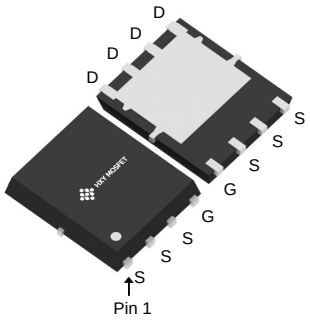
# TSM055N03EPQ56 RLG

N-Channel Enhancement Mode MOSFET

## Description

The TSM055N03EPQ56 RLG uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

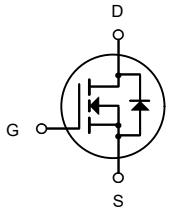



DFN5X6-8L

## General Features

$V_{DS}$ = 30V $I_D$ = 80A

$R_{DS(ON)}$ < 6mΩ $V_{GS}$=10V




N-Channel MOSFET

## Application

Battery protection

Load switch

Uninterruptible power supply

## Ordering Information

| Product ID | Pack | Brand | Qty(PCS) |
|---|---|---|---|
| TSM055N03EPQ56 RLG | DFN5X6-8L | HXY MOSFET | 5000 |

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

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 30 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | V |
| $I_D$@$T_C$=25°C | Continuous Drain Current, $V_{GS}$ @ 10V | 80 | A |
| $I_D$@$T_C$=70°C | Continuous Drain Current, $V_{GS}$ @ 10V | 45 | A |
| $I_{DM}$ | Pulsed Drain Current | 280 | A |
| EAS | Single Pulse Avalanche Energy | 56 | mJ |
| $P_D$@Tc=25°C | Total Power Dissipation | 37 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | °C |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | °C |
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient | 30 | °C/W |

## Electrical Characteristics @$T_j$=25°C(unless otherwise specified)

| Symbol | Parameter | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static Electrical Characteristics** | | | | | | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V $I_D$=250μA | 30 | -- | -- | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=30V,$V_{GS}$=0V | -- | -- | 0.1 | μA |
| | Zero Gate Voltage Drain Current($T_j$=125℃) | $V_{DS}$=30V,$V_{GS}$=0V | -- | -- | 100 | μA |
| $I_{GSS}$ | Gate-Body Leakage Current | $V_{GS}$=±20V,$V_{DS}$=0V | -- | -- | ±100 | nA |
| $V_{GS(TH)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$,$I_D$=250μA | 1.0 | 1.7 | 2.5 | V |
| $R_{DS(ON)}$ | Drain-Source On-State Resistance③ | $V_{GS}$=10V, $I_D$=20A | -- | 4.7 | 6 | mΩ |
| $R_{DS(ON)}$ | Drain-Source On-State Resistance③ | $V_{GS}$=4.5V, $I_D$=16A | -- | 5.4 | 8 | mΩ |
| **Dynamic Electrical Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=15V,$V_{GS}$=0V, f=1MHz | -- | 1930 | -- | pF |
| $C_{oss}$ | Output Capacitance | | -- | 310 | -- | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | -- | 260 | -- | pF |
| $R_g$ | Gate Resistance | f=1MHz | -- | 0.85 | -- | |
| $Q_g$ | Total Gate Charge | $V_{DS}$=15V,$I_D$=20A, $V_{GS}$=10V | -- | 38 | -- | nC |
| $Q_{gs}$ | Gate-Source Charge | | -- | 5.1 | -- | nC |
| $Q_{gd}$ | Gate-Drain Charge | | -- | 12 | -- | nC |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD}$=15V, $I_D$=20A, $R_G$=3, $V_{GS}$=10V | -- | 8.5 | -- | nS |
| $t_r$ | Turn-on Rise Time | | -- | 9 | -- | nS |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 31 | -- | nS |
| $t_f$ | Turn-Off Fall Time | | -- | 9 | -- | nS |
| **Source- Drain Diode Characteristics** | | | | | | |
| $V_{SD}$ | Forward on voltage | $I_{SD}$=20A,$V_{GS}$=0V | -- | 0.8 | 1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $T_j$=25℃,$I_{sd}$=20A, $V_{GS}$=0V di/dt=500A/μs | -- | 16 | -- | nS |
| $Q_{rr}$ | Reverse Recovery Charge | | -- | 42 | -- | nC |

Note:

① Repetitive rating; pulse width limited by max. junction temperature.

② Limited by $T_{Jmax}$, starting $T_J$ = 25°C, L = 0.5mH,$R_G$ = 25 , $I_{AS}$ = 15A, $V_{GS}$ =10V. Part not recommended for use above this value

③ Pulse width ≤ 300μs; duty cycle≤ 2%.

## Typical Electrical and Thermal Characteristics(Curves)

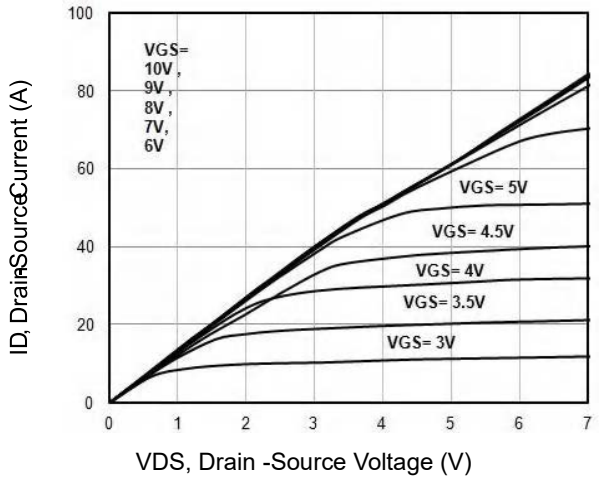



**Fig1.** Typical Output Characteristics

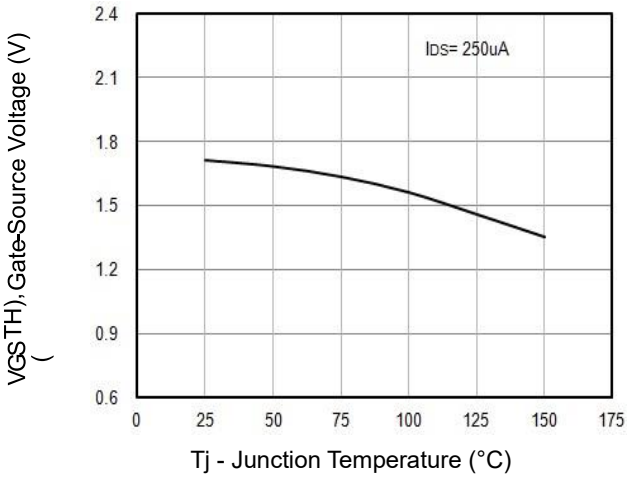



**Fig2.** $V_{GS(TH)}$ Gate -Source Voltage Vs.Tj

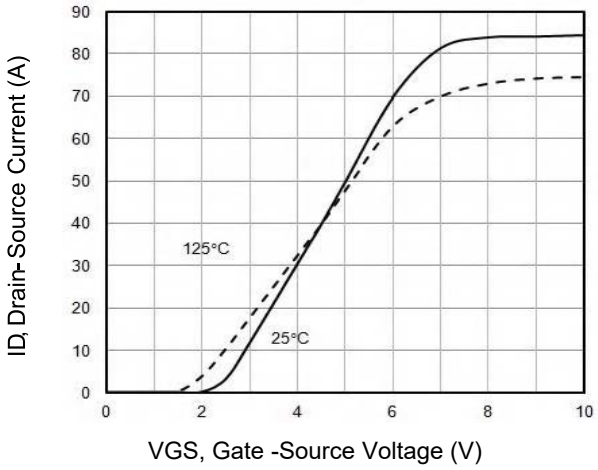



**Fig3.** Typical Transfer Characteristics

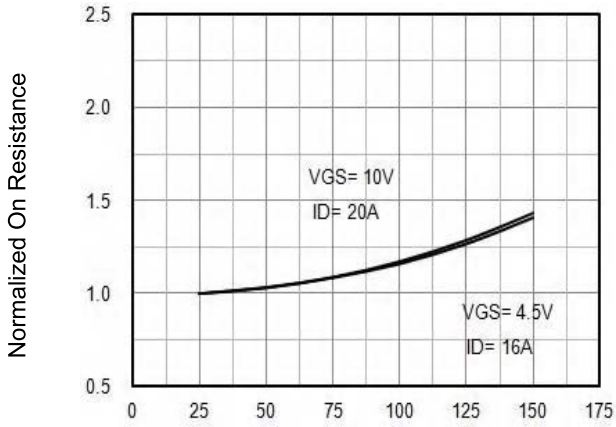



**Fig4.** Normalized On-Resistance Vs. Tj

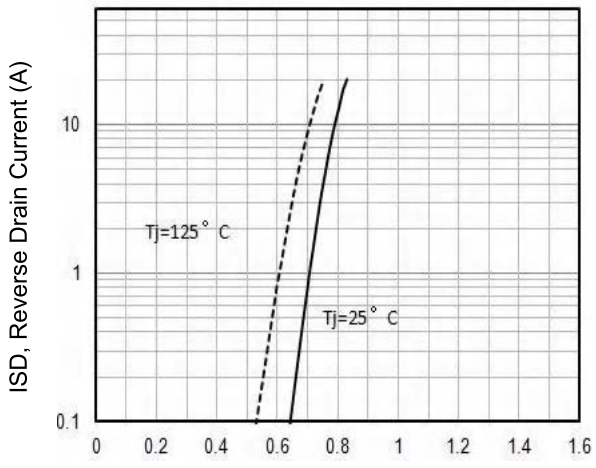



**Fig6.** Maximum Safe Operating Area Voltage

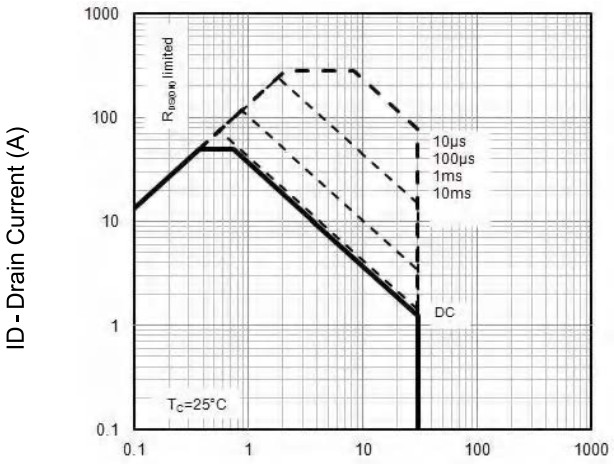



**Fig5.** Typical Source-Drain Diode Forward

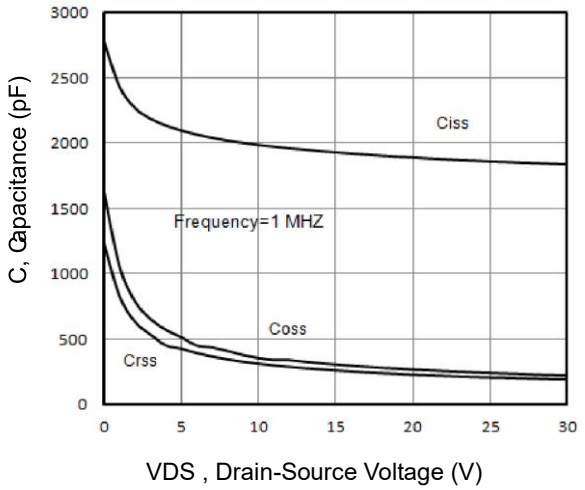



**Fig7.** Typical Capacitance Vs.Drain-Source Voltage

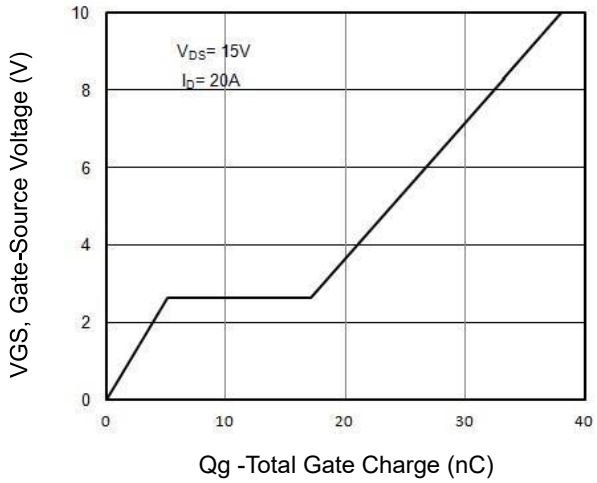



**Fig8.** Typical Gate Charge Vs.Gate-Source Voltage

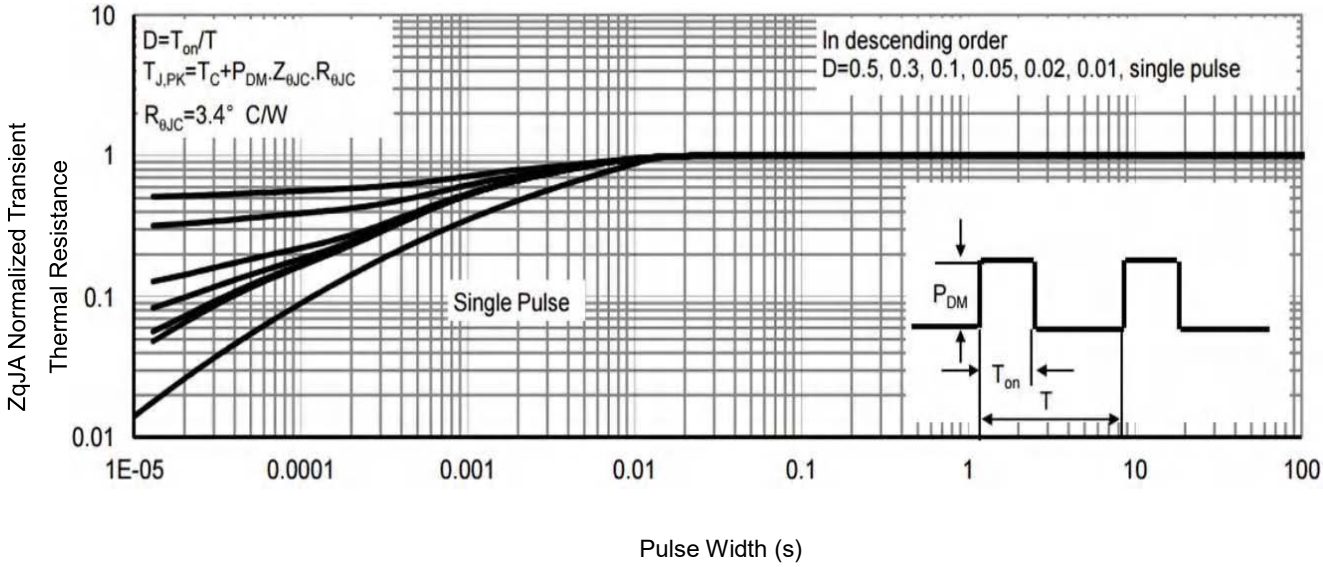



**Fig9.** Normalized Maximum Transient Thermal Impedance

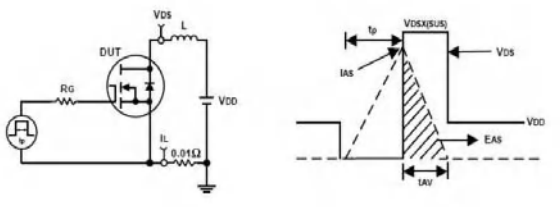



**Fig10.** Unclamped Inductive Test Circuit and waveforms

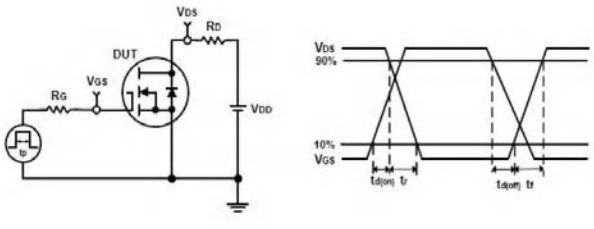
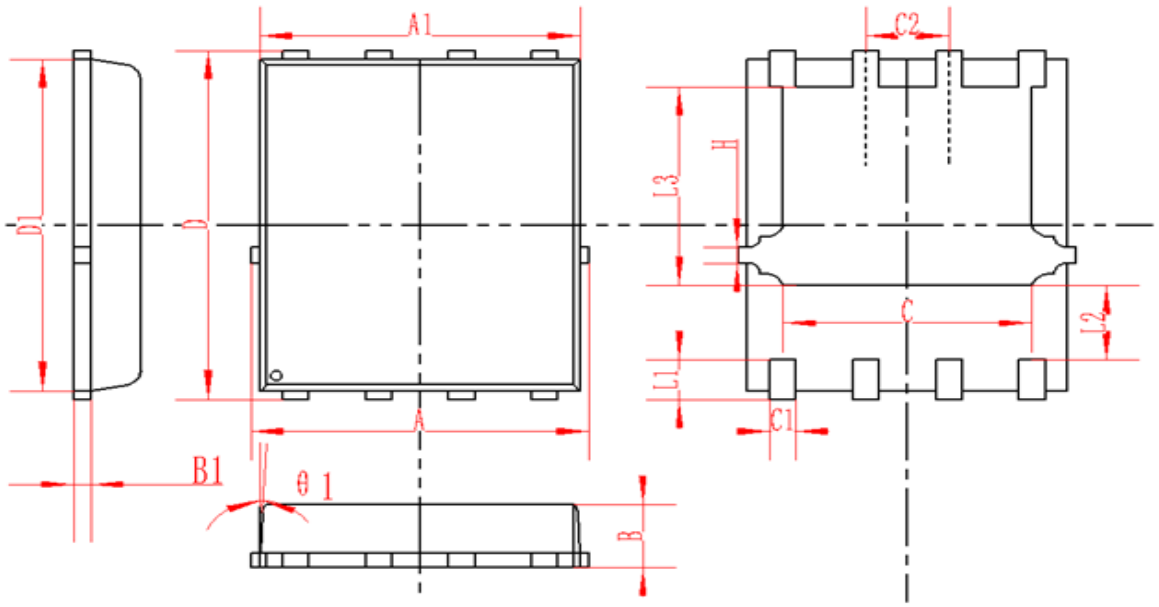



**Fig11.** Switching Time Test Circuit and waveforms

## DFN5X6-8L Package Information




| SYMBOL | MM | | | INCH | | |
|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 4.95 | 5 | 5.05 | 0.195 | 0.197 | 0.199 |
| A1 | 4.82 | 4.9 | 4.98 | 0.190 | 0.193 | 0.196 |
| D | 5.98 | 6 | 6.02 | 0.235 | 0.236 | 0.237 |
| D1 | 5.67 | 5.75 | 5.83 | 0.223 | 0.226 | 0.230 |
| B | 0.9 | 0.95 | 1 | 0.035 | 0.037 | 0.039 |
| B1 | 0.254REF | | | 0.010REF | | |
| C | 3.95 | 4 | 4.05 | 0.156 | 0.157 | 0.159 |
| C1 | 0.35 | 0.4 | 0.45 | 0.014 | 0.016 | 0.018 |
| C2 | 1.27TYP | | | 0.5TYP | | |
| θ1 | 8° | 10° | 12° | 8° | 10° | 12° |
| L1 | 0.63 | 0.64 | 0.65 | 0.025 | 0.025 | 0.026 |
| L2 | 1.2 | 1.3 | 1.4 | 0.047 | 0.051 | 0.055 |
| L3 | 3.415 | 3.42 | 3.425 | 0.134 | 0.135 | 0.135 |
| H | 0.24 | 0.25 | 0.26 | 0.009 | 0.010 | 0.010 |

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