

# M2D-1200-0040

## Silicon Carbide MOSFET Bare Die

### N-Channel Enhancement Mode

#### Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness
- Halogen Free, RoHS Compliant

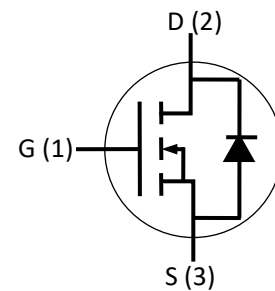
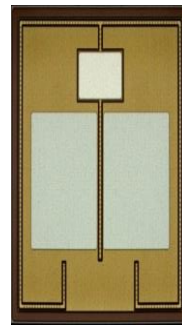
#### Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

#### Applications

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- Battery Chargers
- Motor Drives
- Pulsed Power applications

#### Package



| Part Number   | Package   |
|---------------|-----------|
| M2D-1200-0040 | 3.30*5.60 |

#### Maximum Ratings ( $T_c = 25^\circ\text{C}$ unless otherwise specified)

| Symbol         | Parameter                                  | Value          | Unit             | Test Conditions   | Note |
|----------------|--|----------------|------------------|---|------|
| $V_{DSmax}$    | Drain - Source Voltage                     | 1200           | V                | $V_{GS}=0V, I_D=100\mu A$   |      |
| $V_{GSmax}$    | Gate - Source Voltage                      | -10/+25        | V                | Absolute maximum values   |      |
| $V_{GSop}$     | Gate - Source Voltage                      | -5/+20         | V                | Recommended operational values  |      |
| $I_D$          | Continuous Drain Current                   | 60<br>40       | A                | $V_{GS}=20V, T_c=25^\circ\text{C}$<br>$V_{GS}=20V, T_c=100^\circ\text{C}$ |      |
| $T_J, T_{stg}$ | Operating Junction and Storage Temperature | -55 to<br>+150 | $^\circ\text{C}$ |   |      |

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**Electrical Characteristics**

| Symbol        | Parameter                        | Min. | Typ. | Max. | Unit       | Test Conditions  | Note |
|---------------|----------------------------------|------|------|------|------------|--|------|
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage   | 1200 |      |      | V          | $V_{GS}=0V, I_D=100\mu A$  |      |
| $V_{GS(th)}$  | Gate Threshold Voltage           | 2.0  | 2.50 | 4.0  | V          | $V_{GS}=V_{DS}, I_{DS}=10mA, T_C=25^\circ C$   |      |
|               |                                  |      | 1.80 |      |            | $V_{GS}=V_{DS}, I_{DS}=10mA, T_C=150^\circ C$  |      |
| $I_{DSS}$     | Zero Gate Voltage Drain Current  |      | 1    | 100  | $\mu A$    | $V_{DS}=1200V, V_{GS}=0V$  |      |
| $I_{GSS}$     | Gate-Source Leakage Current      |      |      | 200  | nA         | $V_{GS}=20V, V_{DS}=0V$  |      |
| $R_{DS(on)}$  | Drain-Source on-state Resistance |      | 45   | 55   | m $\Omega$ | $V_{GS}=20V, I_D=40A, T_C=25^\circ C$  |      |
|               |                                  |      | 58   |      | m $\Omega$ | $V_{GS}=20V, I_D=40A, T_C=150^\circ C$   |      |
| $g_{fs}$      | Transconductance                 |      | 14.1 |      | S          | $V_{GS}=20V, I_D=40A, T_J=25^\circ C$  |      |
|               |                                  |      | 12.5 |      | S          | $V_{GS}=20V, I_D=40A, T_J=150^\circ C$   |      |
| $C_{iss}$     | Input Capacitance                |      | 3550 |      | pF         | $V_{GS}=0V, V_{DS}=1000V, f=1MHz, V_{AC}=25mV$   |      |
| $C_{oss}$     | Output Capacitance               |      | 162  |      |            |  |      |
| $C_{rss}$     | Reverse Transfer Capacitance     |      | 29   |      |            |  |      |
| $E_{ON}$      | Turn-On Switching Energy         |      | 1.5  |      | mJ         | $V_{DS}=800V, V_{GS}=-5/20V, I_D=40A, R_{G(ext)}=5\Omega, L=80\mu H$                                       |      |
| $E_{OFF}$     | Turn-Off Switching Energy        |      | 0.7  |      |            |  |      |
| $t_{d(on)}$   | Turn-On Delay Time               |      | 60   |      | ns         | $V_{DD}=800V, V_{GS}=-5/20V, I_D=40A, R_{G(ext)}=5\Omega, R_L=20\Omega, \text{Timing relative to } V_{DS}$ |      |
| $t_r$         | Rise Time                        |      | 140  |      |            |  |      |
| $t_{d(off)}$  | Turn-Off Delay Time              |      | 50   |      |            |  |      |
| $t_f$         | Fall Time                        |      | 42   |      |            |  |      |
| $R_{G(int)}$  | Internal Gate Resistance         |      | 1.0  |      | $\Omega$   | $f=1MHz, V_{AC}=25mV$  |      |
| $Q_{gs}$      | Gate to Source Charge            |      | 40   |      | nC         | $V_{DD}=800V, V_{GS}=-5/20V, I_D=40A$  |      |
| $Q_{gd}$      | Gate to Drain Charge             |      | 55   |      |            |  |      |
| $Q_g$         | Total Gate Charge                |      | 160  |      |            |  |      |

**Reverse Diode Characteristics**

| Symbol   | Parameter                        | Typ. | Max. | Unit | Test Conditions                           | Note |
|----------|----------------------------------|------|------|------|---|------|
| $V_{SD}$ | Diode Forward Voltage            | 3.6  |      | V    | $V_{GS}=-5V, I_{SD}=20A, T_J=25^\circ C$  |      |
|          |                                  | 3.3  |      | V    | $V_{GS}=-5V, I_{SD}=20A, T_J=150^\circ C$ |      |
| $I_S$    | Continuous Diode Forward Current |      | 20   | A    | $T_C=25^\circ C$                          |      |

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**Mechanical Parameters**

| Parameter                        | Typ.        | Unit |
|----------------------------------|-------------|------|
| Die Size                         | 3.30 x 5.60 | mm   |
| Souce Pad Size                   | 3.70*1.20   | mm   |
| Gate Pad Size                    | 0.78*0.48   | mm   |
| Thickness                        | 180 ± 10%   | μm   |
| Wafer Size                       | 150         | mm   |
| Top Side Metalization (Al)       | 4           | μm   |
| Bottom Side Metalization (Ni/Ag) | 1.5         | μm   |

