, T_{vj}=25$ | | | 400 | nA | |
| Turn-on Delay Time | $t_{d(on)}$ | $I_C=75A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=5.1\Omega$ $T_{vj}=25$ | | 100 | | ns | |
| Rise Time | t_r | | | 78 | | ns | |
| Turn-off Delay Time | $t_{d(off)}$ | | | 380 | | ns | |
| Fall Time | t_f | | | 32 | | ns | |
| Energy Dissipation During Turn-on Time | E_{on} | | | 5.6 | | mJ | |
| Energy Dissipation During Turn-off Time | E_{off} | | | 3.6 | | mJ | |
| Turn-on Delay Time | $t_{d(on)}$ | | $I_C=75A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=5.1\Omega$ $T_{vj}=125$ | | 110 | | ns |
| Rise Time | t_r | | | | 85 | | ns |
| Turn-off Delay Time | $t_{d(off)}$ | | | | 450 | | ns |
| Fall Time | t_f | | | | 36 | | ns |
| Energy Dissipation During Turn-on Time | E_{on} | | | 8.8 | | mJ | |
| Energy Dissipation During Turn-off Time | E_{off} | | | 6.4 | | mJ | |
| SC Data | I_{sc} | $T_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150$, $V_{cc}=900V, V_{CEM} \leq 1200V$ | | | 370 | | A |

Diode-inverter

Absolute Maximum Ratings

| Parameter | Symbol | Conditions | Value | Unit |
|---------------------------------|-----------|--------------------------------------|-------|------------------|
| Repetitive Peak Reverse Voltage | V_{RRM} | $T_{vj}=25$ | 1200 | V |
| Continuous DC Forward Current | I_F | | 75 | A |
| Repetitive Peak Forward Current | I_{FRM} | $t_p=1\text{ms}$ | 150 | A |
| I^2t -value | I^2t | $V_R=0, t_p=10\text{ms}, T_{vj}=125$ | 810 | A ² s |
| | | $V_R=0, t_p=10\text{ms}, T_{vj}=150$ | 690 | |

Characteristic values

| Parameter | Symbol | Conditions | Value | | | Unit |
|-------------------------------|-----------|--|-------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Forward Voltage | V_F | $I_F=75\text{A}, T_{vj}=25$ | | 2.20 | 2.60 | V |
| | | $I_F=75\text{A}, T_{vj}=125$ | | 2.25 | | |
| | | $I_F=75\text{A}, T_{vj}=150$ | | 2.25 | | |
| Recovered Charge | Q_{rr} | $I_F=75\text{A}$ | | 4.2 | | uC |
| Peak Reverse Recovery Current | I_{rr} | $V_R=600\text{V}$ $-di_F/dt=900\text{A/us}$ | | 75 | | A |
| Reverse Recovery Energy | E_{rec} | $T_{vj}=25$ | | 2.06 | | mJ |
| Recovered Charge | Q_{rr} | $I_F=75\text{A}$ | | 9.6 | | uC |
| Peak Reverse Recovery Current | I_{rr} | $V_R=600\text{V}$ $-di_F/dt=900\text{A/us}$ | | 92 | | A |
| Reverse Recovery Energy | E_{rec} | $T_{vj}=125$ | | 4.34 | | mJ |

IGBT-brake-chopper

Absolute Maximum Ratings

| Parameter | Symbol | Conditions | Value | Unit |
|-----------------------------------|-----------|---------------------------------|-------|------|
| Collector-Emitter Voltage | V_{CES} | $V_{GE}=0V, I_C=1mA, T_{vj}=25$ | 1200 | V |
| Continuous Collector Current | I_C | $T_c=100$ $v_{jmax}8175$ | 50 | A |
| Repetitive Peak Collector Current | I_{CRM} | $t_p=1ms$ | 100 | A |
| Gate-Emitter Voltage | V_{GES} | $T_{vj}=25$ | 20 | V |
| Total Power Dissipation | P_{tot} | $T_c=25$ $T_{vjmax}=175$ | 442 | W |

Characteristic values

| Parameter | Symbol | Conditions | Value | | | Unit | |
|---|---------------|---|-------|------|------|------|----|
| | | | Min. | Typ. | Max. | | |
| Gate-emitter Threshold Voltage | $V_{GE(th)}$ | $V_{GE}=V_{CE}, I_C=1.7mA, T_{vj}=25$ | 5.0 | 5.7 | 6.5 | V | |
| Collector-Emitter Cut-off Current | I_{CES} | $V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^\circ C$ | | | 1.0 | mA | |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C=50A, V_{GE}=15V, T_{vj}=25$ | | 1.90 | 2.25 | V | |
| | | $I_C=50A, V_{GE}=15V, T_{vj}=125$ | | 2.25 | | | |
| | | $I_C=50A, V_{GE}=15V, T_{vj}=150$ | | 2.35 | | | |
| Gate Charge | Q_G | | | 0.35 | | uC | |
| Input Capacitance | C_{ies} | $V_{CE}=25V, V_{GE}=0V,$ $f=1MHz, T_{vj}=25^\circ C$ | | 2.60 | | nF | |
| Reverse Transfer Capacitance | C_{res} | | | 0.10 | | nF | |
| Gate-Emitter leakage current | I_{GES} | $V_{CE}=0V, V_{GE}=20V, T_{vj}=25$ | | | 400 | nA | |
| Turn-on Delay Time | $t_{d(on)}$ | $I_C=50A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=15\Omega$ $T_{vj}=25$ | | 168 | | ns | |
| Rise Time | t_r | | | 34 | | ns | |
| Turn-off Delay Time | $t_{d(off)}$ | | | 320 | | ns | |
| Fall Time | t_f | | | 78 | | ns | |
| Energy Dissipation During Turn-on Time | E_{on} | | | | 5.42 | | mJ |
| Energy Dissipation During Turn-off Time | E_{off} | | | | 4.15 | | mJ |

| | | | | |
|---|--------------|--|------|----|
| Turn-on Delay Time | $t_{d(on)}$ | $I_C = 50\text{ A}$ $V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_G = 15\Omega$ $T_{vj} = 125$ | 175 | ns |
| Rise Time | t_r | | 42 | ns |
| Turn-off Delay Time | $t_{d(off)}$ | | 426 | ns |
| Fall Time | t_f | | 148 | ns |
| Energy Dissipation During Turn-on Time | E_{on} | | 7.26 | mJ |
| Energy Dissipation During Turn-off Time | E_{off} | | 5.80 | mJ |
| SC Data | I_{sc} | $T_p \leq 10\mu s, V_{GE} = 15\text{ V}, T_{vj} = 150$, $V_{cc} = 900\text{ V}, V_{CEM} \leq 1200\text{ V}$ | 260 | A |

Diode-Brake-Chopper

Absolute Maximum Ratings

| Parameter | Symbol | Conditions | Value | Unit |
|---------------------------------|-----------|--|-------|------------------|
| Repetitive Peak Reverse Voltage | V_{RRM} | $T_j = 25$ | 1200 | V |
| Continuous DC Forward Current | I_F | | 35 | A |
| Repetitive Peak Forward Current | I_{FRM} | $t_p = 1\text{ ms}$ | 70 | A |
| I^2t -value | I^2t | $V_R = 0, t_p = 10\text{ ms}, T_j = 125$ | 240 | A ² s |
| | | $V_R = 0, t_p = 10\text{ ms}, T_j = 150$ | 220 | |

Characteristic values

| Parameter | Symbol | Conditions | Value | | | Unit |
|-------------------------------|-----------|--|-------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Forward Voltage | V_F | $I_F = 35\text{ A}, T_{vj} = 25$ | | 1.95 | | V |
| | | $I_F = 35\text{ A}, T_{vj} = 125$ | | 1.95 | | |
| | | $I_F = 35\text{ A}, T_{vj} = 150$ | | 1.90 | | |
| Recovered Charge | Q_{rr} | $I_F = 35\text{ A}$ | | 4.15 | | uC |
| Peak Reverse Recovery Current | I_{rr} | $V_R = 600\text{ V}$ $-di_F/dt = 1600\text{ A}/\mu s$ | | 42 | | A |
| Reverse Recovery Energy | E_{rec} | $T_{vj} = 25$ | | 1.30 | | mJ |
| Recovered Charge | Q_{rr} | $I_F = 35\text{ A}$ | | 8.00 | | uC |
| Peak Reverse Recovery Current | I_{rr} | $V_R = 600\text{ V}$ $-di_F/dt = 1600\text{ A}/\mu s$ | | 46 | | A |
| Reverse Recovery Energy | E_{rec} | $T_{vj} = 125$ | | 2.38 | | mJ |

Diode-Rectifier

Absolute Maximum Ratings

| Parameter | Symbol | Conditions | Value | Unit |
|--|-------------|---------------------------|-------|------------------|
| Repetitive Peak Reverse Voltage | V_{RRM} | $T_j=25$ | 1600 | V |
| Average output Current 50/60Hz, sine wave | $I_{F(AV)}$ | $T_c=100$ | 80 | A |
| Maximum RMS Current at Rectifier Output | I_{RMSM} | $T_c=100$ | 120 | A |
| Surge Forward Current | I_{FSM} | $V_R=0, t_p=10ms, T_j=45$ | 1100 | A |
| I^2t -value | I^2t | $V_R=0, t_p=10ms, T_j=45$ | 6050 | A ² s |

Characteristic values

| Parameter | Symbol | Conditions | Value | | | Unit |
|-----------------------|--------|----------------------|-------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Diode Forward Voltage | V_F | $I_F=50A, T_j=125$ | | 0.98 | | V |
| Reverse Current | I_R | $T_j=125, V_R=1600V$ | | | 2.0 | mA |

NTC-Thermistor

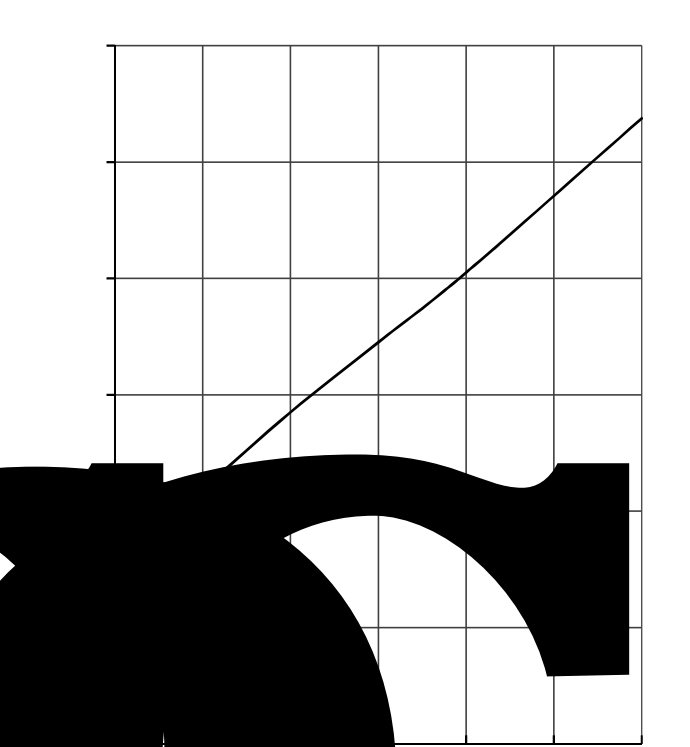
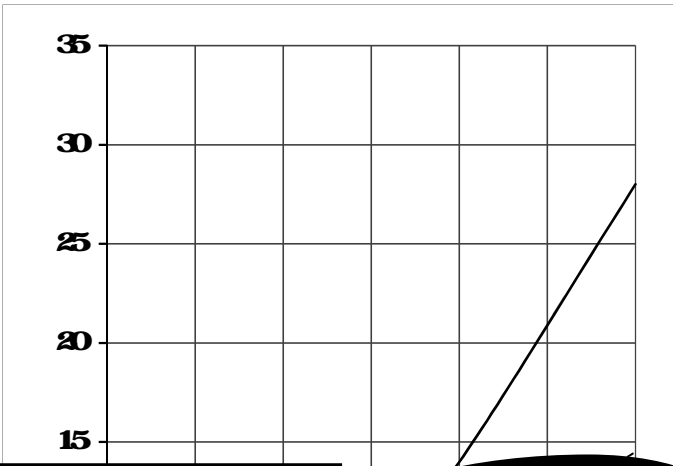
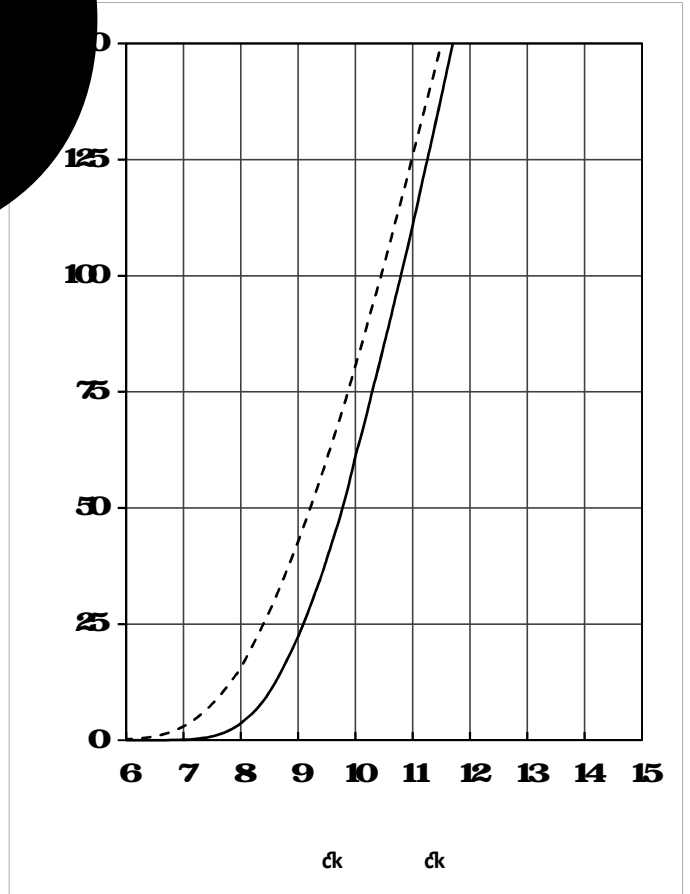
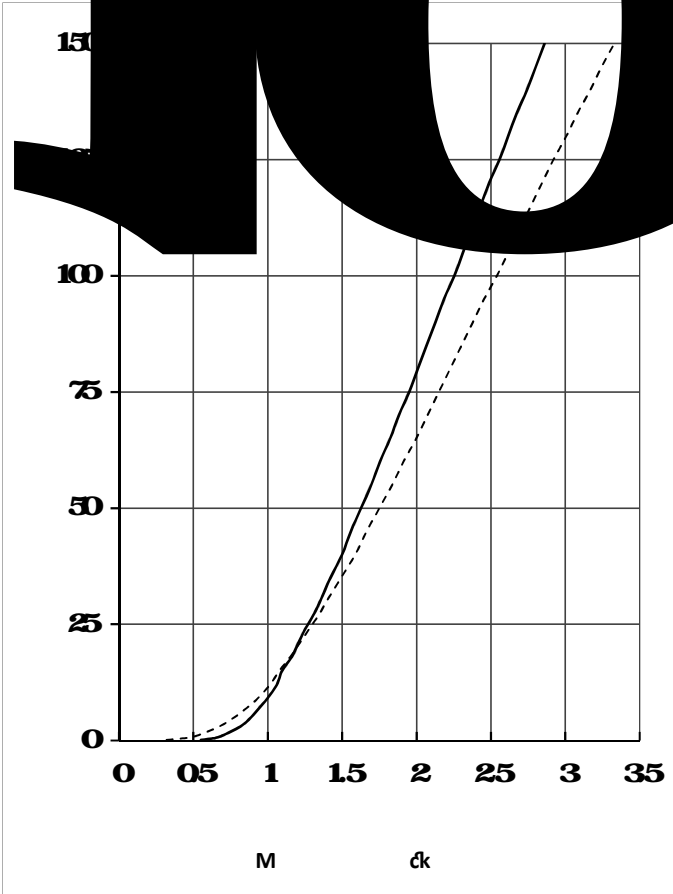
Characteristic values

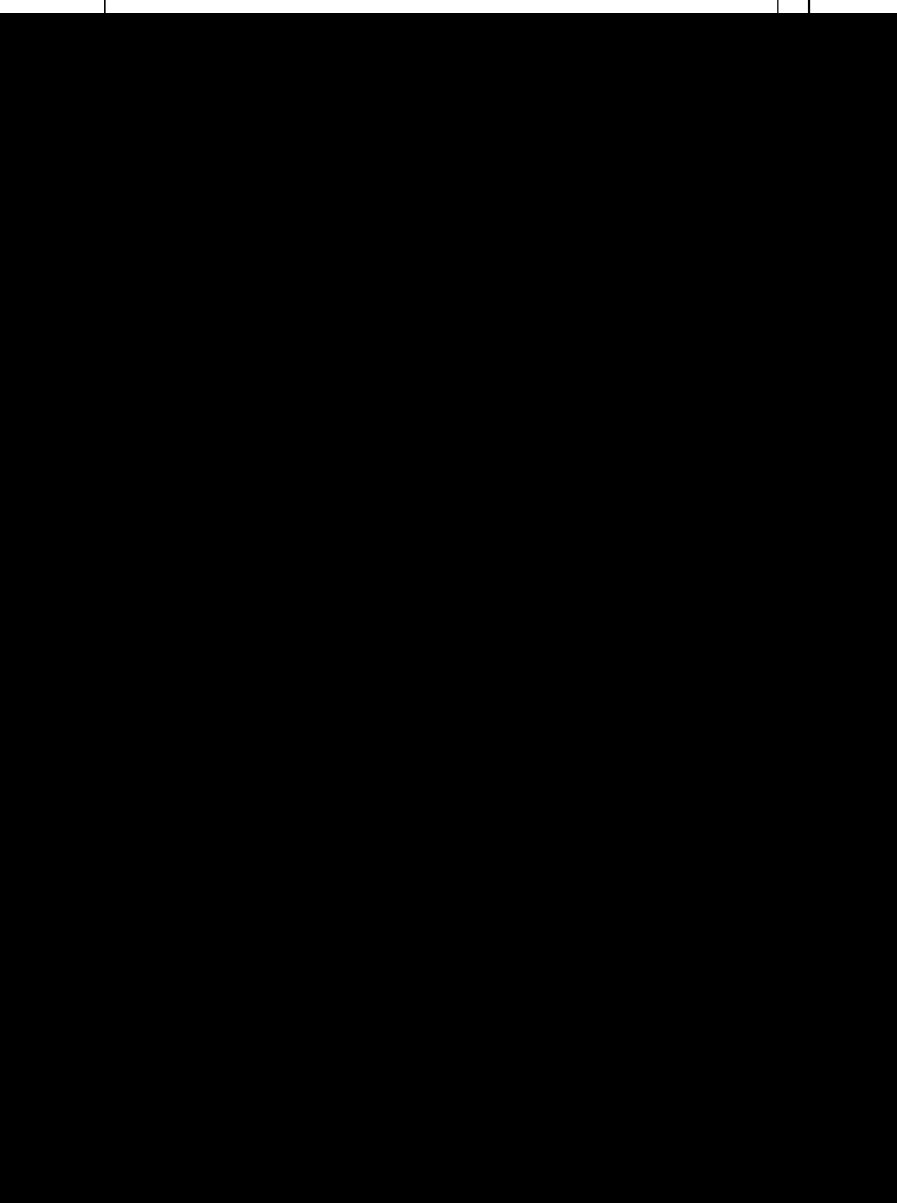
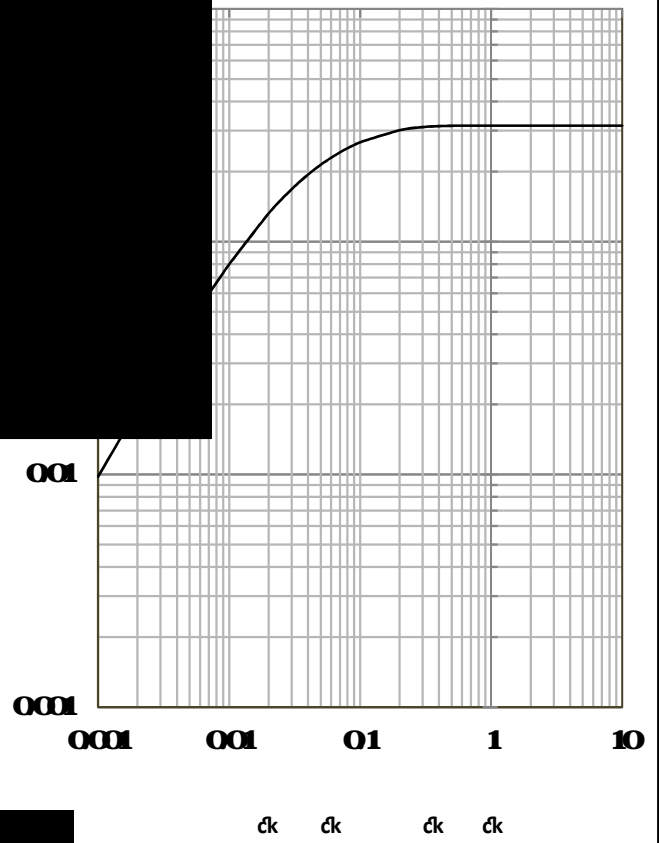
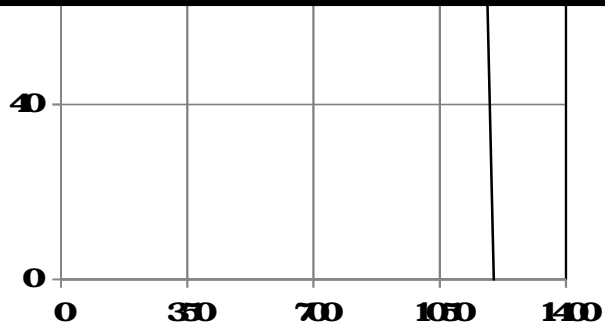
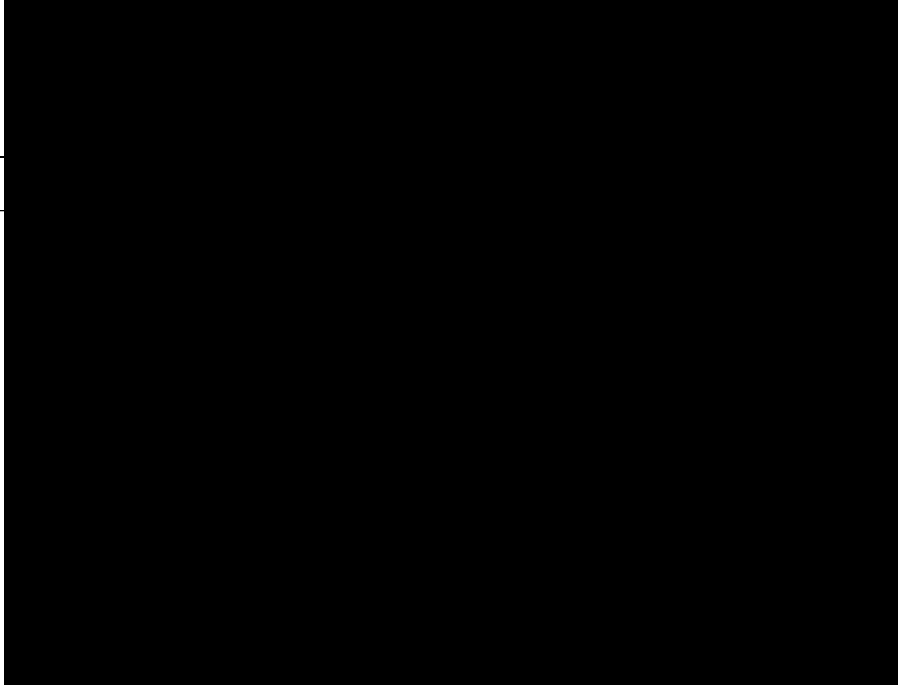
| Parameter | Symbol | Conditions | Value | | | Unit |
|-------------------|-------------|---|-------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Rated Resistance | R_{25} | | | 5.0 | | k |
| Deviation of R100 | R/R | $T_c=100, R_{100}=493.3$ | -5 | | 5 | % |
| Power Dissipation | P_{25} | | | | 20.0 | mW |
| B-value | $B_{25/50}$ | $R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15 K))]$ | | 3375 | | K |

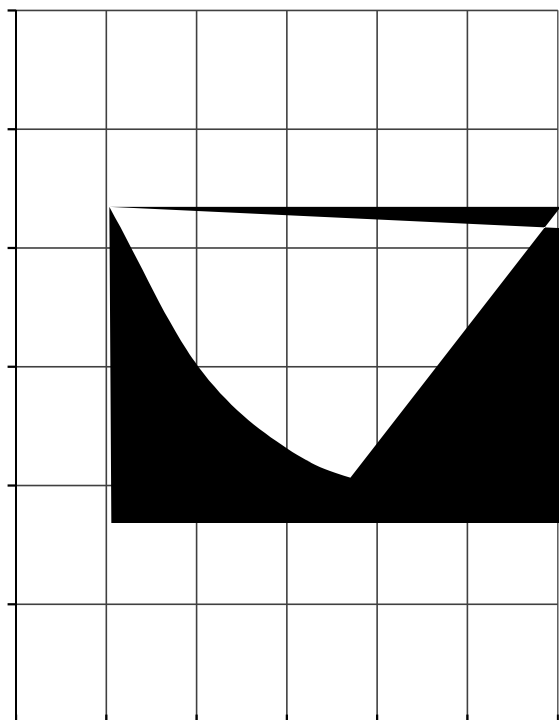
Module Characteristics

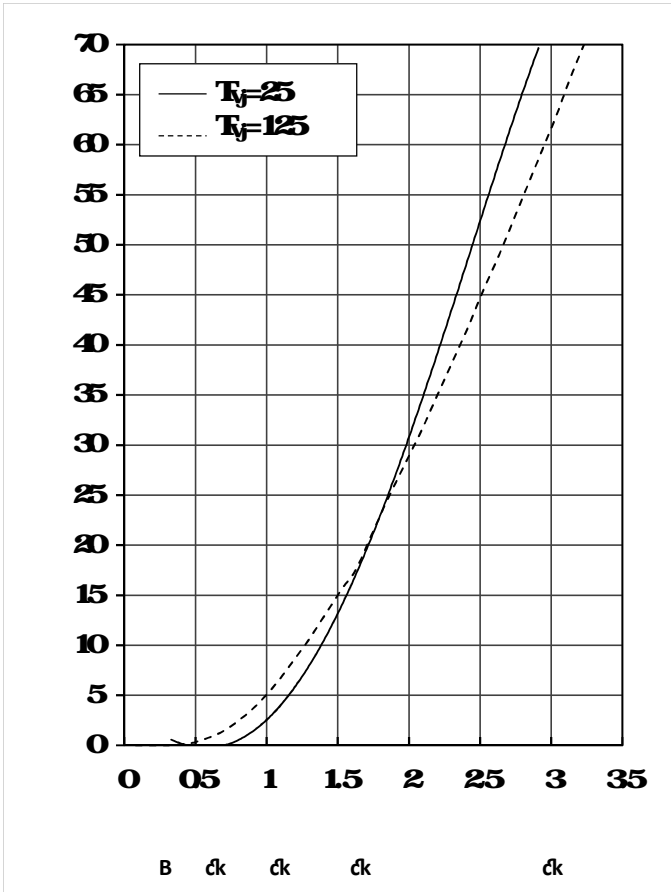
$T_C=25^\circ\text{C}$ unless otherwise specified

| Parameter | Symbol | Conditions | Value | | | Unit |
|--|-----------------------------|-------------------------------------|-------|-------|-------|------|
| | | | Min. | Typ. | Max. | |
| Isolation voltage | V_{isol} | $t=1\text{min}, f=50\text{Hz}$ | 2500 | | | V |
| Maximum Junction Temperature | T_{jmax} | | | | 175 | |
| Operating Junction Temperature | $T_{\text{vj op}}$ | | -40 | | 150 | |
| Storage Temperature | T_{stg} | | -40 | | 125 | |
| Stray-inductance-module | L_{SCE} | | | 60 | | C |
| Module lead resistance, terminals-chip | $R_{\text{CC}'+\text{EE}'}$ | $T_C=25^\circ\text{C}$, per switch | | 4.0 | | |
| | $R_{\text{AA}'+\text{CC}'}$ | | | 3.0 | | |
| Thermal Resistance Junction-to Case | R_{JC} | per IGBT-inverter | | | 0.339 | K/W |
| | | per Diode-inverter | | | 0.619 | |
| | | per IGBT-brake-copper | | | 0.500 | |
| | | per Diode-chopper | | | 1.266 | |
| | | per Diode-rectifier | | | 0.635 | |
| Thermal Resistance Case-to Sink | R_{CS} | per IGBT-inverter | | 0.121 | | K/W |
| | | per Diode-inverter | | 0.221 | | |
| | | per IGBT-brake-copper | | 0.180 | | |
| | | per Diode-chopper | | 0.452 | | |
| | | per Diode-rectifier | | 0.227 | | |
| | | per Module | | 0.009 | | |
| Mounting Force Per Clamp | F | | 3.0 | | 6.0 | N |
| Weight of Module | G | | | 300 | | g |









Circuit Diagram

