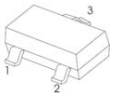
# DMG1013T

## General Description

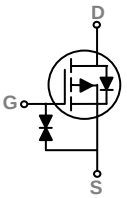
*These P-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.*

## Features

*-20V,-700mA, RDS(ON) =400mΩ@VGS = -4.5V*
*Improved dv/dt capability*
*Fast switching*
*Green Device Available*
*Suit for -1.8V Gate Drive Applications*




1. GATE
2. SOURCE
3. DRAIN

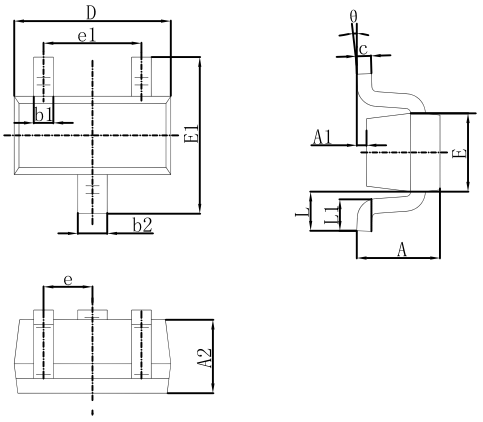



## Applications

*Notebook*
*Load Switch*
*Battery Protection*
*Hand-held Instruments*

| BVDSS | RDSON | ID |
|---|---|---|
| -20V | 400mΩ | -700mA |

## SOT-523




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 0.700 | 0.900 | 0.028 | 0.035 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.700 | 0.800 | 0.028 | 0.031 |
| b1 | 0.150 | 0.250 | 0.006 | 0.010 |
| b2 | 0.250 | 0.350 | 0.010 | 0.014 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| D | 1.500 | 1.700 | 0.059 | 0.067 |
| E | 0.700 | 0.900 | 0.028 | 0.035 |
| E1 | 1.450 | 1.750 | 0.057 | 0.069 |
| e | 0.500 TYP. | | 0.020 TYP. | |
| e1 | 0.900 | 1.100 | 0.035 | 0.043 |
| L | 0.400 REF. | | 0.016 REF. | |
| L1 | 0.260 | 0.460 | 0.010 | 0.018 |
| θ | 0° | 8° | 0° | 8° |

Dimensions in inches and (millimeters)

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

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | -20 | V |
| $V_{GS}$ | Gate-Source Voltage | ±8 | V |
| $I_D$ | Drain Current – Continuous ($T_C$=25˚C) | -700 | mA |
| | Drain Current – Continuous ($T_C$=100˚C) | -250 | mA |
| $I_{DM}$ | Drain Current – Pulsed[1] | -2.1 | A |
| $P_D$ | Power Dissipation ($T_C$=25˚C) | 312 | mW |
| | Power Dissipation – Derate above 25˚C | 2.5 | mW/˚C |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | ˚C |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ˚C |

## Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction to ambient | --- | 400 | ˚C/W |

# DMG1013T

## Electrical Characteristics ($T_J$=25 ℃, unless otherwise noted)

### Off Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=-250uA | -20 | --- | --- | V |
| $\triangle BV_{DSS}/\triangle T_J$ | $BV_{DSS}$ Temperature Coefficient | Reference to 25℃ , $I_D$=-1mA | --- | -0.01 | --- | V/℃ |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=-20V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | -1 | uA |
| | | $V_{DS}$=-16V , $V_{GS}$=0V , $T_J$=125℃ | --- | --- | -10 | uA |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±8V , $V_{DS}$=0V | --- | --- | ±20 | uA |

### On Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=-4.5V , $I_D$=-0.5A | --- | 400 | 560 | mΩ |
| | | $V_{GS}$=-2.5V , $I_D$=-0.4A | --- | 550 | 780 | |
| | | $V_{GS}$=-1.8V , $I_D$=-0.1A | --- | 650 | 950 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =-250uA | -0.3 | -0.6 | -1.0 | V |
| $\triangle V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | 3 | --- | mV/℃ |

### Dynamic and switching Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $Q_g$ | Total Gate Charge[2,3] | $V_{DS}$=-10V , $V_{GS}$=-4.5V , $I_D$=-0.2A | --- | 1 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge[2,3] | | --- | 0.28 | --- | |
| $Q_{gd}$ | Gate-Drain Charge[2,3] | | --- | 0.18 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time[2,3] | $V_{DD}$=-10V , $V_{GS}$=-4.5V , $R_G$=10Ω $_D$=-0.2A | --- | 8 | --- | ns |
| $T_r$ | Rise Time[2,3] | | --- | 5.2 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time[2,3] | | --- | 30 | --- | |
| $T_f$ | Fall Time[2,3] | | --- | 18 | --- | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=-10V , $V_{GS}$=0V , F=1MHz | --- | 40 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 15 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 6.5 | --- | |

### Drain-Source Diode Characteristics and Maximum Ratings

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current | $V_G$=$V_D$=0V , Force Current | --- | --- | -0.7 | A |
| $I_{SM}$ | Pulsed Source Current | | --- | --- | -1.4 | A |
| $V_{SD}$ | Diode Forward Voltage | $V_{GS}$=0V , $I_S$=-0.2A , $T_J$=25℃ | --- | --- | -1.2 | V |

Note :
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
3. Essentially independent of operating temperature.

RATING AND CHARACTERISTIC CURVES ( DMG1013T )

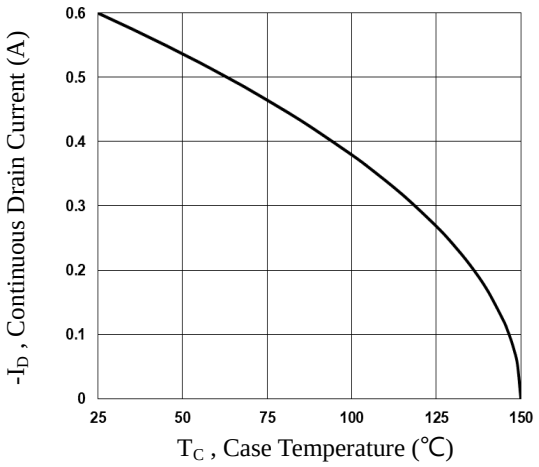



**Fig.1 Continuous Drain Current vs. $T_C$**

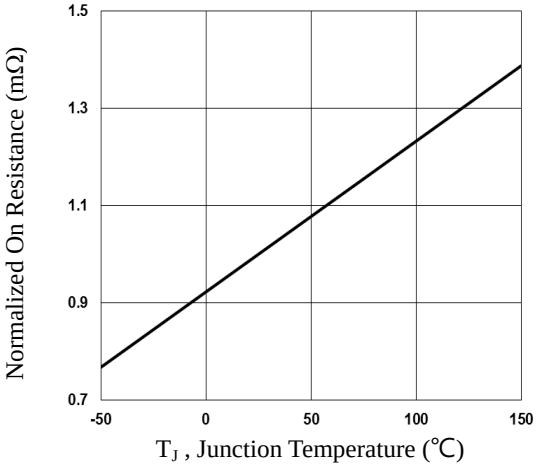



**Fig.2 Normalized RDSON vs. $T_J$**

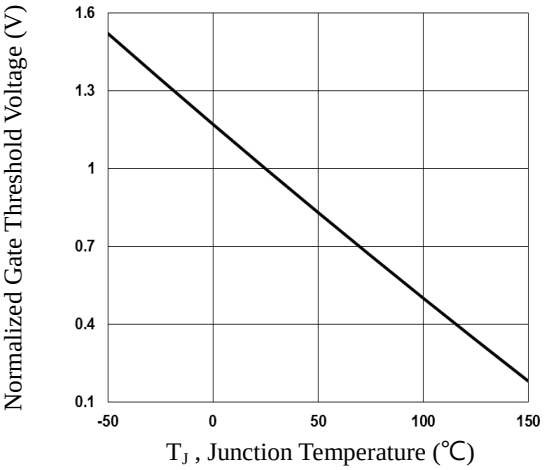



**Fig.3 Normalized $V_{th}$ vs. $T_J$**

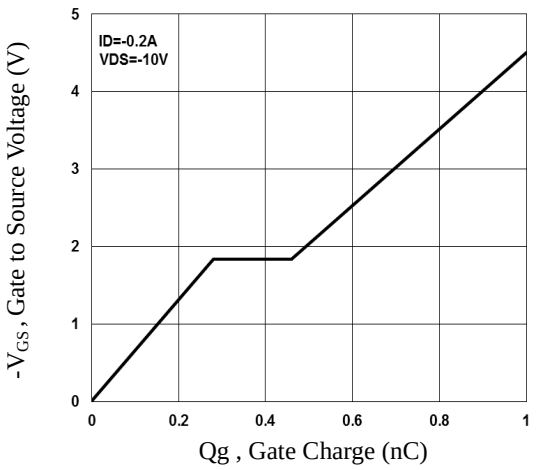



**Fig.4 Gate Charge Waveform**

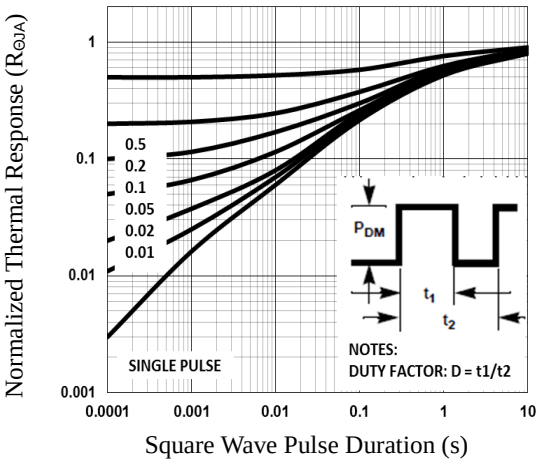



**Fig.5 Normalized Transient Response**

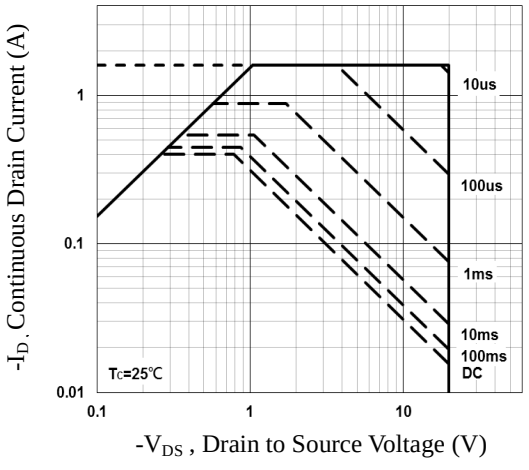



**Fig.6 Maximum Safe Operation Area**

RATING AND CHARACTERISTIC CURVES ( DMG1013T )

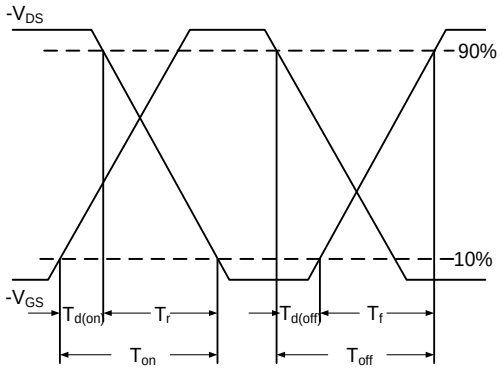



**Fig.7 Switching Time Waveform**

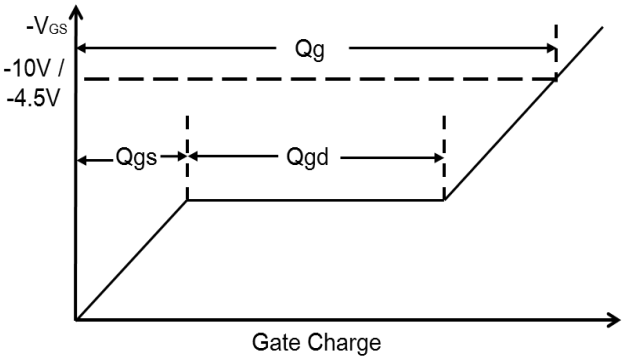



**Fig.8 Gate Charge Waveform**