



## Description

### JMT P-channel Enhancement Mode Power MOSFET

#### Features

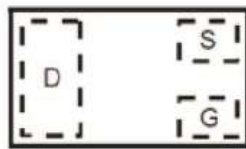
- $V_{DS} = -20V$ ,  $I_D = -0.66A$
- $R_{DS(ON)} < 0.52\Omega @ V_{GS} = -4.5V$
- $R_{DS(ON)} < 0.7\Omega @ V_{GS} = -2.5V$
- Advanced Trench Technology
- Excellent  $R_{DS(ON)}$  and Low Gate Charge
- Lead free product is acquired
- ESD Protected: HBM 2KV

#### Application

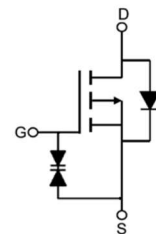
- PWM Applications
- Load Switch
- Power Management



DFN1006-3L



Marking and pin Assignment



Schematic Diagram

## Package Marking and Ordering Information

| Device Marking | Device      | OUTLINE | Device Package | Reel Size | Reel (PCS) | Per Carton (PCS) |
|----------------|-------------|---------|----------------|-----------|------------|------------------|
| 04K            | JMTD2004KNC | TAPING  | DFN1006-3L     | -         | -          | -                |

## Absolute Maximum Ratings ( $T_A=25^\circ C$ unless otherwise specified)

| Symbol          | Parameter                               | Max.                | Units        |
|-----------------|---|---------------------|--------------|
| $V_{DSS}$       | Drain-Source Voltage                    | -20                 | V            |
| $V_{GSS}$       | Gate-Source Voltage                     | $\pm 10$            | V            |
| $I_D$           | Continuous Drain Current                | $T_A = 25^\circ C$  | -0.66        |
|                 |   | $T_A = 100^\circ C$ | -0.43        |
| $I_{DM}$        | Pulsed Drain Current <sup>note1</sup>   | -2.64               | A            |
| $P_D$           | Power Dissipation                       | $T_A = 25^\circ C$  | 0.15         |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 833                 | $^\circ C/W$ |
| $T_J, T_{STG}$  | Operating and Storage Temperature Range | -55 to +150         | $^\circ C$   |



## Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise specified)

| Symbol  | Parameter   | Test Condition   | Min.  | Typ.  | Max.  | Units |
|---|---|--|-------|-------|-------|-------|
| <b>Off Characteristic</b>                                     |   |  |       |       |       |       |
| V <sub>(BR)DSS</sub>  | Drain-Source Breakdown Voltage                            | V <sub>GS</sub> =0V, I <sub>D</sub> = -250μA   | -20   | -     | -     | V     |
| I <sub>DSS</sub>  | Zero Gate Voltage Drain Current                           | V <sub>DS</sub> = -20V, V <sub>GS</sub> =0V,   | -     | -     | -1    | μA    |
| I <sub>GSS</sub>  | Gate to Body Leakage Current                              | V <sub>DS</sub> =0V, V <sub>GS</sub> = ±10V  | -     | -     | ±10   | μA    |
| <b>On Characteristics</b>                                     |   |  |       |       |       |       |
| V <sub>GS(th)</sub>   | Gate Threshold Voltage                                    | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> = -250μA   | -0.35 | -0.65 | -1.0  | V     |
| R <sub>DS(on)</sub>   | Static Drain-Source on-Resistance<br><small>note2</small> | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -0.5A  | -     | 0.36  | 0.52  | Ω     |
|   |   | V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -0.2A  | -     | 0.5   | 0.7   |       |
| <b>Dynamic Characteristics</b>                                |   |  |       |       |       |       |
| C <sub>iss</sub>  | Input Capacitance   | V <sub>DS</sub> = -16V, V <sub>GS</sub> =0V,<br>f=1.0MHz   | -     | 113   | -     | pF    |
| C <sub>oss</sub>  | Output Capacitance  |  | -     | 15    | -     | pF    |
| C <sub>rss</sub>  | Reverse Transfer Capacitance                              |  | -     | 9     | -     | pF    |
| Q <sub>g</sub>  | Total Gate Charge   | V <sub>DS</sub> = -10V, I <sub>D</sub> = -0.3A,<br>V <sub>GS</sub> = -4.5V   | -     | 9.8   | -     | nC    |
| Q <sub>gs</sub>   | Gate-Source Charge  |  | -     | 1.6   | -     | nC    |
| Q <sub>gd</sub>   | Gate-Drain("Miller") Charge                               |  | -     | 3.4   | -     | nC    |
| <b>Switching Characteristics</b>                              |   |  |       |       |       |       |
| t <sub>d(on)</sub>  | Turn-on Delay Time  | V <sub>DD</sub> = -10V, I <sub>D</sub> = -0.2A,<br>R <sub>G</sub> =3Ω, V <sub>GEN</sub> = -4.5V,<br>R <sub>L</sub> =2.5Ω | -     | 9     | -     | ns    |
| t <sub>r</sub>  | Turn-on Rise Time   |  | -     | 5.7   | -     | ns    |
| t <sub>d(off)</sub>   | Turn-off Delay Time                                       |  | -     | 32.6  | -     | ns    |
| t <sub>f</sub>  | Turn-off Fall Time  |  | -     | 20.3  | -     | ns    |
| <b>Drain-Source Diode Characteristics and Maximum Ratings</b> |   |  |       |       |       |       |
| I <sub>S</sub>  | Maximum Continuous Drain to Source Diode Forward Current  |  | -     | -     | -0.66 | A     |
| I <sub>SM</sub>   | Maximum Pulsed Drain to Source Diode Forward Current      |  | -     | -     | -2.64 | A     |
| V <sub>SD</sub>   | Drain to Source Diode Forward Voltage                     | V <sub>GS</sub> =0V, I <sub>S</sub> = -0.66A   | -     | -     | -1.2  | V     |

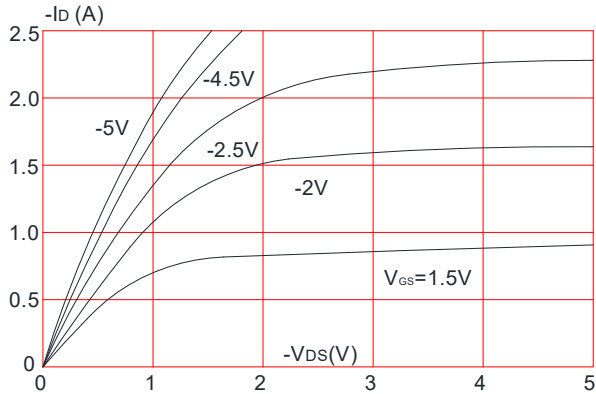
Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

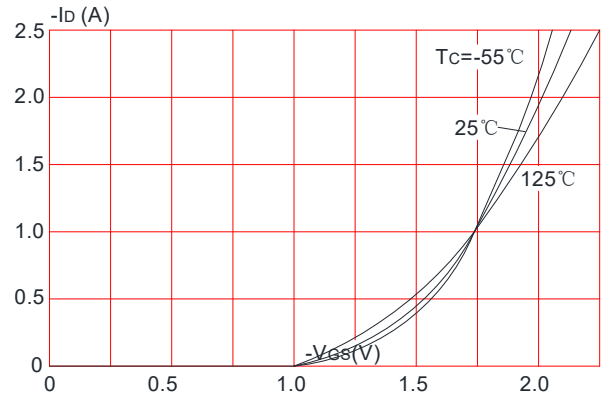


## Typical Performance Characteristics

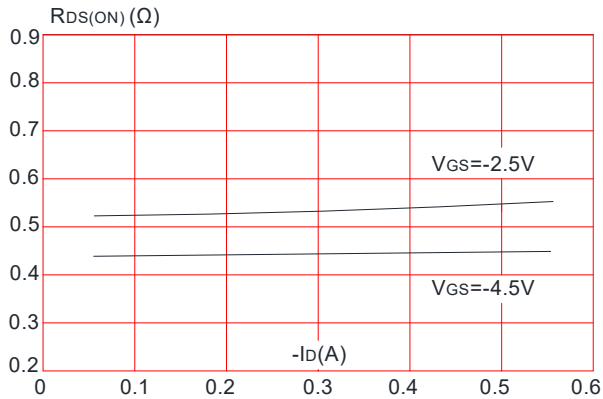
**Figure 1: Output Characteristics**



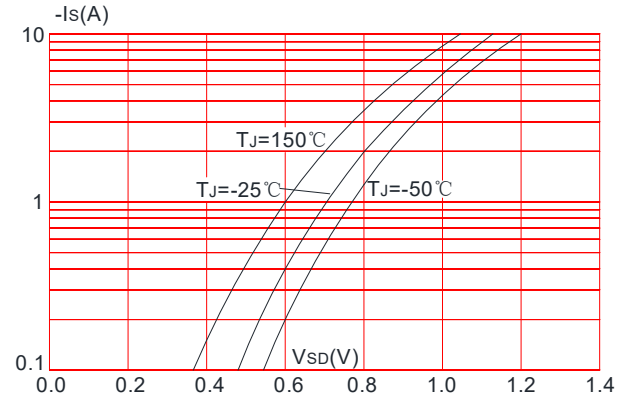
**Figure 2: Typical Transfer Characteristics**



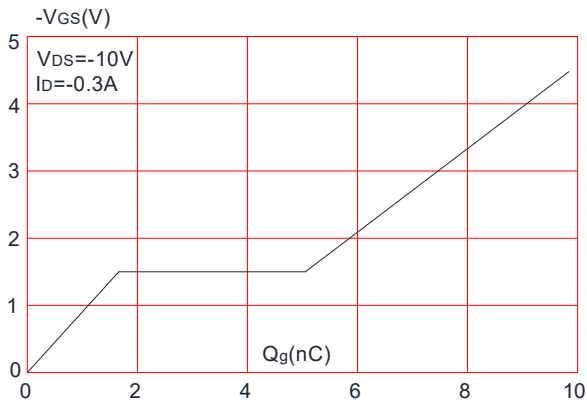
**Figure 3: On-resistance vs. Drain Current**



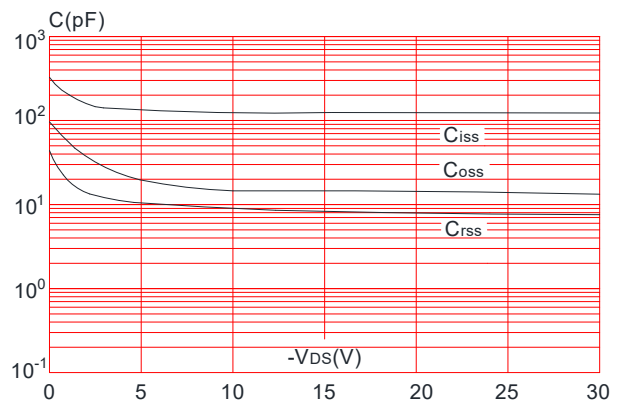
**Figure 4: Body Diode Characteristics**



**Figure 5: Gate Charge Characteristics**

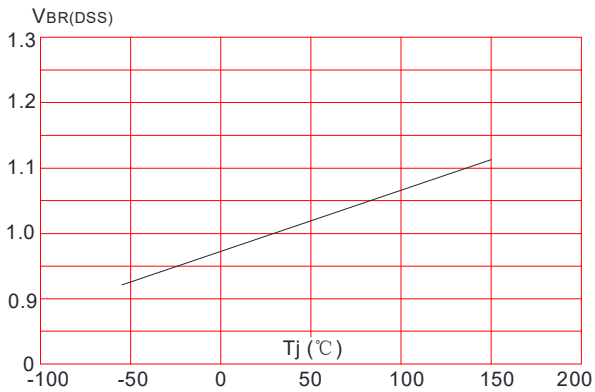


**Figure 6: Capacitance Characteristics**

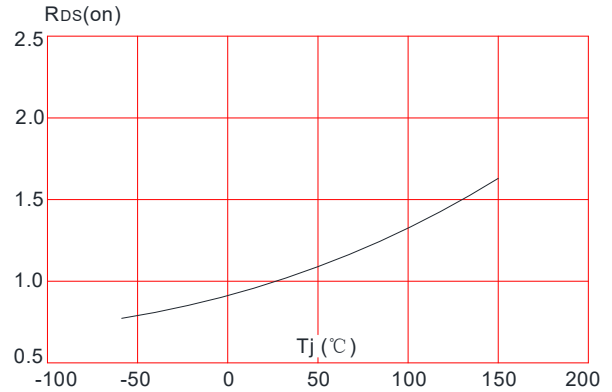




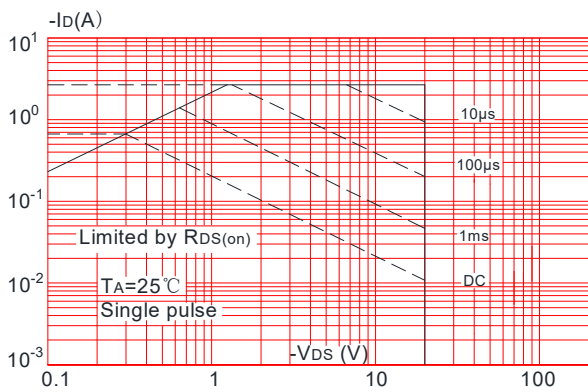
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



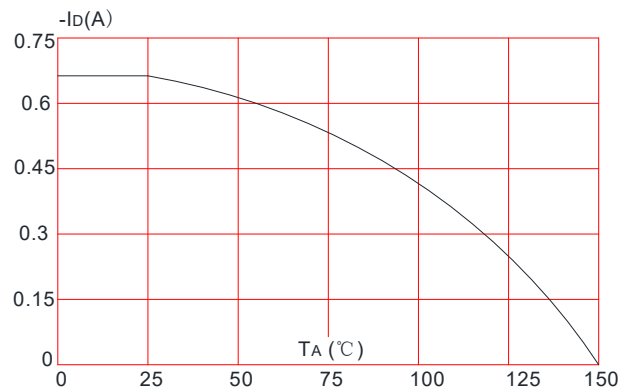
**Figure 8:** Normalized on Resistance vs. Junction Temperature



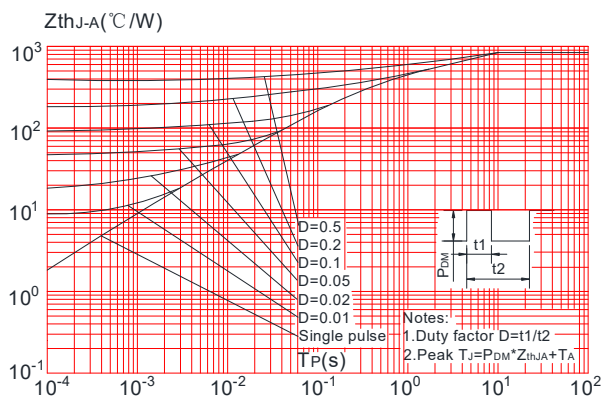
**Figure 9:** Maximum Safe Operating Area



**Figure 10:** Maximum Continuous Drain Current vs. Ambient Temperature

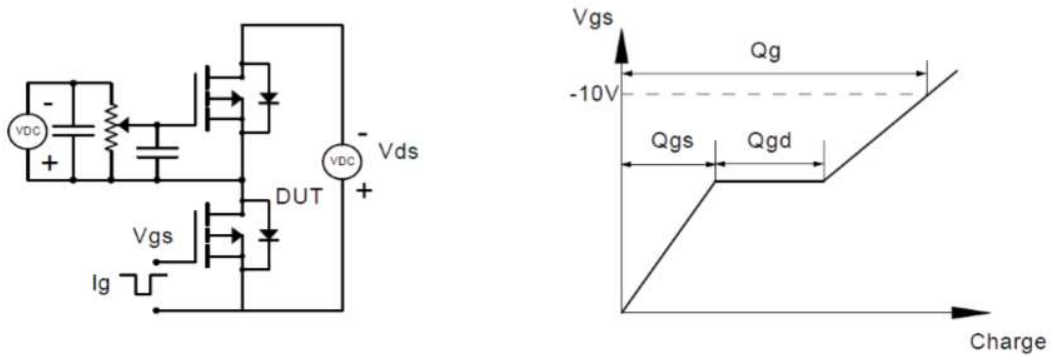


**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

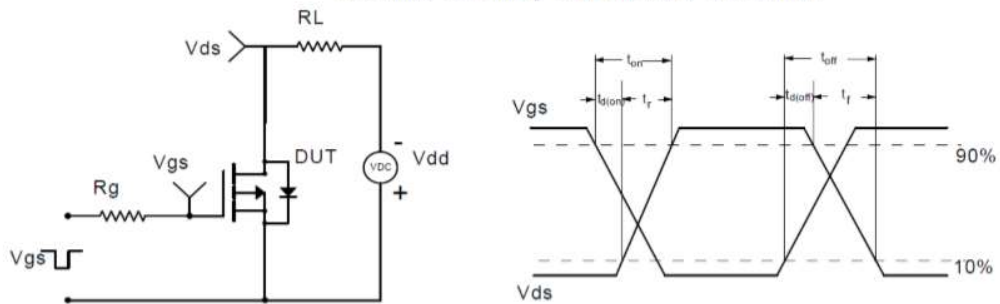


## Test Circuit

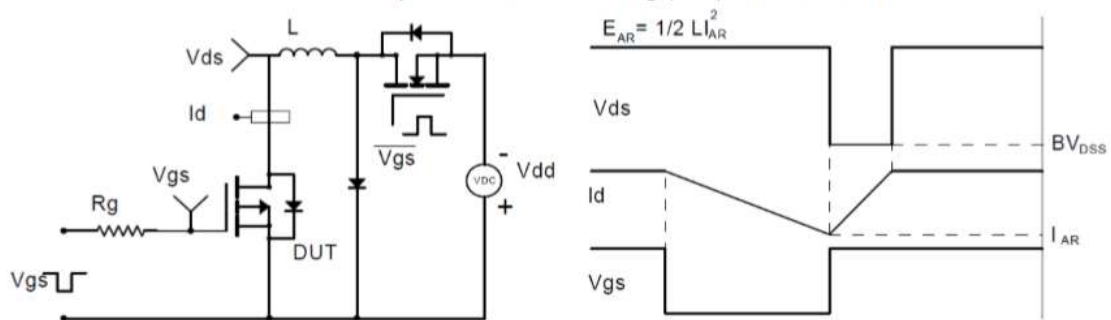
### Gate Charge Test Circuit & Waveform



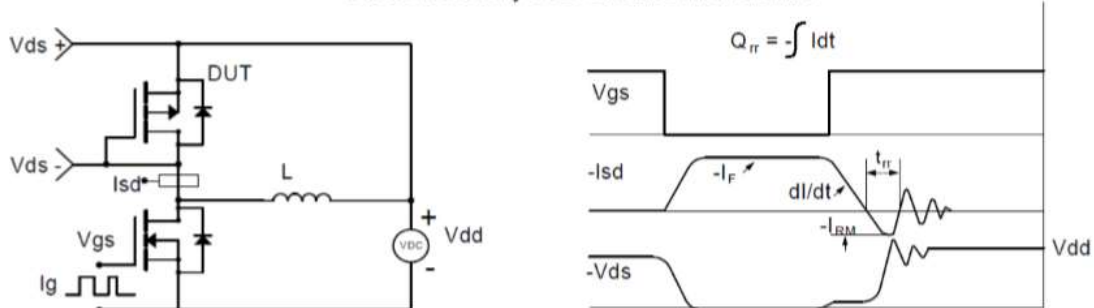
### Resistive Switching Test Circuit & Waveforms



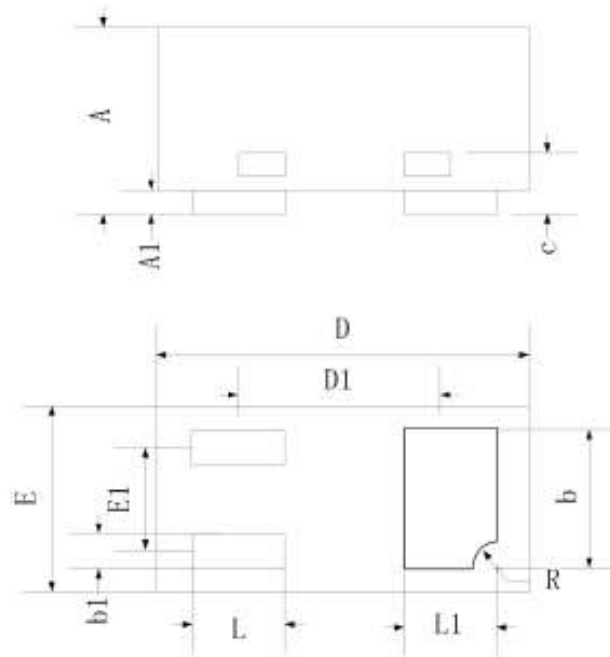
### Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



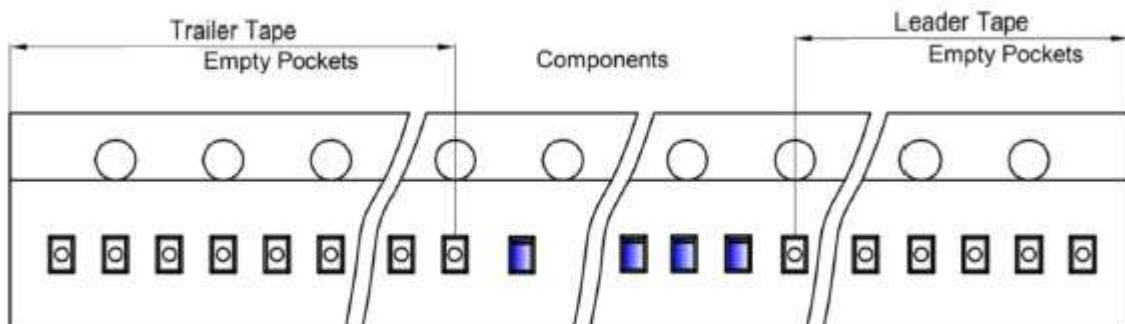
### Diode Recovery Test Circuit & Waveforms



## Package Mechanical Data-DFN1006-3L



| Symbol | Dimensions in millimeters |      |
|--------|---------------------------|------|
|        | Min.                      | Max. |
| A      | 0.46                      | 0.51 |
| A1     | 0                         | 0.05 |
| b      | 0.45                      | 0.55 |
| b1     | 0.1                       | 0.2  |
| c      | 0.08                      | 0.18 |
| D      | 0.95                      | 1.05 |
| D1     | 0.65                      |      |
| E      | 0.55                      | 0.65 |
| E1     | 0.325                     |      |
| L      | 0.2                       | 0.3  |
| L1     | 0.2                       | 0.3  |
| R      | 0.05                      | 0.15 |






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