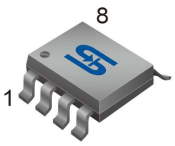
# TSM4424

20V N-Channel MOSFET

**SOP-8**




**Pin Definition:**

| | |
|---|---|
| 1. Source | 8. Drain |
| 2. Source | 7. Drain |
| 3. Source | 6. Drain |
| 4. Gate | 5. Drain |

## Key Parameter Performance

| Parameter | Value | Unit |
|---|---|---|
| $V_{DS}$ | 20 | V |
| $R_{DS(on)}$ (max) | 30 | mΩ |
| $Q_g$ | 11.2 | nC |

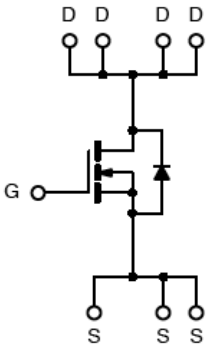
## Features

- Advance Trench Process Technology
- High Density Cell Design for Ultra Low On-resistance

## Application

- Specially Designed for Li-on Battery Packs
- Battery Switch Application

## Block Diagram




N-Channel MOSFET

## Ordering Information

| Part No. | Package | Packing |
|---|---|---|
| TSM4424CS RLG | SOP-8 | 2.5Kpcs / 13” Reel |
| TSM4424CS RVG | SOP-8 | 3Kpcs / 13” Reel |

**Note:** “G” denotes for Halogen- and Antimony-free as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds

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

| Parameter | | Symbol | Limit | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 20 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±8 | V |
| Continuous Drain Current | | $I_D$ | 8 | A |
| Pulsed Drain Current (Note 1) | | $I_{DM}$ | 30 | A |
| Continuous Source Current (Diode Conduction) | | $I_S$ | 2.2 | A |
| Maximum Power Dissipation | Ta = 25°C | $P_D$ | 2.5 | W |
| | Ta = 75°C | | 1.3 | |
| Operating Junction Temperature | | $T_J$ | +150 | °C |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## Thermal Performance

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Thermal Resistance Junction to Foot | $R_{\Theta JF}$ | 25 | °C/W |
| Thermal Resistance Junction to Ambient | $R_{\Theta JA}$ | 52.5 | °C/W |

# TSM4424

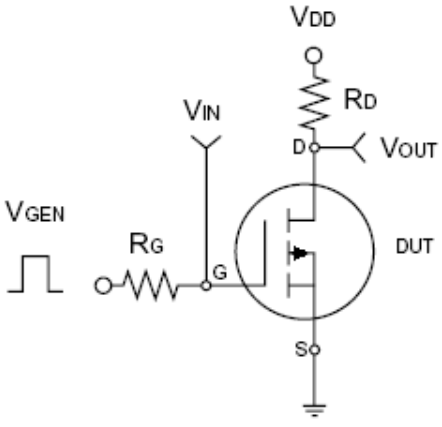
20V N-Channel MOSFET

## Electrical Specifications

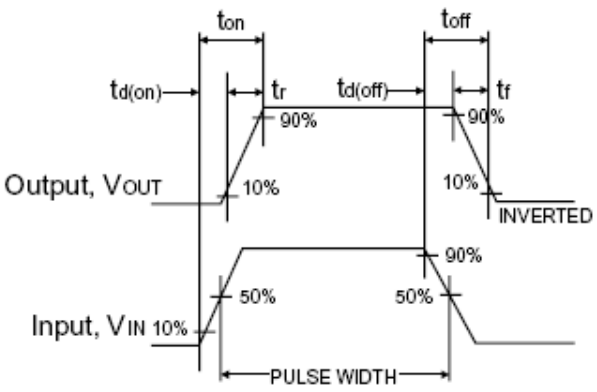
| Parameter | Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static**(Note 2) | | | | | | |
| Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = 250uA | $BV_{DSS}$ | 20 | -- | -- | V |
| Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250uA | $V_{GS(TH)}$ | -- | 0.65 | 1 | V |
| Gate Body Leakage | $V_{GS}$ = ±8V, $V_{DS}$ = 0V | $I_{GSS}$ | -- | -- | ±100 | nA |
| Zero Gate Voltage Drain Current | $V_{DS}$ = 20V, $V_{GS}$ = 0V | $I_{DSS}$ | -- | -- | 1.0 | uA |
| On-State Drain Current | $V_{DS}$ =5V, $V_{GS}$ = 4.5V | $I_{D(ON)}$ | 30 | -- | -- | A |
| Drain-Source On-State Resistance | $V_{GS}$ = 4.5V, $I_D$ = 4.5A | $R_{DS(ON)}$ | -- | 23 | 30 | mΩ |
| | $V_{GS}$ = 2.5V, $I_D$ = 3.5A | | -- | 25 | 35 | |
| | $V_{GS}$ = 1.8V, $I_D$ = 2.0A | | -- | 35 | 45 | |
| Forward Transconductance | $V_{DS}$ = 10V, $I_D$ = 6A | $g_{fs}$ | -- | 40 | -- | S |
| Diode Forward Voltage | $I_S$ = 1.7A, $V_{GS}$ = 0V | $V_{SD}$ | -- | 0.8 | 1.2 | V |
| **Dynamic**(Note 3) | | | | | | |
| Total Gate Charge | $V_{DS}$ = 10V, $I_D$ = 4.5A, $V_{GS}$ = 4.5V | $Q_g$ | -- | 11.2 | 14 | nC |
| Gate-Source Charge | | $Q_{gs}$ | -- | 1.4 | -- | |
| Gate-Drain Charge | | $Q_{gd}$ | -- | 2.2 | -- | |
| Input Capacitance | $V_{DS}$ = 10V, $V_{GS}$ = 0V, f = 1.0MHz | $C_{iss}$ | -- | 500 | -- | pF |
| Output Capacitance | | $C_{oss}$ | -- | 300 | -- | |
| Reverse Transfer Capacitance | | $C_{rss}$ | -- | 140 | -- | |
| **Switching**(Note 4) | | | | | | |
| Turn-On Delay Time | $V_{DD}$ = 10V, $R_L$ = 10Ω, $I_D$ = 1A, $V_{GEN}$ = 4.5V, $R_G$ = 6Ω | $t_{d(on)}$ | -- | 15 | 25 | ns |
| Turn-On Rise Time | | $t_r$ | -- | 30 | 60 | |
| Turn-Off Delay Time | | $t_{d(off)}$ | -- | 35 | 70 | |
| Turn-Off Fall Time | | $t_f$ | -- | 15 | 45 | |

**Notes:**

1. Pulse width limited by the maximum junction temperature
2. Pulse test: PW ≤ 300μs, duty cycle ≤ 2%
3. For DESIGN AID ONLY, not subject to production testing.
4. Switching time is essentially independent of operating temperature.



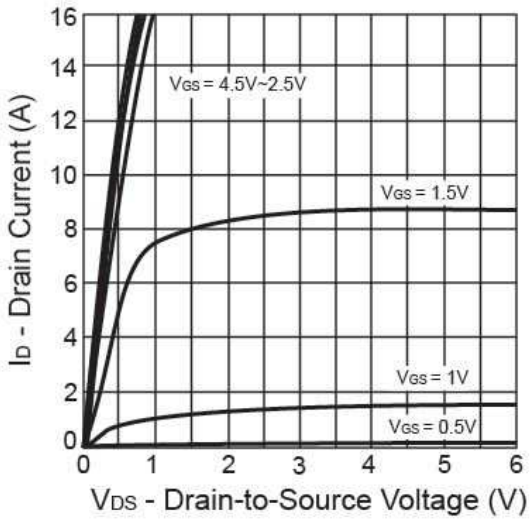

Switching Test Circuit



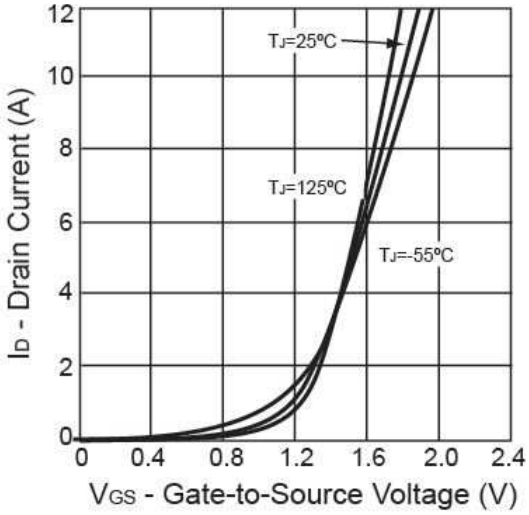

Switchin Waveforms

## Electrical Characteristics Curve

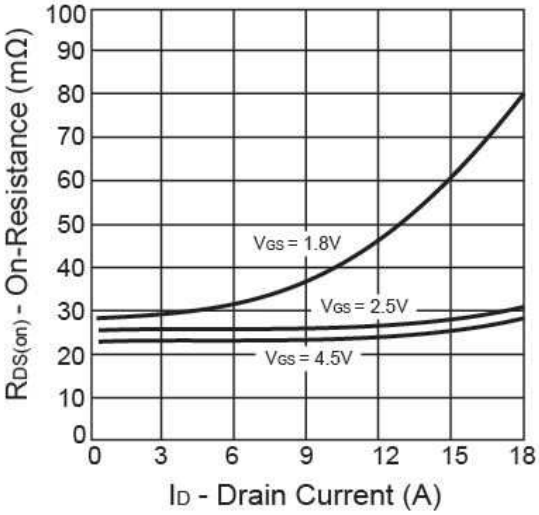
### Output Characteristics



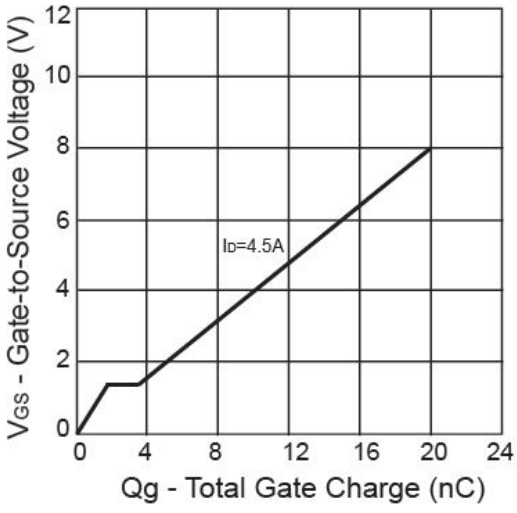

### Transfer Characteristics



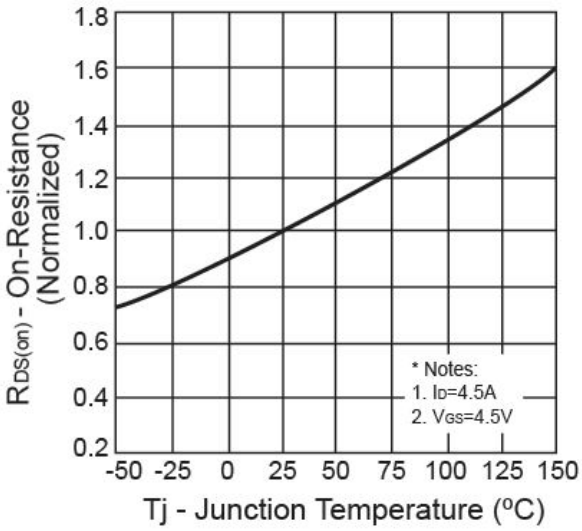

### On-Resistance vs. Drain Current



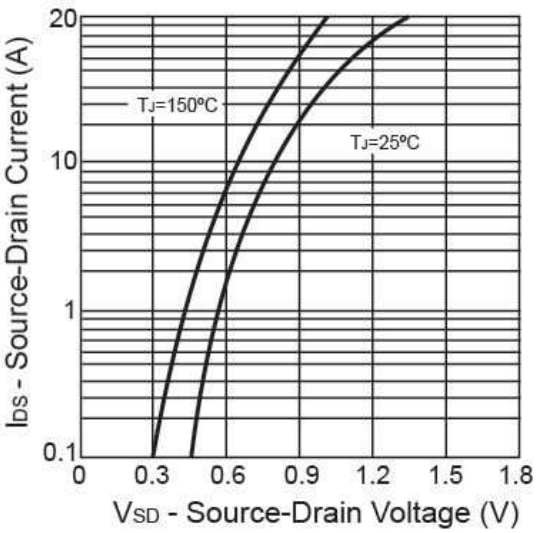

### Gate Charge




### On-Resistance vs. Junction Temperature

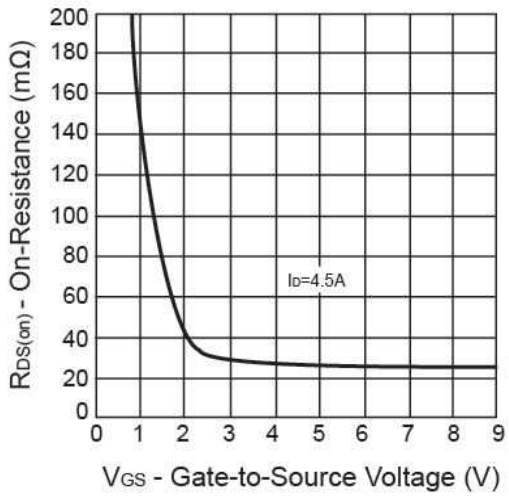



### Source-Drain Diode Forward Voltage

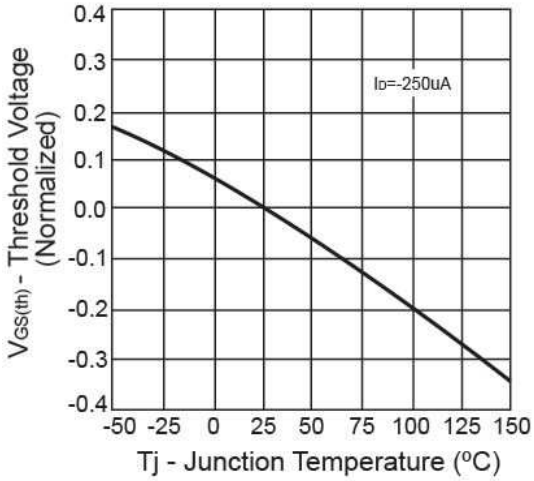


## Electrical Characteristics Curve

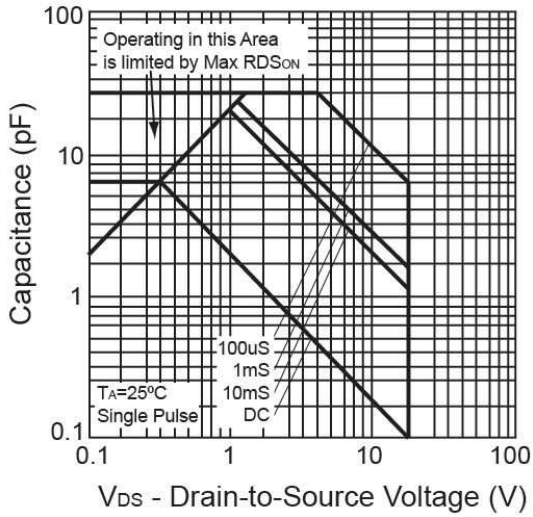
### On-Resistance vs. Gate-Source Voltage



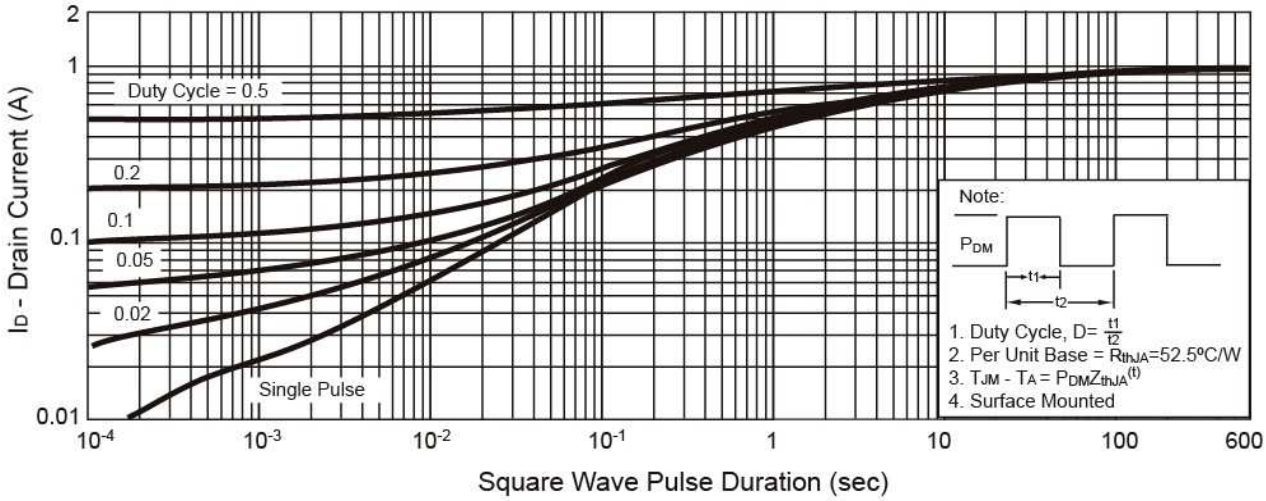

### Threshold Voltage



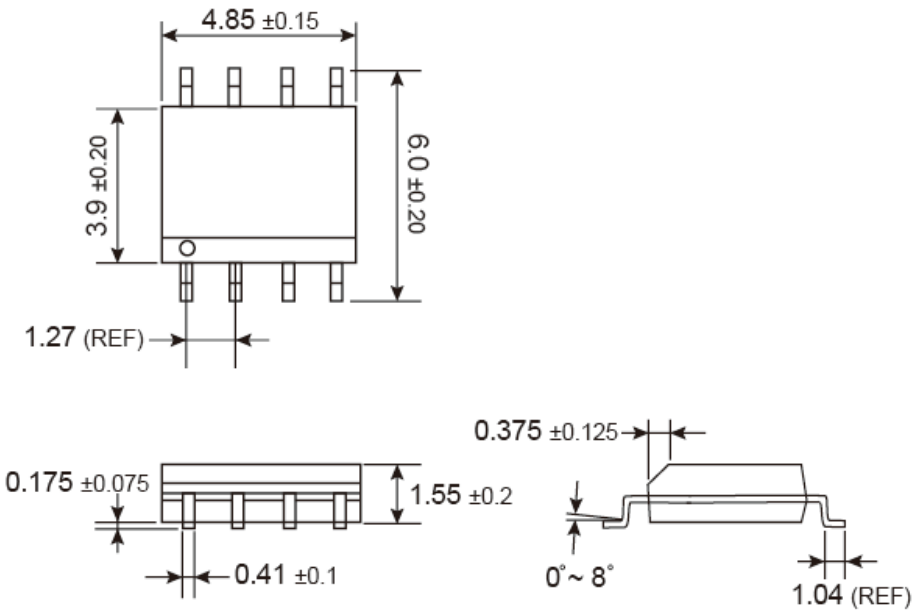

### Safety Operation Area




### Normalized Thermal Transient Impedance, Junction-to-Ambient



## SOP-8 Mechanical Drawing




Unit: Millimeters

## Marking Diagram


**Y** = Year Code
**M** = Month Code for Halogen Free Product

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **O** | =Jan | **P** | =Feb | **Q** | =Mar | **R** | =Apr |
| **S** | =May | **T** | =Jun | **U** | =Jul | **V** | =Aug |
| **W** | =Sep | **X** | =Oct | **Y** | =Nov | **Z** | =Dec |

**L** = Lot Code

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