

MOSFET

Metal Oxide Semiconductor Field Effect Transistor

OptiMOS™

OptiMOS™ Power-MOSFET, 25 V
BSB008NE2LX

Data Sheet

Rev. 2.0
Final

1 Description

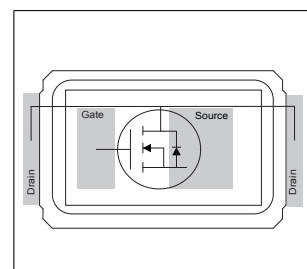
Features

- Optimized for e-fuse and OR-ing application
- Ultra low $R_{DS(on)}$ in CanPAK-MX footprint
- Low profile (<0.7 mm)
- 100% avalanche tested
- 100% R_g Tested
- Double-sided cooling
- Compatible with DirectFET® package MX footprint and outline ¹⁾
- Qualified according to JEDEC²⁾ for target applications



Table 1 Key Performance Parameters

| Parameter | Value | Unit |
|------------------|-------|-----------|
| V_{DS} | 25 | V |
| $R_{DS(on),max}$ | 0.8 | $m\Omega$ |
| I_D | 180 | A |
| Q_{oss} | 74 | nC |
| $Q_g(0V..10V)$ | 258 | nC |



| Type / Ordering Code | Package | Marking | Related Links |
|----------------------|------------|---------|---------------|
| BSB008NE2LX | MG-WDSON-2 | 04E2 | - |

¹⁾ CanPAK™ uses DirectFET® technology licensed from International Rectifier Corporation. DirectFET® is a registered trademark of International Rectifier Corporation.

²⁾ J-STD20 and JESD22

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2 Maximum ratings

at $T_j = 25\text{ °C}$, unless otherwise specified

Table 2 Maximum ratings

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|-------------------|--------|------|------------------|------|---|
| | | Min. | Typ. | Max. | | |
| Continuous drain current | I_D | - | - | 180 165 46 | A | $V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=10\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=10\text{ V}$, $T_A=25\text{ °C}$, $R_{thJA}=45\text{ K/W}$ |
| Pulsed drain current ¹⁾ | $I_{D,pulse}$ | - | - | 400 | A | $T_C=25\text{ °C}$ |
| Avalanche current, single pulse ²⁾ | I_{AS} | - | - | 40 | A | $T_C=25\text{ °C}$ |
| Avalanche energy, single pulse | E_{AS} | - | - | 600 | mJ | $I_D=40\text{ A}$, $R_{GS}=25\text{ }\Omega$ |
| Gate source voltage | V_{GS} | -20 | - | 20 | V | - |
| Power dissipation | P_{tot} | - | - | 89 2.8 | W | $T_C=25\text{ °C}$ $T_A=25\text{ °C}$, $R_{thJA}=45\text{ K/W}$ |
| Operating and storage temperature | T_j , T_{stg} | -40 | - | 150 | °C | IEC climatic category; DIN IEC 68-1: 40/150/56 |

3 Thermal characteristics

Table 3 Thermal characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|------------|--------|------|------|------|-----------------------|
| | | Min. | Typ. | Max. | | |
| Thermal resistance, junction - case, bottom | R_{thJC} | - | 1.0 | - | K/W | - |
| Thermal resistance, junction - case, top | R_{thJC} | - | - | 1.4 | K/W | - |
| Device on PCB, 6 cm ² cooling area ³⁾ | R_{thJA} | - | - | 45 | K/W | - |

¹⁾ See figure 3 for more detailed information

²⁾ See figure 13 for more detailed information

³⁾ Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical in still air.

4 Electrical characteristics

Table 4 Static characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|----------------------------------|---------------|--------|-------------|------------|---------------|---|
| | | Min. | Typ. | Max. | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | 25 | - | - | V | $V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$ |
| Gate threshold voltage | $V_{GS(th)}$ | 1.2 | - | 2 | V | $V_{DS}=V_{GS}$, $I_D=250\text{ }\mu\text{A}$ |
| Zero gate voltage drain current | I_{DSS} | - | 0.1 10 | 10 100 | μA | $V_{DS}=25\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ }^\circ\text{C}$ $V_{DS}=25\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ }^\circ\text{C}$ |
| Gate-source leakage current | I_{GSS} | - | 10 | 100 | nA | $V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$ |
| Drain-source on-state resistance | $R_{DS(on)}$ | - | 0.75 0.6 | 1.0 0.8 | m Ω | $V_{GS}=4.5\text{ V}$, $I_D=25\text{ A}$ $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$ |
| Gate resistance | R_G | 0.3 | 0.5 | 1.0 | Ω | - |
| Transconductance | g_{fs} | 120 | 240 | - | S | $ V_{DS} >2 I_D /R_{DS(on)max}$, $I_D=30\text{ A}$ |

Table 5 Dynamic characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|------------------------------|--------------|--------|-------|-------|------|--|
| | | Min. | Typ. | Max. | | |
| Input capacitance | C_{iss} | - | 12000 | 16000 | pF | $V_{GS}=0\text{ V}$, $V_{DS}=12\text{ V}$, $f=1\text{ MHz}$ |
| Output capacitance | C_{oss} | - | 3800 | 5100 | pF | $V_{GS}=0\text{ V}$, $V_{DS}=12\text{ V}$, $f=1\text{ MHz}$ |
| Reverse transfer capacitance | C_{rss} | - | 3300 | - | pF | $V_{GS}=0\text{ V}$, $V_{DS}=12\text{ V}$, $f=1\text{ MHz}$ |
| Turn-on delay time | $t_{d(on)}$ | - | 12.6 | - | ns | $V_{DD}=12\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$ |
| Rise time | t_r | - | 47.2 | - | ns | $V_{DD}=12\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$ |
| Turn-off delay time | $t_{d(off)}$ | - | 75 | - | ns | $V_{DD}=12\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$ |
| Fall time | t_f | - | 32.4 | - | ns | $V_{DD}=12\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$ |

Table 6 Gate charge characteristics¹⁾

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|------------------------------|---------------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Gate to source charge | Q_{gs} | - | 27 | 36 | nC | $V_{DD}=12\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate charge at threshold | $Q_{g(th)}$ | - | 19 | - | nC | $V_{DD}=12\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate to drain charge | Q_{gd} | - | 73 | 110 | nC | $V_{DD}=12\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Switching charge | Q_{sw} | - | 81 | - | nC | $V_{DD}=12\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate charge total | Q_g | - | 146 | 194 | nC | $V_{DD}=12\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate plateau voltage | $V_{plateau}$ | - | 2.2 | - | V | $V_{DD}=12\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate charge total | Q_g | - | 258 | 343 | nC | $V_{DD}=12\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate charge total, sync. FET | $Q_{g(sync)}$ | - | 88 | - | nC | $V_{DS}=0.1\text{ V}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Output charge | Q_{oss} | - | 74 | 98 | nC | $V_{DD}=12\text{ V}$, $V_{GS}=0\text{ V}$ |

¹⁾ See "Gate charge waveforms" for parameter definition

Table 7 Reverse diode

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|----------------------------------|---------------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Diode continuous forward current | I_S | - | - | 89 | A | $T_C=25\text{ °C}$ |
| Diode pulse current | $I_{S,pulse}$ | - | - | 400 | A | $T_C=25\text{ °C}$ |
| Diode forward voltage | V_{SD} | - | 0.78 | - | V | $V_{GS}=0\text{ V}, I_F=30\text{ A}, T_J=25\text{ °C}$ |
| Reverse recovery charge | Q_{rr} | - | 20 | - | nC | $V_R=15\text{ V}, I_F=I_S, di_F/dt=400\text{ A}/\mu\text{s}$ |

5 Electrical characteristics diagrams

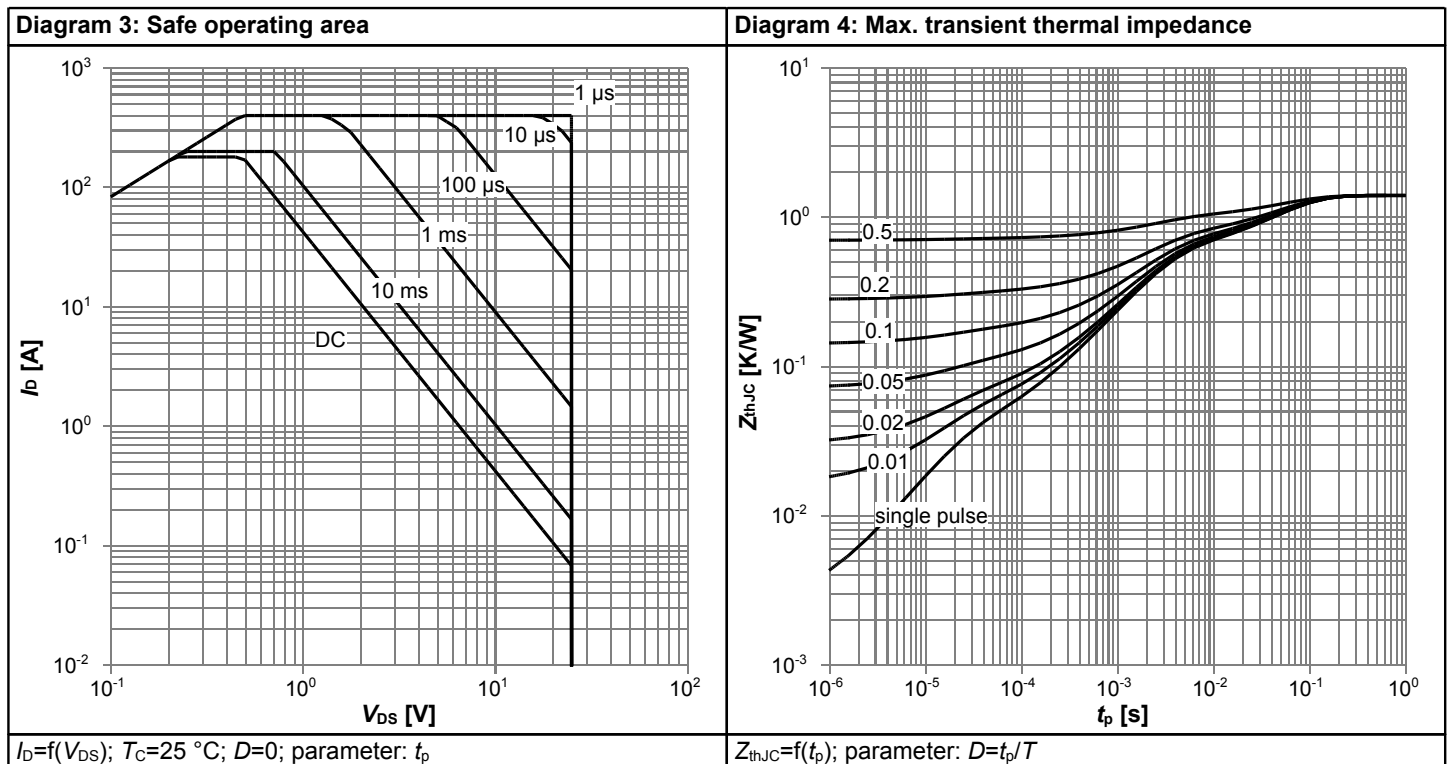
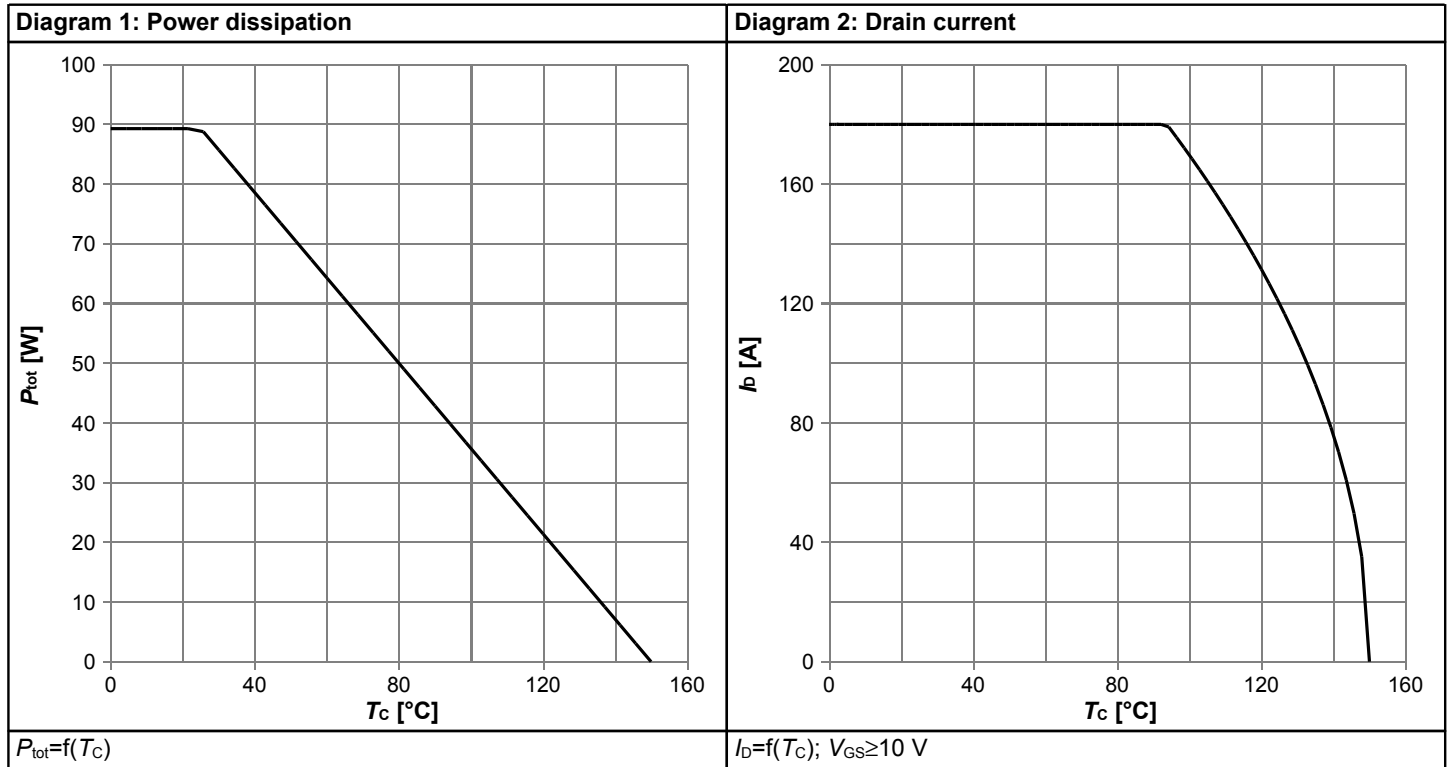
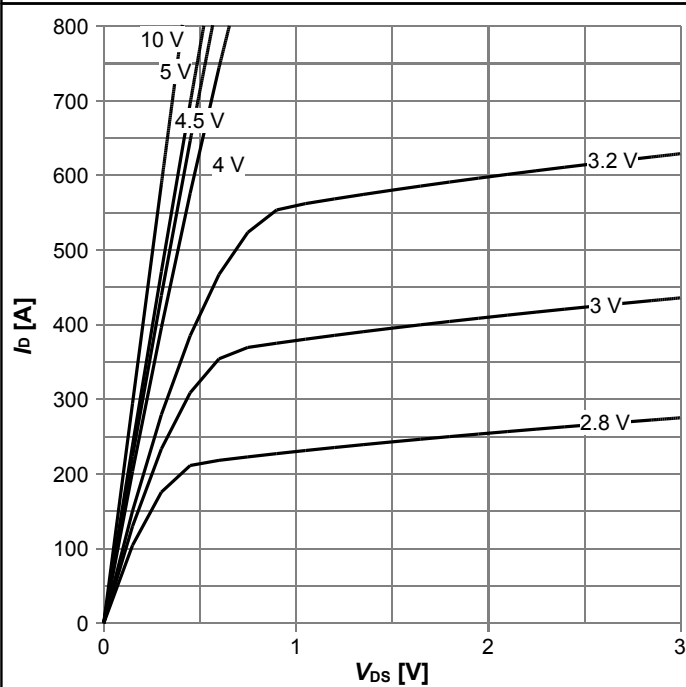
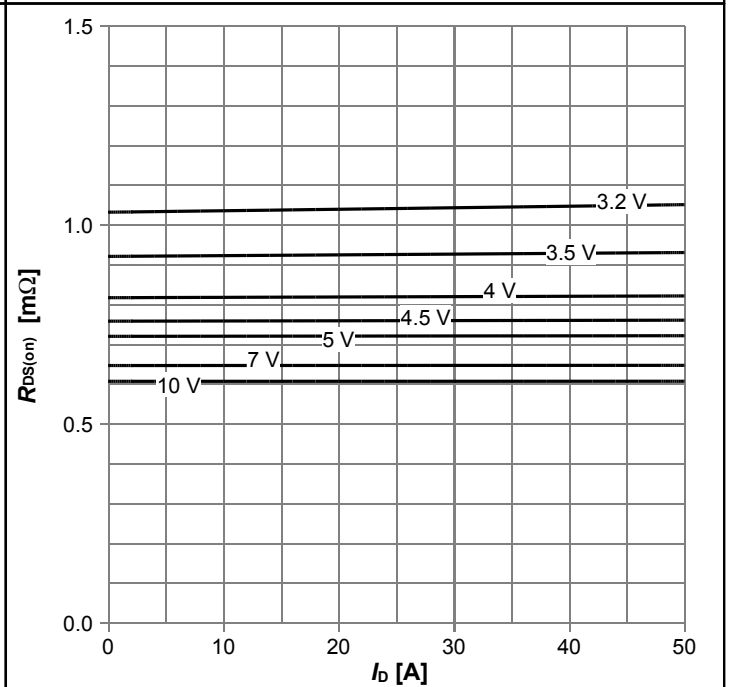


Diagram 5: Typ. output characteristics



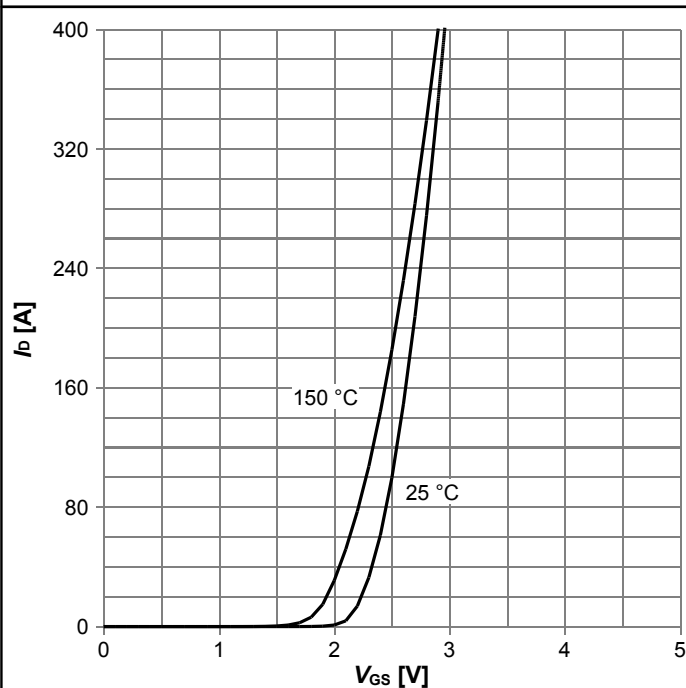
$I_D=f(V_{DS}); T_j=25\text{ }^\circ\text{C};$ parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



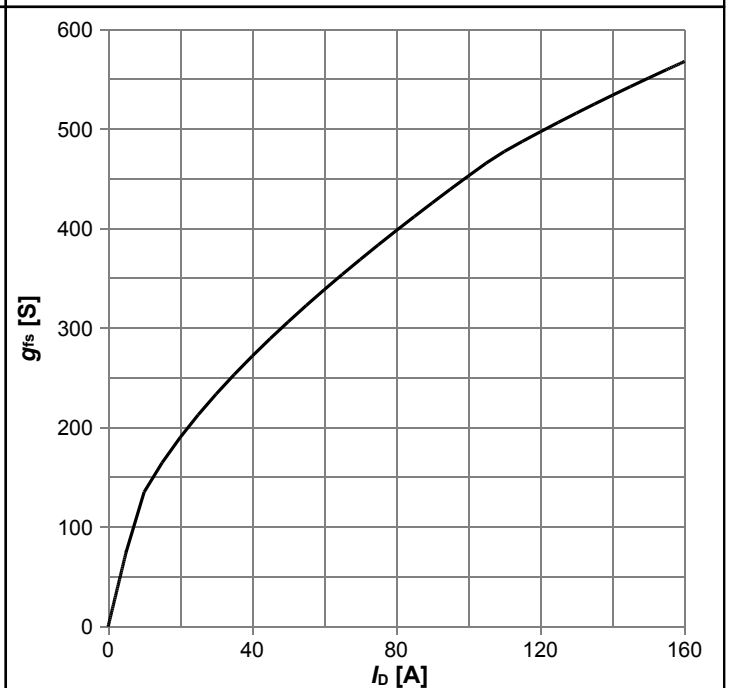
$R_{DS(on)}=f(I_D); T_j=25\text{ }^\circ\text{C};$ parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



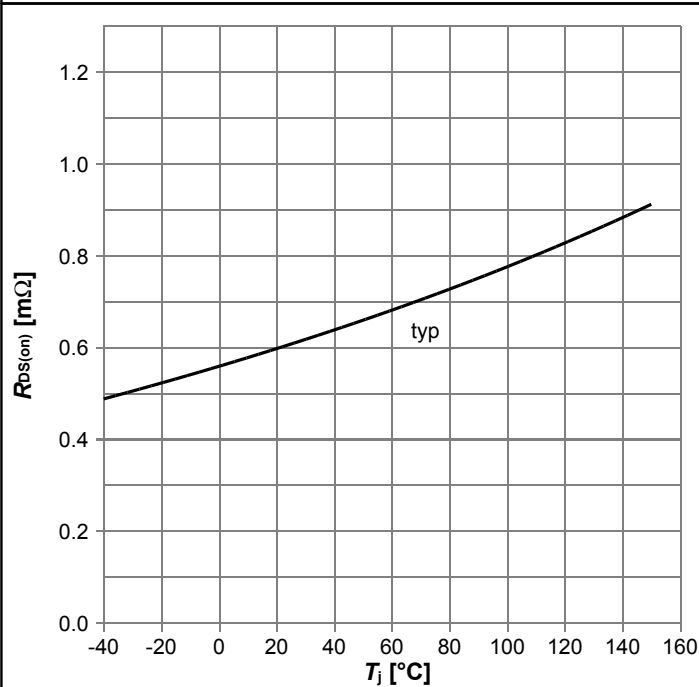
$I_D=f(V_{GS}); |V_{DS}|>2|I_D|R_{DS(on)max};$ parameter: T_j

Diagram 8: Typ. forward transconductance



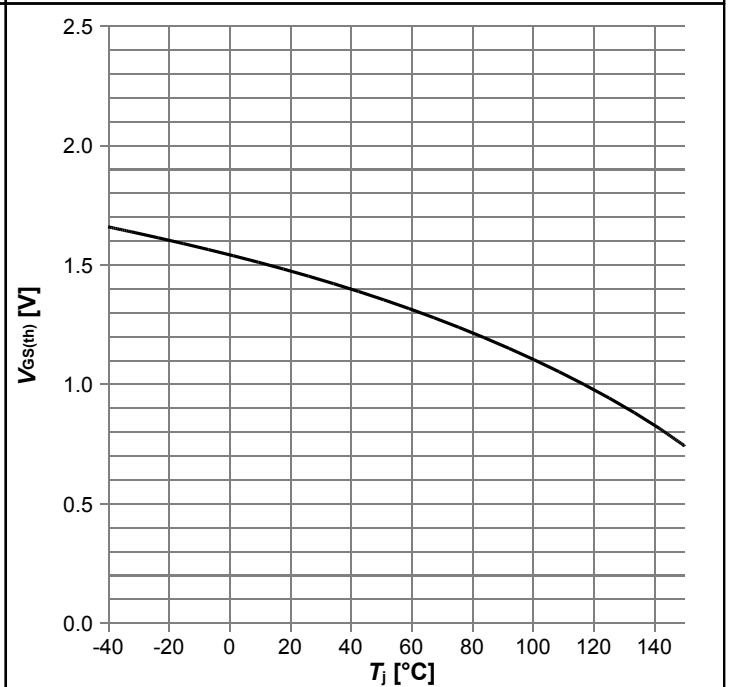
$g_{fs}=f(I_D); T_j=25\text{ }^\circ\text{C}$

Diagram 9: Drain-source on-state resistance



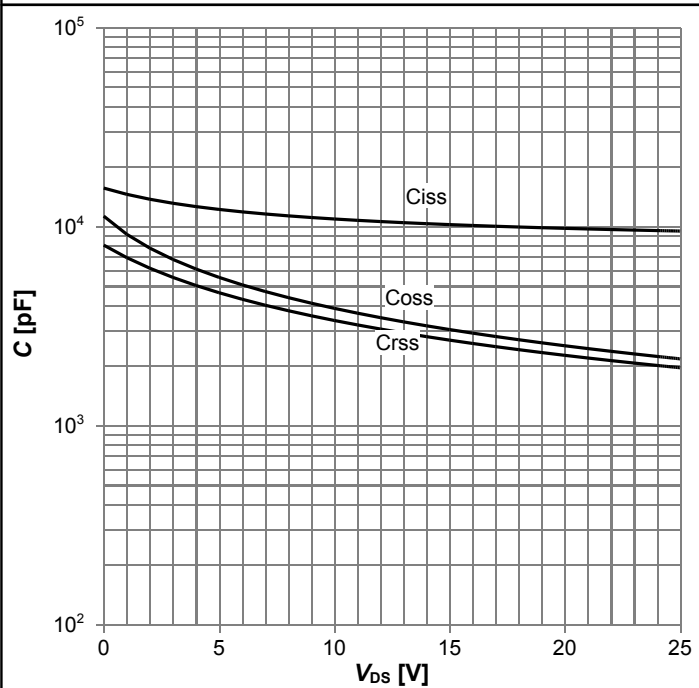
$R_{DS(on)}=f(T_j); I_D=30\text{ A}; V_{GS}=10\text{ V}$

Diagram 10: Typ. gate threshold voltage



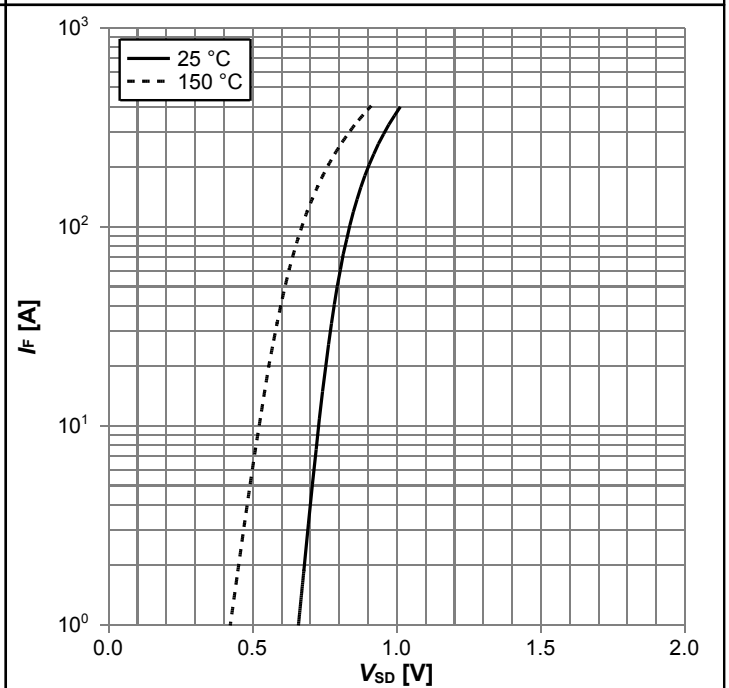
$V_{GS(th)}=f(T_j); V_{GS}=V_{DS}; I_D=250\ \mu\text{A}$

Diagram 11: Typ. capacitances



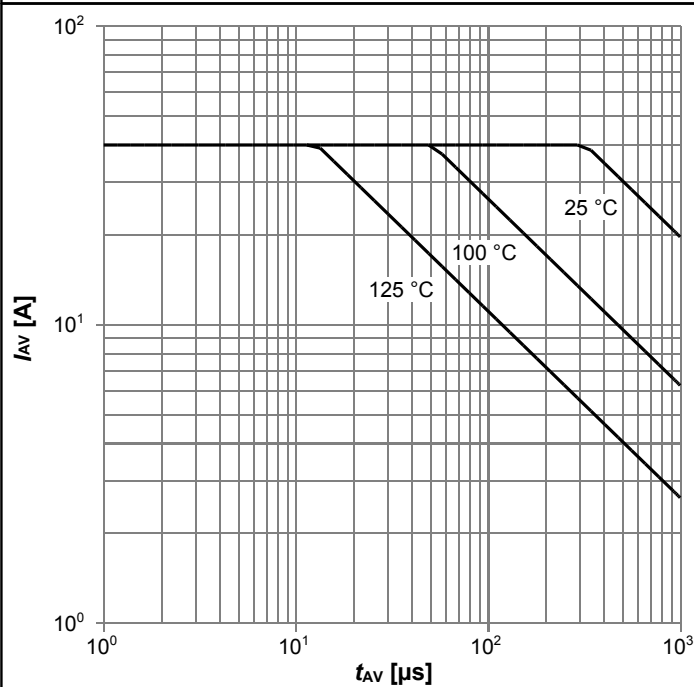
$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$

Diagram 12: Forward characteristics of reverse diode



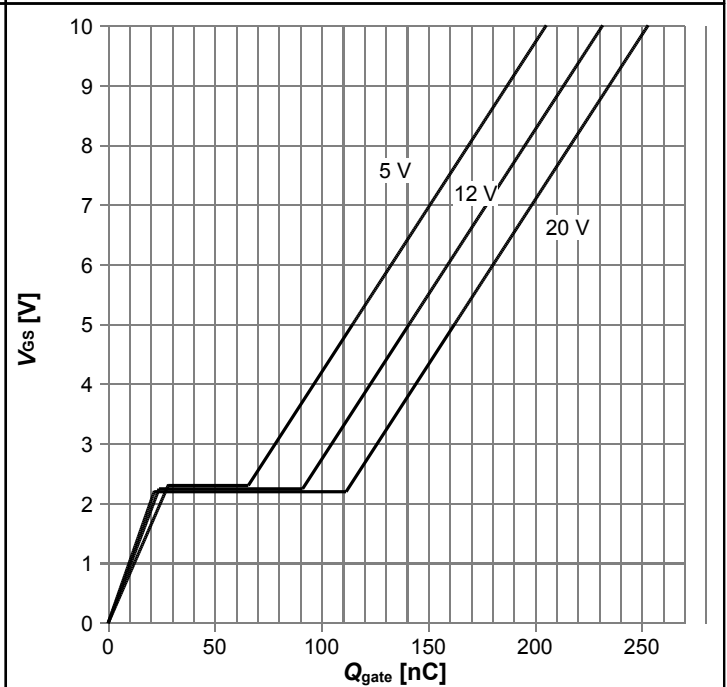
$I_F=f(V_{SD}); \text{parameter: } T_j$

Diagram 13: Avalanche characteristics



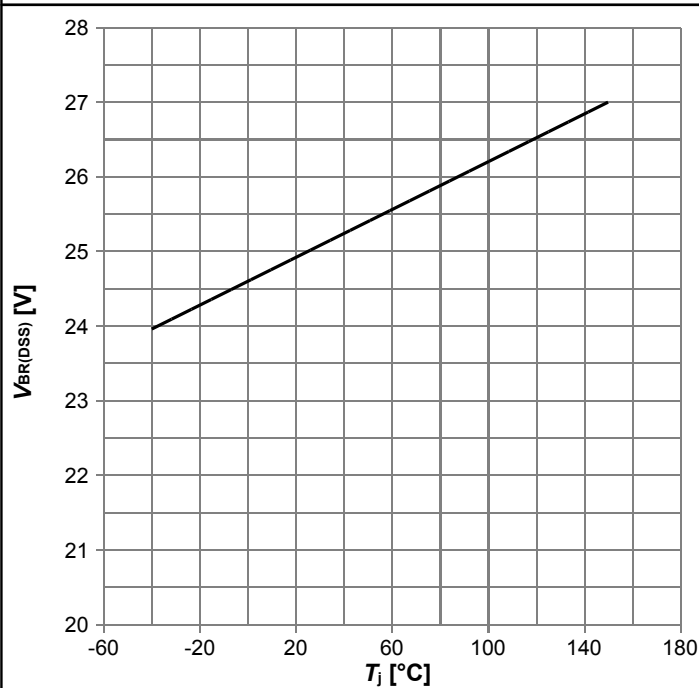
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



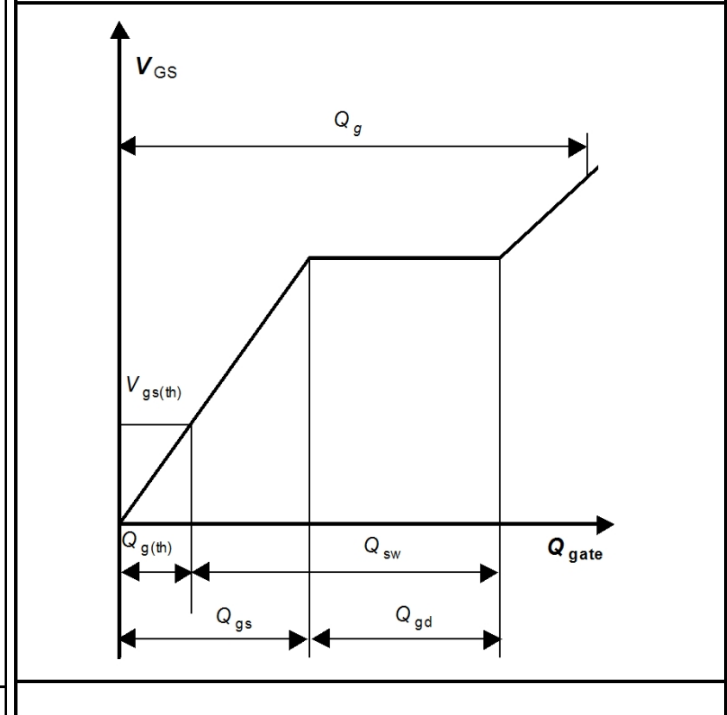
$V_{GS}=f(Q_{gate}); I_D=30 \text{ A pulsed}$; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage



$V_{BR(DSS)}=f(T_j); I_D=1 \text{ mA}$

Gate charge waveforms



6 Package Outlines

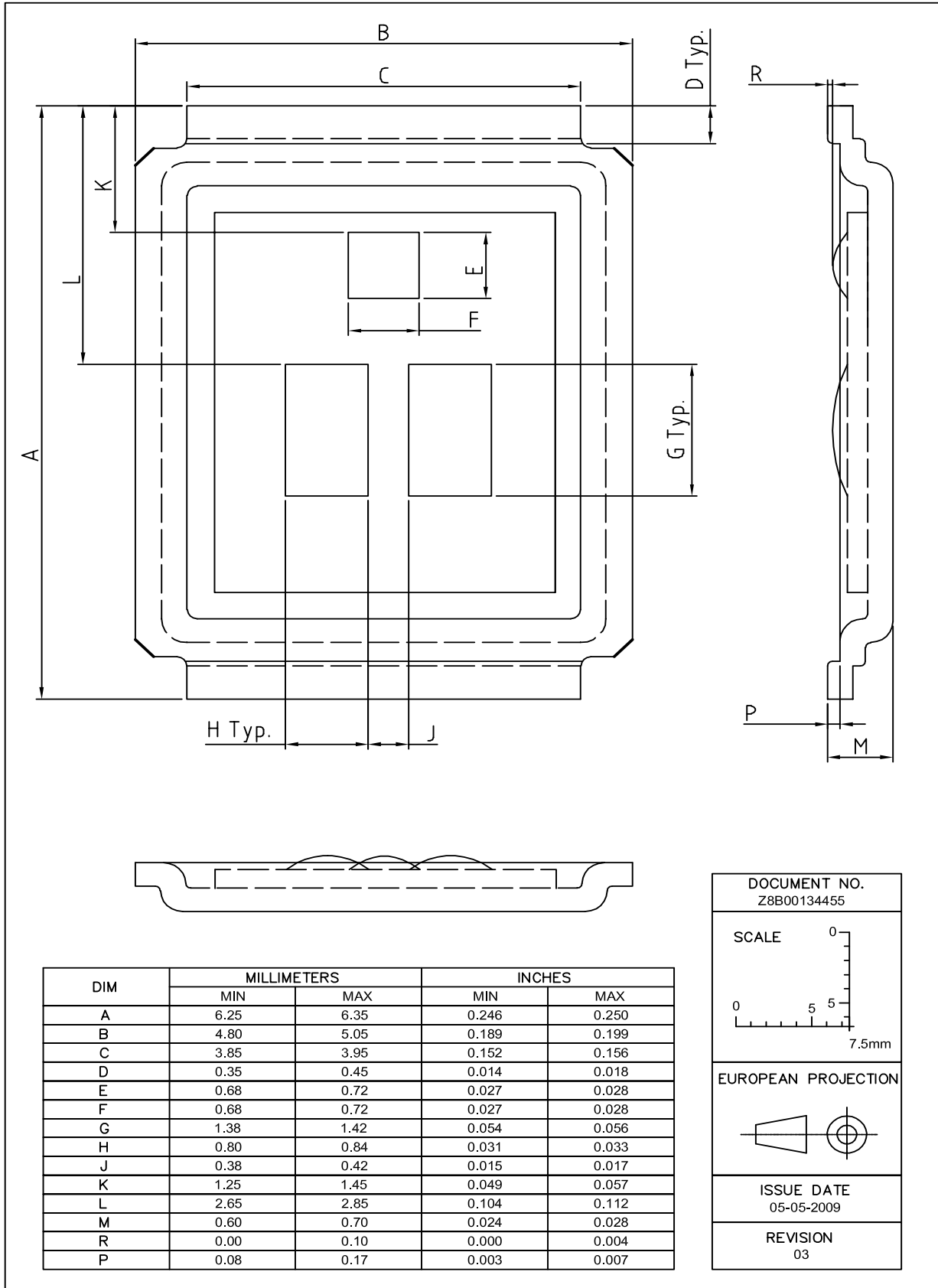


Figure 1 Outline MG-WDSO-2, dimensions in mm/inches

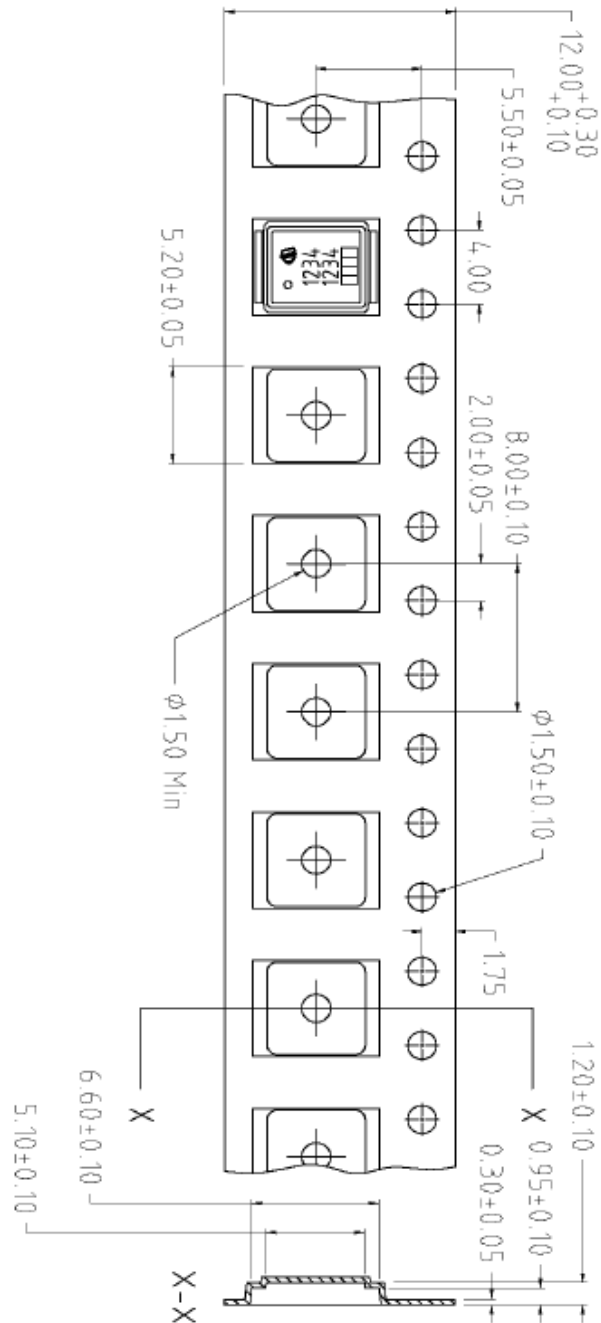
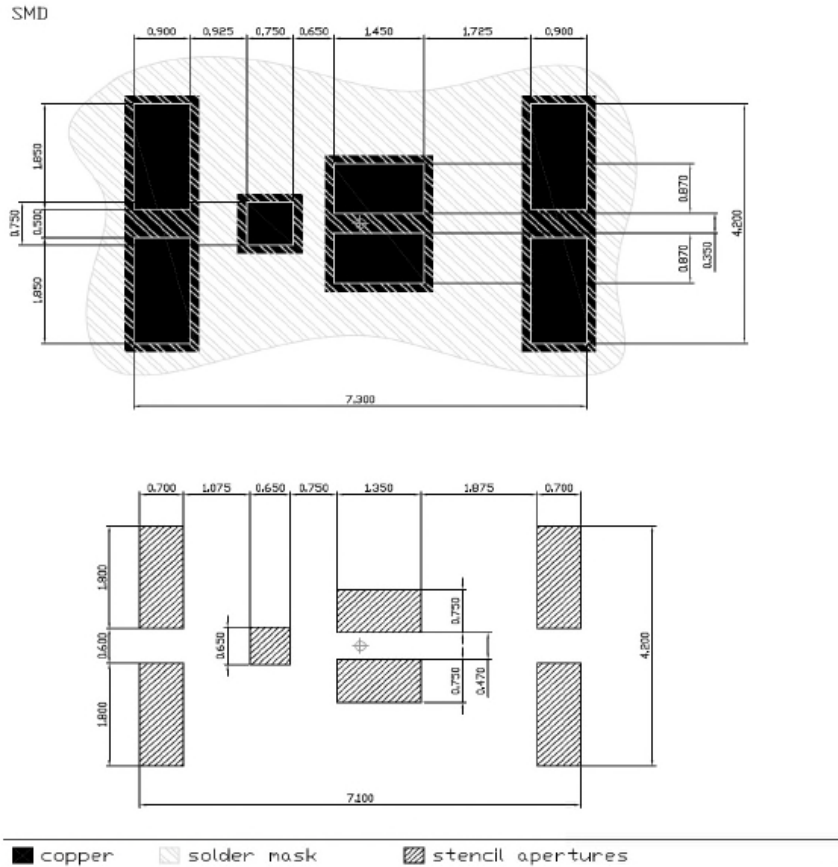


Figure 2 Outline Tape CanPAK MX, dimensions in mm



Dimensions in mm
Recommended stencil thickness 150 µm

Marking Layout

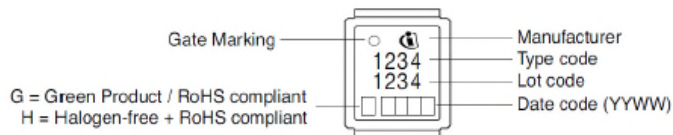


Figure 3 Outline Boardpads and apertures CanPAK MX, dimensions in mm

Revision History

BSB008NE2LX

Revision: 2015-01-20, Rev. 2.0

Previous Revision

| Revision | Date | Subjects (major changes since last revision) |
|----------|------------|--|
| 2.0 | 2015-01-20 | Release of final version |

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