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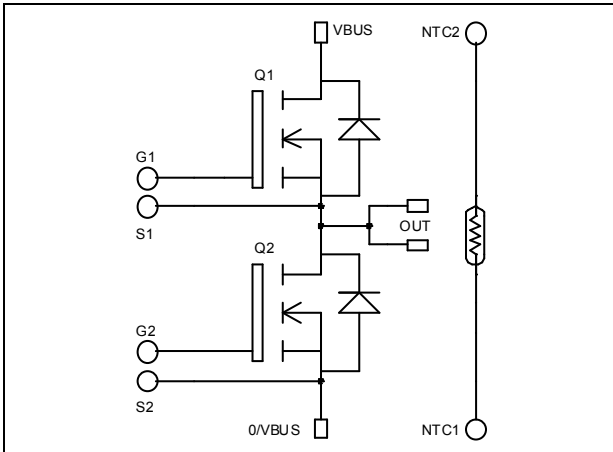
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Phase leg
MOSFET Power Module

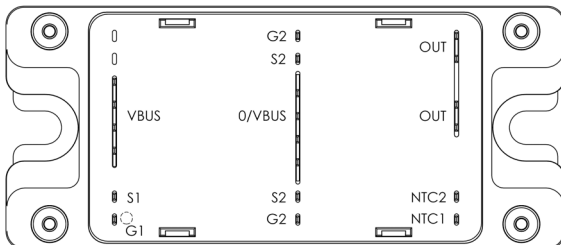
$V_{DSS} = 500V$
 $R_{DSon} = 35m\Omega \text{ typ @ } T_j = 25^\circ C$
 $I_D = 99A \text{ @ } T_c = 25^\circ C$


Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies

Features

- Power MOS 7[®] FREDFETs
 - Low R_{DSon}
 - Low input and Miller capacitance
 - Low gate charge
 - Fast intrinsic reverse diode
 - Avalanche energy rated
 - Very rugged
- Kelvin source for easy drive
- Very low stray inductance
 - Symmetrical design
 - Lead frames for power connections
- Internal thermistor for temperature monitoring
- High level of integration


Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Low profile
- RoHS Compliant

Absolute maximum ratings

| Symbol | Parameter | Max ratings | Unit |
|------------|---|--------------------|-----------|
| V_{DSS} | Drain - Source Breakdown Voltage | 500 | V |
| I_D | Continuous Drain Current | $T_c = 25^\circ C$ | 99 |
| | | $T_c = 80^\circ C$ | 74 |
| I_{DM} | Pulsed Drain current | 396 | |
| V_{GS} | Gate - Source Voltage | ± 30 | V |
| R_{DSon} | Drain - Source ON Resistance | 39 | $m\Omega$ |
| P_D | Maximum Power Dissipation | $T_c = 25^\circ C$ | 781 |
| I_{AR} | Avalanche current (repetitive and non repetitive) | 51 | A |
| E_{AR} | Repetitive Avalanche Energy | 50 | mJ |
| E_{AS} | Single Pulse Avalanche Energy | 3000 | |

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on www.microsemi.com

All ratings @ $T_j = 25^\circ\text{C}$ unless otherwise specified

Electrical Characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|--------------|---------------------------------|-------------------------------------|--------------------------|-----|-----------|------------------|
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{GS} = 0V, V_{DS} = 500V$ | | | 200 | μA |
| | | $V_{GS} = 0V, V_{DS} = 400V$ | $T_j = 25^\circ\text{C}$ | | 1000 | |
| $R_{DS(on)}$ | Drain – Source on Resistance | $V_{GS} = 10V, I_D = 49.5A$ | | 35 | 39 | $\text{m}\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS} = V_{DS}, I_D = 5\text{mA}$ | 3 | | 5 | V |
| I_{GSS} | Gate – Source Leakage Current | $V_{GS} = \pm 30V, V_{DS} = 0V$ | | | ± 150 | nA |

Dynamic Characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|--------------|------------------------------|---|-----|------|-----|---------------|
| C_{iss} | Input Capacitance | $V_{GS} = 0V$ | | 14 | | nF |
| C_{oss} | Output Capacitance | $V_{DS} = 25V$ | | 2.8 | | |
| C_{rss} | Reverse Transfer Capacitance | $f = 1\text{MHz}$ | | 0.2 | | |
| Q_g | Total gate Charge | $V_{GS} = 10V$ | | 280 | | nC |
| Q_{gs} | Gate – Source Charge | $V_{Bus} = 250V$ | | 80 | | |
| Q_{gd} | Gate – Drain Charge | $I_D = 99A$ | | 140 | | |
| $T_{d(on)}$ | Turn-on Delay Time | Inductive switching @ 125°C $V_{GS} = 15V$ $V_{Bus} = 333V$ $I_D = 99A$ $R_G = 1\Omega$ | | 21 | | ns |
| T_r | Rise Time | | | 38 | | |
| $T_{d(off)}$ | Turn-off Delay Time | | | 75 | | |
| T_f | Fall Time | | | 93 | | |
| E_{on} | Turn-on Switching Energy | Inductive switching @ 25°C $V_{GS} = 15V, V_{Bus} = 333V$ $I_D = 99A, R_G = 1\Omega$ | | 2070 | | μJ |
| E_{off} | Turn-off Switching Energy | | | 1690 | | |
| E_{on} | Turn-on Switching Energy | Inductive switching @ 125°C $V_{GS} = 15V, V_{Bus} = 333V$ $I_D = 99A, R_G = 1\Omega$ | | 3112 | | μJ |
| E_{off} | Turn-off Switching Energy | | | 2026 | | |

Source - Drain diode ratings and characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|----------|--|------------------------------|---------------------------|-----|------|---------------|
| I_S | Continuous Source current (Body diode) | $T_c = 25^\circ\text{C}$ | | | 99 | A |
| | | $T_c = 80^\circ\text{C}$ | | | 74 | |
| V_{SD} | Diode Forward Voltage | $V_{GS} = 0V, I_S = -99A$ | | | 1.3 | V |
| dv/dt | Peak Diode Recovery ① | | | | 15 | V/ns |
| t_{rr} | Reverse Recovery Time | $I_S = -99A$ $V_R = 333V$ | $T_j = 25^\circ\text{C}$ | | 270 | ns |
| | | | $T_j = 125^\circ\text{C}$ | | 540 | |
| Q_{rr} | Reverse Recovery Charge | $di_S/dt = 200A/\mu\text{s}$ | $T_j = 25^\circ\text{C}$ | | 5.2 | μC |
| | | | $T_j = 125^\circ\text{C}$ | | 19.2 | |

① dv/dt numbers reflect the limitations of the circuit rather than the device itself.

$I_S \leq -99A$ $di/dt \leq 700A/\mu\text{s}$ $V_R \leq V_{DSS}$ $T_j \leq 150^\circ\text{C}$

Thermal and package characteristics

| Symbol | Characteristic | Min | Typ | Max | Unit | |
|-------------------|--|-------------|-----|------|------|-----|
| R _{thJC} | Junction to Case Thermal Resistance | | | 0.16 | °C/W | |
| V _{ISOL} | RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz | 4000 | | | V | |
| T _J | Operating junction temperature range | -40 | | 150 | °C | |
| T _{STG} | Storage Temperature Range | -40 | | 125 | | |
| T _C | Operating Case Temperature | -40 | | 100 | | |
| Torque | Mounting torque | To Heatsink | M5 | 2.5 | 4.7 | N.m |
| Wt | Package Weight | | | | 160 | g |

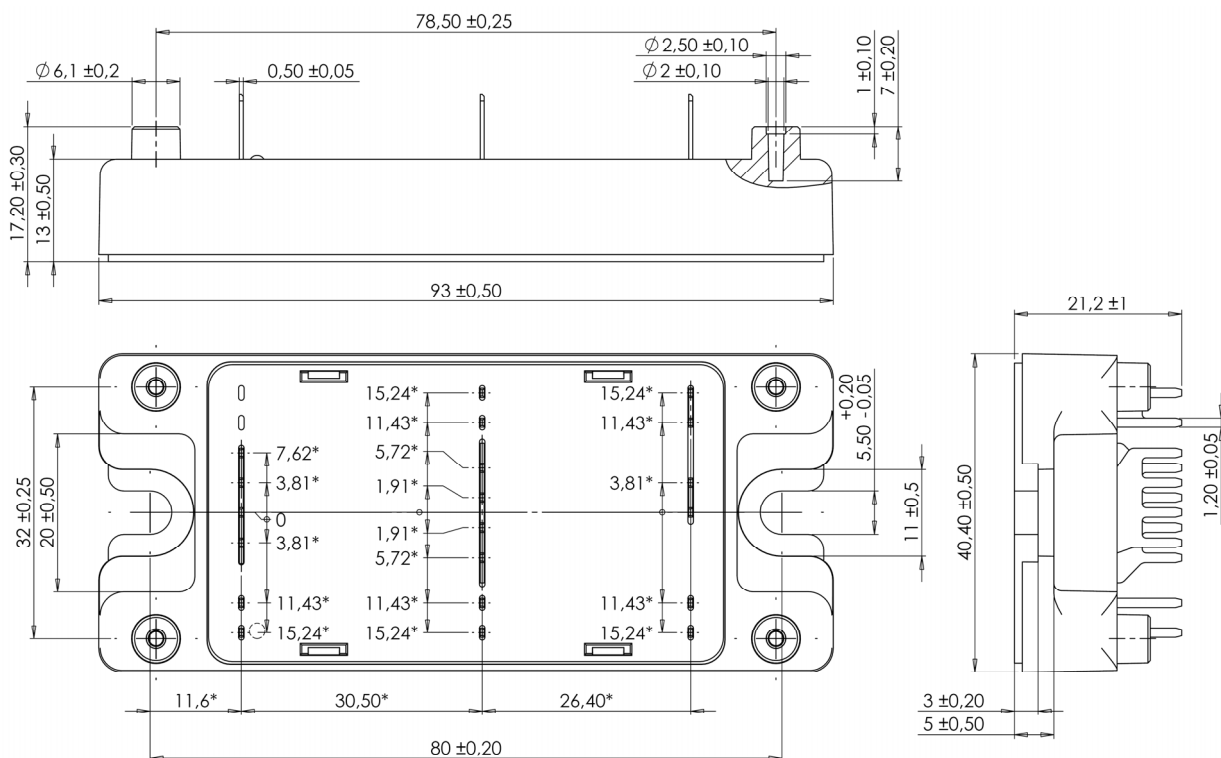
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

| Symbol | Characteristic | Min | Typ | Max | Unit |
|--------------------|----------------------------|-----|------|-----|------|
| R ₂₅ | Resistance @ 25°C | | 50 | | kΩ |
| B _{25/85} | T ₂₅ = 298.15 K | | 3952 | | K |

$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
 R_T: Thermistor value at T

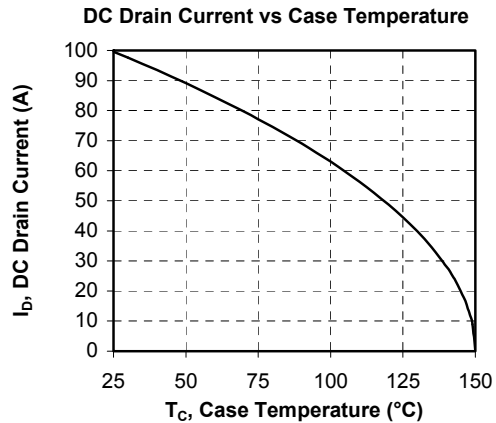
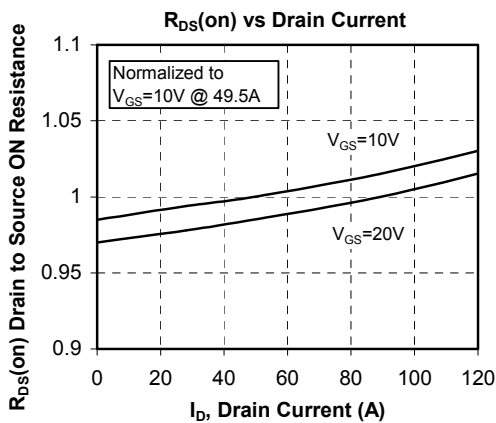
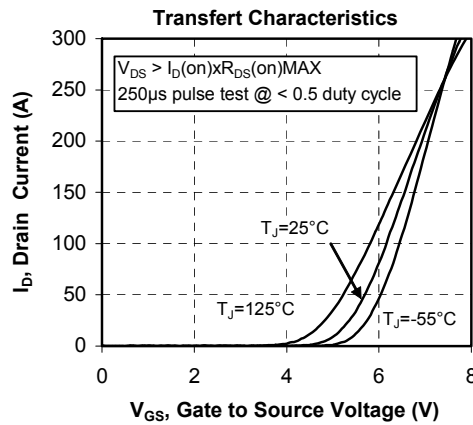
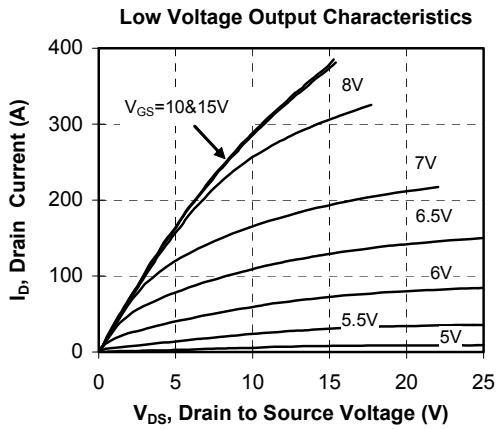
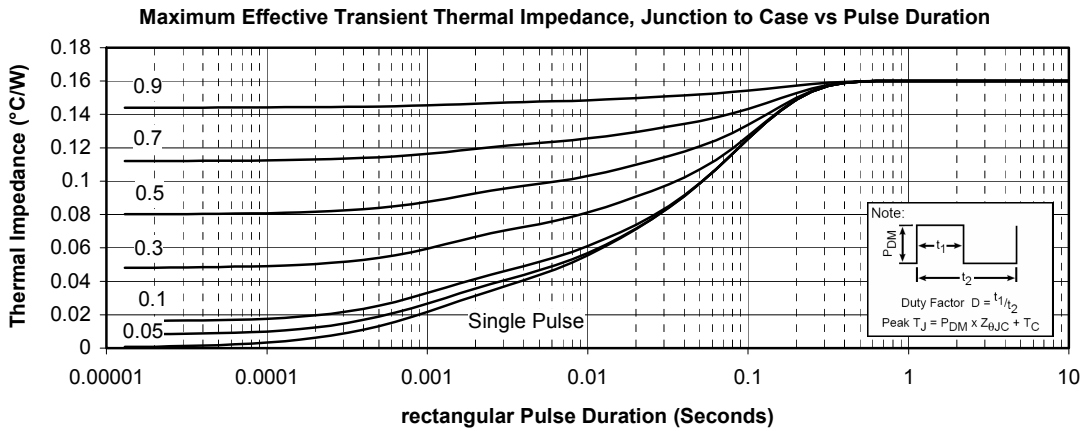
SP4 Package outline (dimensions in mm)

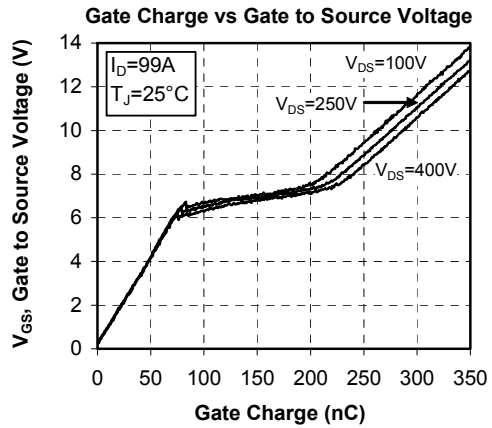
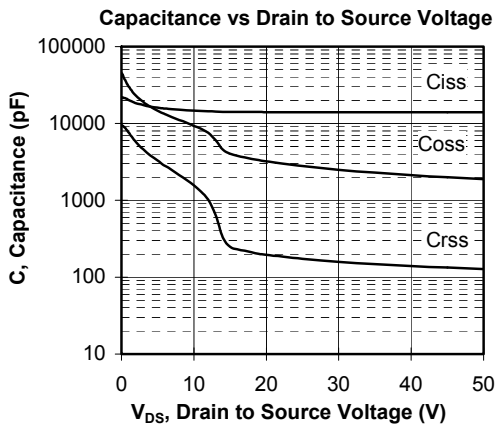
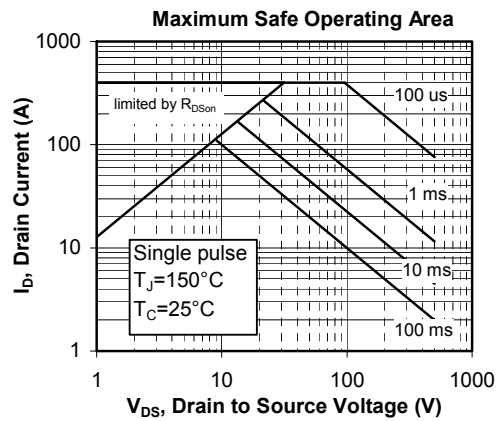
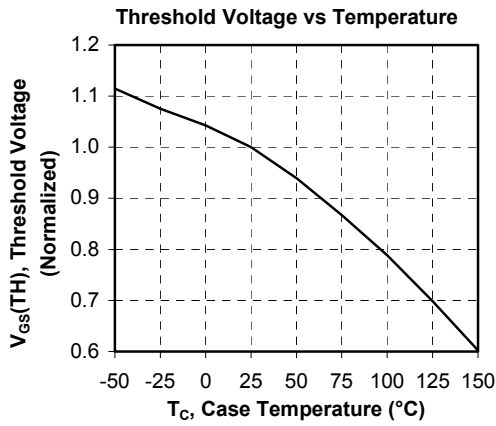
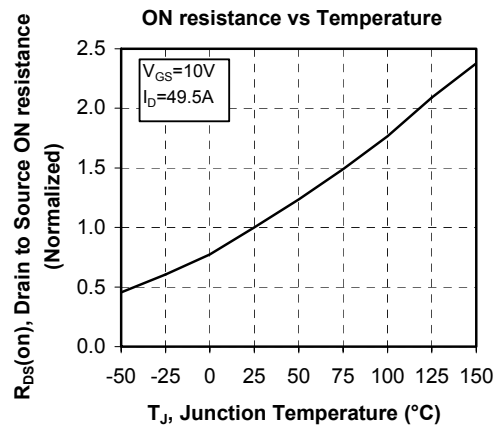
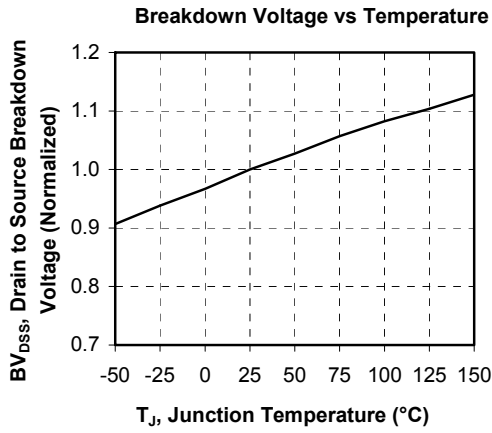


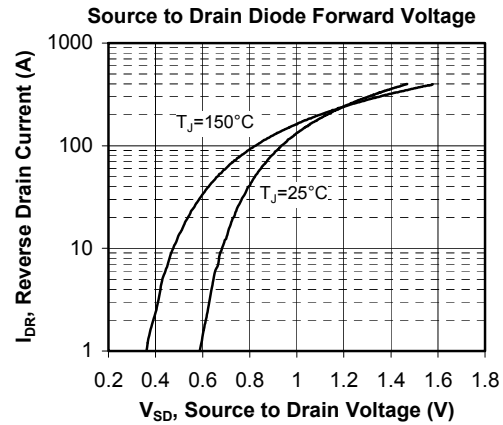
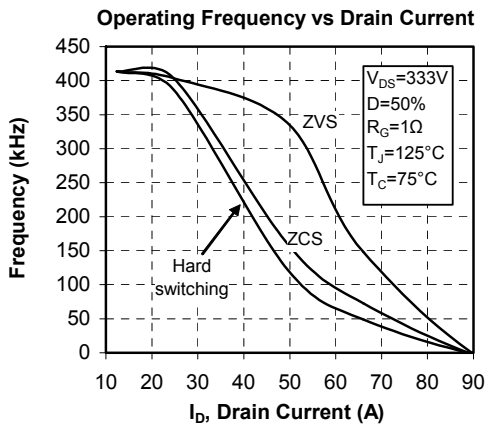
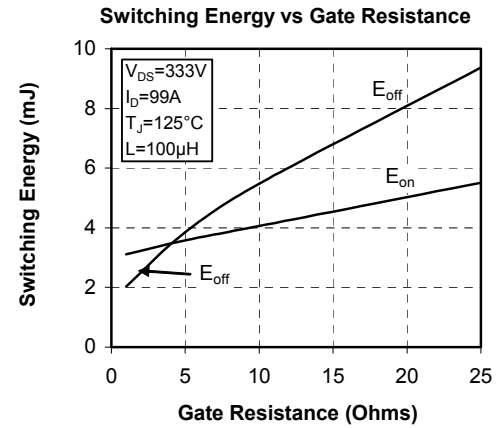
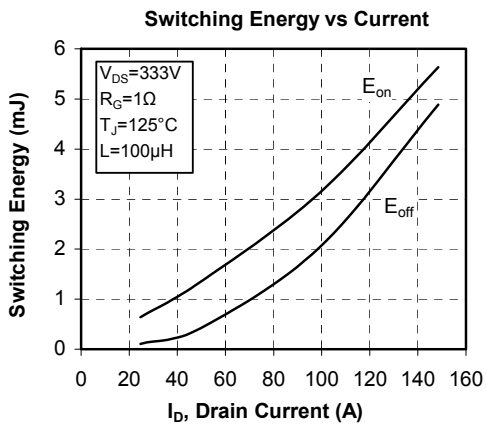
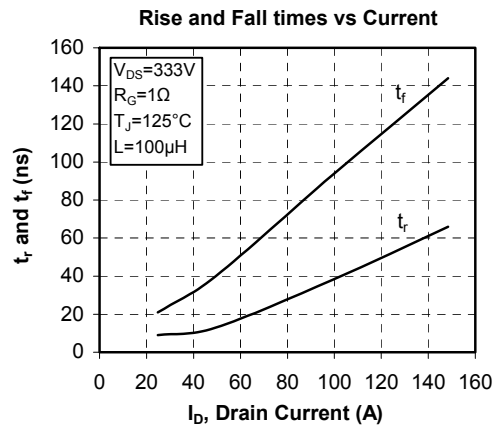
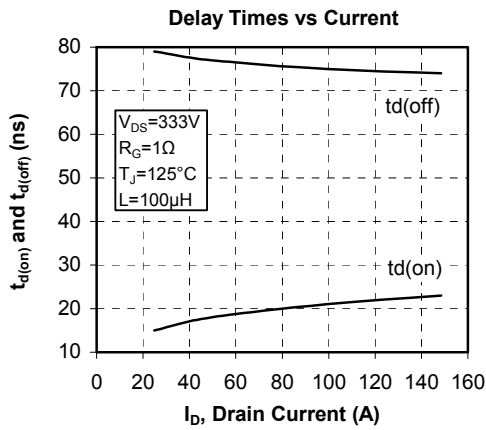
ALL DIMENSIONS MARKED "*" ARE TOLERANCED AS: ± 0.1

See application note APT0501 - Mounting Instructions for SP4 Power Modules on www.microsemi.com

Typical Performance Curve







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