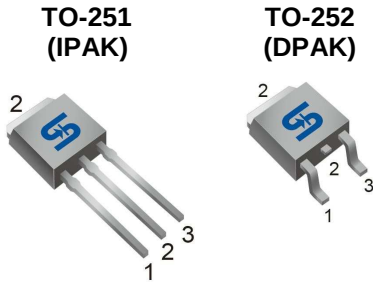


# TSM600N25E

## 250V N-Channel Power MOSFET



### Pin Definition:

1. Gate
2. Drain
3. Source

### Key Parameter Performance

| Parameter          | Value | Unit     |
|--------------------|-------|----------|
| $V_{DS}$           | 250   | V        |
| $R_{DS(on)}$ (max) | 0.6   | $\Omega$ |
| $Q_g$              | 8.4   | nC       |

### Features

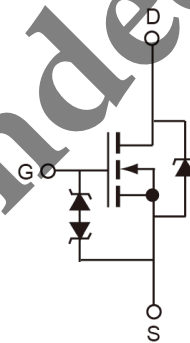
- 100% avalanche tested
- Improved ESD performance

### Ordering Information

| Part No.         | Package | Packing            |
|------------------|---------|--------------------|
| TSM600N25ECH C5G | TO-251  | 75pcs / Tube       |
| TSM600N25ECP ROG | TO-252  | 2.5kpcs / 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

### Block Diagram



N-Channel MOSFET

### Absolute Maximum Ratings

| Parameter                                         |                        | Symbol           | Limit       | Unit |
|---------------------------------------------------|------------------------|------------------|-------------|------|
| Drain-Source Voltage                              |                        | V <sub>DS</sub>  | 250         | V    |
| Gate-Source Voltage                               |                        | V <sub>GS</sub>  | ±30         | V    |
| Continuous Drain Current                          | T <sub>C</sub> = 25°C  | I <sub>D</sub>   | 8           | A    |
|                                                   | T <sub>C</sub> = 100°C |                  | 3.6         | A    |
| Pulsed Drain Current <sup>(Note 1)</sup>          |                        | I <sub>DM</sub>  | 32          | A    |
| Single Pulse Avalanche Energy <sup>(Note 2)</sup> |                        | E <sub>AS</sub>  | 147         | mJ   |
| Repetitive Avalanche Current <sup>(Note 1)</sup>  |                        | I <sub>AR</sub>  | 8           | A    |
| Repetitive Avalanche Energy <sup>(Note 1)</sup>   |                        | E <sub>AR</sub>  | 5.2         | mJ   |
| Power Dissipation @ T <sub>C</sub> = 25°C         |                        | P <sub>D</sub>   | 52          | W    |
| Peak Diode Recovery <sup>(Note 3)</sup>           |                        | dv/dt            | 4.5         | V/ns |
| Operating Junction Temperature                    |                        | T <sub>J</sub>   | 150         | °C   |
| Storage Temperature Range                         |                        | T <sub>STG</sub> | -55 to +150 | °C   |

### Thermal Performance

| Parameter                                | Symbol          | Limit | Unit               |
|------------------------------------------|-----------------|-------|--------------------|
| Thermal Resistance - Junction to Case    | $R_{\theta JC}$ | 2.4   | $^\circ\text{C/W}$ |
| Thermal Resistance - Junction to Ambient | $R_{\theta JA}$ | 110   |                    |

**Electrical Specifications** ( $T_c=25^{\circ}\text{C}$  unless otherwise noted)

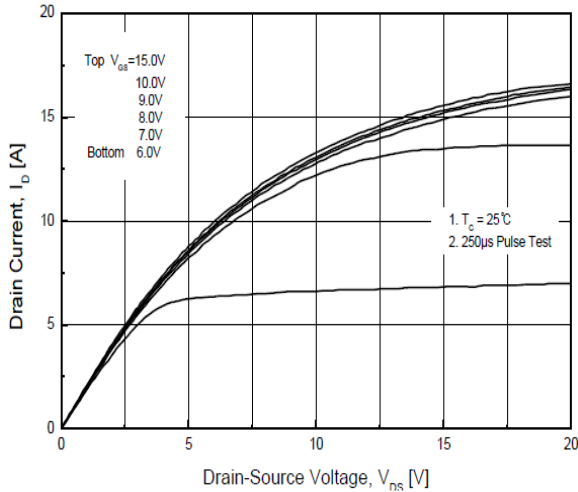
| Parameter                                             | Conditions                                         | Symbol       | Min | Typ | Max       | Unit     |
|-------------------------------------------------------|----------------------------------------------------|--------------|-----|-----|-----------|----------|
| Static                                                |                                                    |              |     |     |           |          |
| Drain-Source Breakdown Voltage                        | $V_{GS} = 0V, I_D = 250\mu A$                      | $BV_{DSS}$   | 250 | --  | --        | V        |
| Drain-Source On-State Resistance                      | $V_{GS} = 10V, I_D = 4A$                           | $R_{DS(ON)}$ | --  | 0.5 | 0.6       | $\Omega$ |
| Gate Threshold Voltage                                | $V_{DS} = V_{GS}, I_D = 250\mu A$                  | $V_{GS(TH)}$ | 3   | --  | 5         | V        |
| Zero Gate Voltage Drain Current                       | $V_{DS} = 250V, V_{GS} = 0V$                       | $I_{DSS}$    | --  | --  | 1         | $\mu A$  |
|                                                       | $V_{DS} = 200V, T_c = 125^{\circ}C$                |              | --  | --  | 10        |          |
| Gate Body Leakage                                     | $V_{GS} = \pm 30V, V_{DS} = 0V$                    | $I_{GSS}$    | --  | --  | $\pm 100$ | $\mu A$  |
| Forward Transconductance <sup>(Note 4)</sup>          | $V_{DS} = 30V, I_D = 4A$                           | $g_{fs}$     | --  | 7.5 | --        | S        |
| Dynamic                                               |                                                    |              |     |     |           |          |
| Total Gate Charge <sup>(Note 4,5)</sup>               | $V_{DS} = 200V, I_D = 8A,$<br>$V_{GS} = 10V$       | $Q_g$        | --  | 8.4 | --        | nC       |
| Gate-Source Charge <sup>(Note 4,5)</sup>              |                                                    | $Q_{gs}$     | --  | 1.9 | --        |          |
| Gate-Drain Charge <sup>(Note 4,5)</sup>               |                                                    | $Q_{gd}$     | --  | 4   | --        |          |
| Input Capacitance                                     | $V_{DS} = 25V, V_{GS} = 0V,$<br>$f = 1.0MHz$       | $C_{iss}$    | --  | 423 | --        | pF       |
| Output Capacitance                                    |                                                    | $C_{oss}$    | --  | 74  | --        |          |
| Reverse Transfer Capacitance                          |                                                    | $C_{rss}$    | --  | 12  | --        |          |
| Switching                                             |                                                    |              |     |     |           |          |
| Turn-On Delay Time <sup>(Note 4,5)</sup>              | $V_{DD} = 125V, I_D = 8A,$<br>$R_{GEN} = 25\Omega$ | $t_{d(on)}$  | --  | 14  | --        | ns       |
| Turn-On Rise Time <sup>(Note 4,5)</sup>               |                                                    | $t_r$        | --  | 25  | --        |          |
| Turn-Off Delay Time <sup>(Note 4,5)</sup>             |                                                    | $t_{d(off)}$ | --  | 30  | --        |          |
| Turn-Off Fall Time <sup>(Note 4,5)</sup>              |                                                    | $t_f$        | --  | 14  | --        |          |
| Source-Drain Diode Ratings and Characteristic         |                                                    |              |     |     |           |          |
| Maximum Continuous Drain-Source Diode Forward Current |                                                    | $I_S$        | --  | --  | 8         | A        |
| Maximum Pulse Drain-Source Diode Forward Current      |                                                    | $I_{SM}$     | --  | --  | 32        | A        |
| Diode-Source Forward Voltage                          | $V_{GS} = 0V, I_S = 8A$                            | $V_{SD}$     | --  | --  | 1.5       | V        |
| Reverse Recovery Time <sup>(Note 4)</sup>             | $V_{GS} = 0V, I_S = 8A$                            | $t_{rr}$     | --  | 157 | --        | ns       |
| Reverse Recovery Charge <sup>(Note 4)</sup>           | $di_F/dt = 100A/\mu s$                             | $Q_{rr}$     | --  | 0.6 | --        | $\mu C$  |

**Note:**

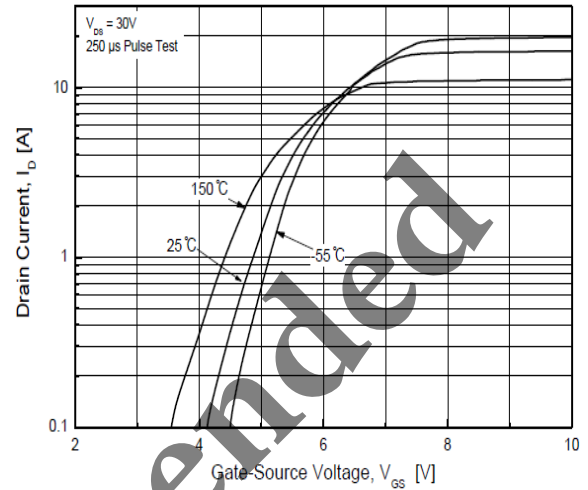
- Pulse width limited by safe operating area
- $L=3.68\text{mH}, I_{AS}=8A, V_{DD}=50V, R_G=25\Omega$ , Starting  $T_J=25^{\circ}\text{C}$
- $I_{SD} \leq 8A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DS}$ , Starting  $T_J=25^{\circ}\text{C}$
- Pulse test: pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
- Switching time is essentially independent of operating temperature.

### Electrical Characteristics Curves

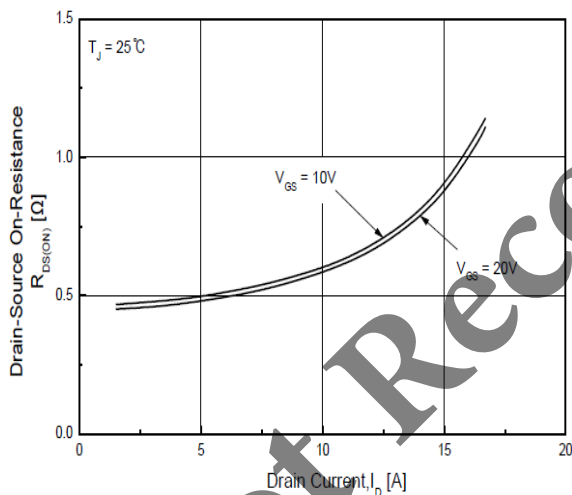
**Output Characteristics**



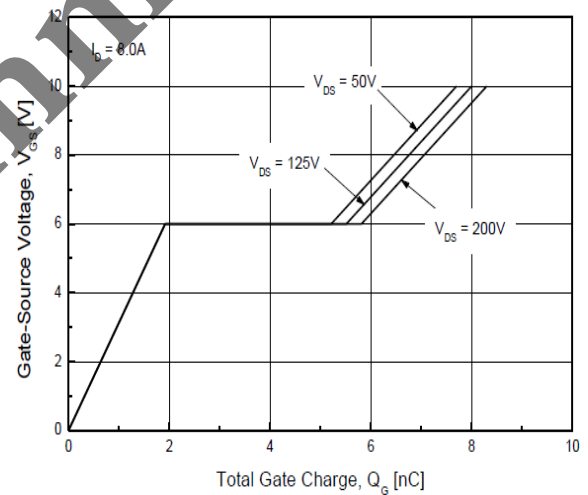
**Transfer Characteristics**



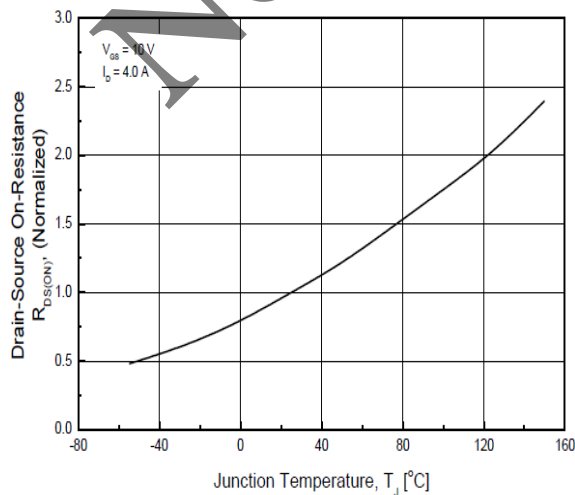
**On-Resistance vs. Drain Current**



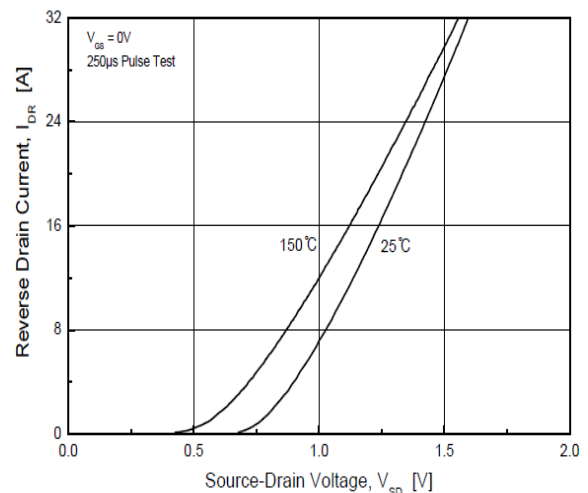
**Gate Charge**



**On-Resistance vs. Junction Temperature**

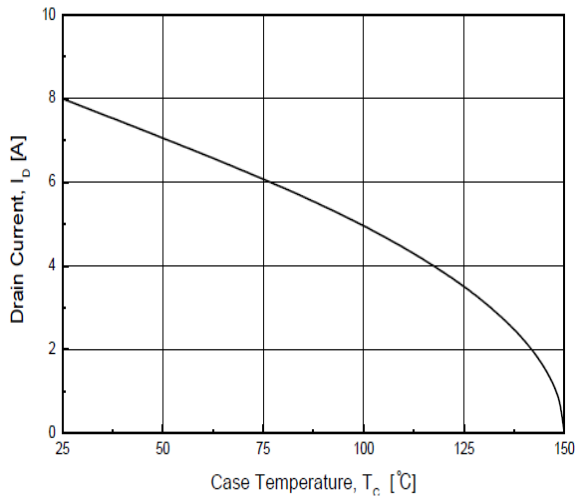


**Source-Drain Diode Forward Voltage**

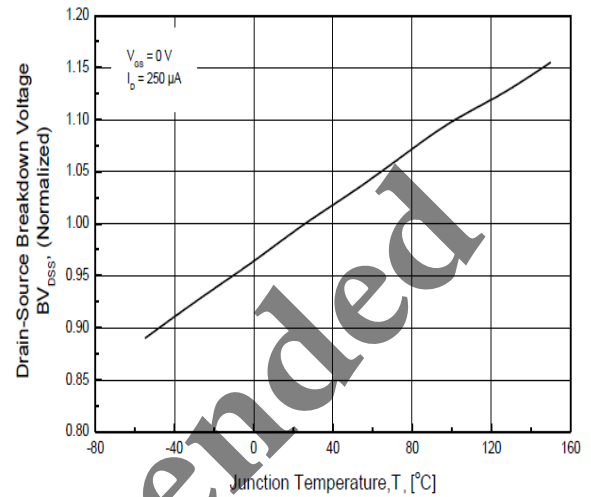


### Electrical Characteristics Curves

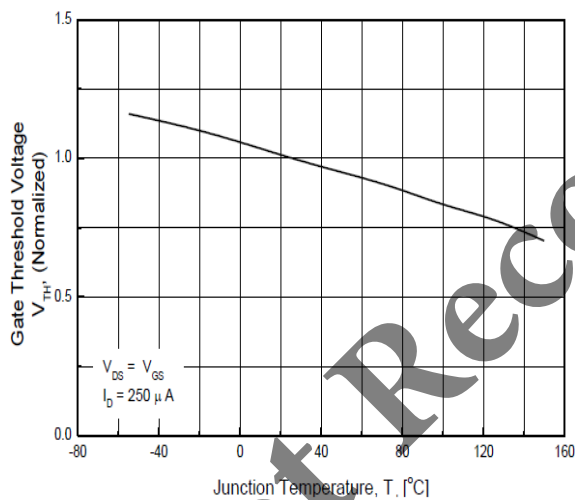
**Drain Current vs. Case Temperature**



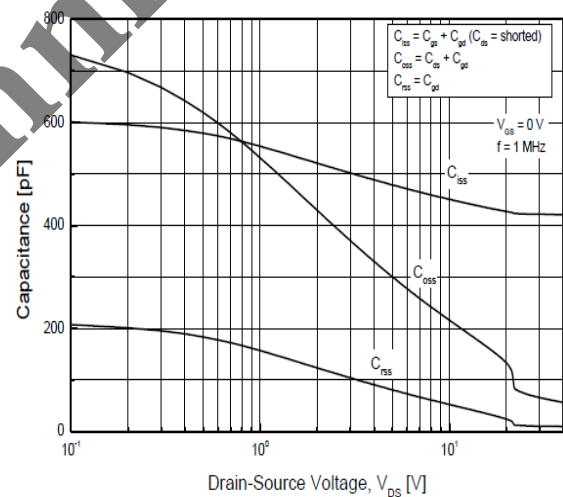
**$BV_{DSS}$  vs. Junction Temperature**



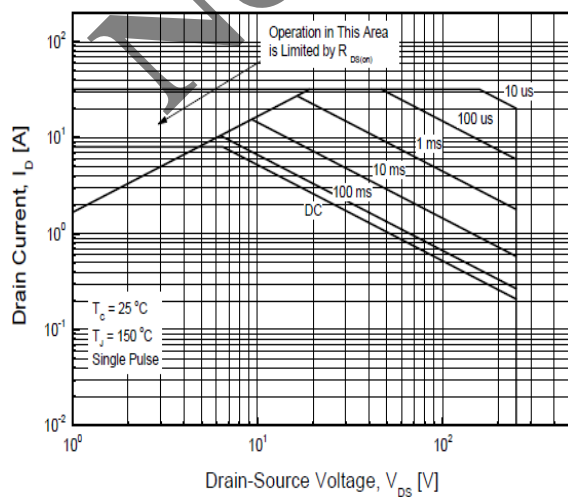
**$V_{TH}$  vs. Junction Temperature**



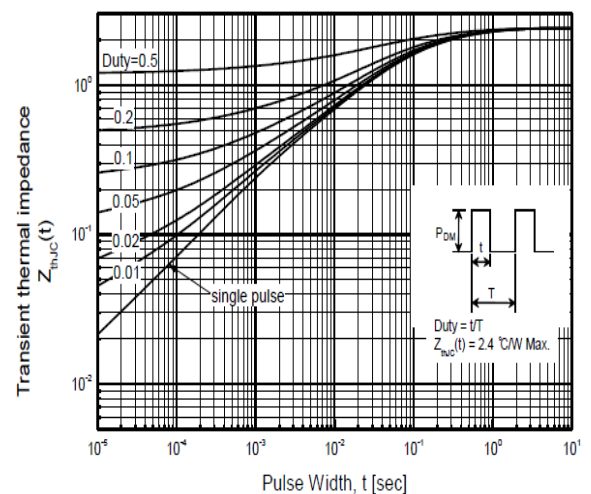
**Capacitance vs. Drain-Source Voltage**



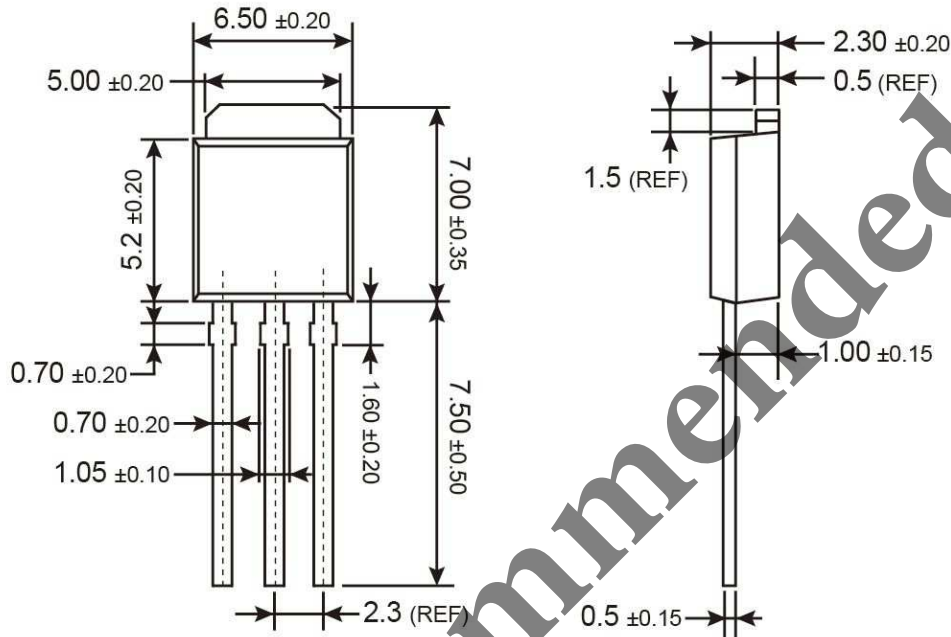
**Maximum Safe Operating Area**



**Transient Thermal Impedance**

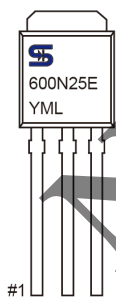


## TO-251 Mechanical Drawing



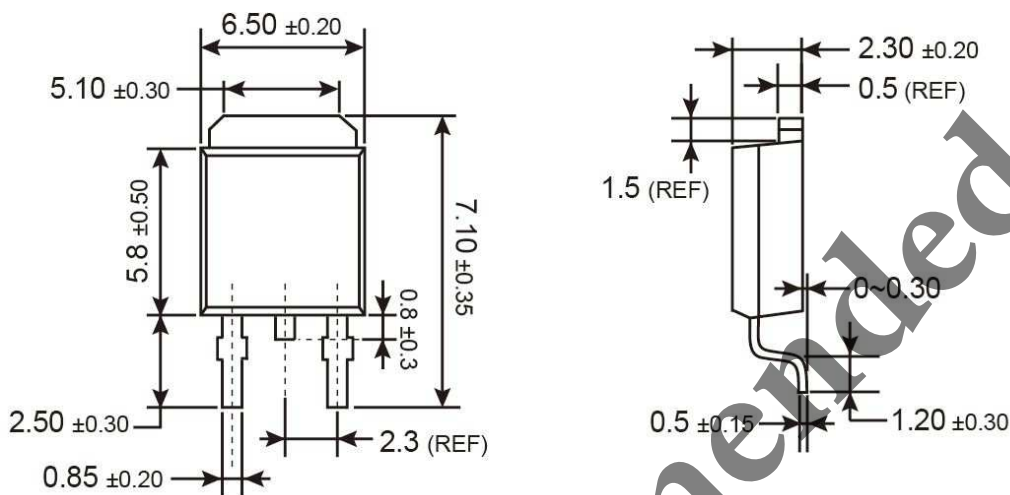
Unit: Millimeters

## Marking Diagram



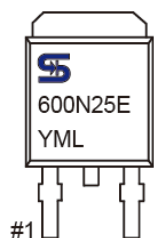
- Y** = Year Code
- M** = Month Code for Halogen Free Product  
(O=Jan, P=Feb, Q=Mar, R=Apl, S=May, T=Jun, U=Jul, V=Aug, W=Sep, X=Oct, Y=Nov, Z=Dec)
- L** = Lot Code

## TO-252 Mechanical Drawing



Unit: Millimeters

## Marking Diagram



**Y** = Year Code  
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 (O=Jan, P=Feb, Q=Mar, R=Apl, S=May, T=Jun, U=Jul, V=Aug, W=Sep, X=Oct, Y=Nov, Z=Dec)  
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# TSM600N25E

## 250V N-Channel Power MOSFET

Not Recommended

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