

# TM06N03MI

## N-Channel Enhancement Mosfet

### General Description

- Low  $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

### Applications

- Load switch
- PWM

### General Features

$V_{DS} = 30V$   $I_D = 6.0A$

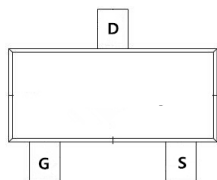
$R_{DS(ON)} = 24m\Omega (typ.) @ V_{GS} = 10V$

100% UIS Tested

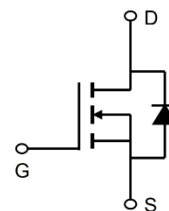
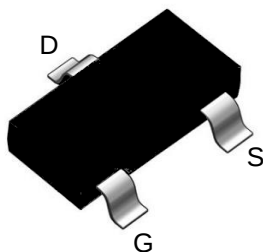
100%  $R_g$  Tested



MI:SOT-23-3L



Marking: XO



### Absolute Maximum Ratings ( $T_C = 25^\circ C$ unless otherwise noted)

| Symbol                   | Parameter                                                         | Rating     | Units        |
|--------------------------|-------------------------------------------------------------------|------------|--------------|
| $V_{DS}$                 | Drain-Source Voltage                                              | 30         | V            |
| $V_{GS}$                 | Gate-Source Voltage                                               | $\pm 12$   | V            |
| $I_D @ T_A = 25^\circ C$ | Continuous Drain Current                                          | 6.0        | A            |
| $I_D @ T_A = 70^\circ C$ | Continuous Drain Current                                          | 4.9        | A            |
| $I_{DM}$                 | Pulsed Drain Current <sup>2</sup>                                 | 20         | A            |
| $P_D @ T_A = 25^\circ C$ | Total Power Dissipation <sup>3</sup>                              | 1          | W            |
| $T_{STG}$                | Storage Temperature Range                                         | -55 to 150 | $^\circ C$   |
| $T_J$                    | Operating Junction Temperature Range                              | -55 to 150 | $^\circ C$   |
| $R_{\theta JA}$          | Thermal Resistance Junction-ambient <sup>1</sup>                  | 125        | $^\circ C/W$ |
| $R_{\theta JA}$          | Thermal Resistance Junction-Ambient <sup>1</sup> ( $t \leq 10s$ ) | 85         | $^\circ C/W$ |



## TM06N03MI

## N-Channel Enhancement Mosfet

Electrical Characteristics ( $T_J=25^\circ\text{C}$ , unless otherwise noted)

| Symbol                       | Parameter                                      | Conditions                                              | Min. | Typ.  | Max.      | Unit                 |
|------------------------------|------------------------------------------------|---------------------------------------------------------|------|-------|-----------|----------------------|
| $BV_{DSS}$                   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V$ , $I_D=250\mu A$                            | 30   | ---   | ---       | V                    |
| $\Delta BV_{DSS}/\Delta T_J$ | $BV_{DSS}$ Temperature Coefficient             | Reference to $25^\circ\text{C}$ , $I_D=1mA$             | ---  | 0.029 | ---       | V/ $^\circ\text{C}$  |
| $R_{DS(on)}$                 | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V$ , $I_D=5A$                                 | ---  | 24    | 26        | m $\Omega$           |
|                              |                                                | $V_{GS}=4.5V$ , $I_D=3A$                                | ---  | 27    | 29        |                      |
|                              |                                                |                                                         |      |       |           |                      |
| $V_{GS(th)}$                 | Gate Threshold Voltage                         | $V_{GS}=V_{DS}$ , $I_D=250\mu A$                        | 0.5  | 0.9   | 1.2       | V                    |
| $\Delta V_{GS(th)}$          | $V_{GS(th)}$ Temperature Coefficient           |                                                         | ---  | -2.82 | ---       | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                    | Drain-Source Leakage Current                   | $V_{DS}=24V$ , $V_{GS}=0V$ , $T_J=25^\circ\text{C}$     | ---  | ---   | 1         | $\mu A$              |
|                              |                                                | $V_{DS}=24V$ , $V_{GS}=0V$ , $T_J=55^\circ\text{C}$     | ---  | ---   | 5         |                      |
| $I_{GSS}$                    | Gate-Source Leakage Current                    | $V_{GS}=\pm 12V$ , $V_{DS}=0V$                          | ---  | ---   | $\pm 100$ | nA                   |
| $g_{fs}$                     | Forward Transconductance                       | $V_{DS}=5V$ , $I_D=5A$                                  | ---  | 25    | ---       | S                    |
| $R_g$                        | Gate Resistance                                | $V_{DS}=0V$ , $V_{GS}=0V$ , $f=1MHz$                    | ---  | 1.5   | ---       | $\Omega$             |
| $Q_g$                        | Total Gate Charge (4.5V)                       | $V_{DS}=15V$ , $V_{GS}=4.5V$ , $I_D=5.8A$               | ---  | 11.5  | ---       | nC                   |
| $Q_{gs}$                     | Gate-Source Charge                             |                                                         | ---  | 1.6   | ---       |                      |
| $Q_{gd}$                     | Gate-Drain Charge                              |                                                         | ---  | 2.9   | ---       |                      |
| $T_{d(on)}$                  | Turn-On Delay Time                             | $V_{DD}=15V$ , $V_{GS}=10V$ , $R_G=3\Omega$<br>$I_D=5A$ | ---  | 5     | ---       | ns                   |
| $T_r$                        | Rise Time                                      |                                                         | ---  | 47.   | ---       |                      |
| $T_{d(off)}$                 | Turn-Off Delay Time                            |                                                         | ---  | 26    | ---       |                      |
| $T_f$                        | Fall Time                                      |                                                         | ---  | 8     | ---       |                      |
| $C_{iss}$                    | Input Capacitance                              | $V_{DS}=15V$ , $V_{GS}=0V$ , $f=1MHz$                   | ---  | 490   | ---       | pF                   |
| $C_{oss}$                    | Output Capacitance                             |                                                         | ---  | 130   | ---       |                      |
| $C_{rss}$                    | Reverse Transfer Capacitance                   |                                                         | ---  | 36    | ---       |                      |
| $I_S$                        | Continuous Source Current <sup>1,4</sup>       | $V_G=V_D=0V$ , Force Current                            | ---  | ---   | 6.0       | A                    |
| $V_{SD}$                     | Diode Forward Voltage <sup>2</sup>             | $V_{GS}=0V$ , $I_S=1A$ , $T_J=25^\circ\text{C}$         | ---  | ---   | 1.2       | V                    |

## Note :

- 1、The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2、The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$
- 3、The power dissipation is limited by  $150^\circ\text{C}$  junction temperature
- 4、The data is theoretically the same as  $I_D$  and  $I_{DM}$  , in real applications , should be limited by total power dissipation.



## TM06N03MI

## N-Channel Enhancement Mosfet

## Typical Characteristics

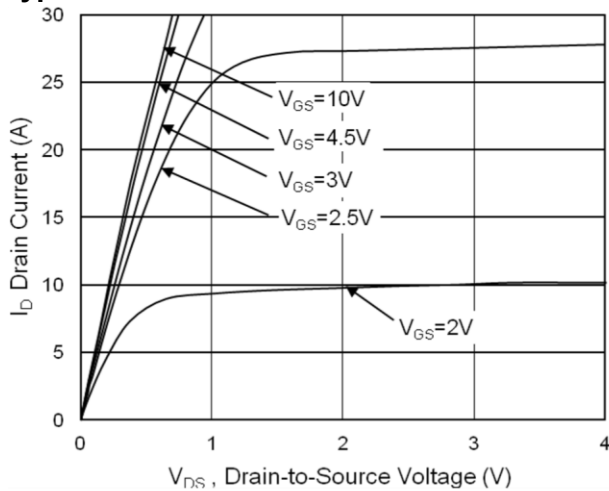


Fig.1 Typical Output Characteristics

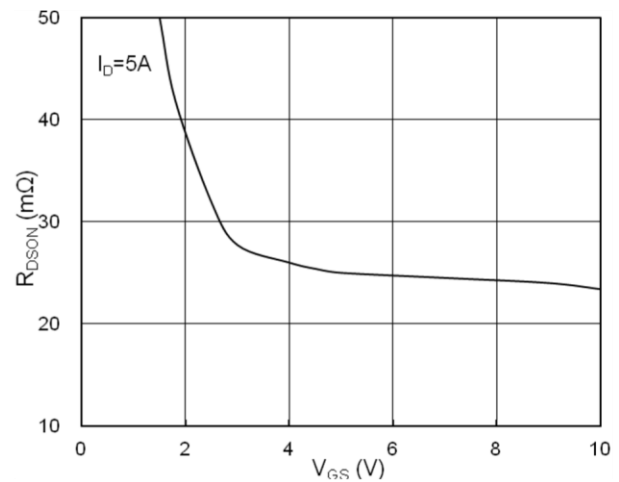


Fig.2 On-Resistance vs. Gate-Source

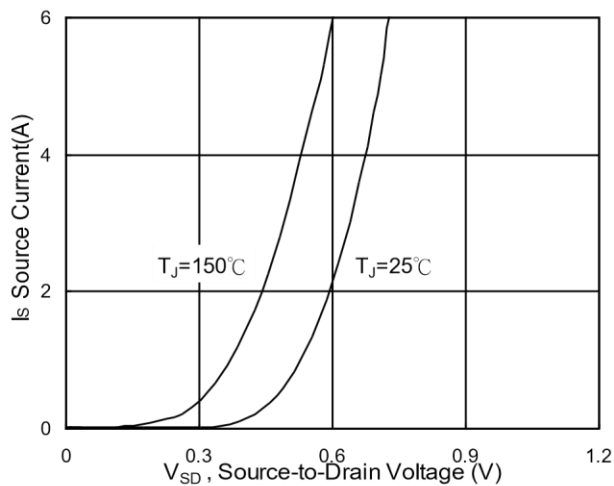


Fig.3 Forward Characteristics Of Reverse

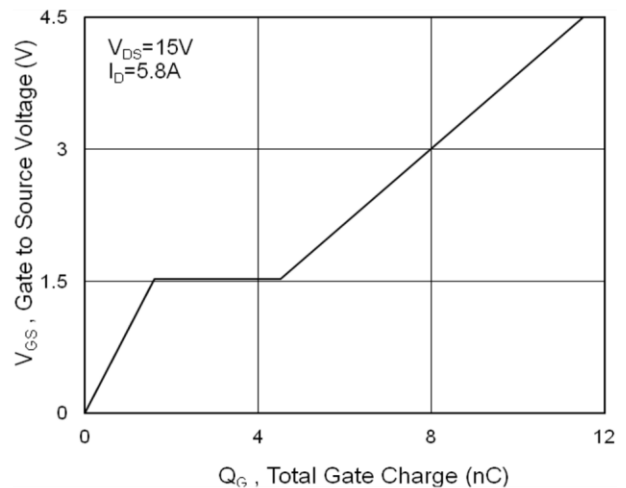
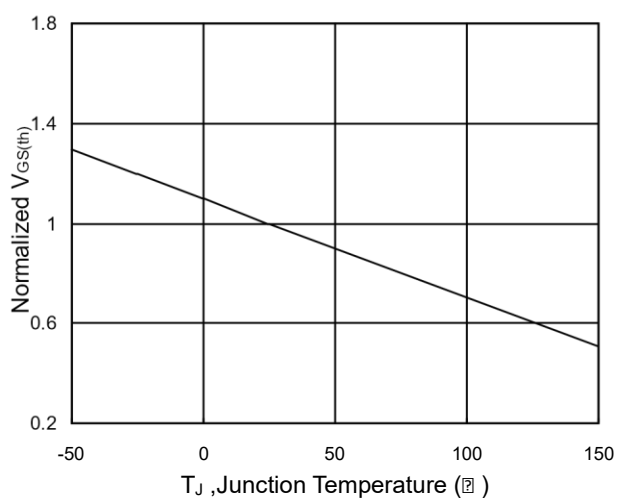
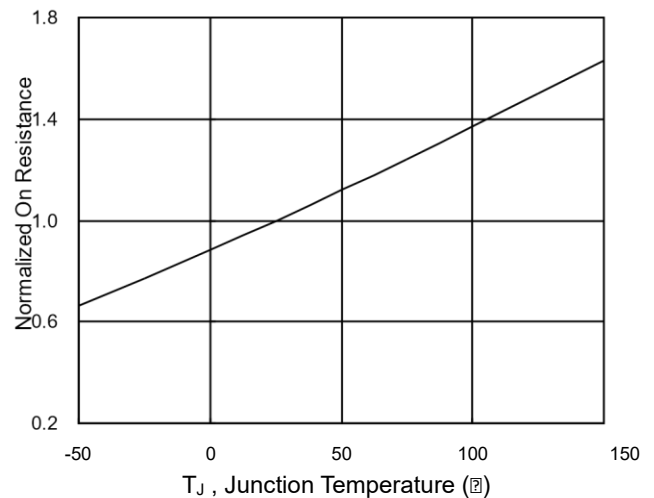


Fig.4 Gate-Charge Characteristics

Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$ Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$



## TM06N03MI

## N-Channel Enhancement Mosfet

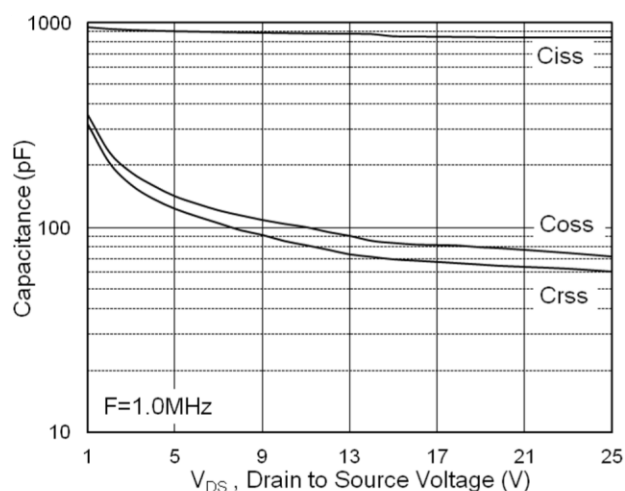


Fig.7 Capacitance

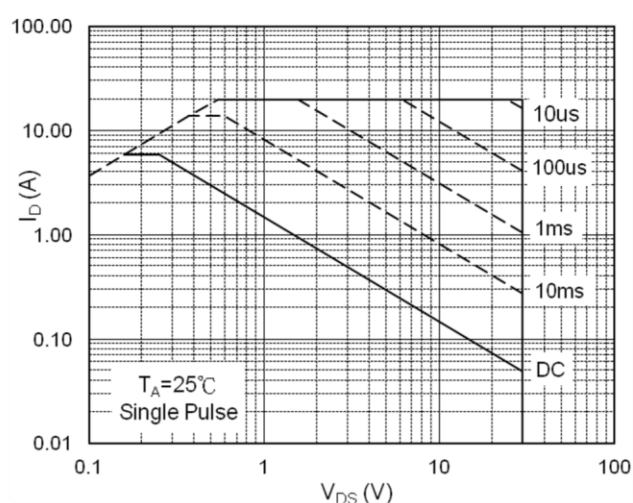


Fig.8 Safe Operating Area

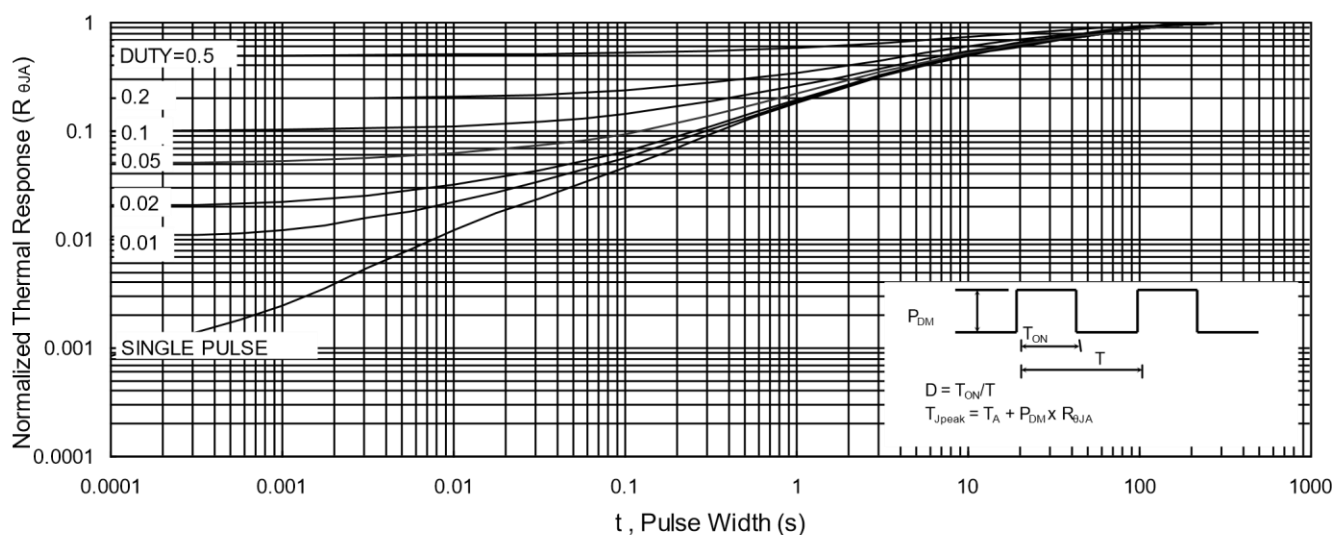


Fig.9 Normalized Maximum Transient Thermal Impedance

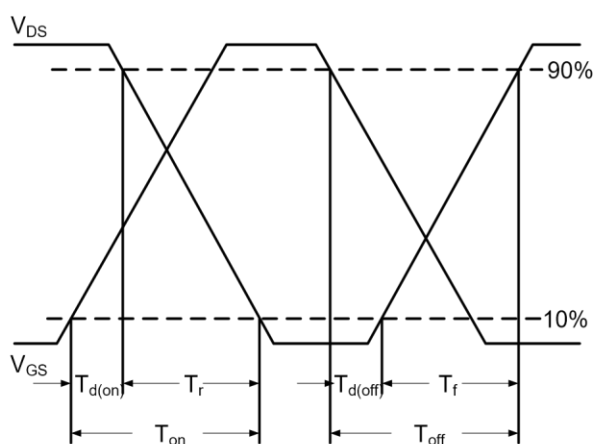


Fig.10 Switching Time Waveform

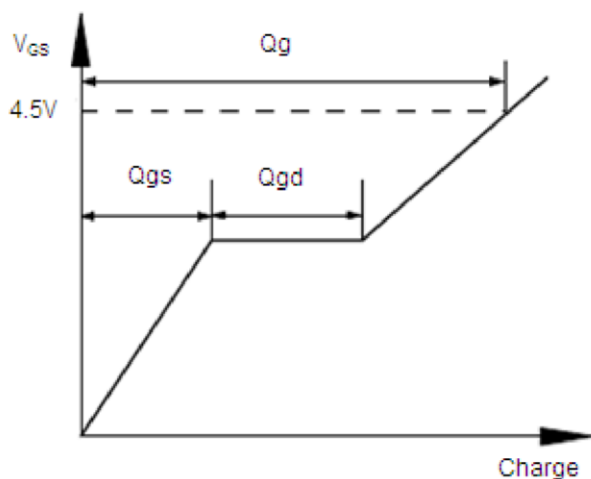
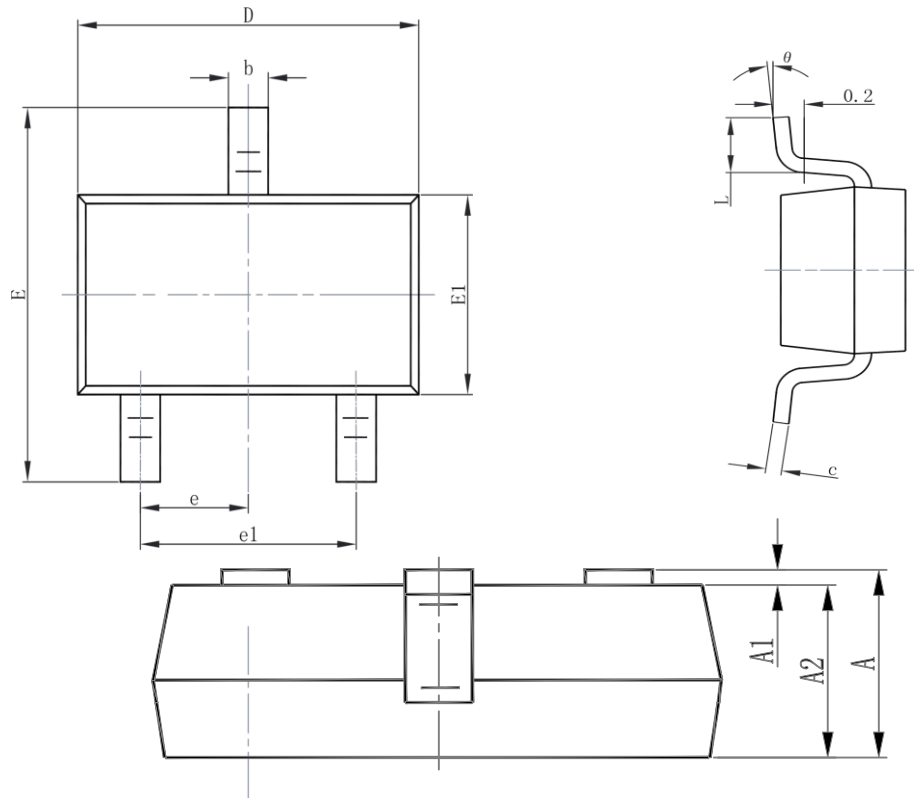


Fig.11 Gate Charge Waveform

## Package Mechanical Data: SOT-23-3L



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 1.050                     | 1.250 | 0.041                | 0.049 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 1.050                     | 1.150 | 0.041                | 0.045 |
| b      | 0.300                     | 0.500 | 0.012                | 0.020 |
| c      | 0.100                     | 0.200 | 0.004                | 0.008 |
| D      | 2.820                     | 3.020 | 0.111                | 0.119 |
| E1     | 1.500                     | 1.700 | 0.059                | 0.067 |
| E      | 2.650                     | 2.950 | 0.104                | 0.116 |
| e      | 0.950(BSC)                |       | 0.037(BSC)           |       |
| e1     | 1.800                     | 2.000 | 0.071                | 0.079 |
| L      | 0.300                     | 0.600 | 0.012                | 0.024 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |