# TMG02N13I

## N-Channel Enhancement Mosfet

### General Description

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

### Applications

- Load switch
- PWM

### General Features

$V_{DS}$ = 130V $I_D$ =2A

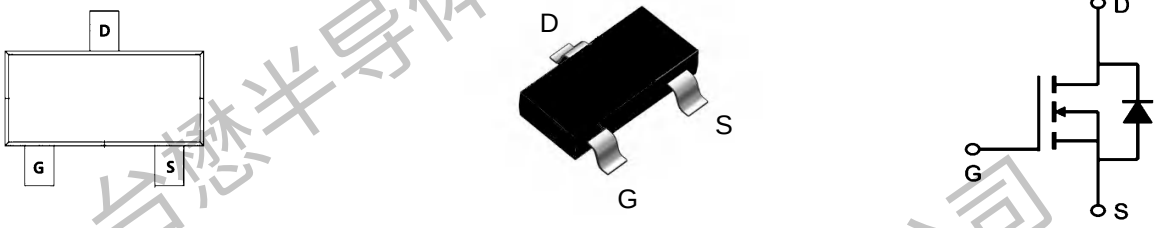
$R_{DS(ON)}$ =165mΩ(typ.)@ $V_{GS}$=10V

100% UIS Tested

100% $R_g$ Tested

Green Product

I:SOT-23




Marking: 2N13

### Absolute Maximum Ratings ($T_C$=25℃unless otherwise noted)

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 130 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | V |
| $I_D$@$T_A$=25℃ | Continuous Drain Current, $V_{GS}$ @ 10V | 2 | A |
| $I_D$@$T_A$=70℃ | Continuous Drain Current, $V_{GS}$ @ 10V | 1.2 | A |
| $I_{DM}$ | Pulsed Drain Current | 4 | A |
| $P_D$@$T_A$=25℃ | Total Power Dissipation | 1 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 175 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 175 | ℃ |

### Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient | --- | 162 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction Case | --- | 80 | ℃/W |

# TMG02N13I N-Channel Enhancement Mosfet

## Electrical Characteristics $T_C$=25℃ unless otherwise specified

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **Off Characteristic** | | | | | | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = 250μA | 130 | - | - | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 100V, $V_{GS}$ = 0V | - | - | 1 | μA |
| $I_{GSS}$ | Gate to Body Leakage Current | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | - | - | ±100 | nA |
| **On Characteristics** note3 | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 2.0 | 2.5 | 3.0 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance note | $V_{GS}$ = 10V, $I_D$ = 3A | - | 165 | - | mΩ |
| **Dynamic Characteristics** note4 | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 50V, $V_{GS}$ = 0V, f = 1.0MHz | - | 196 | - | pF |
| $C_{oss}$ | Output Capacitance | | - | 26 | - | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 1.3 | - | pF |
| $Q_g$ | Total Gate Charge | $V_{DS}$ = 50V, $I_D$ = 3A, $V_{GS}$ = 10V | - | 4.3 | - | nC |
| $Q_{gs}$ | Gate-Source Charge | | - | 1.5 | - | nC |
| $Q_{gd}$ | Gate-Drain("Miller") Charge | | - | 1.1 | - | nC |
| **Switching Characteristics** note | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$ = 50V, $I_{DS}$=3A $R_G$ = 2Ω, $V_{GEN}$ = 10V | - | 14.7 | - | ns |
| $t_r$ | Turn-On Rise Time | | - | 3.5 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 20.9 | - | ns |
| $t_f$ | Turn-Off Fall Time | | - | 2.7 | - | ns |
| **Drain-Source Diode Characteristics and Maximum Ratings** | | | | | | |
| $I_S$ | Maximum Continuous Drain to Source Diode Forward Current note | | - | - | 2 | A |
| $I_{SM}$ | Maximum Pulsed Drain to Source Diode Forward Current | | - | - | 6 | A |
| $V_{SD}$ | Drain to Source Diode Forward Voltage note | $V_{GS}$ = 0V, $I_S$ =3A | - | - | 1.3 | V |
| $t_{rr}$ | Body Diode Reverse Recovery Time | $V_{GS}$ = 0V, $I_F$ = 3A, di/dt =100A/μs | - | 32.1 | - | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery Time Charge | | - | 39.4 | - | nC |
| $I_{rrm}$ | Peak Reverse Recovery Current | | - | 2.0 | - | A |

# TMG02N13I

## N-Channel Enhancement Mosfet

## Typical Characteristics

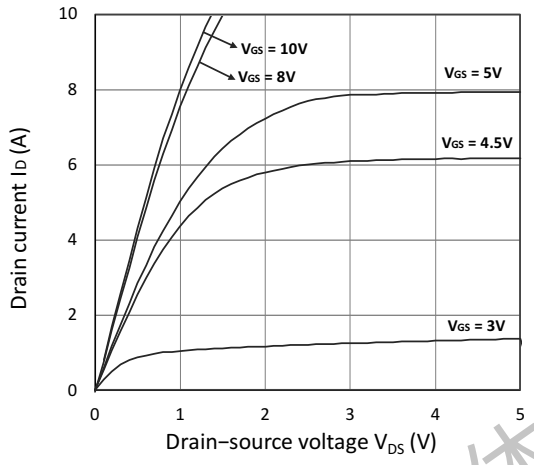



Figure 1. Output Characteristics

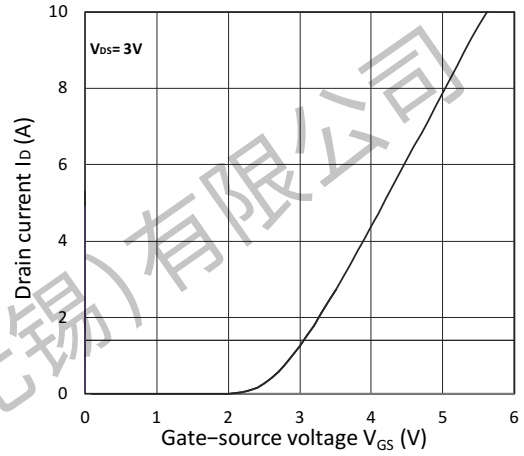



Figure 2. Transfer Characteristics

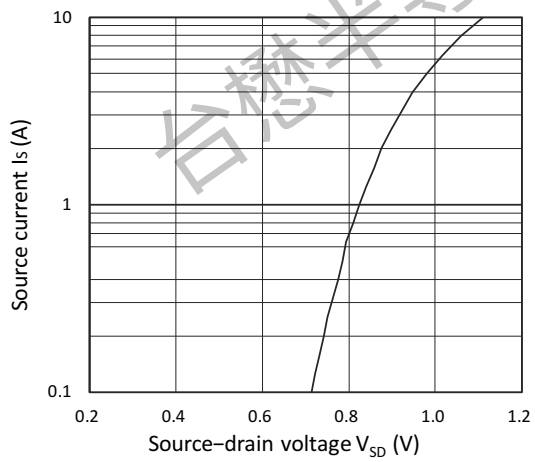



Figure 3. Forward Characteristics of Reverse

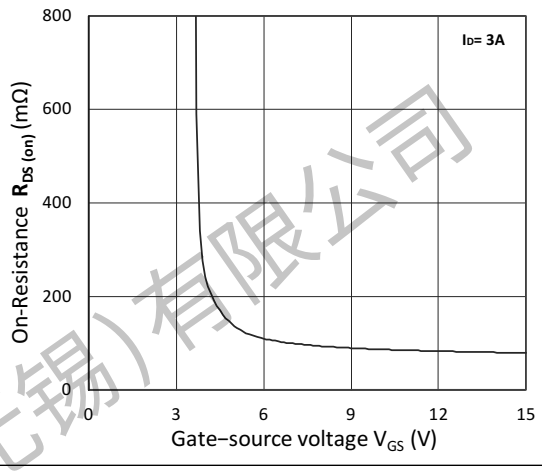



Figure 4. $R_{DS(ON)}$ vs. $V_{GS}$

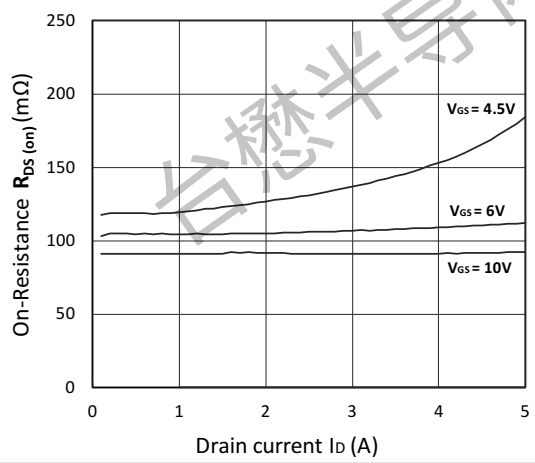



Figure 5. $R_{DS(ON)}$ vs. $I_D$

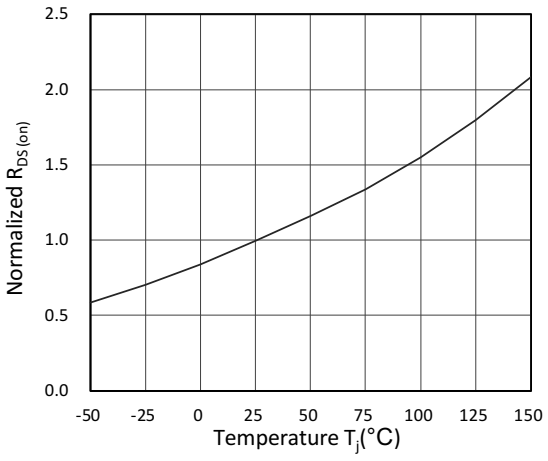



Figure 6. Normalized $R_{DS(on)}$ vs. Temperature

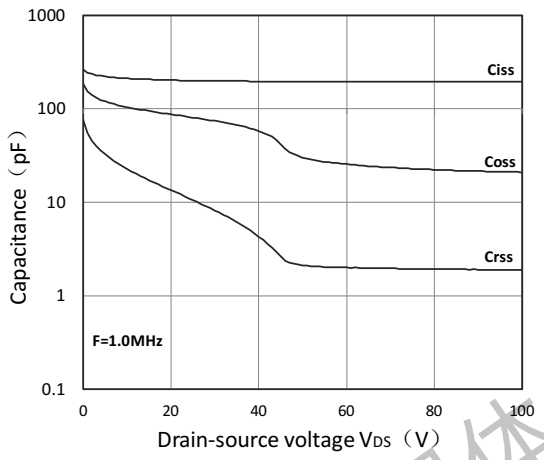



Figure 7. Capacitance Characteristics

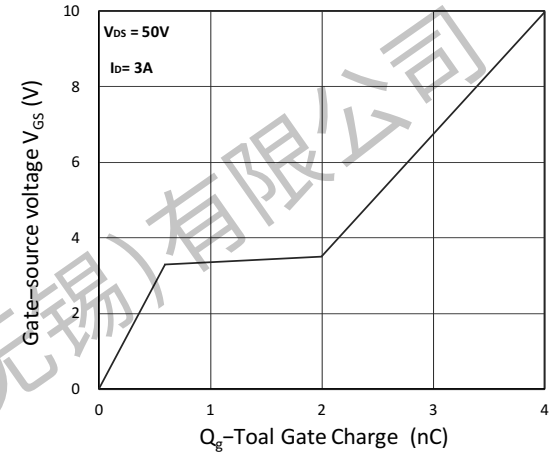
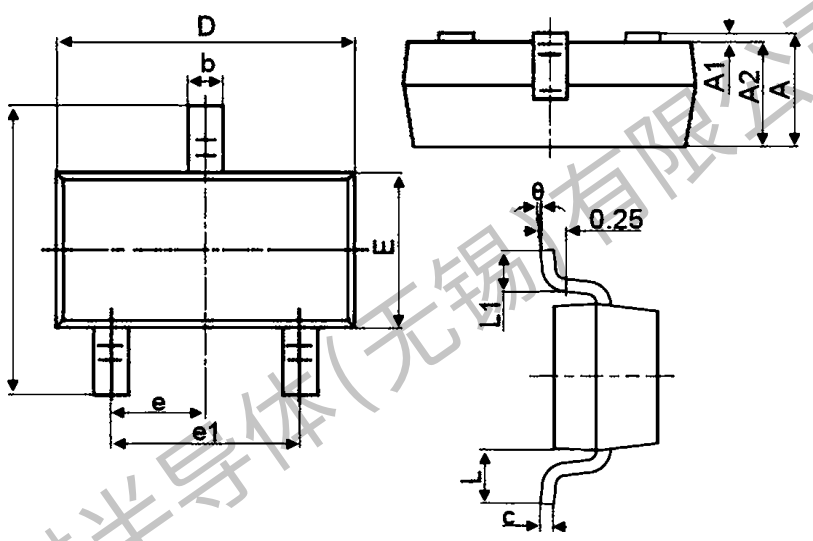



Figure 8. Gate Charge Characteristics

## Package Mechanical Data:SOT-23

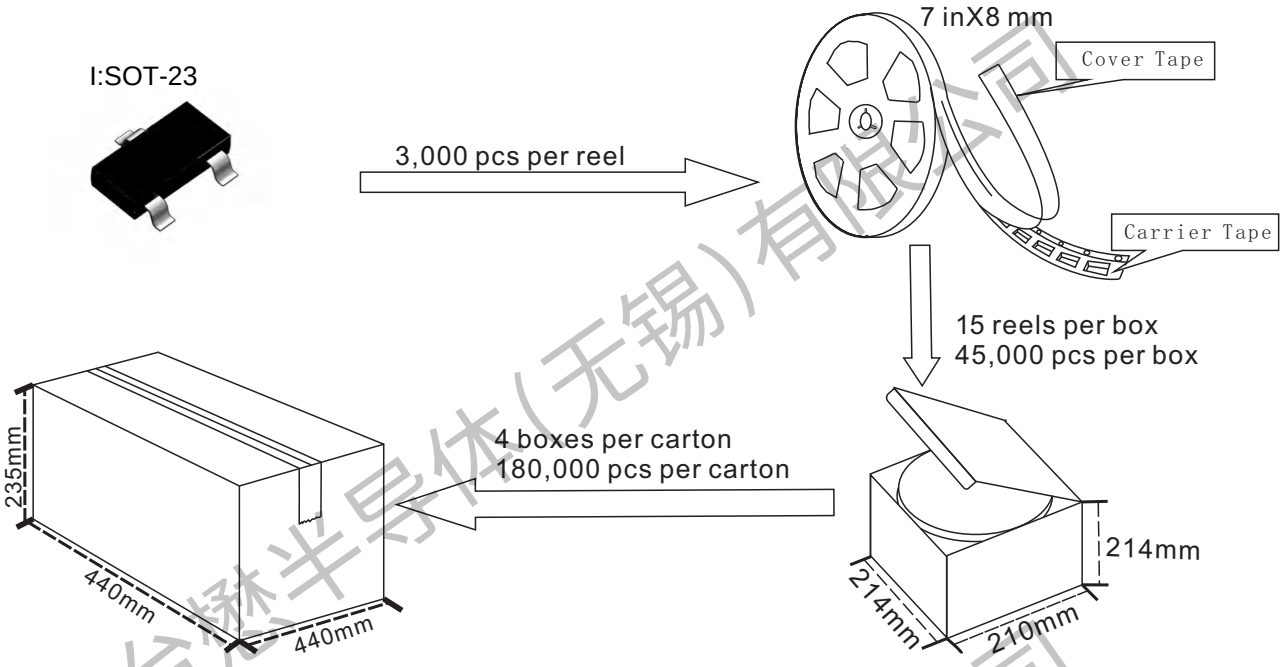



| Symbol | Dimensions in Millimeters | |
|---|---|---|
| | MIN. | MAX. |
| A | 0.900 | 1.150 |
| A1 | 0.000 | 0.100 |
| A2 | 0.900 | 1.050 |
| b | 0.300 | 0.500 |
| c | 0.080 | 0.150 |
| D | 2.800 | 3.000 |
| E | 1.200 | 1.400 |
| E1 | 2.250 | 2.550 |
| e | 0.950TYP | |
| e1 | 1.800 | 2.000 |
| L | 0.550REF | |
| L1 | 0.300 | 0.500 |
| θ | 0° | 8° |

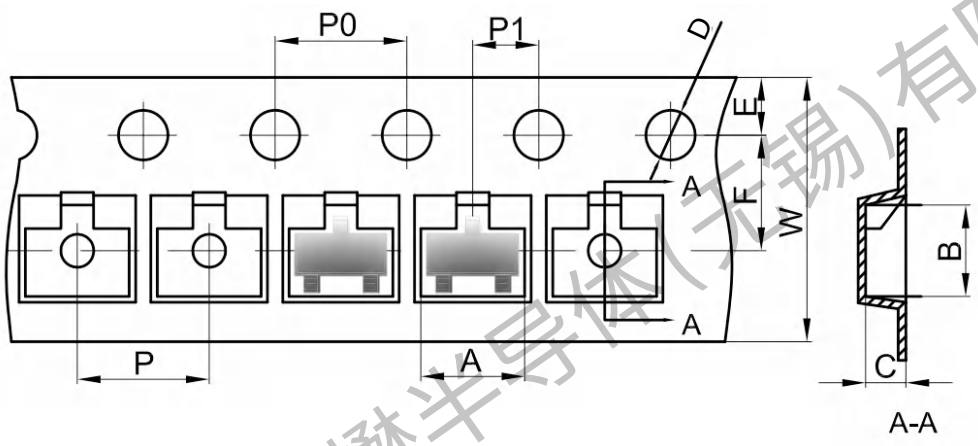
**TMG02N13I** N-Channel Enhancement Mosfet

# SOT-23 Packing

1.The method of packaging and dimension are shown as below figure. (Dimension in mm)

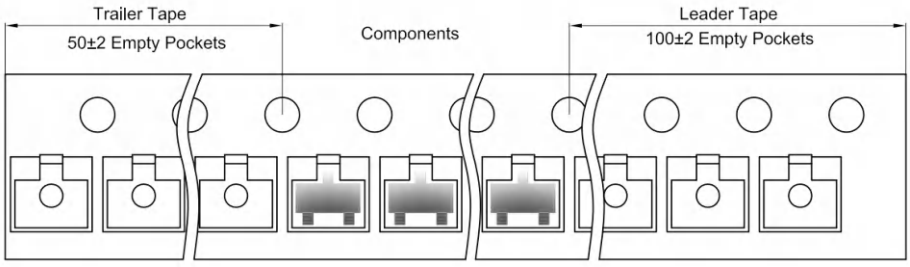



## SOT-23 Embossed Carrier Tape




| Dimensions are in millimeter | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pkg type | A | B | C | D | E | F | P0 | P | P1 | W |
| SOT-23 | 3.15 | 2.77 | 1.22 | Ø1.50 | 1.75 | 3.50 | 4.00 | 4.00 | 2.00 | 8.00 |

## SOT-23 Tape Leader and Trailer



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Revision history:

| Date | Rev | Description | Page |
|---|---|---|---|
| 2023.05.09 | 23.05 | Original | |