



**SOP-8**



**Pin Definition:**

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

# TSM9926D

## 20V Dual N-Channel MOSFET

### PRODUCT SUMMARY

| $V_{DS}$ (V) | $R_{DS(on)}$ (m $\Omega$ ) | $I_D$ (A) |
|--------------|----------------------------|-----------|
| 20           | 30 @ $V_{GS} = 4.5V$       | 6.0       |
|              | 40 @ $V_{GS} = 2.5V$       | 5.2       |

### Features

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

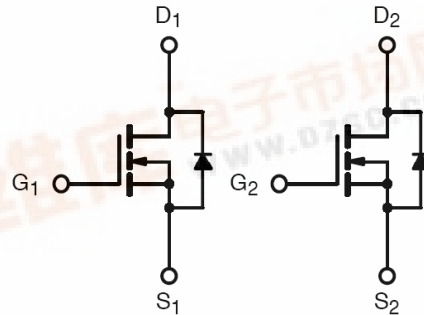
### Application

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

### Ordering Information

| Part No.      | Package | Packing            |
|---------------|---------|--------------------|
| TSM9926DCS RL | SOP-8   | 2.5Kpcs / 13" Reel |

### Block Diagram



Dual N-Channel MOSFET

### Absolute Maximum Rating ( $T_a = 25^\circ C$ unless otherwise noted)

| Parameter                                                   | Symbol         | Limit       | Unit       |
|-------------------------------------------------------------|----------------|-------------|------------|
| Drain-Source Voltage                                        | $V_{DS}$       | 20          | V          |
| Gate-Source Voltage                                         | $V_{GS}$       | $\pm 12$    | V          |
| Continuous Drain Current                                    | $I_D$          | 6           | A          |
| Pulsed Drain Current                                        | $I_{DM}$       | 30          | A          |
| Continuous Source Current (Diode Conduction) <sup>a,b</sup> | $I_S$          | 1.7         | A          |
| Maximum Power Dissipation                                   | $P_D$          | 1.6         | W          |
|                                                             |                | 1.1         |            |
| Operating Junction Temperature                              | $T_J$          | +150        | $^\circ C$ |
| Operating Junction and Storage Temperature Range            | $T_J, T_{STG}$ | -55 to +150 | $^\circ C$ |

### Thermal Performance

| Parameter                                            | Symbol          | Limit | Unit         |
|------------------------------------------------------|-----------------|-------|--------------|
| Junction to Case Thermal Resistance                  | $R_{\theta JC}$ | 40    | $^\circ C/W$ |
| Junction to Ambient Thermal Resistance (PCB mounted) | $R_{\theta JA}$ | 77    | $^\circ C/W$ |

Notes:

- a. Pulse width limited by the Maximum junction temperature  
b. Surface Mounted on FR4 Board,  $t \leq 5$  sec.



### Electrical Specifications

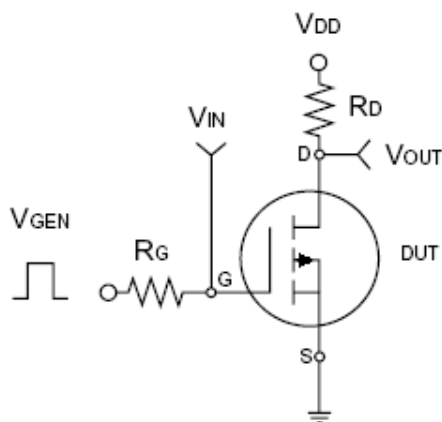
| Parameter                        | Conditions                                                                        | Symbol       | Min | Typ   | Max       | Unit       |
|----------------------------------|-----------------------------------------------------------------------------------|--------------|-----|-------|-----------|------------|
| Static                           |                                                                                   |              |     |       |           |            |
| Drain-Source Breakdown Voltage   | $V_{GS} = 0V, I_D = 250\mu A$                                                     | $BV_{DSS}$   | 20  | --    | --        | V          |
| Gate Threshold Voltage           | $V_{DS} = V_{GS}, I_D = 250\mu A$                                                 | $V_{GS(TH)}$ | 0.6 | --    | --        | V          |
| Gate Body Leakage                | $V_{GS} = \pm 12V, V_{DS} = 0V$                                                   | $I_{GSS}$    | --  | --    | $\pm 100$ | nA         |
| Zero Gate Voltage Drain Current  | $V_{DS} = 20V, V_{GS} = 0V$                                                       | $I_{DSS}$    | --  | --    | 1.0       | $\mu A$    |
| On-State Drain Current           | $V_{DS} = 5V, V_{GS} = 4.5V$                                                      | $I_{D(ON)}$  | 30  | --    | --        | A          |
| Drain-Source On-State Resistance | $V_{GS} = 4.5V, I_D = 6.0A$                                                       | $R_{DS(ON)}$ | --  | 21    | 30        | m $\Omega$ |
|                                  | $V_{GS} = 2.5V, I_D = 5.2A$                                                       |              | --  | 30    | 40        |            |
| Forward Transconductance         | $V_{DS} = 10V, I_D = 6A$                                                          | $g_{fs}$     | --  | 30    | --        | S          |
| Diode Forward Voltage            | $I_S = 1.7A, V_{GS} = 0V$                                                         | $V_{SD}$     | --  | 0.7   | 1.2       | V          |
| Dynamic <sup>b</sup>             |                                                                                   |              |     |       |           |            |
| Total Gate Charge                | $V_{DS} = 10V, I_D = 6A,$<br>$V_{GS} = 4.5V$                                      | $Q_g$        | --  | 4.86  | --        | nC         |
| Gate-Source Charge               |                                                                                   | $Q_{gs}$     | --  | 0.92  | --        |            |
| Gate-Drain Charge                |                                                                                   | $Q_{gd}$     | --  | 1.4   | --        |            |
| Input Capacitance                | $V_{DS} = 8V, V_{GS} = 0V,$<br>$f = 1.0MHz$                                       | $C_{iss}$    | --  | 562   | --        | pF         |
| Output Capacitance               |                                                                                   | $C_{oss}$    | --  | 106   | --        |            |
| Reverse Transfer Capacitance     |                                                                                   | $C_{rss}$    | --  | 75    | --        |            |
| Switching <sup>c</sup>           |                                                                                   |              |     |       |           |            |
| Turn-On Delay Time               | $V_{DD} = 10V, R_L = 10\Omega,$<br>$I_D = 1A, V_{GEN} = 4.5V,$<br>$R_G = 6\Omega$ | $t_{d(on)}$  | --  | 8.1   | --        | nS         |
| Turn-On Rise Time                |                                                                                   | $t_r$        | --  | 9.95  | --        |            |
| Turn-Off Delay Time              |                                                                                   | $t_{d(off)}$ | --  | 21.85 | --        |            |
| Turn-Off Fall Time               |                                                                                   | $t_f$        | --  | 5.35  | --        |            |

Notes:

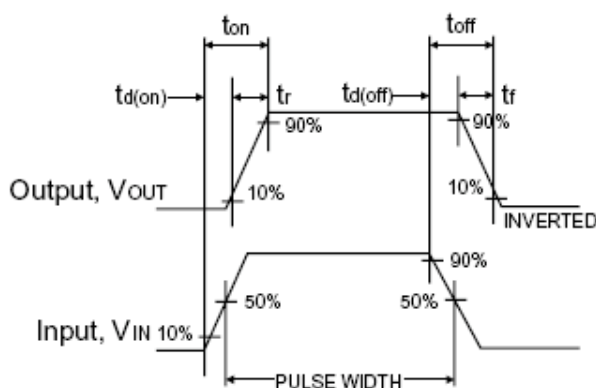
a. pulse test:  $PW \leq 300\mu s$ , duty cycle  $\leq 2\%$

b. For DESIGN AID ONLY, not subject to production testing.

b. Switching time is essentially independent of operating temperature.



Switching Test Circuit



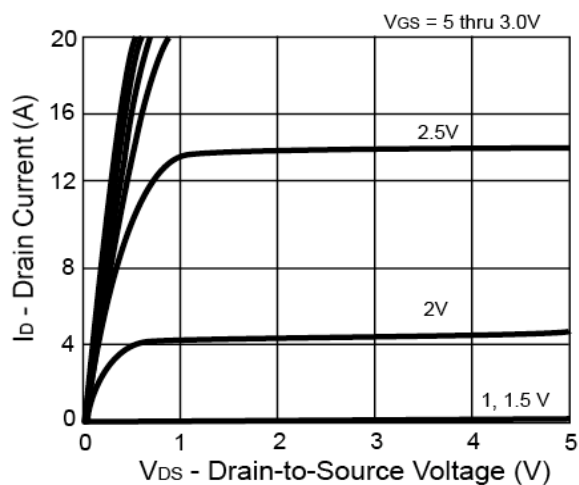
Switchin Waveforms

# TSM9926D

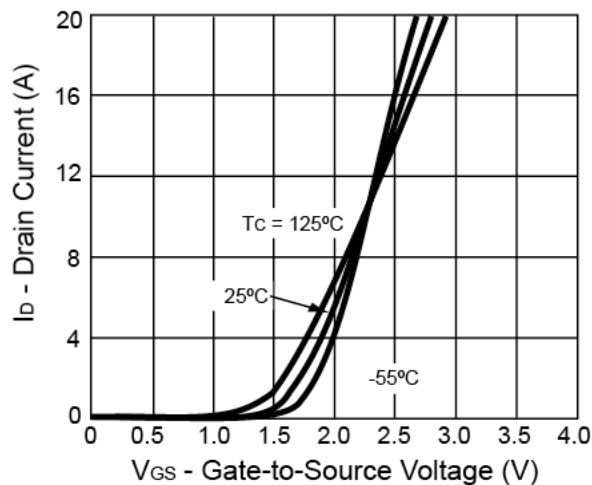
## 20V Dual N-Channel MOSFET

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

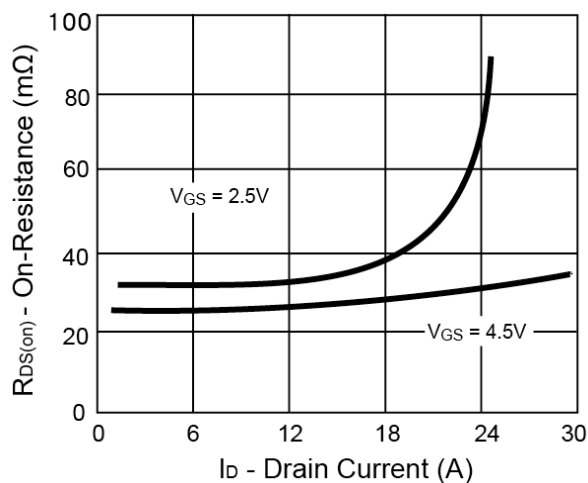
**Output Characteristics**



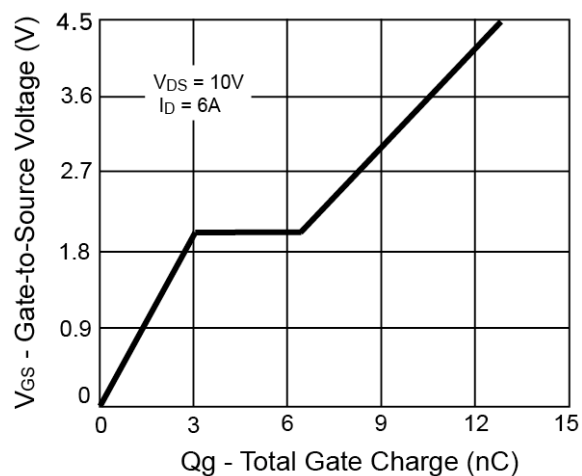
**Transfer Characteristics**



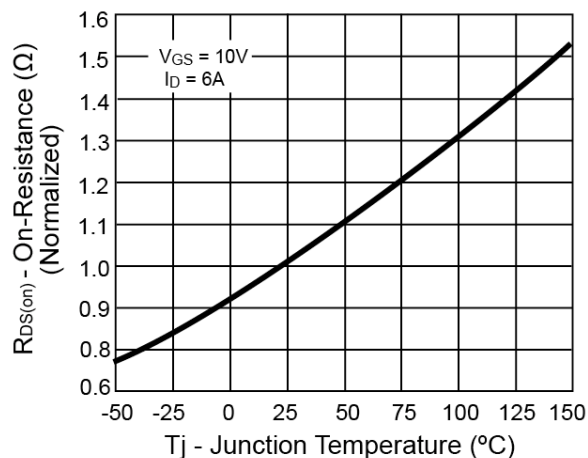
**On-Resistance vs. Drain Current**



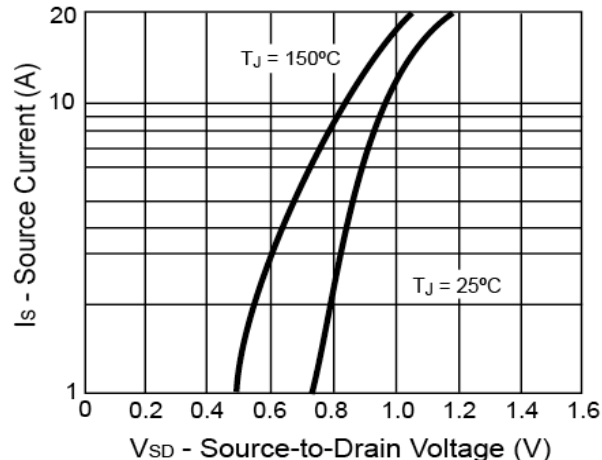
**Gate Charge**



**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**

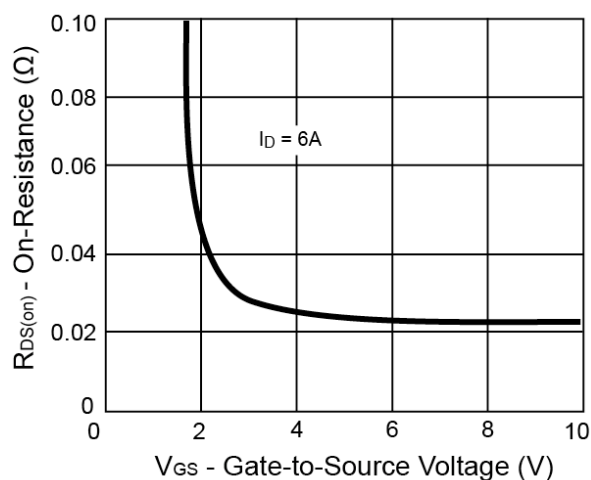


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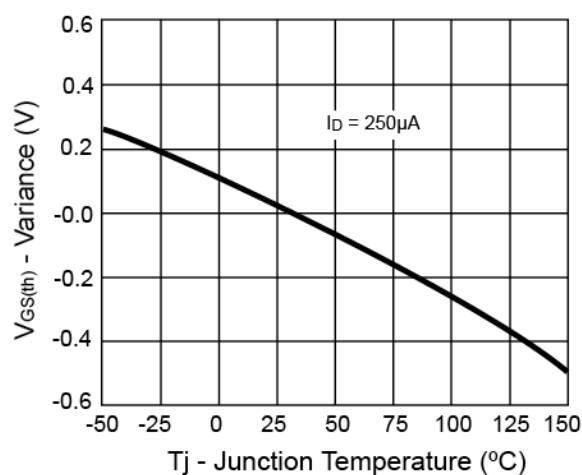
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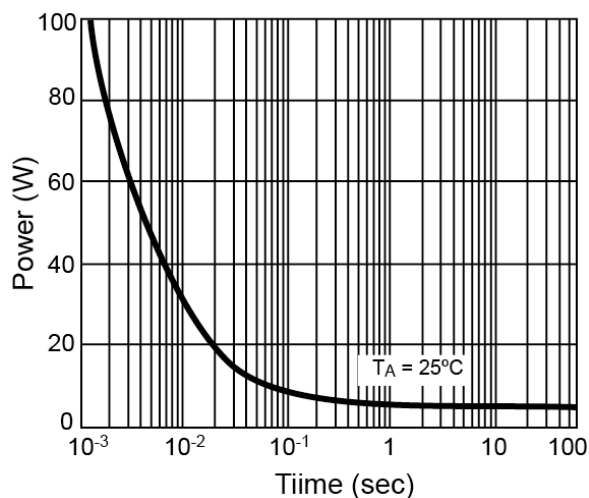
**On-Resistance vs. Gate-Source Voltage**



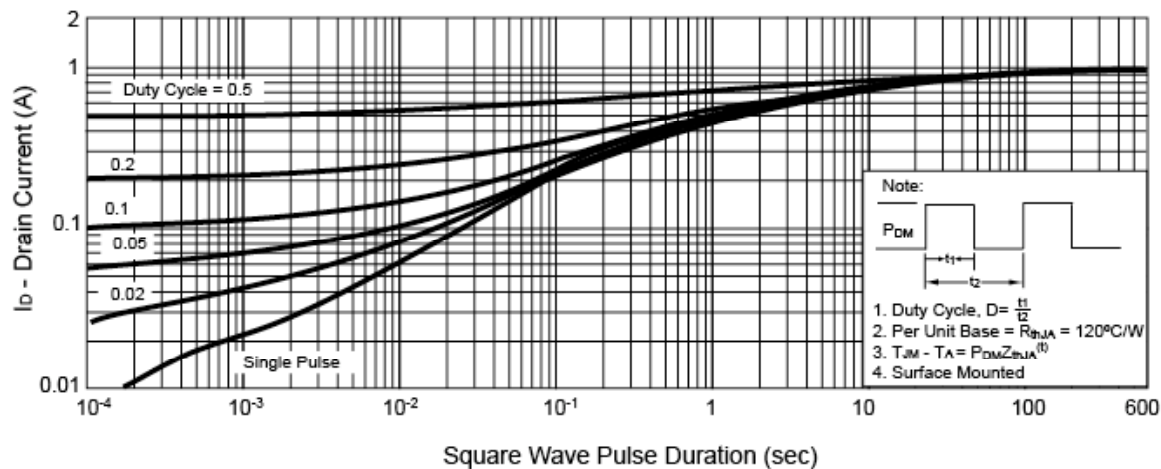
**Threshold Voltage**



**Single Pulse Power**



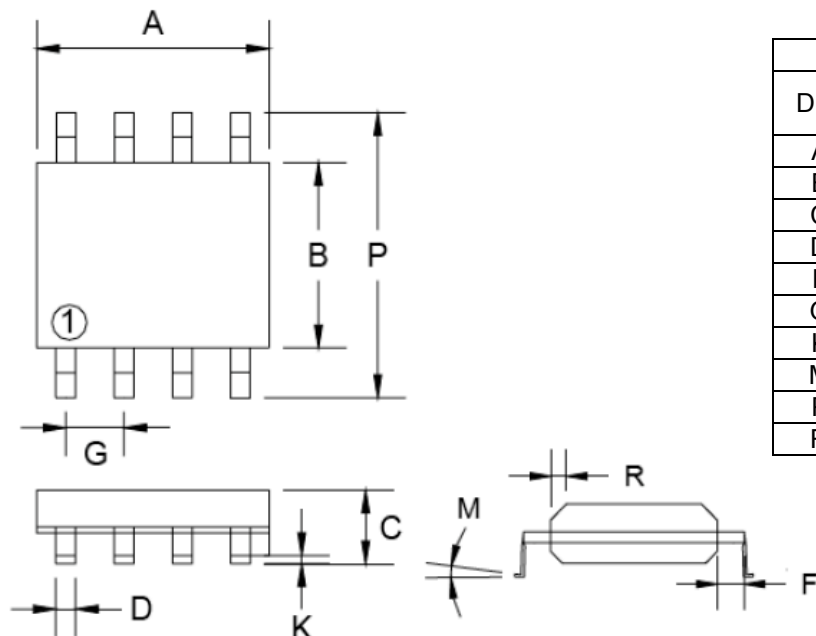
**Normalized Thermal Transient Impedance, Junction-to-Ambient**



# TSM9926D

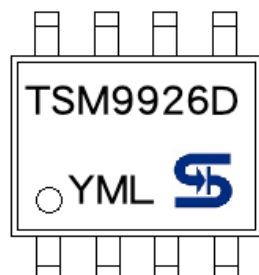
## 20V Dual N-Channel MOSFET

### SOP-8 Mechanical Drawing



| DIM | SOP-8 DIMENSION |      |         |       |
|-----|-----------------|------|---------|-------|
|     | MILLIMETERS     |      | INCHES  |       |
|     | MIN             | MAX  | MIN     | MAX.  |
| A   | 4.80            | 5.00 | 0.189   | 0.196 |
| B   | 3.80            | 4.00 | 0.150   | 0.157 |
| C   | 1.35            | 1.75 | 0.054   | 0.068 |
| D   | 0.35            | 0.49 | 0.014   | 0.019 |
| F   | 0.40            | 1.25 | 0.016   | 0.049 |
| G   | 1.27BSC         |      | 0.05BSC |       |
| K   | 0.10            | 0.25 | 0.004   | 0.009 |
| M   | 0°              | 7°   | 0°      | 7°    |
| P   | 5.80            | 6.20 | 0.229   | 0.244 |
| R   | 0.25            | 0.50 | 0.010   | 0.019 |

### Marking Diagram



**Y** = Year Code  
**M** = Month Code  
 (A=Jan, B=Feb, C=Mar, D=Apl, E=May, F=Jun, G=Jul, H=Aug, I=Sep, J=Oct, K=Nov, L=Dec)  
**L** = Lot Code



# **TSM9926D**

## **20V Dual N-Channel MOSFET**

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