

# MDD3134KW

## 20V N-Channel Enhancement Mode MOSFET

### 1. Description

This 20V N-channel MOSFET is based on MDD's unique device design to achieve low  $R_{DS(on)}$  and fast switching and good ESD rating performance.

### 2. Features

- Lead free product is acquired
- Surface mount package
- Moisture Sensitivity Level 3

### 3. Application

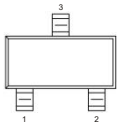
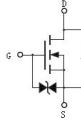
- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories
- Battery Operated Systems
- Power Supply Converter Circuits
- Load/Power Switching Cell Phones, Pagers

### 4. Absolute Maximum Ratings( $T_A=25^{\circ}\text{C}$ unless otherwise noted)

| Parameter                                   | Symbol          | Value    | Unit                 |
|---------------------------------------------|-----------------|----------|----------------------|
| Drain-Source Voltage                        | $V_{DS}$        | 20       | V                    |
| Gate-Source Voltage                         | $V_{GS}$        | $\pm 12$ | V                    |
| Continuous Drain Current                    | $I_D$           | 0.75     | A                    |
| Pulsed Drain Current                        | $I_{DM}$        | 3        | A                    |
| Power Dissipation                           | $P_D$           | 200      | mW                   |
| Thermal Resistance From Junction to Ambient | $R_{\theta JA}$ | 625      | $^{\circ}\text{C/W}$ |
| Storage Temperature                         | $T_{stg}$       | -50~+150 | $^{\circ}\text{C}$   |
| Junction Temperature                        | $T_J$           | 150      | $^{\circ}\text{C}$   |

- Stresses exceeding Maximum Ratings may damage the device.
- Maximum Ratings are stress ratings only.
- Functional operation above the Recommended Operating Conditions is not implied.
- Extended exposure to stresses above the recommended Operating Conditions may affect device reliability

## 5. Pinning information

| Pin | Symbol | Description | Simplified outline                                                                | Equivalent Circuit                                                                | Marking | Package |
|-----|--------|-------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------|---------|
| 1   | G      | Gate        |  |  | 34K     | SOT-323 |
| 2   | S      | Source      |                                                                                   |                                                                                   |         |         |
| 3   | D      | Drain       |                                                                                   |                                                                                   |         |         |

## 6. $T_A=25^{\circ}\text{C}$ unless otherwise specified

| Symbol        | Parameter                         | Condition                     | Min  | Typ | Max      | Unit       |
|---------------|-----------------------------------|-------------------------------|------|-----|----------|------------|
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage    | $V_{GS}=0V, I_D=250\mu A$     | 20   | —   | —        | V          |
| $V_{GS(TH)}$  | Gate Threshold Voltage(note3)     | $V_{DS}=V_{GS}, I_D=250\mu A$ | 0.35 | —   | 1.1      | V          |
| $I_{GSS}$     | Gate-body Leakage                 | $V_{DS}=0V, V_{GS}=\pm 10V$   | —    | —   | $\pm 20$ | $\mu A$    |
| $I_{DSS}$     | Zero Gate Voltage Drain current   | $V_{DS}=20V, V_{GS}=0V$       | —    | —   | 1        | $\mu A$    |
| $R_{DS(ON)}$  | Drain-Source On-Resistance(note3) | $V_{GS}=4.5V, I_D=0.65A$      | —    | —   | 380      | m $\Omega$ |
|               |                                   | $V_{GS}=2.5V, I_C=0.55A$      | —    | —   | 450      | m $\Omega$ |
|               |                                   | $V_{GS}=1.8V, I_C=0.45A$      | —    | —   | 800      | m $\Omega$ |
| gfs           | Forward trans conductance         | $V_{DS}=10V, I_D=0.8A$        | 1    | —   | —        | S          |

## 7. Dynamic Electrical Characteristics(note4)

| Symbol    | Parameter                    | Condition    | Min | Typ | Max | Unit |
|-----------|------------------------------|--------------|-----|-----|-----|------|
| $C_{iss}$ | Input Capacitance            | $V_{GS}=0V$  | —   | —   | 120 | pF   |
| $C_{oss}$ | Output Capacitance           | $V_{DS}=16V$ | —   | —   | 20  | pF   |
| $C_{rss}$ | Reverse Transfer Capacitance | $f=1.0MHz$   | —   | —   | 15  | pF   |

## 8. Switching Characteristics(note4)

| Symbol       | Parameter           | Condition                                                         | Min | Typ  | Max | Unit |
|--------------|---------------------|-------------------------------------------------------------------|-----|------|-----|------|
| $t_{d(on)}$  | Turn on Delay Time  | $V_{GS}=4.5V$<br>$V_{DD}=10V$<br>$I_D=0.5A$<br>$R_{GEN}=10\Omega$ | —   | 6.7  | —   | nS   |
| $t_r$        | Turn on Rise Time   |                                                                   | —   | 4.8  | —   | nS   |
| $t_{d(off)}$ | Turn Off Delay Time |                                                                   | —   | 17.3 | —   | nS   |
| $t_f$        | Turn Off Fall Time  |                                                                   | —   | 7.4  | —   | nS   |

## 9. Drain-Source Diode Characteristics

| Symbol   | Parameter                    | Condition              | Min | Typ | Max | Unit |
|----------|------------------------------|------------------------|-----|-----|-----|------|
| $V_{SD}$ | Diode forward voltage(note3) | $V_{GS}=0V, I_S=0.15A$ | —   | —   | 12  | V    |

Notes: 1.Repetitive Rating: Pulse width limited by maximum junction temperature

2.This test is performed with on heat sink at  $T_A=25^{\circ}\text{C}$

3.Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 0.5\%$

4.These parameters have no way to verify

### 10. Electrical Characteristics Diagrams

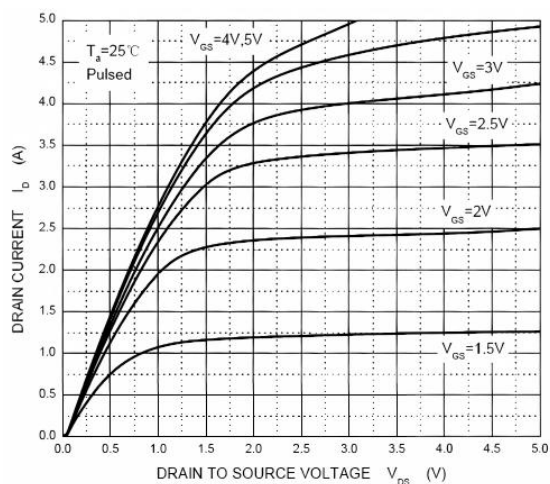


Figure 1. Output Characteristics

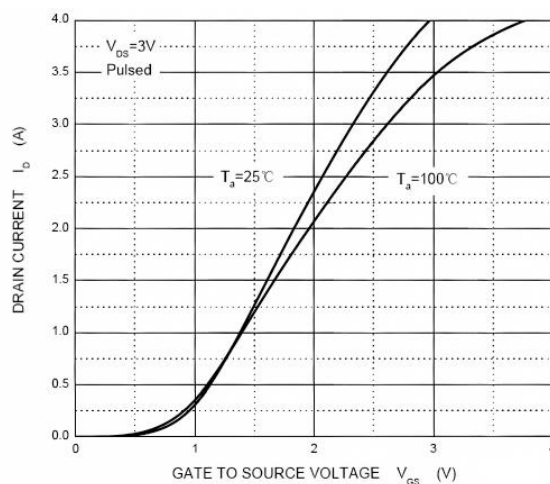


Figure 2. Transfer Characteristics

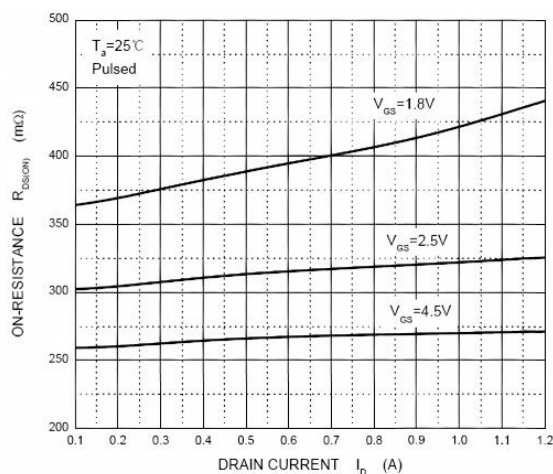


Figure 3.  $R_{DS(on)}$  VS Drain Current

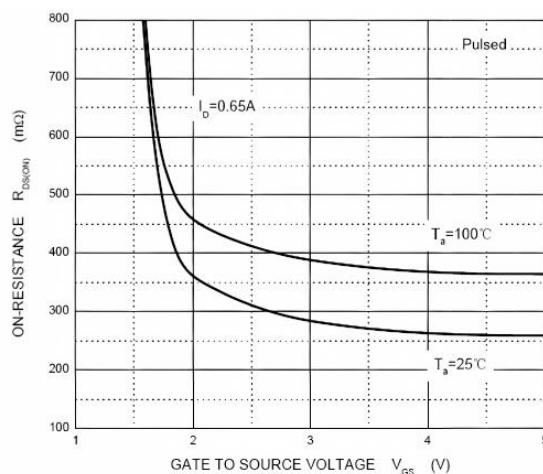


Figure 4.  $R_{DS(on)}$  VS  $V_{GS}$

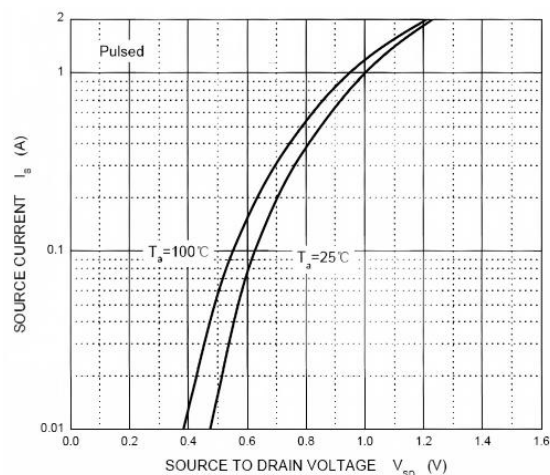


Figure 5. Source-Drain Diode Forward Characteristics

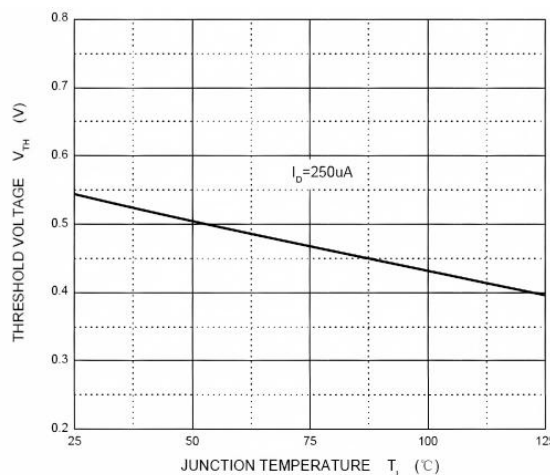
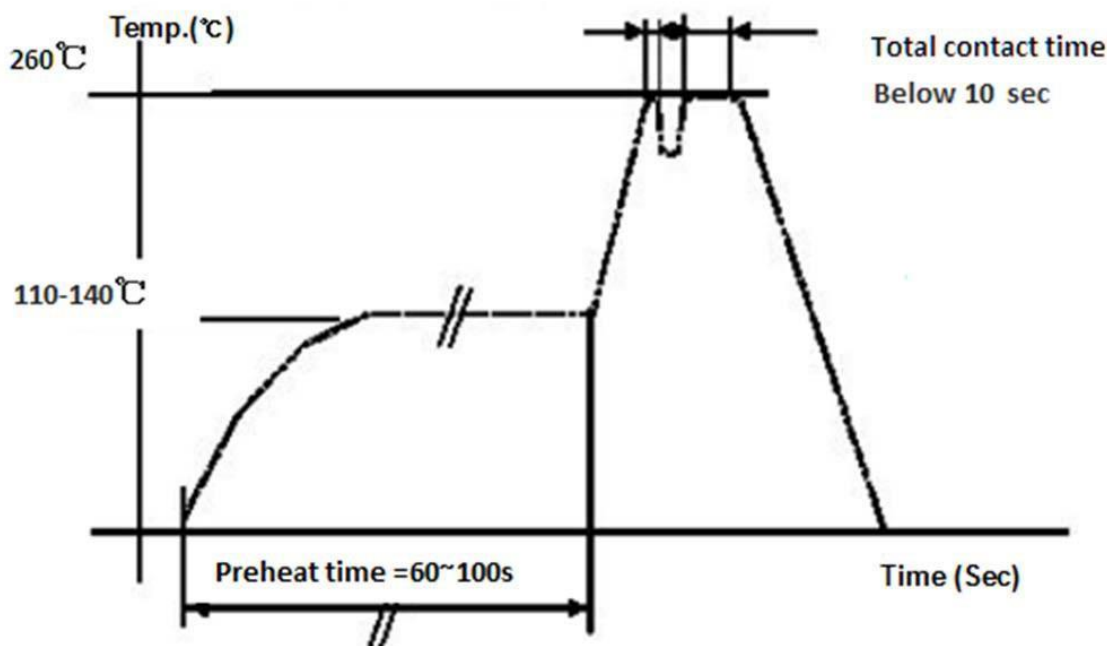


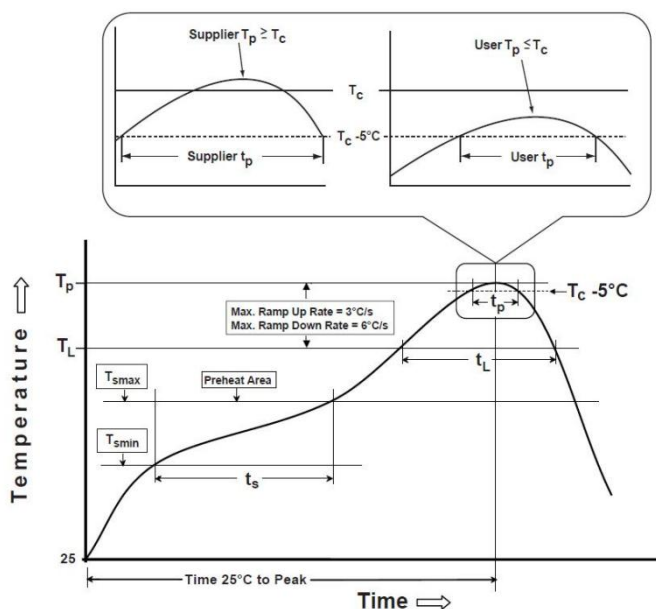
Figure 6. Threshold Voltage vs. Junction Temperature

## 11. Recommended Soldering Profile for Rectifier Diodes (PbFree)

### a)Wave Soldering Profile



**b)Reflow Soldering Profile(PbFreeApplication),refer to IPC/JEDEC J-STD-020**

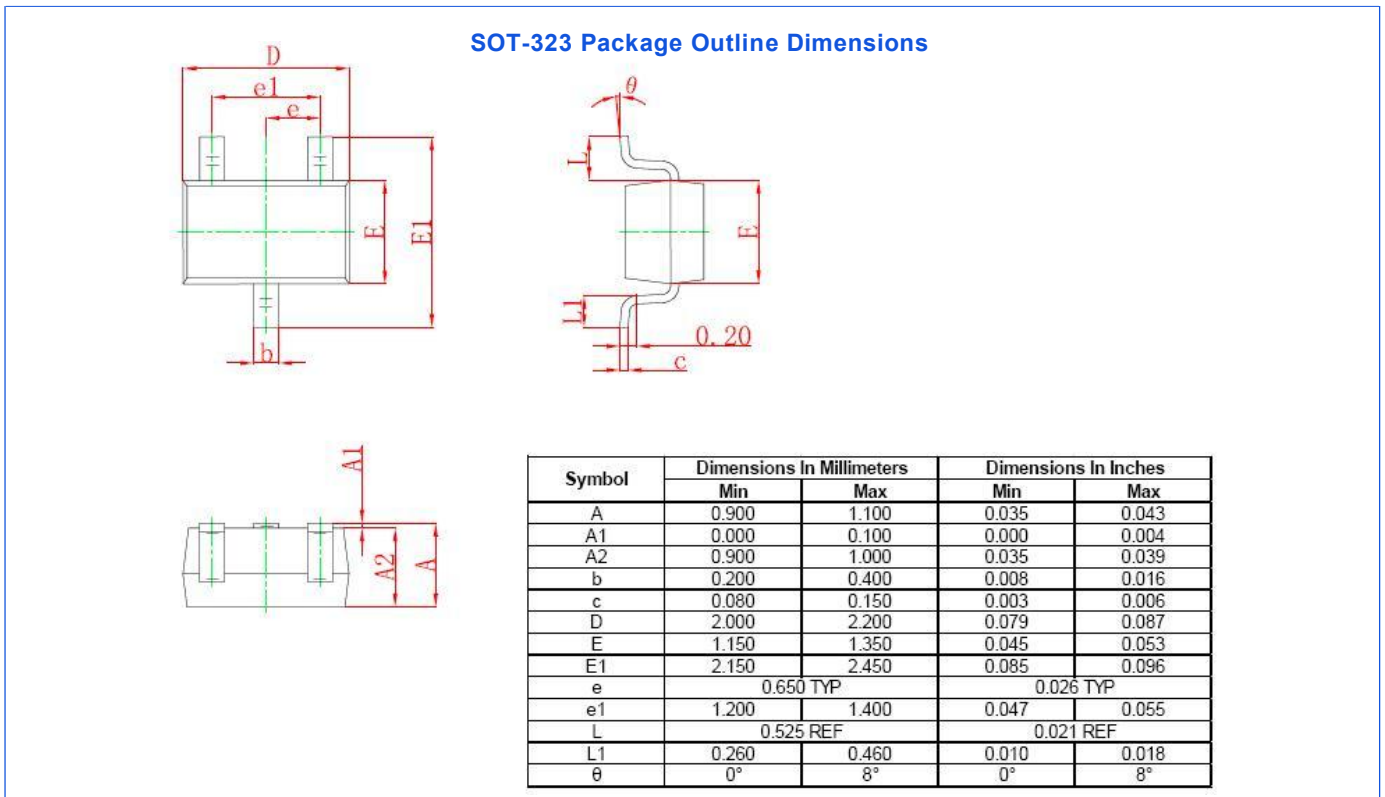


|                                                                                                                                                     |                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| Preheat/Soak Temperature Min<br>(T <sub>sm</sub> ) Temperature Max (T <sub>sm</sub> max)<br>Time (ts) from (T <sub>sm</sub> to T <sub>sm</sub> max) | 50 °C<br>200 °C<br>60-120 seconds |
| Melting Point of Solder (Sn Ag Cu)                                                                                                                  | 217°C                             |
| Ramp-up Rate to 217°C (Melting Point of Solder)                                                                                                     | 3°C/sec                           |
| Time at Temp.>217°C (Melting Point of Solder)                                                                                                       | 60–150 Sec                        |
| Peak Temperature                                                                                                                                    | 255±5°C                           |
| Time within 5°C below Peak Temp.                                                                                                                    | 20–40 Sec                         |
| Cooling Rate                                                                                                                                        | 6°C/sec (max)                     |
| Time from 25°C to Peak Temp.                                                                                                                        | 8min (max)                        |

### c)Manual Soldering

When using an electric soldering iron for manual soldering, it is recommended that the temperature does not exceed 300°C and the soldering time is less than 10 seconds.

## 12. Outline Drawing



## 13. Important Notice and Disclaimer

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