

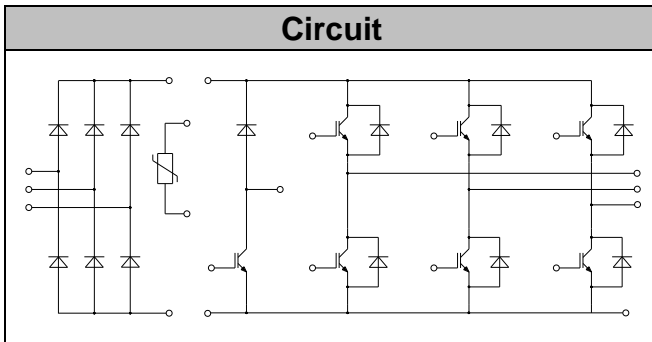


IGBT Modules

| | |
|--------------------------|-------|
| V_{CE(S)} | 1200V |
| I_C | 75A |

Applications

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



Features

- Low $V_{ce(sat)}$ with Trench technology
- 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} | $V_{GE}=0V, I_C=1mA, T_{vj}=25^{\circ}C$ | 1200 | V |
| Continuous Collector Current | I_C | $T_c=100^{\circ}C, T_{vjmax}=175^{\circ}C$ | 75 | A |
| Repetitive Peak Collector Current | I_{CRM} | $t_p=1ms$ | 150 | A |
| Gate-Emitter Voltage | V_{GES} | $T_{vj}=25^{\circ}C$ | ± 20 | V |
| Total Power Dissipation | P_{tot} | $T_c=25^{\circ}C, T_{vjmax}=175^{\circ}C$ | 476 | W |



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Characteristic values

| Parameter | Symbol | Conditions | Value | | | Unit | |
|-----------------------------------------|---------------|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|------|------|----------|----|
| | | | Min. | Typ. | Max. | | |
| Gate-Emitter Threshold Voltage | $V_{GE(th)}$ | $V_{GE}=V_{CE}, I_C=2.6mA, T_{vj}=25^{\circ}C$ | 5.8 | 6.5 | 7.2 | 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 | $V_{CE(sat)}$ | $I_C=75A, V_{GE}=15V, T_{vj}=25^{\circ}C$ | | 1.85 | 2.15 | V | |
| | | $I_C=75A, V_{GE}=15V, T_{vj}=125^{\circ}C$ | | 2.05 | | | |
| | | $I_C=75A, V_{GE}=15V, T_{vj}=150^{\circ}C$ | | 2.10 | | | |
| Gate Charge | Q_G | | | 0.78 | | μC | |
| Input Capacitance | C_{ies} | $V_{CE}=25V, V_{GE}=0V,$ $f=1MHz, T_{vj}=25^{\circ}C$ | | 4.00 | | nF | |
| Reverse Transfer Capacitance | C_{res} | | | 0.30 | | nF | |
| Internal Gate Resistance | R_{gint} | | | 2.5 | | Ω | |
| Gate-Emitter leakage current | I_{GES} | $V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$ | | | 400 | nA | |
| Turn-on Delay Time | $t_{d(on)}$ | $I_C=75A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=5.1\Omega$ $T_{vj}=25^{\circ}C$ | | 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 | $t_{d(on)}$ | | $I_C=75A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=5.1\Omega$ $T_{vj}=125^{\circ}C$ | | 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} | $T_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C,$ $V_{cc}=900V, V_{CEM} \leq 1200V$ | | 400 | | A | |



● Diode-inverter

Absolute Maximum Ratings

| Parameter | Symbol | Conditions | Value | Unit |
|---------------------------------|-----------|-----------------------------|-------|------|
| Repetitive Peak Reverse Voltage | V_{RRM} | $T_{vj}=25^{\circ}\text{C}$ | 1200 | V |
| Continuous DC Forward Current | I_F | | 75 | A |
| Repetitive Peak Forward Current | I_{FRM} | $t_p=1\text{ms}$ | 150 | A |

Characteristic values

| Parameter | Symbol | Conditions | Value | | | Unit |
|-------------------------------|-----------|-----------------------------------------------------------|-------|------|------|---------------|
| | | | Min. | Typ. | Max. | |
| Forward Voltage | V_F | $I_F=75\text{A}, T_{vj}=25^{\circ}\text{C}$ | | 2.00 | 2.30 | V |
| | | $I_F=75\text{A}, T_{vj}=125^{\circ}\text{C}$ | | 2.10 | | |
| | | $I_F=75\text{A}, T_{vj}=150^{\circ}\text{C}$ | | 2.15 | | |
| Recovered Charge | Q_{rr} | $I_F = 75\text{ A}$ | | 4.2 | | μC |
| Peak Reverse Recovery Current | I_{rr} | $V_R=600\text{V}$ $-di_F/dt = 900\text{A}/\mu\text{s}$ | | 75 | | A |
| Reverse Recovery Energy | E_{rec} | $T_{vj}=25^{\circ}\text{C}$ | | 2.06 | | mJ |
| Recovered Charge | Q_{rr} | $I_F = 75\text{ A}$ | | 9.6 | | μC |
| Peak Reverse Recovery Current | I_{rr} | $V_R=600\text{V}$ $-di_F/dt = 900\text{A}/\mu\text{s}$ | | 92 | | A |
| Reverse Recovery Energy | E_{rec} | $T_{vj}=125^{\circ}\text{C}$ | | 4.34 | | mJ |



● IGBT-brake-chopper

Absolute Maximum Ratings

| Parameter | Symbol | Conditions | Value | Unit |
|-----------------------------------|-----------|--------------------------------------------|----------|------|
| Collector-Emitter Voltage | V_{CES} | $V_{GE}=0V, I_C=1mA, T_{vj}=25^{\circ}C$ | 1200 | V |
| Continuous Collector Current | I_C | $T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$ | 40 | A |
| Repetitive Peak Collector Current | I_{CRM} | $tp=1ms$ | 80 | A |
| Gate-Emitter Voltage | V_{GES} | $T_{vj}=25^{\circ}C$ | ± 20 | V |
| Total Power Dissipation | P_{tot} | $T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$ | 300 | W |

Characteristic values

| Parameter | Symbol | Conditions | Value | | | Unit |
|-----------------------------------------|---------------|------------------------------------------------------------------------------------------|-------|------|------|---------|
| | | | Min. | Typ. | Max. | |
| Gate-Emitter Threshold Voltage | $V_{GE(th)}$ | $V_{GE}=V_{CE}, I_C=1.2mA, T_{vj}=25^{\circ}C$ | 5.8 | 6.7 | 7.2 | 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 | $V_{CE(sat)}$ | $I_C=40A, V_{GE}=15V, T_{vj}=25^{\circ}C$ | | 1.95 | 2.35 | V |
| | | $I_C=40A, V_{GE}=15V, T_{vj}=125^{\circ}C$ | | 2.30 | | |
| | | $I_C=40A, V_{GE}=15V, T_{vj}=150^{\circ}C$ | | 2.40 | | |
| Gate Charge | Q_G | | | 0.27 | | μC |
| Input Capacitance | C_{ies} | $V_{CE}=25V, V_{GE}=0V,$ | | 2.00 | | nF |
| Reverse Transfer Capacitance | C_{res} | $f=1MHz, T_{vj}=25^{\circ}C$ | | 0.07 | | nF |
| Gate-Emitter leakage current | I_{GES} | $V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$ | | | 400 | nA |
| Turn-on Delay Time | $t_{d(on)}$ | $I_C=40A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=12\Omega$ $T_{vj}=25^{\circ}C$ | | 28 | | ns |
| Rise Time | t_r | | | 16 | | ns |
| Turn-off Delay Time | $t_{d(off)}$ | | | 26 | | ns |
| Fall Time | t_f | | | 125 | | ns |
| Energy Dissipation During Turn-on Time | E_{on} | | | 2.40 | | mJ |
| Energy Dissipation During Turn-off Time | E_{off} | | | 2.25 | | mJ |



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| | | | | |
|-----------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----|
| Turn-on Delay Time | $t_{d(on)}$ | $I_C = 40\text{ A}$ $V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_G = 12\Omega$ $T_{vj} = 125^\circ\text{C}$ | 28 | ns |
| Rise Time | t_r | | 18 | ns |
| Turn-off Delay Time | $t_{d(off)}$ | | 310 | ns |
| Fall Time | t_f | | 190 | ns |
| Energy Dissipation During Turn-on Time | E_{on} | | 3.60 | mJ |
| Energy Dissipation During Turn-off Time | E_{off} | | 3.20 | mJ |
| SC Data | I_{sc} | | $T_p \leq 10\mu\text{s}, V_{GE} = 15\text{ V}, T_{vj} = 150^\circ\text{C},$ $V_{cc} = 900\text{ V}, V_{CEM} \leq 1200\text{ V}$ | 130 |

● Diode-Brake-Chopper

Absolute Maximum Ratings

| Parameter | Symbol | Conditions | Value | Unit |
|---------------------------------|-----------|--------------------------------------------------------|-------|------------------|
| Repetitive Peak Reverse Voltage | V_{RRM} | $T_j = 25^\circ\text{C}$ | 1200 | V |
| Continuous DC Forward Current | I_F | | 40 | A |
| Repetitive Peak Forward Current | I_{FRM} | $t_p = 1\text{ ms}$ | 80 | A |
| I^2t -value | I^2t | $V_R = 0, t_p = 10\text{ ms}, T_j = 125^\circ\text{C}$ | 240 | A ² s |
| | | $V_R = 0, t_p = 10\text{ ms}, T_j = 150^\circ\text{C}$ | 220 | |

Characteristic values

| Parameter | Symbol | Conditions | Value | | | Unit |
|-------------------------------|-----------|----------------------------------------------------------------|-------|------|------|---------------|
| | | | Min. | Typ. | Max. | |
| Forward Voltage | V_F | $I_F = 40\text{ A}, T_{vj} = 25^\circ\text{C}$ | | 1.75 | 2.25 | V |
| | | $I_F = 40\text{ A}, T_{vj} = 125^\circ\text{C}$ | | 1.75 | | |
| | | $I_F = 40\text{ A}, T_{vj} = 150^\circ\text{C}$ | | 1.75 | | |
| Recovered Charge | Q_{rr} | $I_F = 40\text{ A}$ | | 4.15 | | μC |
| Peak Reverse Recovery Current | I_{rr} | $V_R = 600\text{ V}$ $-di_F/dt = 1600\text{ A}/\mu\text{s}$ | | 42 | | A |
| Reverse Recovery Energy | E_{rec} | $T_{vj} = 25^\circ\text{C}$ | | 1.30 | | mJ |



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| | | | | |
|-------------------------------|-----------|----------------------------------------------------------------|------|---------------|
| Recovered Charge | Q_{rr} | $I_F = 40\text{ A}$ | 8.00 | μC |
| Peak Reverse Recovery Current | I_{rr} | $V_R = 600\text{ V}$ $-di_F/dt = 1600\text{ A}/\mu\text{s}$ | 46 | A |
| Reverse Recovery Energy | E_{rec} | $T_{vj} = 125^\circ\text{C}$ | 2.38 | mJ |

● Diode-Rectifier

Absolute Maximum Ratings

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

Characteristic values

| Parameter | Symbol | Conditions | Value | | | Unit |
|-----------------------|--------|------------------------------------------------|-------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Diode Forward Voltage | V_F | $I_F = 50\text{ A}, T_j = 150^\circ\text{C}$ | | 0.98 | | V |
| Reverse Current | I_R | $T_j = 125^\circ\text{C}, V_R = 1600\text{ V}$ | | | 2.0 | mA |

● NTC-Thermistor

Characteristic values

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



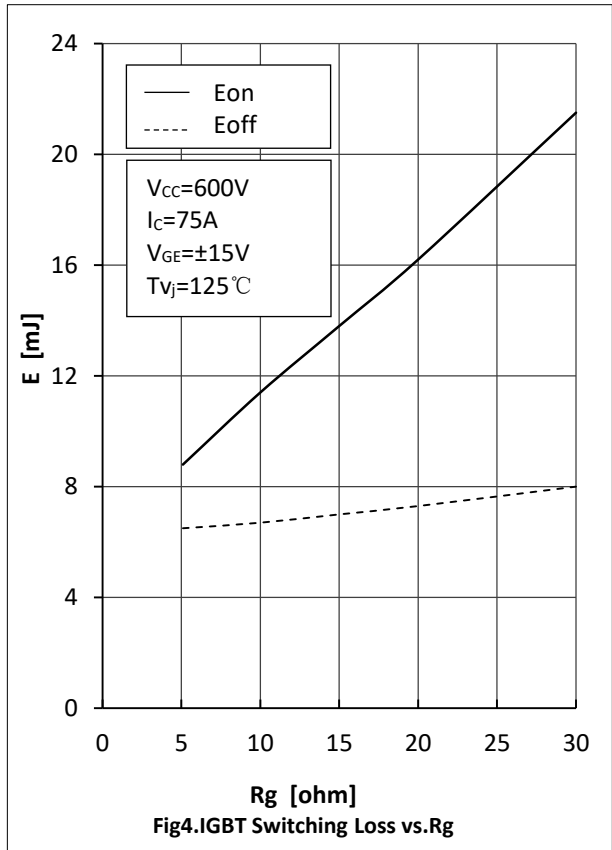
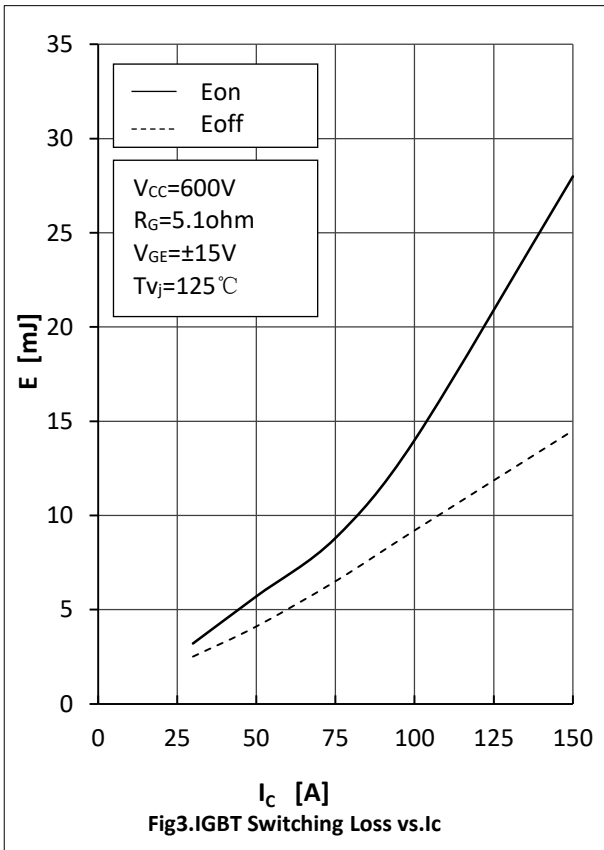
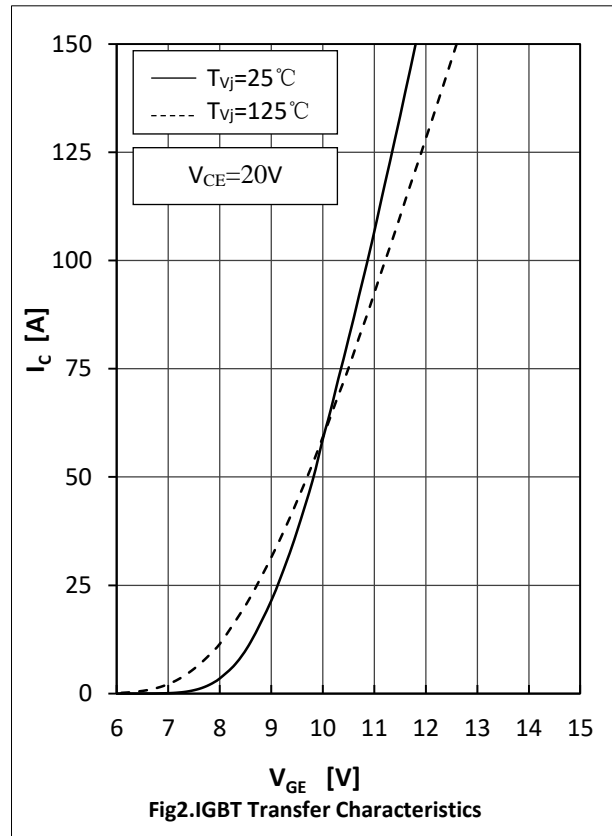
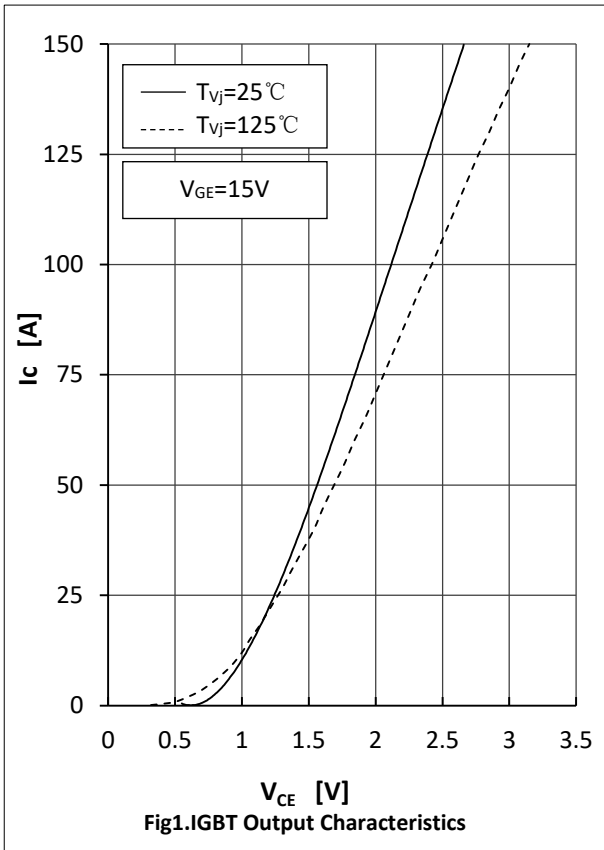
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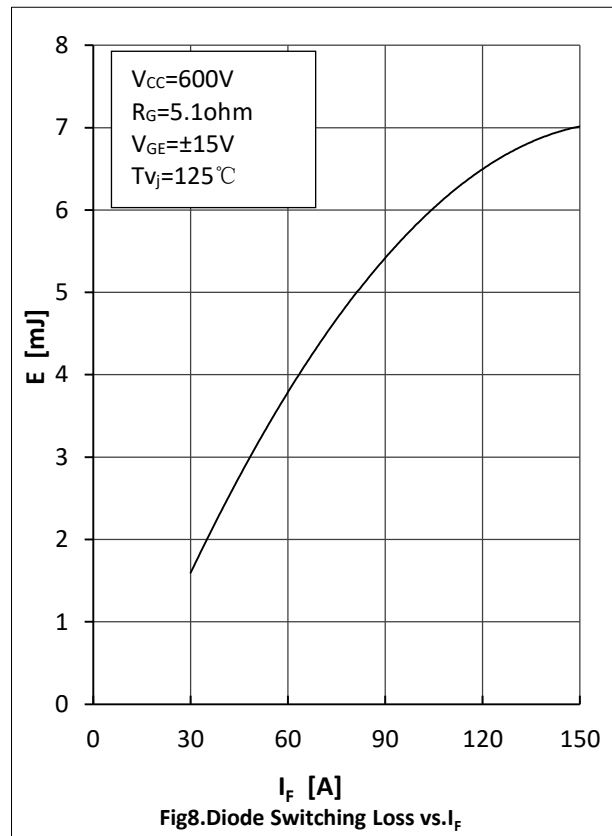
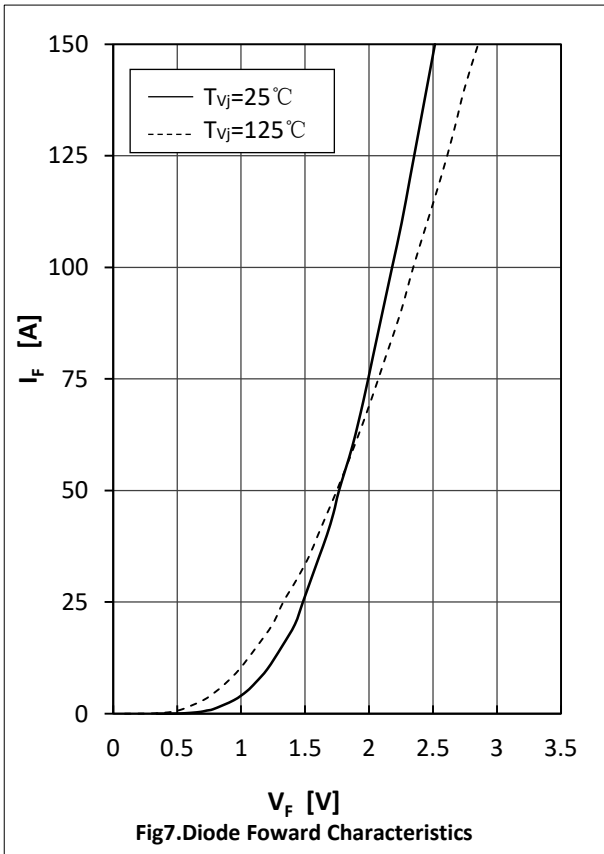
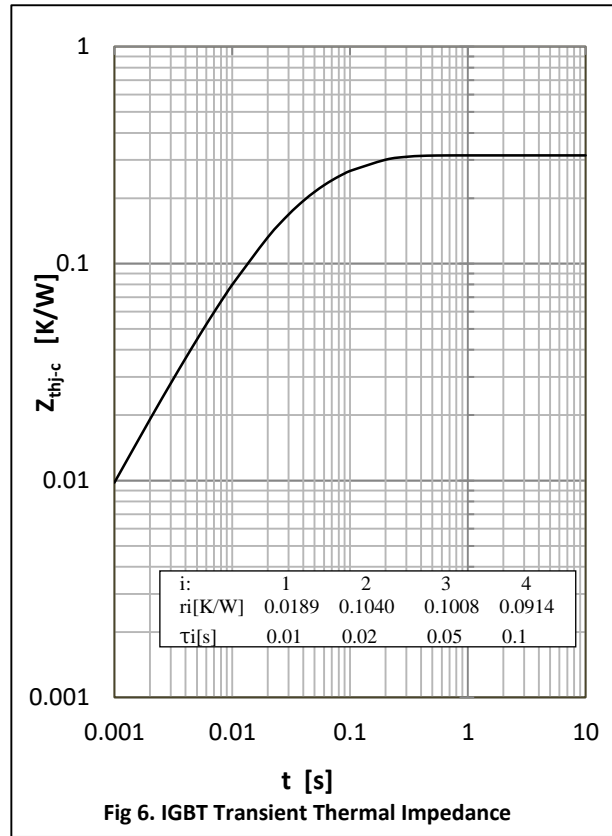
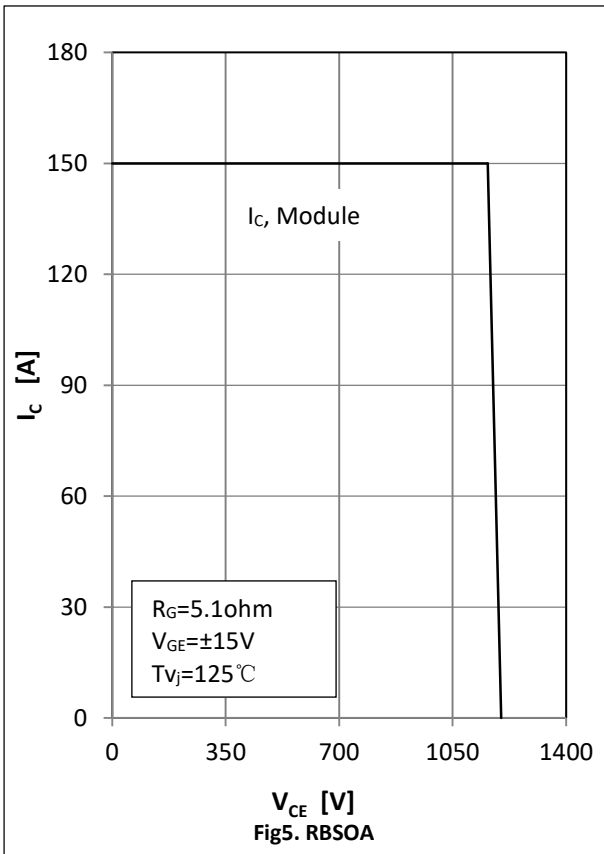
● **Module Characteristics** $T_C=25^\circ\text{C}$ unless otherwise specified

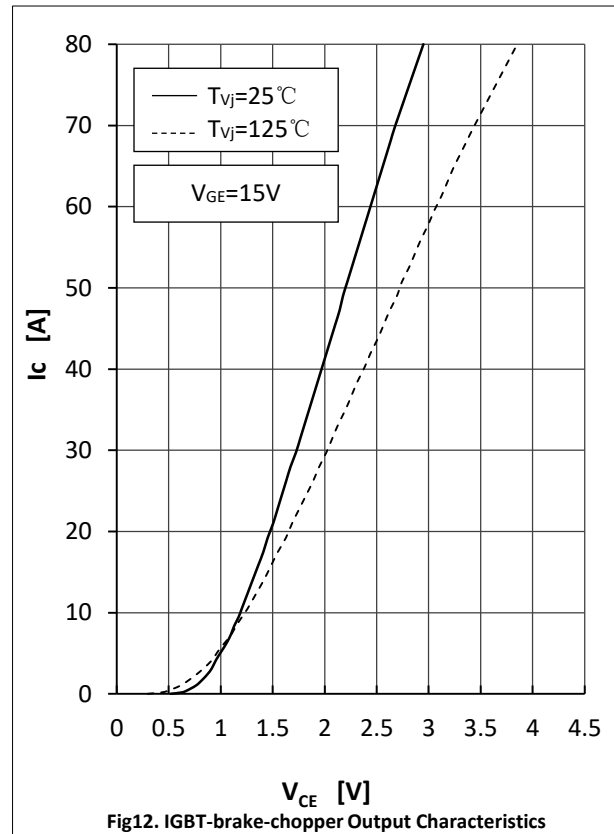
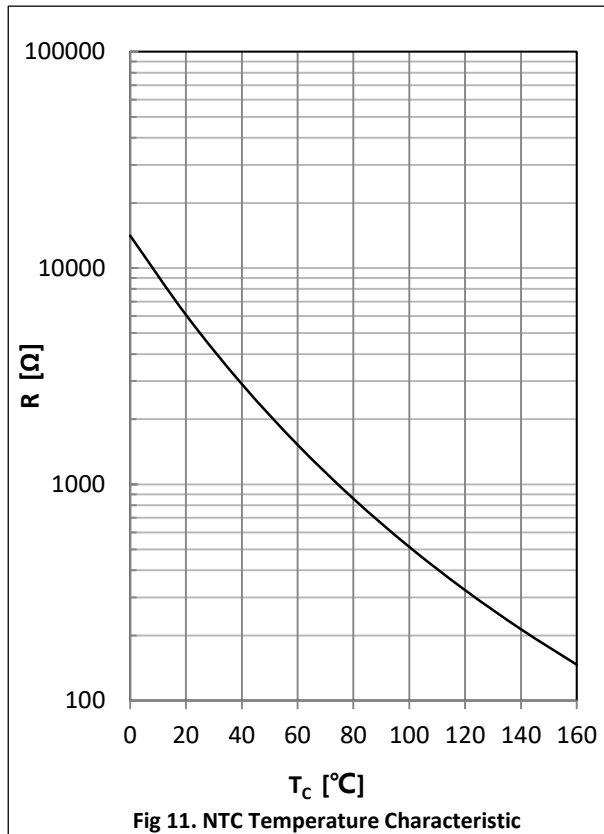
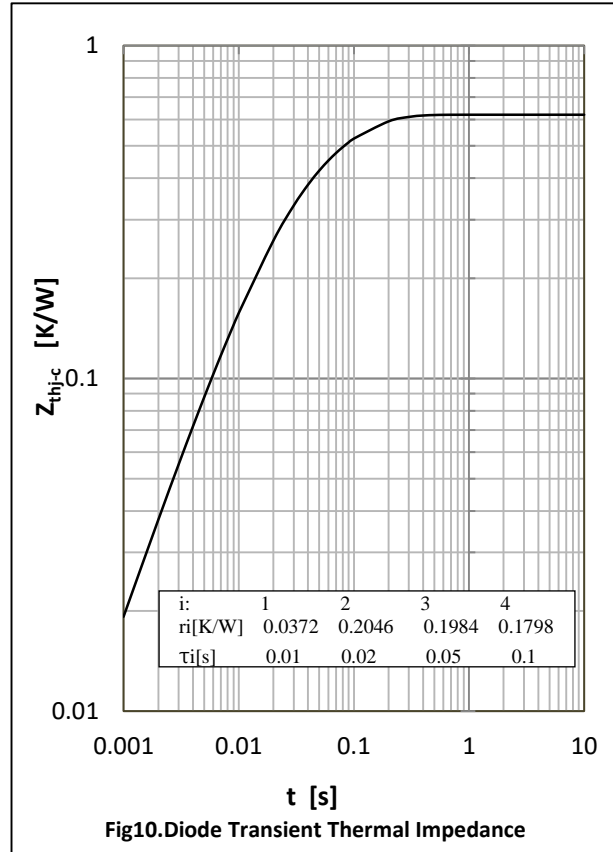
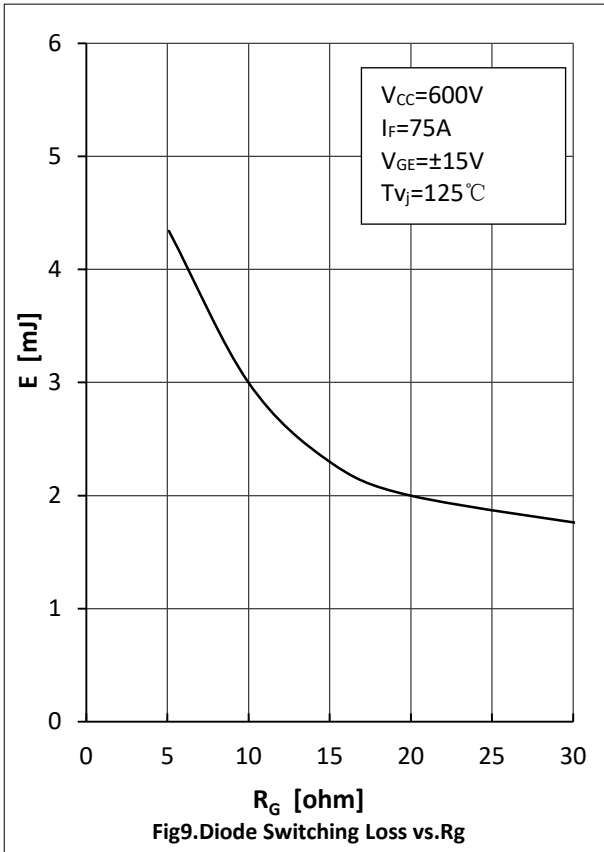
| Parameter | Symbol | Conditions | Value | | | Unit |
|------------------------------------------|-----------------|-------------------------------------|-------|-------|-------|------------------|
| | | | Min. | Typ. | Max. | |
| Isolation voltage | V_{isol} | $t=1\text{min}, f=50\text{Hz}$ | 2500 | | | V |
| Maximum Junction Temperature | T_{jmax} | Inverter, brake | | | 175 | $^\circ\text{C}$ |
| | | rectifier | | | 150 | |
| Operating Junction Temperature | T_{vjop} | | -40 | | 150 | $^\circ\text{C}$ |
| Storage Temperature | T_{stg} | | -40 | | 125 | $^\circ\text{C}$ |
| Stray Inductance | L_{CE} | | | 60 | | nH |
| Module Lead Resistance ,Terminal to Chip | $R_{cc'+EE'}$ | $T_C=25^\circ\text{C}$, per switch | | 4.0 | | $\text{m}\Omega$ |
| | $R_{AA'+CC'}$ | | | 2.0 | | |
| Thermal Resistance Junction-to Case | $R_{\theta jc}$ | per IGBT-inverter | | | 0.315 | K/W |
| | | per Diode-inverter | | | 0.620 | |
| | | per IGBT-brake-copper | | | 0.500 | |
| | | per Diode-chopper | | | 1.266 | |
| | | per Diode-rectifier | | | 0.548 | |
| Thermal Resistance Case-to Sink | $R_{\theta cs}$ | per IGBT-inverter | | 0.118 | | K/W |
| | | per Diode-inverter | | 0.205 | | |
| | | per IGBT-brake-copper | | 0.180 | | |
| | | per Diode-chopper | | 0.452 | | |
| | | per Diode-rectifier | | 0.236 | | |
| | | per Module | | 0.009 | | |
| Module-to-Sink Torque | M_s | | 3.0 | | 6.0 | N·m |
| Weight of Module | G | | | 300 | | g |

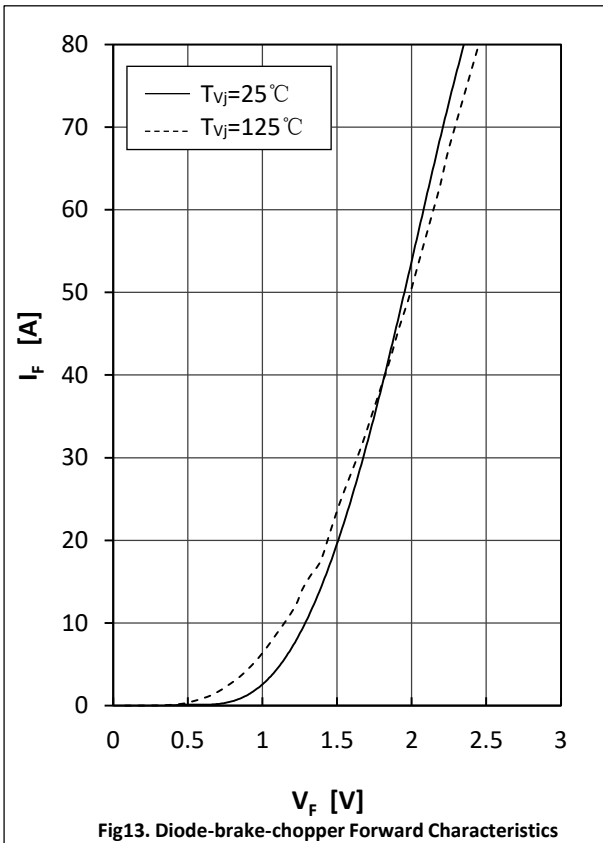


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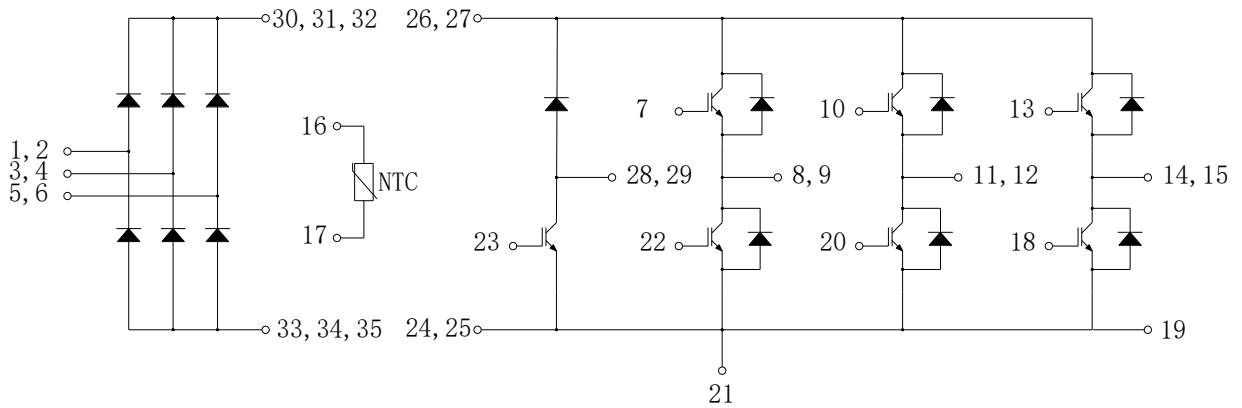






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● Circuit Diagram



● Package Dimensions

