

OptiMOS™2 Power-MOSFET
Features

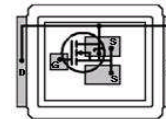
- Pb-free plating; RoHS compliant
- Dual sided cooling
- Low profile (<0.7 mm)
- 100% avalanche tested
- Qualified for consumer level application
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Very low on-resistance $R_{DS(on)}$
- Optimized for high switching frequency DC/DC converter
- Low parasitic inductance
- Compatible with DirectFET® package MX footprint and outline ¹⁾

Product Summary

| | | |
|------------------|-----|----|
| V_{DS} | 30 | V |
| $R_{DS(on),max}$ | 2.4 | mΩ |
| I_D | 145 | A |

MG-WDSO-2


| Type | Package | Outline | Marking |
|---------------|-----------|---------|---------|
| BSB024N03LX G | MG-WDSO-2 | MX | 0603 |


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

| Parameter | Symbol | Conditions | Value | Unit |
|---|---------------|---|-------|------|
| Continuous drain current | I_D | $V_{GS}=10\text{ V}, T_C=25\text{ °C}$ | 145 | A |
| | | $V_{GS}=10\text{ V}, T_C=100\text{ °C}$ | 92 | |
| | | $V_{GS}=10\text{ V}, T_A=25\text{ °C}, R_{thJA}=45\text{ K/W}^2)$ | 27 | |
| Pulsed drain current ³⁾ | $I_{D,pulse}$ | $T_C=25\text{ °C}$ | 400 | |
| Avalanche current, single pulse ⁴⁾ | I_{AS} | $T_C=25\text{ °C}$ | 50 | |
| Avalanche energy, single pulse | E_{AS} | $I_D=50\text{ A}, R_{GS}=25\text{ Ω}$ | 220 | mJ |
| Gate source voltage | V_{GS} | | ±20 | V |

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

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

| Parameter | Symbol | Conditions | Value | Unit |
|-------------------------------------|-----------------------|--|-------------|------|
| Power dissipation | P_{tot} | $T_C=25\text{ °C}$ | 78 | W |
| | | $T_A=25\text{ °C}$, $R_{\text{thJA}}=45\text{ K/W}^2)$ | 2.8 | |
| Operating and storage temperature | T_j, T_{stg} | | -40 ... 150 | °C |
| IEC climatic category; DIN IEC 68-1 | | | 55/150/56 | |

| Parameter | Symbol | Conditions | Values | | | Unit |
|-----------|--------|------------|--------|------|------|------|
| | | | min. | typ. | max. | |

Thermal characteristics

| | | | | | | |
|-------------------------------------|-------------------|--|---|-----|-----|-----|
| Thermal resistance, junction - case | R_{thJC} | bottom | - | 1.0 | | K/W |
| | | top | - | - | 1.6 | |
| Device on PCB | R_{thJA} | 6 cm ² cooling area ²⁾ | - | - | 45 | |

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

Static characteristics

| | | | | | | |
|----------------------------------|-----------------------------|---|----|-----|-----|---------------|
| Drain-source breakdown voltage | $V_{(\text{BR})\text{DSS}}$ | $V_{\text{GS}}=0\text{ V}$, $I_{\text{D}}=1\text{ mA}$ | 30 | - | - | V |
| Gate threshold voltage | $V_{\text{GS(th)}}$ | $V_{\text{DS}}=V_{\text{GS}}$, $I_{\text{D}}=250\text{ }\mu\text{A}$ | 1 | - | 2.2 | |
| Zero gate voltage drain current | I_{DSS} | $V_{\text{DS}}=30\text{ V}$, $V_{\text{GS}}=0\text{ V}$, $T_j=25\text{ °C}$ | - | 0.1 | 1 | μA |
| | | $V_{\text{DS}}=30\text{ V}$, $V_{\text{GS}}=0\text{ V}$, $T_j=125\text{ °C}$ | - | 10 | 100 | |
| Gate-source leakage current | I_{GSS} | $V_{\text{GS}}=20\text{ V}$, $V_{\text{DS}}=0\text{ V}$ | - | 10 | 100 | nA |
| Drain-source on-state resistance | $R_{\text{DS(on)}}$ | $V_{\text{GS}}=4.5\text{ V}$, $I_{\text{D}}=25\text{ A}$ | - | 3.4 | 4.2 | m Ω |
| | | $V_{\text{GS}}=10\text{ V}$, $I_{\text{D}}=30\text{ A}$ | - | 2.0 | 2.4 | |
| Gate resistance | R_{G} | | - | 0.6 | - | Ω |
| Transconductance | g_{fs} | $ V_{\text{DS}} >2 I_{\text{D}} R_{\text{DS(on)max}}$, $I_{\text{D}}=30\text{ A}$ | 50 | 100 | - | S |

²⁾ 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.

³⁾ See figure 3 for more detailed information

| Parameter | Symbol | Conditions | Values | | | Unit |
|-----------|--------|------------|--------|------|------|------|
| | | | min. | typ. | max. | |

Dynamic characteristics

| | | | | | | |
|------------------------------|--------------|---|---|------|---|----|
| Input capacitance | C_{iss} | $V_{GS}=0\text{ V}, V_{DS}=15\text{ V},$ $f=1\text{ MHz}$ | - | 4900 | - | pF |
| Output capacitance | C_{oss} | | - | 1700 | - | |
| Reverse transfer capacitance | C_{rss} | | - | 220 | - | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}=15\text{ V}, V_{GS}=10\text{ V},$ $I_D=30\text{ A}, R_G=1.6\ \Omega$ | - | 8.4 | - | ns |
| Rise time | t_r | | - | 7.0 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 35 | - | |
| Fall time | t_f | | - | 5.6 | - | |

Gate Charge Characteristics⁵⁾

| | | | | | | |
|------------------------------|---------------|---|---|-----|---|----|
| Gate to source charge | Q_{gs} | $V_{DD}=15\text{ V}, I_D=30\text{ A},$ $V_{GS}=0\text{ to }4.5\text{ V}$ | - | 14 | - | nC |
| Gate charge at threshold | $Q_{g(th)}$ | | - | 7.9 | - | |
| Gate to drain charge | Q_{gd} | | - | 9.6 | - | |
| Switching charge | Q_{sw} | | - | 16 | - | |
| Gate charge total | Q_g | | - | 35 | - | |
| Gate plateau voltage | $V_{plateau}$ | | - | 2.9 | - | |
| Gate charge total | Q_g | $V_{DD}=15\text{ V}, I_D=30\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$ | - | 72 | - | nC |
| Gate charge total, sync. FET | $Q_{g(sync)}$ | $V_{DS}=0.1\text{ V},$ $V_{GS}=0\text{ to }4.5\text{ V}$ | - | 30 | - | |
| Output charge | Q_{oss} | $V_{DD}=15\text{ V}, V_{GS}=0\text{ V}$ | - | 39 | - | |

Reverse Diode

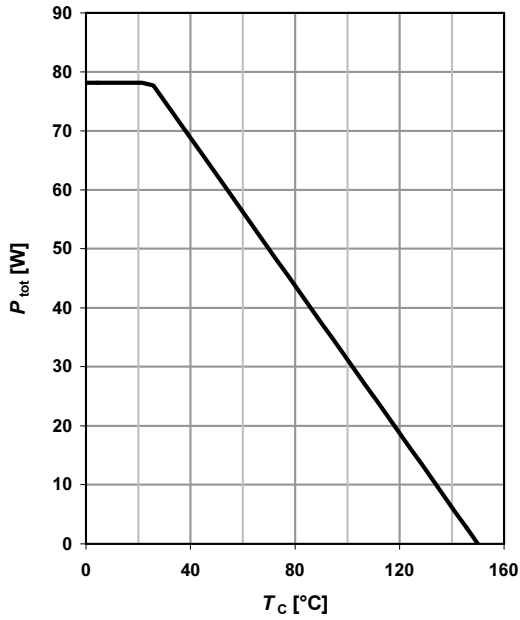
| | | | | | | |
|----------------------------------|---------------|---|---|------|-----|----|
| Diode continuous forward current | I_S | $T_C=25\text{ }^\circ\text{C}$ | - | - | 78 | A |
| Diode pulse current | $I_{S,pulse}$ | | - | - | 400 | |
| Diode forward voltage | V_{SD} | $V_{GS}=0\text{ V}, I_F=30\text{ A},$ $T_J=25\text{ }^\circ\text{C}$ | - | 0.79 | - | V |
| Reverse recovery charge | Q_{rr} | $V_R=15\text{ V}, I_F=I_S,$ $di_F/dt=400\text{ A}/\mu\text{s}$ | - | - | 50 | nC |

⁴⁾ See figure 13 for more detailed information

⁵⁾ See figure 16 for gate charge parameter definition

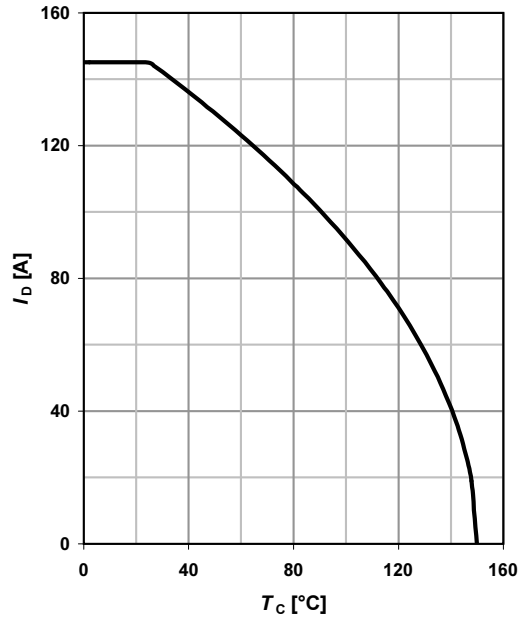
1 Power dissipation

$$P_{\text{tot}} = f(T_C)$$



2 Drain current

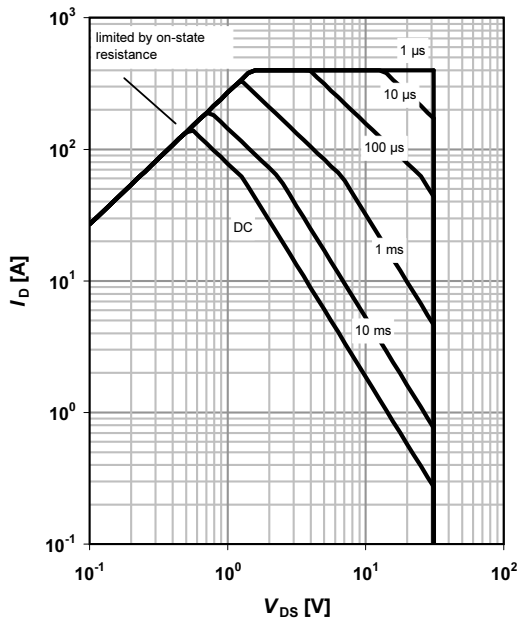
$$I_D = f(T_C); V_{GS} \geq 10 \text{ V}$$



3 Safe operating area

$$I_D = f(V_{DS}); T_C = 25 \text{ °C}; D = 0$$

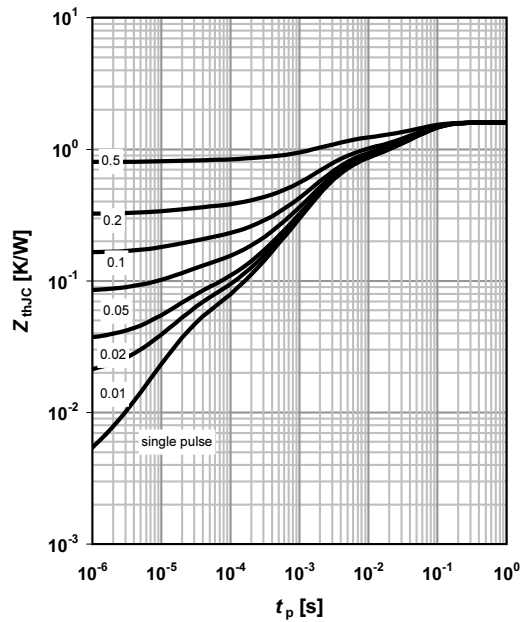
parameter: t_p



4 Max. transient thermal impedance

$$Z_{\text{thJC}} = f(t_p)$$

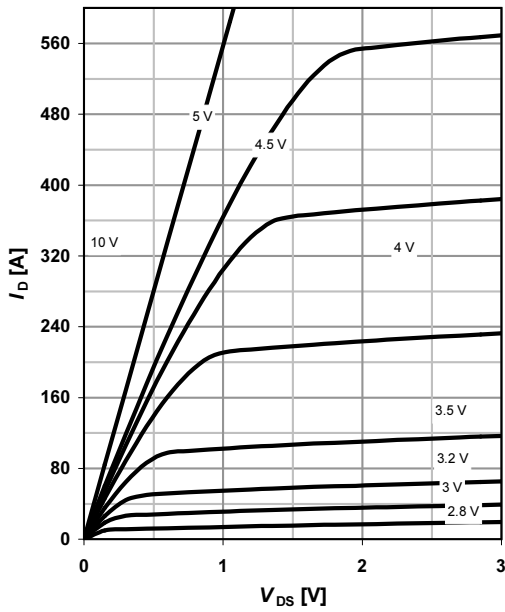
parameter: $D = t_p/T$



5 Typ. output characteristics

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

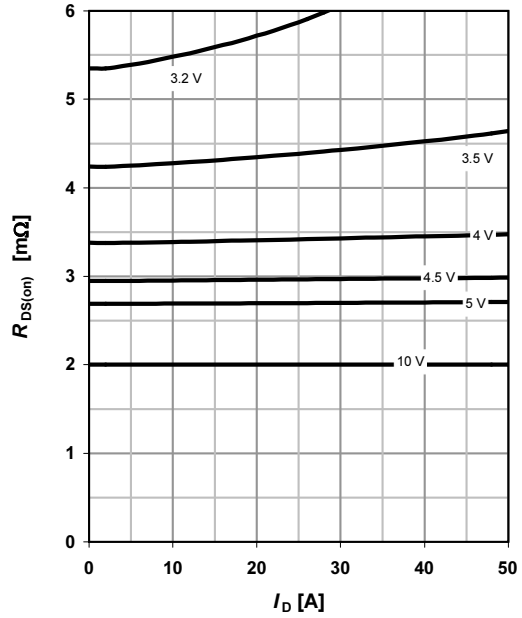
parameter: V_{GS}



6 Typ. drain-source on resistance

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

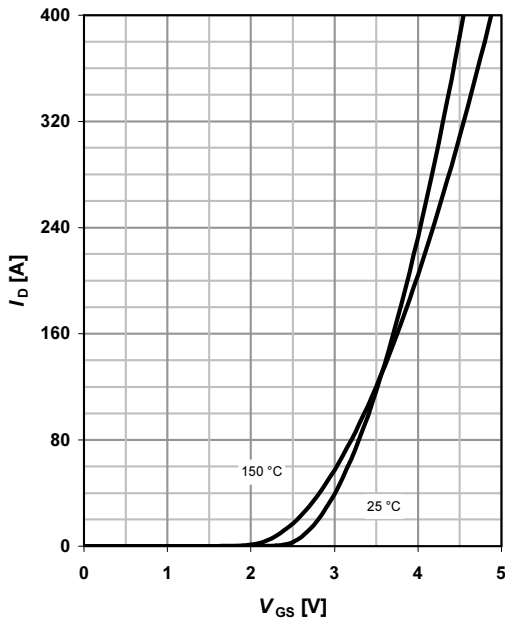
parameter: V_{GS}



7 Typ. transfer characteristics

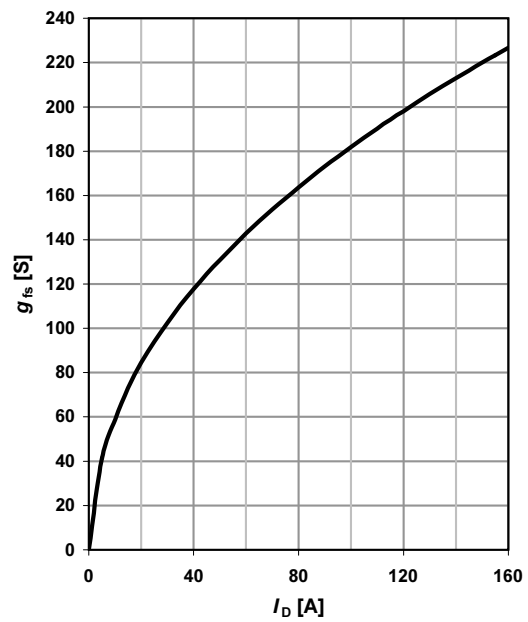
$$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$$

parameter: T_j



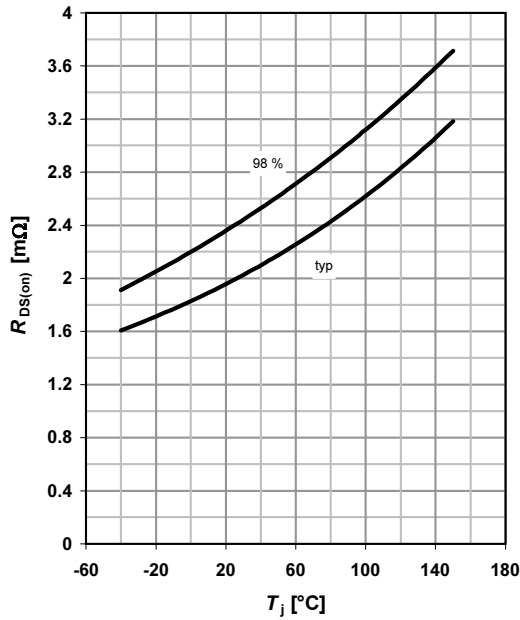
8 Typ. forward transconductance

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



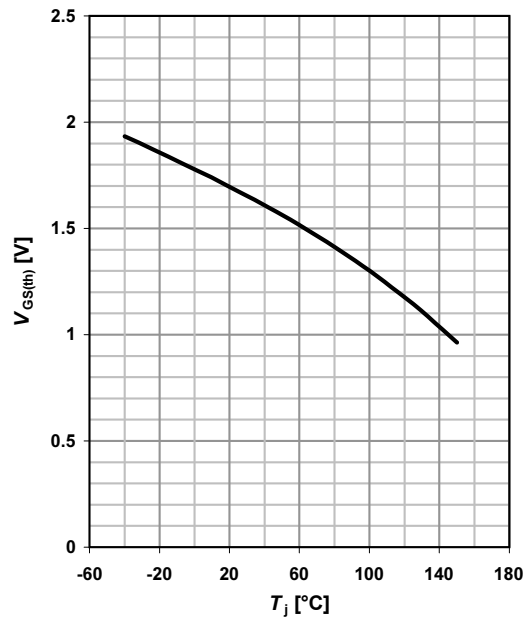
9 Drain-source on-state resistance

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



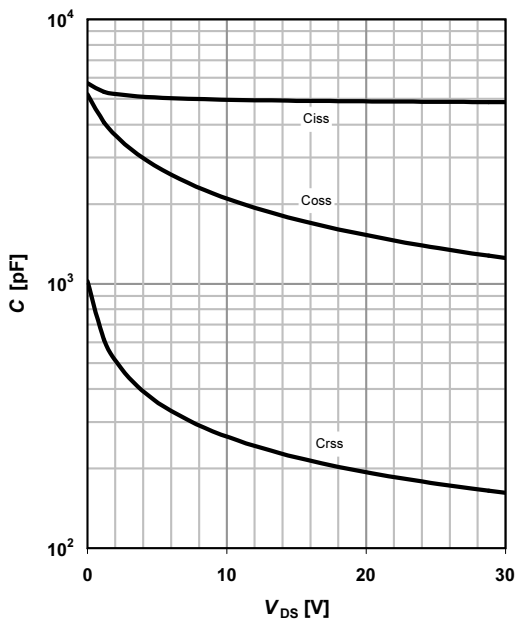
10 Typ. gate threshold voltage

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



11 Typ. capacitances

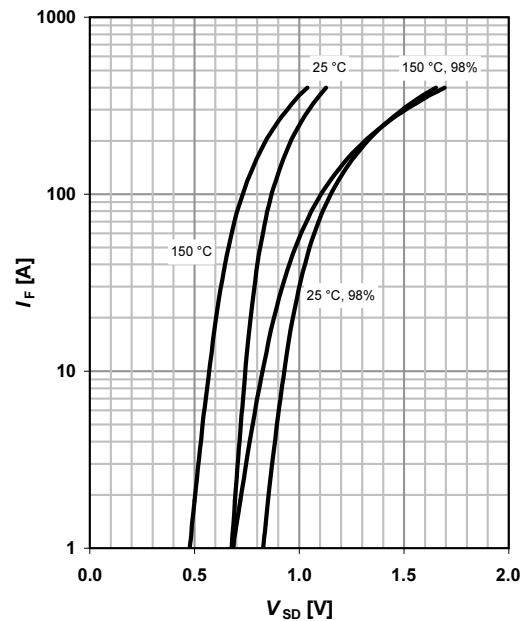
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



12 Forward characteristics of reverse diode

$$I_F = f(V_{SD})$$

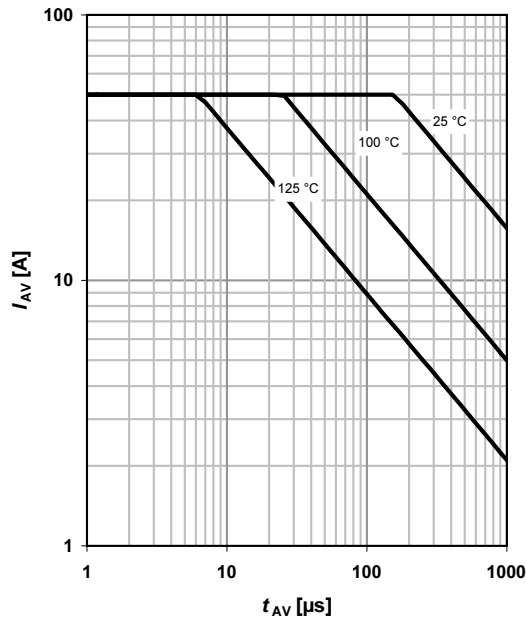
parameter: T_j



13 Avalanche characteristics

$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$

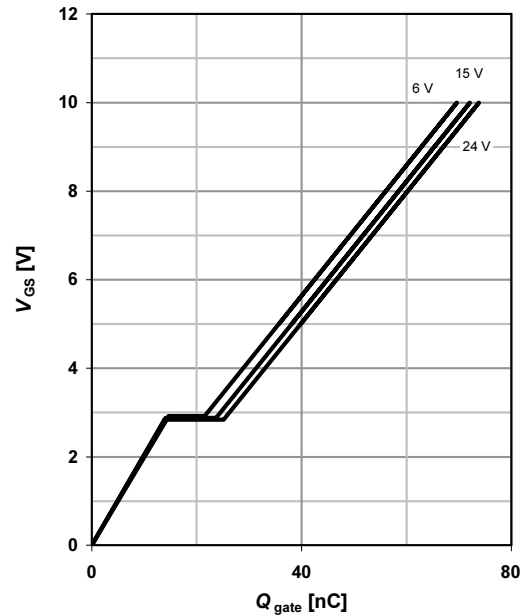
parameter: $T_{j(start)}$



14 Typ. gate charge

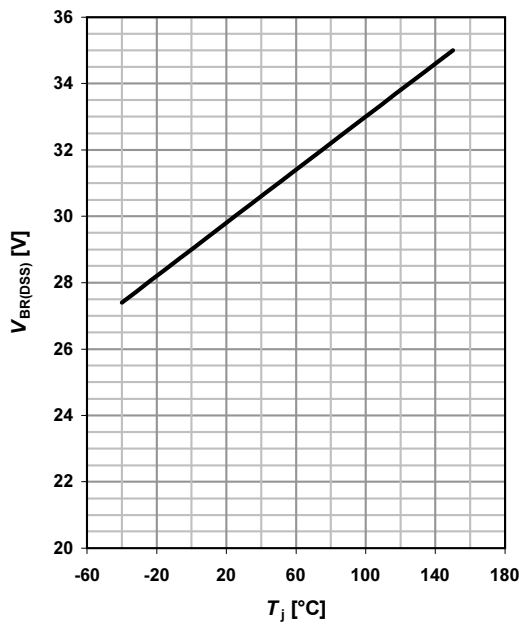
$V_{GS}=f(Q_{gate}); I_D=30 \text{ A pulsed}$

parameter: V_{DD}

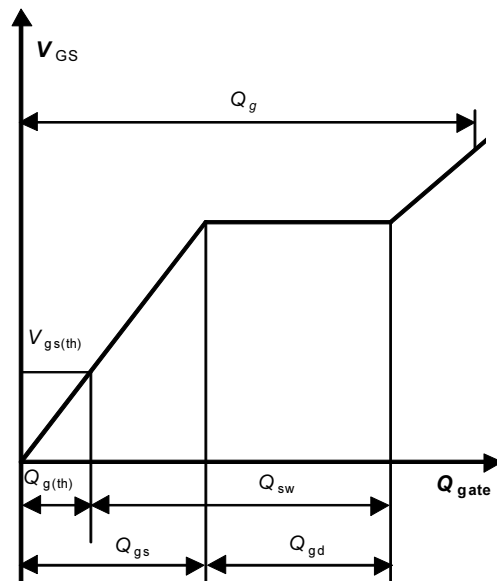


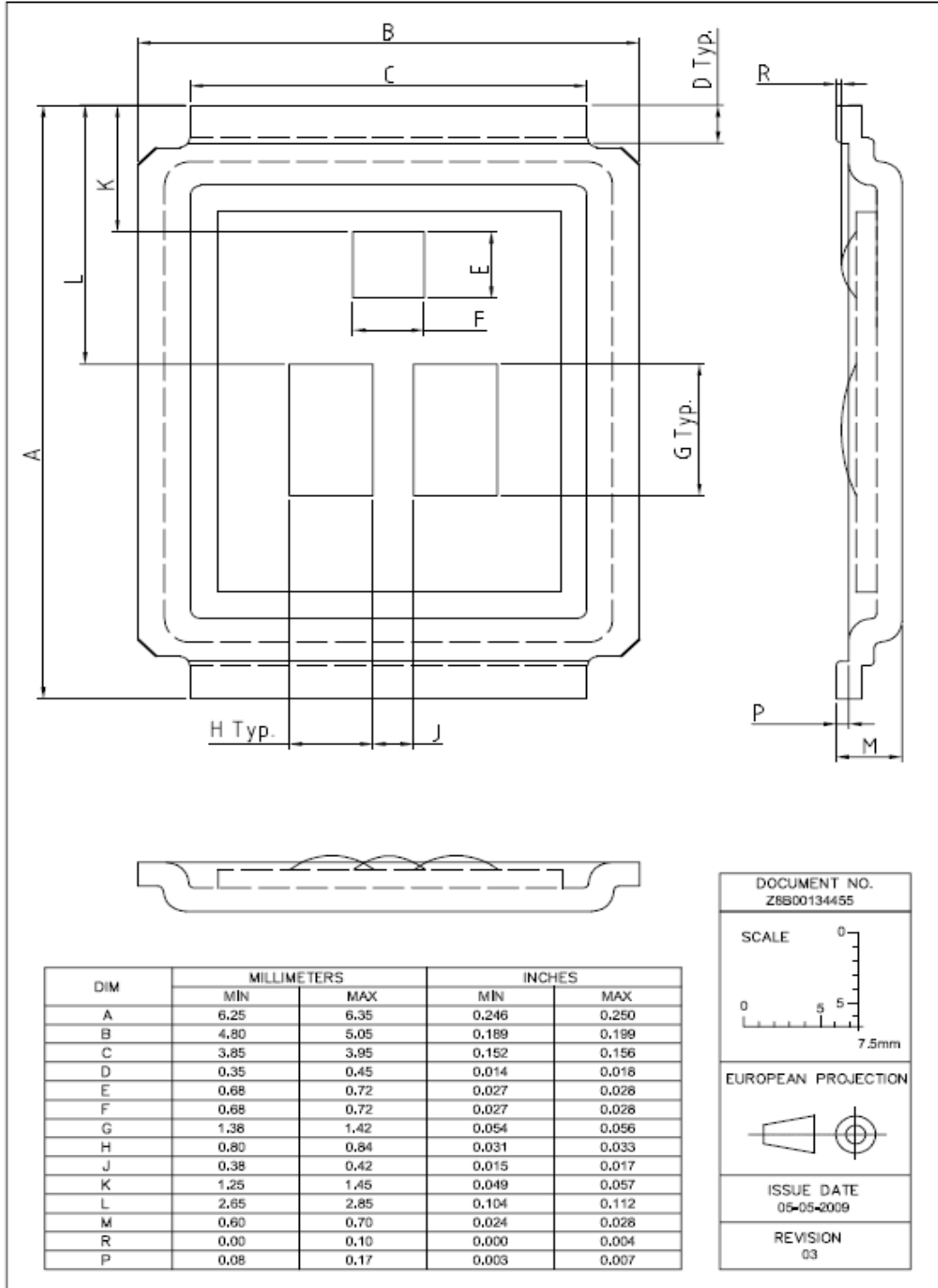
15 Drain-source breakdown voltage

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



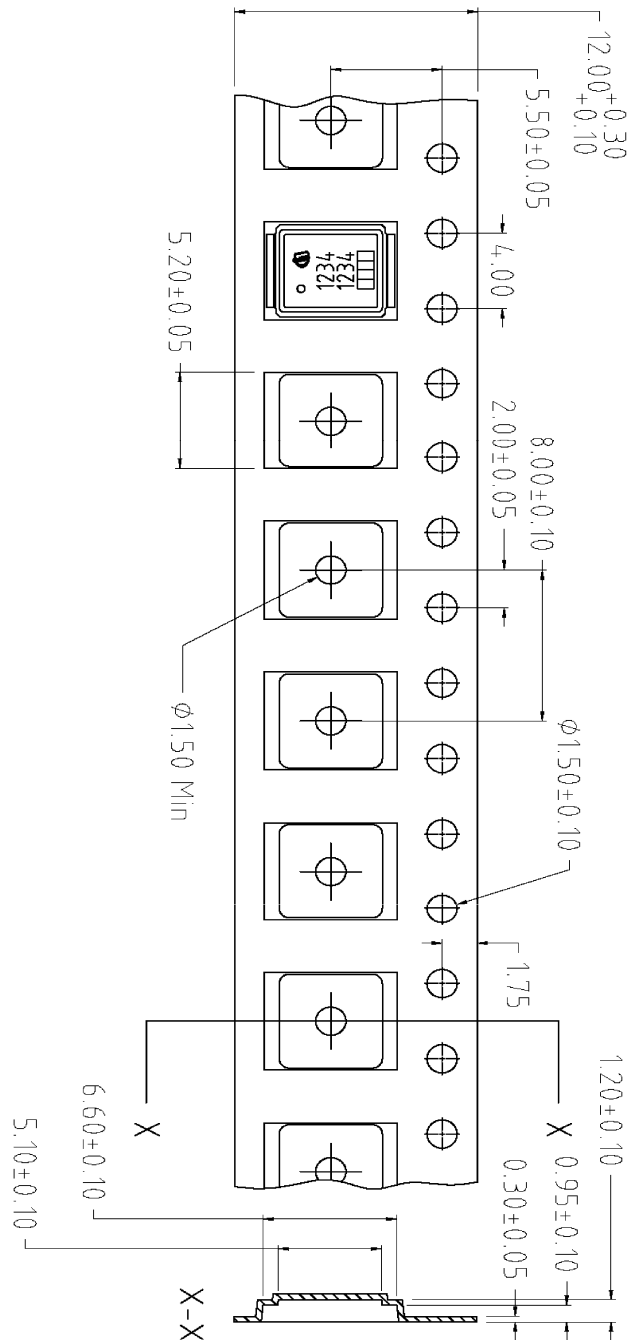
16 Gate charge waveforms



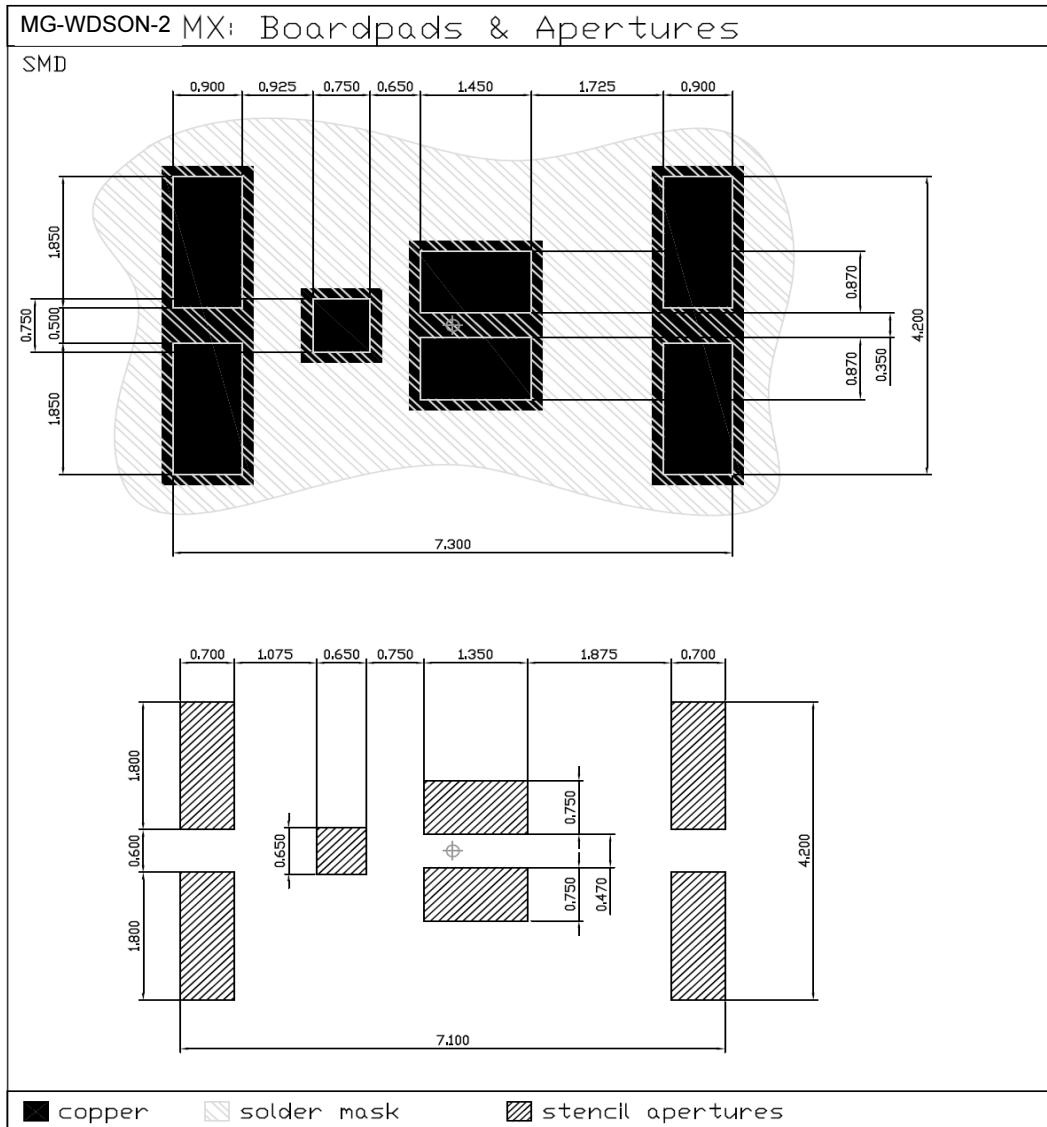


Package Outline

MG-WDSO-2



Dimensions in mm



Dimensions in mm

Reccomended stencil thickness 150 μ m

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