

Electrical Features

- Trench/Fieldstop IGBT
- V_{CEsat} with positive Temperature Coefficient
- Low V_{CEsat}

Typical Applications

- Auxiliary inverters
- Motor drives
- Servo drives

Mechanical Features

- High power density
- Integrated NTC temperature sensor
- Copper base plate
- Solder contact technology
- Standard housing



IGBT, Inverter

| Maximum Rated Values | | | | | | | |
|------------------------|--------------------------------------|---|-----------------------|------|------|----------|---|
| Symbol | Item | Conditions | Rating | Unit | | | |
| IGBT | | | | | | | |
| V_{CES} | Collector-emitter voltage | $T_{vj}=25^{\circ}C$ | 1200 | V | | | |
| V_{GES} | Gate-emitter voltage | - | ± 20 | V | | | |
| I_C | Collector current,DC | $T_C=100^{\circ}C, T_{vj}=175^{\circ}C$ | 150 | A | | | |
| I_{CRM} | Repetitive peak collector current | $t_p=1ms$ | 300 | A | | | |
| P_{tot} | Total power dissipation | $T_C=25^{\circ}C, T_{vj}=175^{\circ}C$ | 872 | W | | | |
| Characteristics Values | | | | | | | |
| Symbol | Item | Conditions | Values | | | Unit | |
| IGBT | | | Min. | Typ. | Max. | | |
| I_{CES} | Collector-emitter cut-off current | $V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$ | - | - | 1 | mA | |
| I_{GES} | Gate leakage current | $V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$ | - | - | 500 | nA | |
| $V_{GE(th)}$ | Gate-emitter threshold voltage | $I_C=5.7mA, V_{CE}=V_{GE}, T_{vj}=25^{\circ}C$ | 5.2 | 5.71 | 6.2 | V | |
| V_{CEsat} | Collector-emitter saturation voltage | $I_C=150A$ $V_{GE}=15V$ | $T_{vj}=25^{\circ}C$ | - | 2.08 | - | V |
| | | | $T_{vj}=125^{\circ}C$ | - | - | - | |
| | | | $T_{vj}=150^{\circ}C$ | - | - | - | |
| C_{ies} | Input capacitance | $V_{CE}=25V, V_{GE}=0V$ $f=1MHz, T_{vj}=25^{\circ}C$ | - | 10.6 | - | nF | |
| C_{oes} | Output capacitance | | - | 0.69 | - | | |
| C_{res} | Reverse transfer capacitance | | - | 0.36 | - | | |
| Q_G | Gate charge | $V_{GE}=-15...+15V, T_{vj}=25^{\circ}C$ | - | - | - | μC | |
| R_g | Internal gate resistance | $T_{vj}=25^{\circ}C$ | - | 1.2 | - | Ω | |

| | | | | | | | |
|--------------|--|--|----------------------|--------|-------|------------|----|
| $t_{d(on)}$ | Turn-on delay time | $V_{CC}=600V$ $I_C=150A$ $V_{GE}=\pm 15V$ $R_{G(on)}=6.8\Omega$ $R_{G(off)}=6.8\Omega$ | $T_{vj}=25^\circ C$ | - | - | - | ns |
| | | | $T_{vj}=125^\circ C$ | - | 282 | - | |
| | | | $T_{vj}=150^\circ C$ | - | - | - | |
| t_r | Rise time | | $T_{vj}=25^\circ C$ | - | - | - | |
| | | | $T_{vj}=125^\circ C$ | - | 97 | - | |
| | | | $T_{vj}=150^\circ C$ | - | - | - | |
| $t_{d(off)}$ | Turn-off delay time | | $T_{vj}=25^\circ C$ | - | - | - | |
| | | | $T_{vj}=125^\circ C$ | - | 525 | - | |
| | | | $T_{vj}=150^\circ C$ | - | - | - | |
| t_f | Fall time | | $T_{vj}=25^\circ C$ | - | - | - | |
| | | | $T_{vj}=125^\circ C$ | - | 274 | - | |
| | | | $T_{vj}=150^\circ C$ | - | - | - | |
| E_{on} | Turn-on energy (per pulse) | $T_{vj}=25^\circ C$ | - | - | - | mJ | |
| | | $T_{vj}=125^\circ C$ | - | 36.75 | - | | |
| | | $T_{vj}=150^\circ C$ | - | - | - | | |
| E_{off} | Turn-off energy (per pulse) | $T_{vj}=25^\circ C$ | - | - | - | | |
| | | $T_{vj}=125^\circ C$ | - | 13.97 | - | | |
| | | $T_{vj}=150^\circ C$ | - | - | - | | |
| SC data | Short-circuit current | $V_{CC}=600V, V_{GE}\leq 15V, T_{vj}=150^\circ C$ $V_{CES}\leq 1200V, t_p\leq 10\mu s$ | - | 633 | - | A | |
| R_{thJC} | Thermal resistance, junction to case | Per IGBT | - | - | 0.172 | K/W | |
| R_{thCH} | Thermal resistance, case to heatsink | Per IGBT $\lambda_{grease}=1W/(m\cdot K)$ | - | 0.0785 | - | K/W | |
| T_{vjop} | Temperature under switching conditions | | -40 | | 150 | $^\circ C$ | |

Diode, Inverter
Maximum Rated Values

| Symbol | Item | Conditions | Rating | Unit |
|-----------|---------------------------------|--|--------|--------|
| V_{RRM} | Repetitive peak reverse voltage | $T_{vj}=25^\circ C$ | 1200 | V |
| I_F | Forward current, DC | | 150 | A |
| I_{FRM} | Repetitive peak forward current | $t_p=1ms$ | 300 | A |
| I^2t | I^2t -value | $V_R=0V, t_p=10ms, T_{vj}=150^\circ C$ | 2950 | A^2s |

Characteristic Values

| | | | | | | | | |
|----------|---------------------------------|---|----------------------|---|-------|---|----|---------|
| V_F | Continuous forward voltage | $I_F=150A$ $V_{GE}=0V$ | $T_{vj}=25^\circ C$ | - | 1.92 | - | V | |
| | | | $T_{vj}=125^\circ C$ | - | - | - | | |
| | | | $T_{vj}=150^\circ C$ | - | - | - | | |
| I_{RM} | Peak reverse recovery current | | $T_{vj}=25^\circ C$ | - | - | - | | A |
| | | | $T_{vj}=125^\circ C$ | - | 170.7 | - | | |
| | | | $T_{vj}=150^\circ C$ | - | - | - | | |
| t_{rr} | Reverse recovery time | $V_R=600V$ $I_F=150A$ $V_{GE}=-15V$ | $T_{vj}=25^\circ C$ | - | - | - | ns | |
| | | | $T_{vj}=125^\circ C$ | - | 516 | - | | |
| | | | $T_{vj}=150^\circ C$ | - | - | - | | |
| Q_r | Repetitive peak forward current | | $T_{vj}=25^\circ C$ | - | - | - | | μC |
| | | | $T_{vj}=125^\circ C$ | - | 32.86 | - | | |
| | | | $T_{vj}=150^\circ C$ | - | - | - | | |

| | | | | | | | |
|-------------------|--|---|------------------------|-------|-------|-----|----|
| E _{rec} | Recovered charge | | T _{vj} =25°C | - | - | - | mJ |
| | | | T _{vj} =125°C | - | 9.44 | - | |
| | | | T _{vj} =150°C | - | - | - | |
| R _{thJC} | Thermal resistance, junction to case | per diode | - | - | 0.299 | K/W | |
| R _{thCH} | Thermal resistance, case to heatsink | per diode, λ _{grease} =1 W/(m • K) | - | 0.105 | - | K/W | |
| T _{vjop} | Temperature under switching conditions | | -40 | | 150 | °C | |

Diode, Rectifier

| Maximum Rated Values | | | | | | | |
|-----------------------|---|--|------------------------|--------|-------|------|------------------|
| Symbol | Item | Conditions | | Rating | | | Unit |
| V _{RRM} | Repetitive peak reverse voltage | T _{vj} =25°C | | 1600 | | | V |
| I _{FRMSM} | Maximum RMS forward current per chip | T _C =100°C, T _{vj} =175°C | | 150 | | | A |
| I _{RMSM} | Maximum RMS current at rectifier output | T _C = 100°C | | 150 | | | A |
| I _{FSM} | Surge forward current | tp = 10 ms, T _{vj} = 25° C | | 1320 | | | A |
| I ² t | I ² t-value | V _R =0V, t _p =10ms, T _{vj} =150°C | | 9800 | | | A ² s |
| Characteristic Values | | | | | | | |
| Symbol | Item | Conditions | Values | | | Unit | |
| | | | Min. | Typ. | Max. | | |
| V _F | Continuous forward voltage | I _F =150A V _{GE} =0V | T _{vj} =25°C | - | 1.24 | - | V |
| | | | T _{vj} =125°C | - | - | - | |
| | | | T _{vj} =150°C | - | - | - | |
| I _R | Reverse current | V _R =1600V | T _{vj} =25°C | - | 3.45 | - | uA |
| | | | T _{vj} =125°C | - | - | - | |
| | | | T _{vj} =150°C | - | - | - | |
| R _{thJC} | Thermal resistance, junction to case | per diode | - | - | 0.284 | K/W | |
| R _{thCH} | Thermal resistance, case to heatsink | per diode, λ _{grease} =1 W/(m • K) | - | 0.0887 | - | K/W | |
| T _{vjop} | Temperature under switching conditions | | -40 | | 150 | °C | |

IGBT, Brake-Chopper

| Maximum Rated Values | | | | | | | |
|-----------------------|-----------------------------------|--|--------|--------|------|------|------|
| Symbol | Item | Conditions | | Values | | | Unit |
| V _{CES} | Collector-emitter voltage | T _{vj} =25°C | | 1200 | | | V |
| V _{GES} | Gate-emitter voltage | - | | ±20 | | | V |
| I _C | Collector current,DC | T _C =100°C, T _{vj} =175°C | | 100 | | | A |
| I _{CRM} | Repetitive peak collector current | t _p =1ms | | 200 | | | A |
| P _{tot} | Total power dissipation | T _C =25°C, T _{vj} =175°C | | 652 | | | W |
| Characteristic Values | | | | | | | |
| Symbol | Item | Conditions | Values | | | Unit | |
| | | | Min. | Typ. | Max. | | |
| IGBT | | | | | | | |
| I _{CES} | Collector-emitter cut-off current | V _{CE} =1200V, V _{GE} =0V, T _{vj} =25°C | | - | - | 1 | mA |
| I _{GES} | Gate leakage current | V _{CE} =0V, V _{GE} =20V, T _{vj} =25°C | | - | - | 500 | nA |

| | | | | | | | | |
|------------------------------|--|---|----------------------|----------------------|--------|--------|------------|---|
| $V_{GE(th)}$ | Gate-emitter threshold voltage | $I_C=3.8mA, V_{CE}=V_{GE}, T_{vj}=25^\circ C$ | | 5.2 | 5.56 | 6.2 | | |
| V_{CEsat} | Collector-emitter saturation voltage | $I_C=100A$ $V_{GE}=15V$ | $T_{vj}=25^\circ C$ | - | 1.98 | - | V | |
| | | | $T_{vj}=125^\circ C$ | - | - | - | | |
| | | | $T_{vj}=150^\circ C$ | - | - | - | | |
| C_{ies} | Input capacitance | $V_{CE}=25V, V_{GE}=0V$ $f=1MHz, T_{vj}=25^\circ C$ | | - | 7.07 | - | pF | |
| C_{oes} | Output capacitance | | | - | 0.46 | - | | |
| C_{res} | Reverse transfer capacitance | | | - | 0.24 | - | | |
| Q_G | Gate charge | $V_{CC}=600V, I_C=100A$ $V_{GE}=-15\dots+15V, T_{vj}=25^\circ C$ | | - | - | - | nC | |
| R_g | Internal gate resistance | $T_{vj}=25^\circ C$ | | - | 1.8 | - | Ω | |
| $t_{d(on)}$ | Turn-on delay time | | | $T_{vj}=25^\circ C$ | - | - | ns | |
| | | | | $T_{vj}=125^\circ C$ | - | 237 | | - |
| | | | | $T_{vj}=150^\circ C$ | - | - | | - |
| t_r | Rise time | | | $T_{vj}=25^\circ C$ | - | - | ns | |
| | | | | $T_{vj}=125^\circ C$ | - | 25.6 | | - |
| | | | | $T_{vj}=150^\circ C$ | - | - | | - |
| $t_{d(off)}$ | Turn-off delay time | $V_{CC}=600V$ $I_C=100A$ $V_{GE}=\pm 15V$ | | $T_{vj}=25^\circ C$ | - | - | ns | |
| | | | | $T_{vj}=125^\circ C$ | - | 333 | | - |
| | | | | $T_{vj}=150^\circ C$ | - | - | | - |
| t_f | Fall time | $R_{G(on)}=2\Omega$ $R_{G(off)}=2\Omega$ | | $T_{vj}=25^\circ C$ | - | - | ns | |
| | | | | $T_{vj}=125^\circ C$ | - | 376 | | - |
| | | | | $T_{vj}=150^\circ C$ | - | - | | - |
| E_{on} | Turn-on energy (per pulse) | | | $T_{vj}=25^\circ C$ | - | - | mJ | |
| | | | | $T_{vj}=125^\circ C$ | - | 4.99 | | - |
| | | | | $T_{vj}=150^\circ C$ | - | - | | - |
| E_{off} | Turn-off energy (per pulse) | | | $T_{vj}=25^\circ C$ | - | - | mJ | |
| | | | | $T_{vj}=125^\circ C$ | - | 4.25 | | - |
| | | | | $T_{vj}=150^\circ C$ | - | - | | - |
| SC data | Short-circuit current | $V_{CC}=600V, V_{GE}\leq 15V, T_{vj}=150^\circ C$ $V_{CES}\leq 1200V, t_p\leq 10\mu s$ | | - | 428 | - | A | |
| R_{thJC} | Thermal resistance, junction to case | Per IGBT | | - | - | 0.23 | K/W | |
| R_{thCH} | Thermal resistance, case to heatsink | Per IGBT $\lambda_{grease}=1W/(m\cdot K)$ | | - | 0.0941 | - | K/W | |
| T_{vjop} | Temperature under switching conditions | | | -40 | | 150 | $^\circ C$ | |
| Diode, Brake-Chopper | | | | | | | | |
| Maximum Rated Values | | | | | | | | |
| Symbol | Item | Conditions | | Rating | | Unit | | |
| V_{RRM} | Repetitive peak reverse voltage | $T_{vj}=25^\circ C$ | | 1200 | | V | | |
| I_F | Forward current, DC | | | 50 | | A | | |
| I_{FRM} | Repetitive peak forward current | $t_p=1ms$ | | 100 | | A | | |
| I^2t | I^2t -value | $V_R=0V, t_p=10ms, T_{vj}=125^\circ C$ | | 560 | | A^2s | | |
| Characteristic Values | | | | | | | | |
| V_F | Continuous forward voltage | $I_F=50A$ $V_{GE}=0V$ | | $T_{vj}=25^\circ C$ | - | 1.89 | V | |
| | | | | $T_{vj}=125^\circ C$ | - | - | | |

| | | | | | | | |
|------------|--|--|------------------------------|------|-------|-------|--------------------|
| | | | $T_{vj}=150^{\circ}\text{C}$ | - | - | - | |
| I_{RM} | Peak reverse recovery current | $V_R=600\text{V}$ $I_F=50\text{A}$ $V_{GE}=-15\text{V}$ | $T_{vj}=25^{\circ}\text{C}$ | - | - | - | A |
| | | | $T_{vj}=125^{\circ}\text{C}$ | - | 116 | - | |
| | | | $T_{vj}=150^{\circ}\text{C}$ | - | - | - | |
| t_{rr} | Reverse recovery time | | $T_{vj}=25^{\circ}\text{C}$ | - | - | - | ns |
| | | | $T_{vj}=125^{\circ}\text{C}$ | - | 160 | - | |
| Q_r | Repetitive peak forward current | | $T_{vj}=25^{\circ}\text{C}$ | - | - | - | μC |
| | | $T_{vj}=125^{\circ}\text{C}$ | - | 9.5 | - | | |
| E_{rec} | Recovered charge | $T_{vj}=25^{\circ}\text{C}$ | - | - | - | mJ | |
| | | $T_{vj}=125^{\circ}\text{C}$ | - | 2.57 | - | | |
| R_{thJC} | Thermal resistance, junction to case | per diode | | - | - | 0.682 | K/W |
| R_{thCH} | Thermal resistance, case to heatsink | per diode, $\lambda_{grease}=1\text{ W}/(\text{m}\cdot\text{K})$ | | - | 0.123 | - | K/W |
| T_{vjop} | Temperature under switching conditions | | | -40 | | 150 | $^{\circ}\text{C}$ |

Note:

IGBT electrical characteristics according to IEC 60747 – 9

Diode electrical characteristics according to IEC 60747 – 2

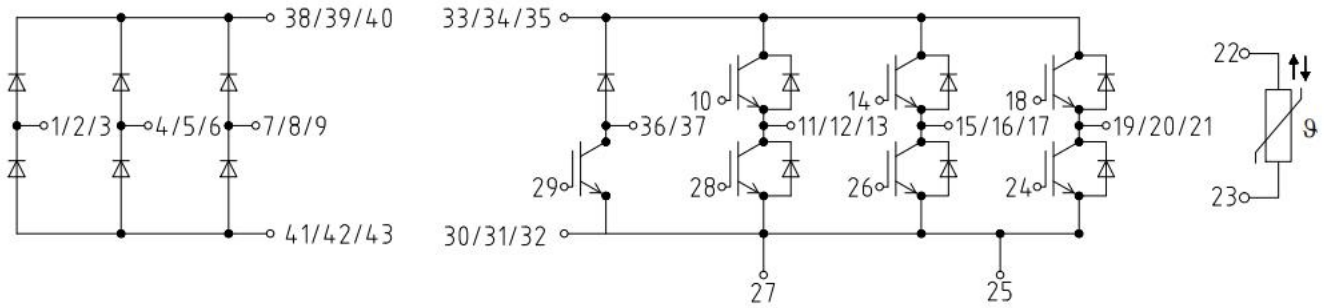
NTC Thermistor Characteristics

| Symbol | Item | Conditions | Values | | | Unit |
|--------------|-------------------------|--|--------|------|------|------------|
| | | | Min. | Typ. | Max. | |
| R_{25} | Rated resistance | $T_C=25^{\circ}\text{C}$ | - | 5 | - | k Ω |
| $\Delta R/R$ | Deviation of resistance | $T_C=100^{\circ}\text{C}, R_{100}=477\Omega$ | -5 | - | 5 | % |
| P_{25} | Power dissipation | $T_C=25^{\circ}\text{C}$ | - | - | 20 | mW |
| $B_{25/50}$ | B-constant | $R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$ | - | 3375 | - | K |
| $B_{25/80}$ | B-constant | $R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15\text{K}))]$ | - | 3411 | - | |
| $B_{25/100}$ | B-constant | $R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15\text{K}))]$ | - | 3433 | - | |

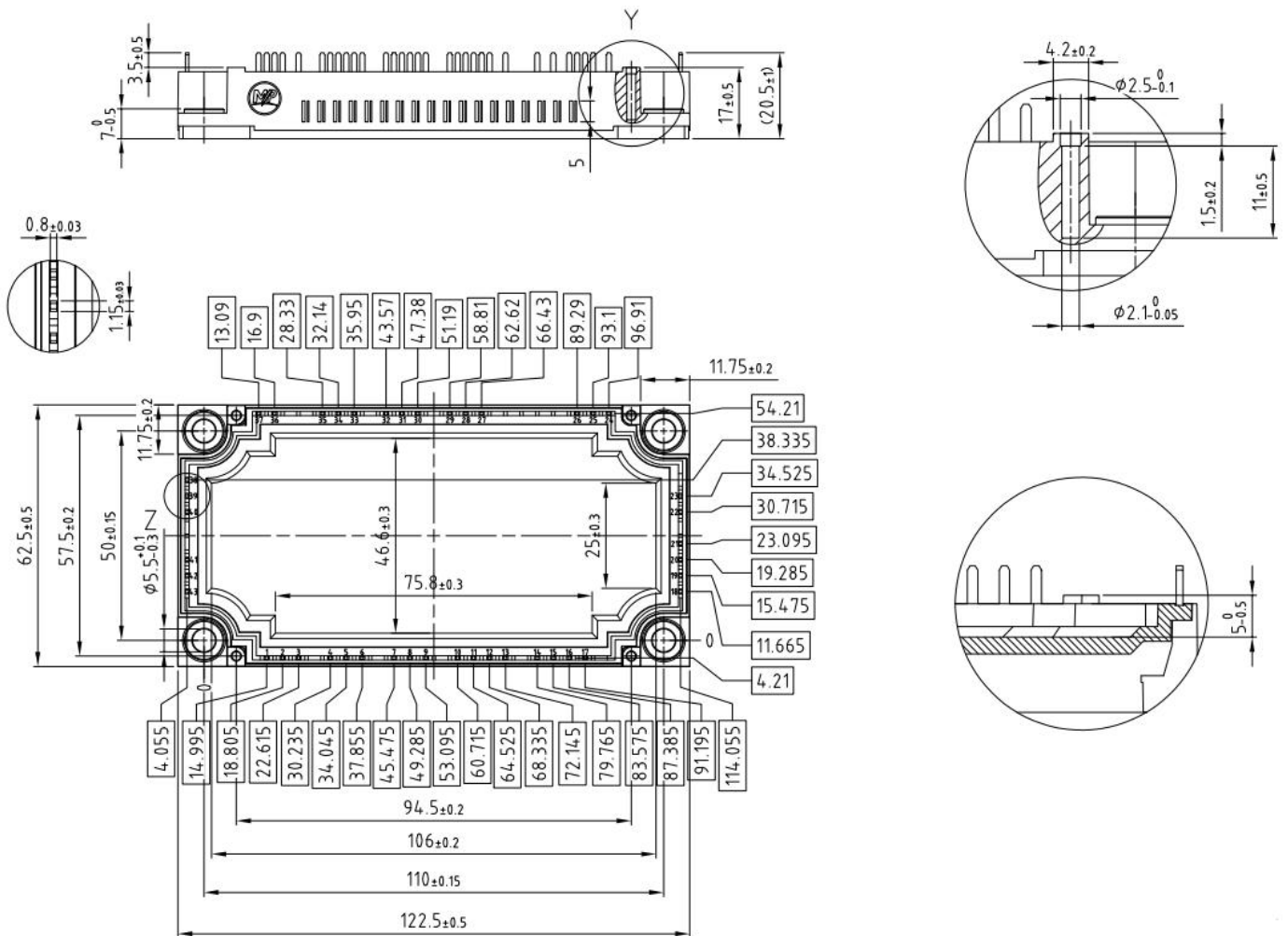
Module

| Symbol | Item | Conditions | Rating | | | Unit |
|-------------------|-------------------------------------|--|---------|------|------|--------------------|
| V_{ISOL} | Isolation voltage | Terminals to baseplate, RMS, $f=50\text{Hz}, t=1\text{min}$ | 2500 | | | V |
| $T_{vj\max}$ | Maximum junction temperature | - | 175 | | | $^{\circ}\text{C}$ |
| $T_{vj\text{op}}$ | Operating junction temperature | Continuous operation(underswitching) | -40~150 | | | $^{\circ}\text{C}$ |
| T_{stg} | Storage temperature | - | -40~125 | | | $^{\circ}\text{C}$ |
| Symbol | Item | Conditions | Values | | | Unit |
| | | | Min. | Typ. | Max. | |
| M | Mounting torque for module mounting | - | 3 | - | 6 | Nm |
| ds | Creepage distance | Terminal to terminal | - | - | - | mm |
| | | Terminal to base plate | - | 10 | - | |
| da | Clearance | Terminal to terminal | - | - | - | mm |
| | | Terminal to base plate | - | 7.5 | - | |
| m | Weight | - | - | 290 | - | g |

Circuit Diagram



Package Outlines



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