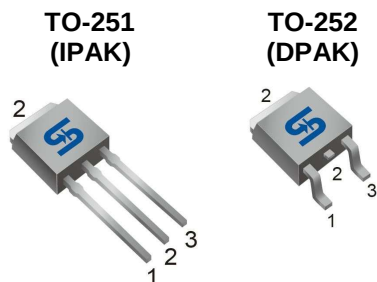


# TSM600N25E

## 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

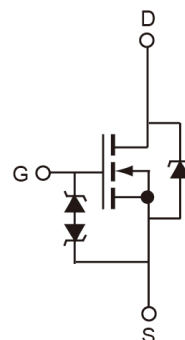
- 100% avalanche tested
- Improved ESD performance

### 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   | $^\circ C/W$ |
| Thermal Resistance - Junction to Ambient | $R_{\theta JA}$ | 110   |              |

**Electrical Specifications** (T<sub>c</sub>=25°C unless otherwise noted)

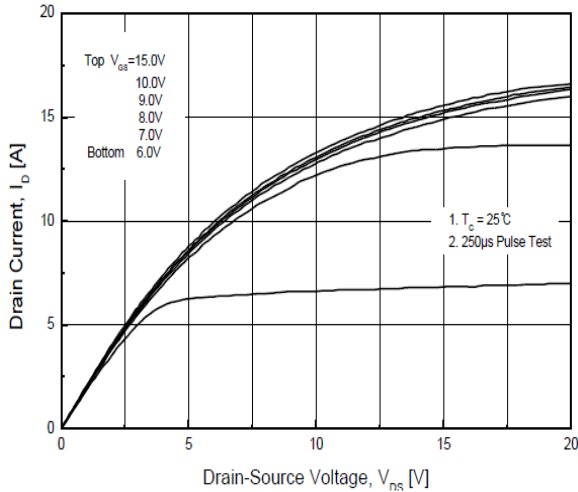
| Parameter                                             | Conditions                                                            | Symbol              | Min | Typ | Max  | Unit |
|-------------------------------------------------------|-----------------------------------------------------------------------|---------------------|-----|-----|------|------|
| Static                                                |                                                                       |                     |     |     |      |      |
| Drain-Source Breakdown Voltage                        | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                          | BV <sub>DSS</sub>   | 250 | --  | --   | V    |
| Drain-Source On-State Resistance                      | V <sub>GS</sub> = 10V, I <sub>D</sub> = 4A                            | R <sub>DS(ON)</sub> | --  | 0.5 | 0.6  | Ω    |
| Gate Threshold Voltage                                | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA            | V <sub>GS(TH)</sub> | 3   | --  | 5    | V    |
| Zero Gate Voltage Drain Current                       | V <sub>DS</sub> = 250V, V <sub>GS</sub> = 0V                          | I <sub>DSS</sub>    | --  | --  | 1    | μA   |
|                                                       | V <sub>DS</sub> = 200V, T <sub>C</sub> = 125°C                        |                     | --  | --  | 10   |      |
| Gate Body Leakage                                     | V <sub>GS</sub> = ±30V, V <sub>DS</sub> = 0V                          | I <sub>GSS</sub>    | --  | --  | ±100 | μA   |
| Forward Transconductance <sup>(Note 4)</sup>          | V <sub>DS</sub> = 30V, I <sub>D</sub> = 4A                            | g <sub>fs</sub>     | --  | 7.5 | --   | S    |
| Dynamic                                               |                                                                       |                     |     |     |      |      |
| Total Gate Charge <sup>(Note 4,5)</sup>               | V <sub>DS</sub> = 200V, I <sub>D</sub> = 8A,<br>V <sub>GS</sub> = 10V | Q <sub>g</sub>      | --  | 8.4 | --   | nC   |
| Gate-Source Charge <sup>(Note 4,5)</sup>              |                                                                       | Q <sub>gs</sub>     | --  | 1.9 | --   |      |
| Gate-Drain Charge <sup>(Note 4,5)</sup>               |                                                                       | Q <sub>gd</sub>     | --  | 4   | --   |      |
| Input Capacitance                                     | V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz            | C <sub>iss</sub>    | --  | 423 | --   | pF   |
| Output Capacitance                                    |                                                                       | C <sub>oss</sub>    | --  | 74  | --   |      |
| Reverse Transfer Capacitance                          |                                                                       | C <sub>rss</sub>    | --  | 12  | --   |      |
| Switching                                             |                                                                       |                     |     |     |      |      |
| Turn-On Delay Time <sup>(Note 4,5)</sup>              | V <sub>DD</sub> = 125V, I <sub>D</sub> = 8A,<br>R <sub>GEN</sub> =25Ω | t <sub>d(on)</sub>  | --  | 14  | --   | ns   |
| Turn-On Rise Time <sup>(Note 4,5)</sup>               |                                                                       | t <sub>r</sub>      | --  | 25  | --   |      |
| Turn-Off Delay Time <sup>(Note 4,5)</sup>             |                                                                       | t <sub>d(off)</sub> | --  | 30  | --   |      |
| Turn-Off Fall Time <sup>(Note 4,5)</sup>              |                                                                       | t <sub>f</sub>      | --  | 14  | --   |      |
| Source-Drain Diode Ratings and Characteristic         |                                                                       |                     |     |     |      |      |
| Maximum Continuous Drain-Source Diode Forward Current |                                                                       | I <sub>S</sub>      | --  | --  | 8    | A    |
| Maximum Pulse Drain-Source Diode Forward Current      |                                                                       | I <sub>SM</sub>     | --  | --  | 32   | A    |
| Diode-Source Forward Voltage                          | V <sub>GS</sub> = 0V, I <sub>S</sub> = 8A                             | V <sub>SD</sub>     | --  | --  | 1.5  | V    |
| Reverse Recovery Time <sup>(Note 4)</sup>             | V <sub>GS</sub> = 0V, I <sub>S</sub> = 8A                             | t <sub>rr</sub>     | --  | 157 | --   | ns   |
| Reverse Recovery Charge <sup>(Note 4)</sup>           | dI <sub>F</sub> /dt = 100A/μs                                         | Q <sub>rr</sub>     | --  | 0.6 | --   | μC   |

**Note:**

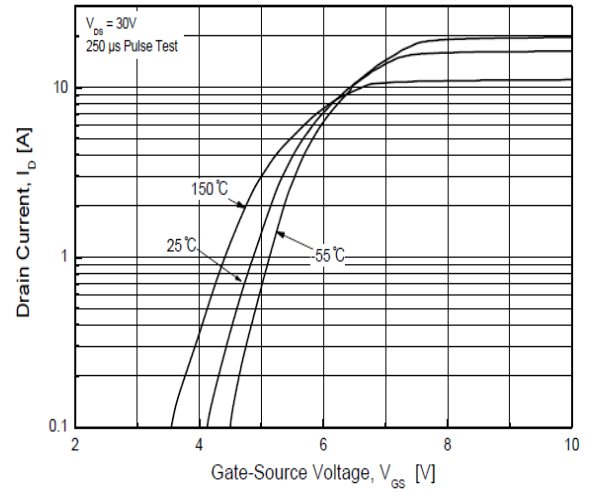
- Pulse width limited by safe operating area
- L=3.68mH, I<sub>AS</sub> =8A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25Ω, Starting T<sub>J</sub> = 25°C
- I<sub>SD</sub> ≤8A, di/dt ≤ 200A/μs, V<sub>DD</sub> ≤ BV<sub>DS</sub>, Starting T<sub>J</sub>=25°C
- Pulse test: pulse width ≤300μs, duty cycle ≤2%
- Switching time is essentially independent of operating temperature.

### Electrical Characteristics Curves

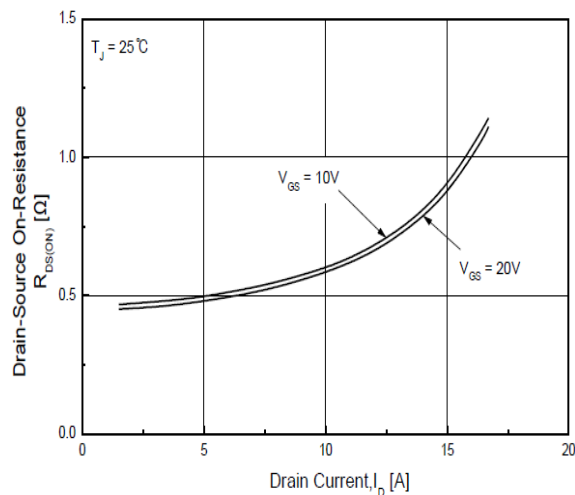
**Output Characteristics**



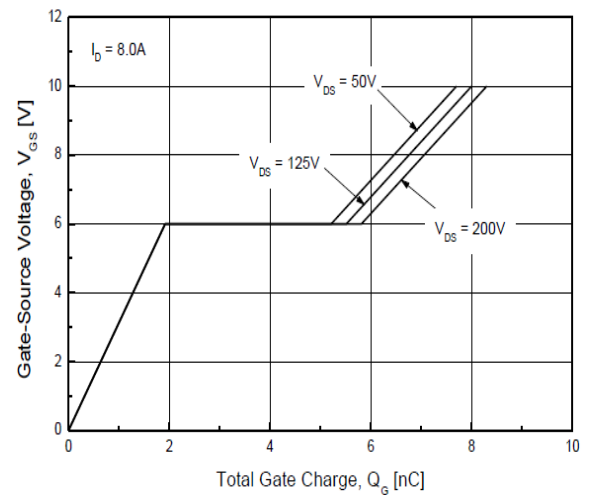
**Transfer Characteristics**



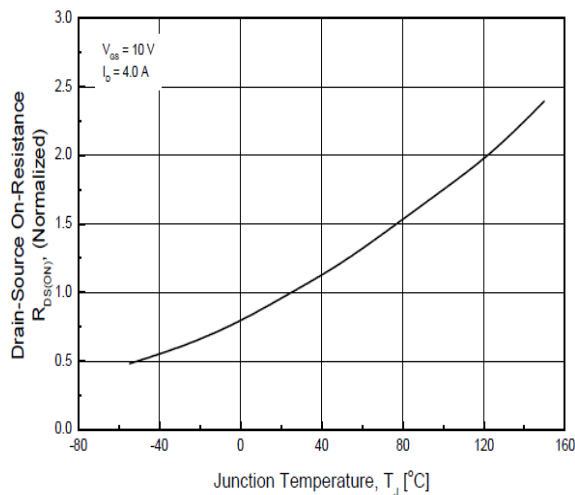
**On-Resistance vs. Drain Current**



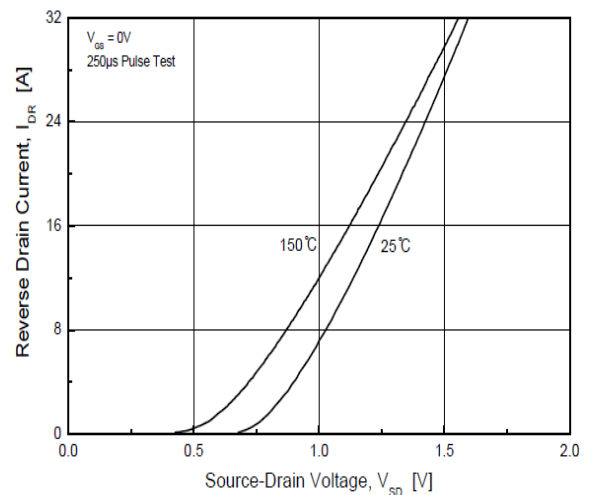
**Gate Charge**



**On-Resistance vs. Junction Temperature**

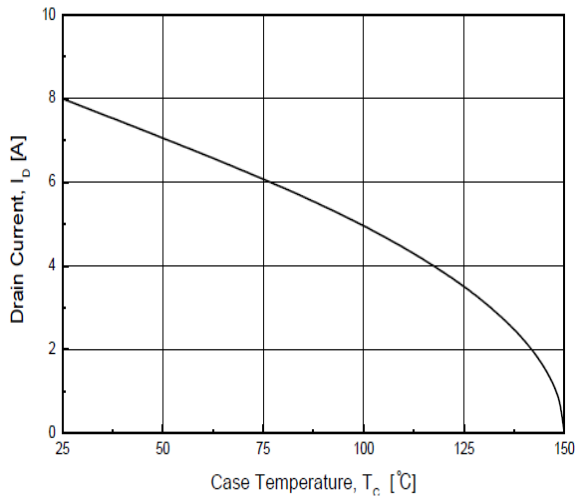


**Source-Drain Diode Forward Voltage**

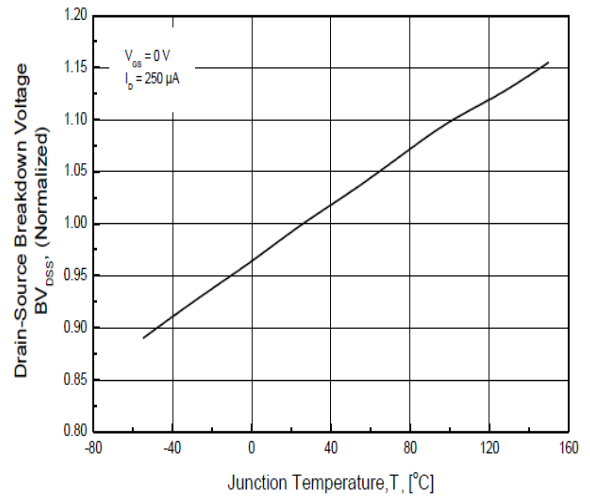


### Electrical Characteristics Curves

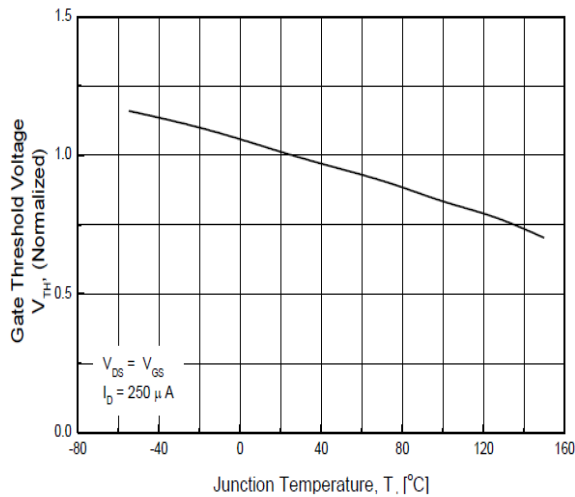
**Drain Current vs. Case Temperature**



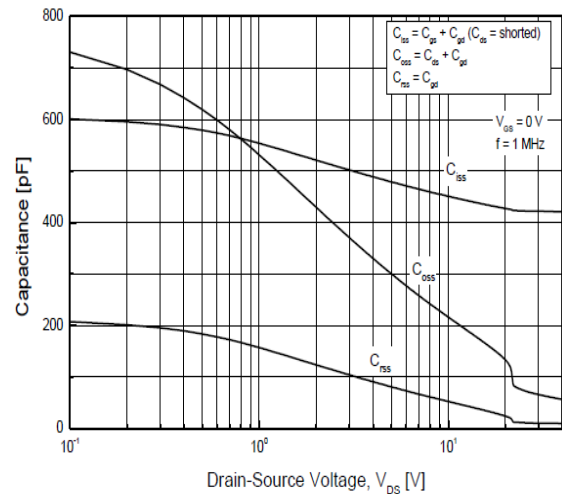
**$BV_{DSS}$  vs. Junction Temperature**



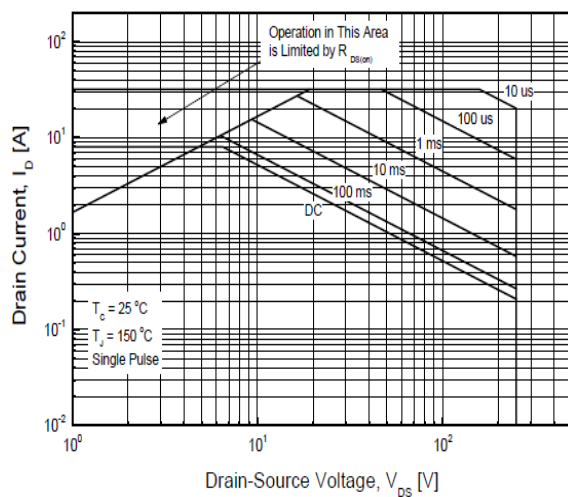
**$V_{TH}$  vs. Junction Temperature**



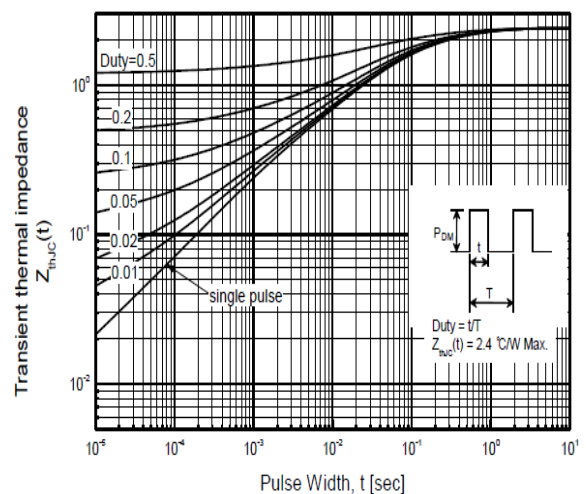
**Capacitance vs. Drain-Source Voltage**



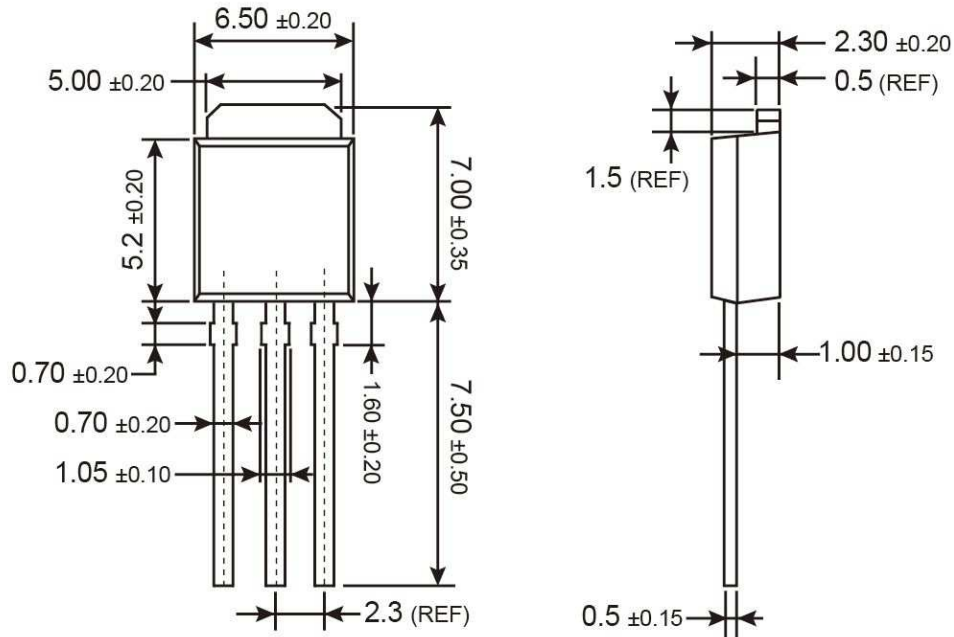
**Maximum Safe Operating Area**



**Transient Thermal Impedance**

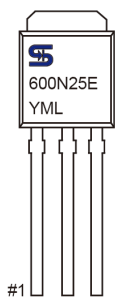


## TO-251 Mechanical Drawing



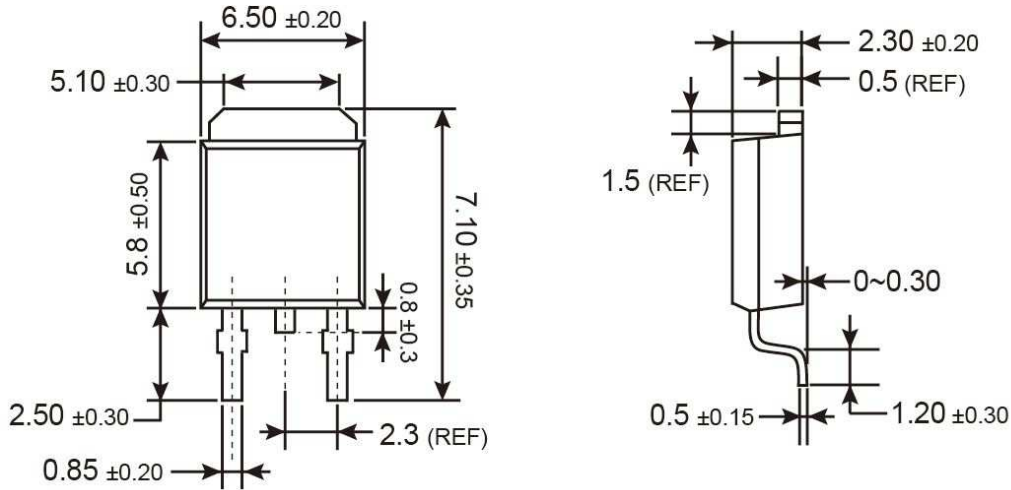
Unit: Millimeters

## Marking Diagram



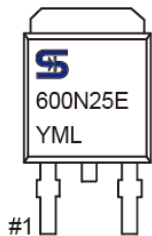
- Y** = Year Code
- M** = Month Code for Halogen Free Product  
(**O**=Jan, **P**=Feb, **Q**=Mar, **R**=Apr, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug, **W**=Sep, **X**=Oct, **Y**=Nov, **Z**=Dec)
- L** = Lot Code

## TO-252 Mechanical Drawing



Unit: Millimeters

## Marking Diagram



- Y** = Year Code
- 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

# **TSM600N25E**

## **250V N-Channel Power MOSFET**

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