



# PJM30N20TES

## N-Channel Enhancement Mode Power MOSFET

### Product Summary

- $V_{DS} = 20V, I_D = 38A$
- $R_{DS(on)} < 9.5m\Omega @ V_{GS} = 4.5V$
- $R_{DS(on)} < 13.5m\Omega @ V_{GS} = 2.5V$

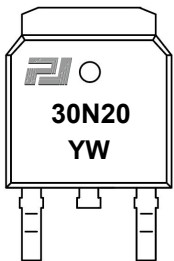
### Features

- Advanced Trench Technology
- 100% Avalanche Tested
- 100% DVDS
- RoHS Compliant
- Halogen and Antimony Free
- Moisture Sensitivity Level 3
- Molding Compound Meets UL 94 V-0 Flammability Rating

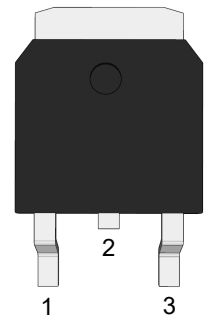
### Application

- Load Switch
- PWM Application
- Power Management

### Marking Code



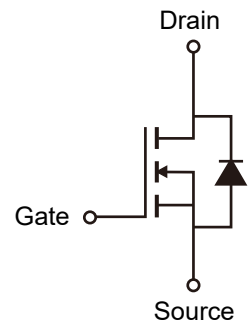
### TO-252S



(Top View)

| Pin | Description |
|-----|-------------|
| 1   | Gate        |
| 2   | Drain       |
| 3   | Source      |

### Schematic Diagram



### Absolute Maximum Ratings

Ratings at 25°C case temperature unless otherwise specified.

| Parameter                                      |                     | Symbol         | Value       | Unit |
|------------------------------------------------|---------------------|----------------|-------------|------|
| Drain-Source Voltage                           |                     | $V_{DS}$       | 20          | V    |
| Gate-Source Voltage                            |                     | $V_{GS}$       | $\pm 12$    | V    |
| Drain Current-Continuous                       | $T_C = 25^\circ C$  | $I_D$          | 38          | A    |
|                                                | $T_C = 100^\circ C$ |                | 22.8        |      |
| Drain Current-Pulsed <sup>Note1</sup>          |                     | $I_{DM}$       | 152         | A    |
| Single Pulse Avalanche Energy <sup>Note2</sup> |                     | $E_{AS}$       | 33          | mJ   |
| Maximum Power Dissipation                      |                     | $P_D$          | 27          | W    |
| Junction and Storage Temperature Range         |                     | $T_J, T_{STG}$ | -55 to +150 | °C   |

### Thermal Characteristics

|                                                          |                 |     |      |
|----------------------------------------------------------|-----------------|-----|------|
| Thermal Resistance, Junction-to-Ambient <sup>Note3</sup> | $R_{\theta JA}$ | 62  | °C/W |
| Thermal Resistance, Junction-to-Case                     | $R_{\theta JC}$ | 4.6 | °C/W |



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### Electrical Characteristics

(T<sub>J</sub>=25°C unless otherwise specified)

| Parameter                                   | Symbol               | Test Condition                                                                            | Min. | Typ. | Max. | Unit |
|---------------------------------------------|----------------------|-------------------------------------------------------------------------------------------|------|------|------|------|
| Static Characteristics                      |                      |                                                                                           |      |      |      |      |
| Drain-Source Breakdown Voltage              | V <sub>(BR)DSS</sub> | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                                | 20   | --   | --   | V    |
| Zero Gate Voltage Drain Current             | I <sub>DSS</sub>     | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V                                                 | --   | --   | 1    | μA   |
| Gate-Body Leakage Current                   | I <sub>GSS</sub>     | V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V                                                | --   | --   | ±100 | nA   |
| Gate Threshold Voltage <sup>Note4</sup>     | V <sub>GS(th)</sub>  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                  | 0.4  | 0.7  | 1.2  | V    |
| Drain-Source On-Resistance <sup>Note4</sup> | R <sub>DS(on)</sub>  | V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A                                                | --   | 7    | 9.5  | mΩ   |
|                                             |                      | V <sub>GS</sub> =2.5V, I <sub>D</sub> =10A                                                | --   | 10   | 13.5 | mΩ   |
| Forward Transconductance <sup>Note4</sup>   | g <sub>FS</sub>      | V <sub>DS</sub> =5V, I <sub>D</sub> =2A                                                   | --   | 10   | --   | S    |
| Dynamic Characteristics                     |                      |                                                                                           |      |      |      |      |
| Input Capacitance                           | C <sub>iss</sub>     | V <sub>DS</sub> =10V, V <sub>GS</sub> =0V, f=1MHz                                         | --   | 1008 | --   | pF   |
| Output Capacitance                          | C <sub>oss</sub>     |                                                                                           | --   | 173  | --   | pF   |
| Reverse Transfer Capacitance                | C <sub>rss</sub>     |                                                                                           | --   | 158  | --   | pF   |
| Gate Resistance                             | R <sub>g</sub>       | V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz                                          | --   | 1.65 | --   | Ω    |
| Total Gate Charge                           | Q <sub>g</sub>       | V <sub>DS</sub> =10V, I <sub>D</sub> =15A,<br>V <sub>GS</sub> =4.5V                       | --   | 13   | --   | nC   |
| Gate-Source Charge                          | Q <sub>gs</sub>      |                                                                                           | --   | 2.5  | --   | nC   |
| Gate-Drain Charge                           | Q <sub>gd</sub>      |                                                                                           | --   | 3.5  | --   | nC   |
| Switching Characteristics                   |                      |                                                                                           |      |      |      |      |
| Turn-on Delay Time                          | t <sub>d(on)</sub>   | V <sub>DD</sub> =10V, I <sub>D</sub> =15A,<br>V <sub>GS</sub> =4.5V, R <sub>GEN</sub> =3Ω | --   | 8    | --   | nS   |
| Turn-on Rise Time                           | t <sub>r</sub>       |                                                                                           | --   | 19   | --   | nS   |
| Turn-off Delay Time                         | t <sub>d(off)</sub>  |                                                                                           | --   | 30   | --   | nS   |
| Turn-off Fall Time                          | t <sub>f</sub>       |                                                                                           | --   | 11   | --   | nS   |
| Source-Drain Diode Characteristics          |                      |                                                                                           |      |      |      |      |
| Diode Forward Voltage <sup>Note4</sup>      | V <sub>SD</sub>      | V <sub>GS</sub> =0V, I <sub>S</sub> =15A                                                  | --   | --   | 1.2  | V    |
| Diode Forward Current                       | I <sub>S</sub>       |                                                                                           | --   | --   | 38   | A    |
| Reverse Recovery Time                       | trr                  | I <sub>F</sub> =15A, di/dt=100A/μS                                                        | --   | 7.5  | --   | nS   |
| Reverse Recovery Charge                     | Qrr                  |                                                                                           | --   | 1.5  | --   | nC   |

Note:

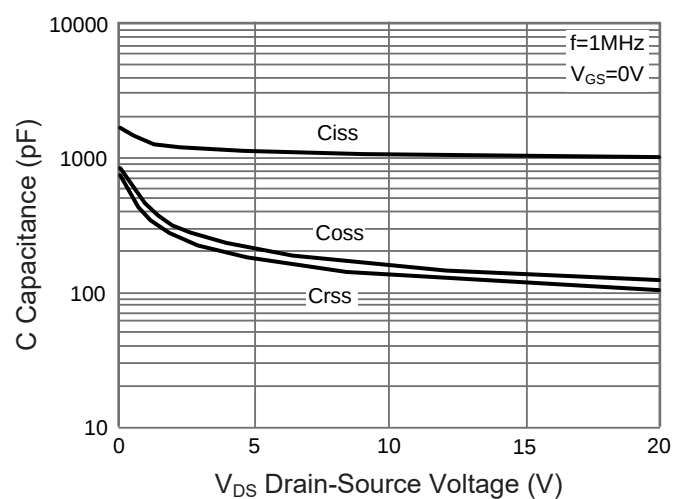
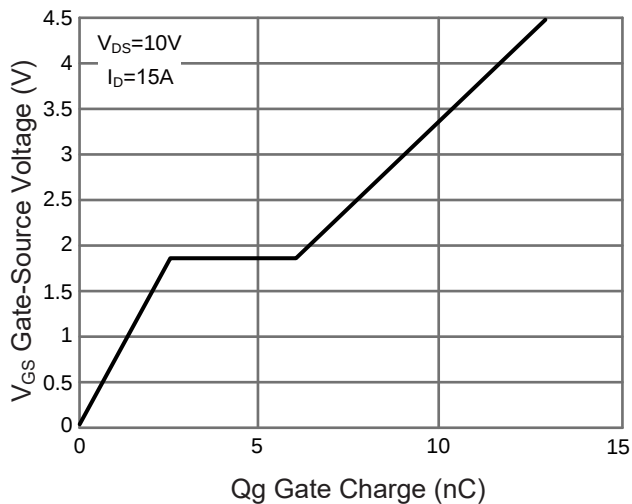
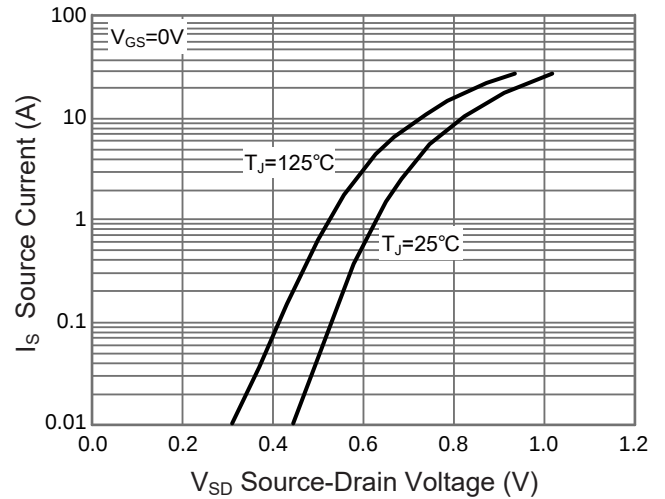
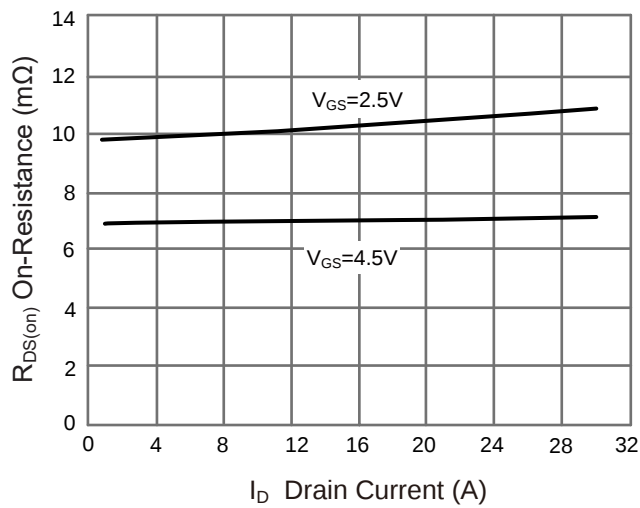
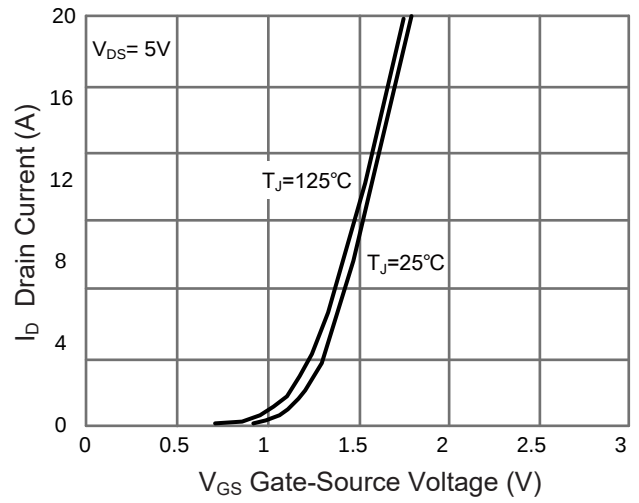
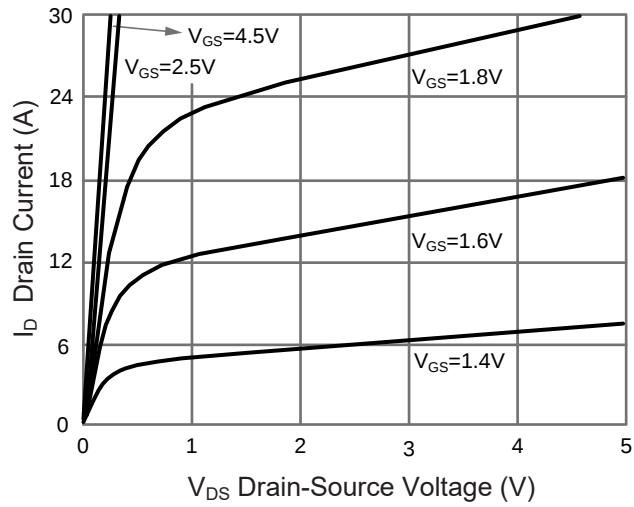
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. E<sub>AS</sub> condition: T<sub>J</sub>=25°C, V<sub>DD</sub>=10V, V<sub>G</sub>=10V, R<sub>G</sub>=25Ω, L=0.5mH, I<sub>AS</sub>=11.5A
3. Surface mounted on 1inch<sup>2</sup> FR-4 board with 2OZ copper
4. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%



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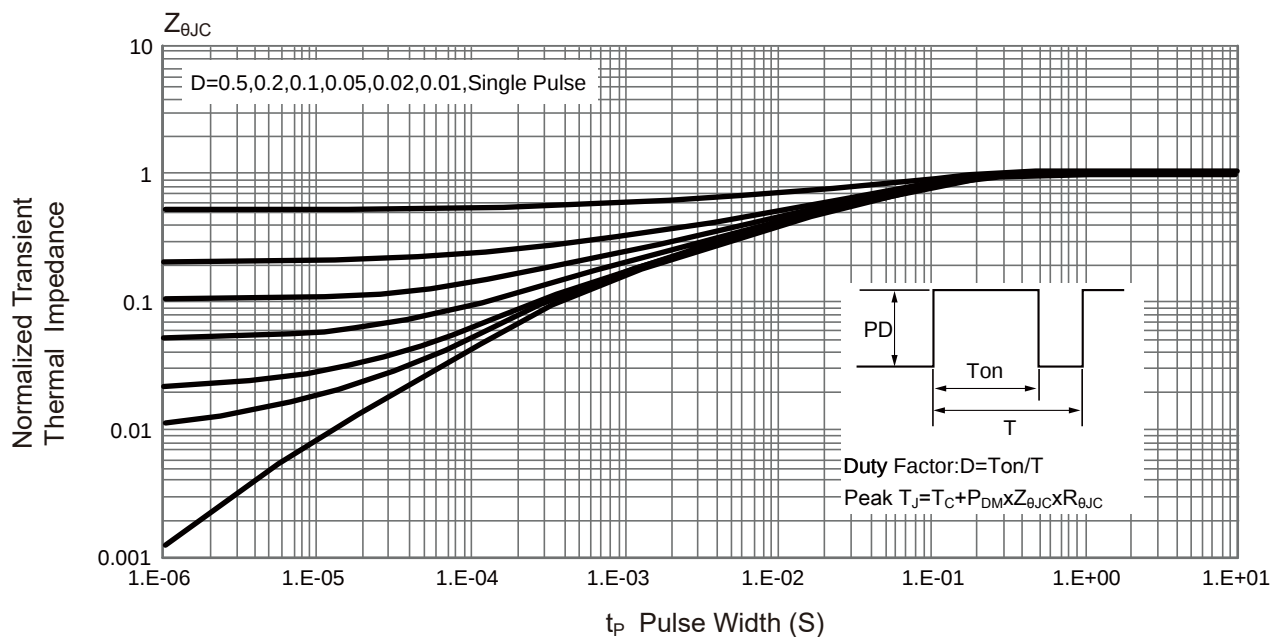
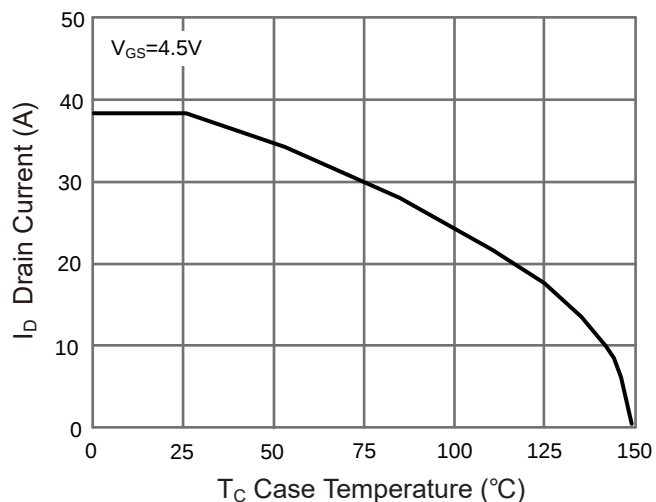
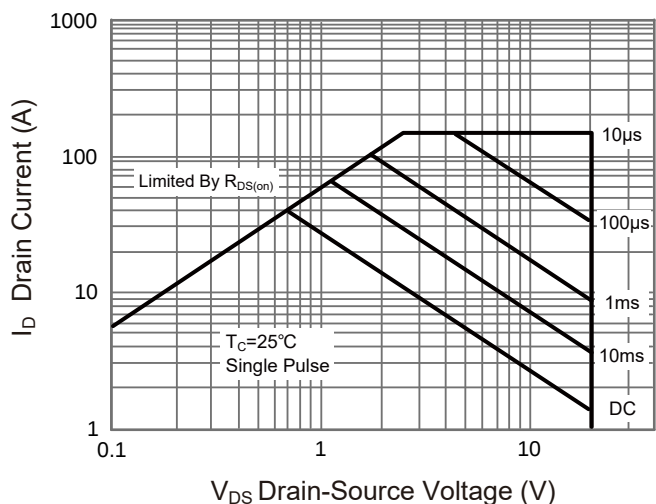
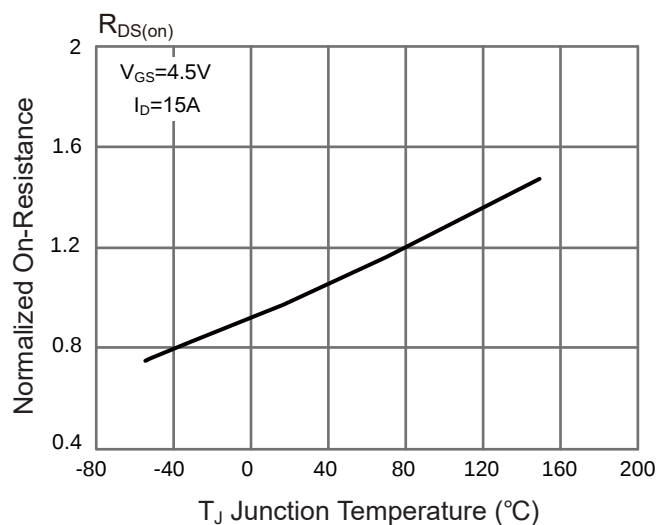
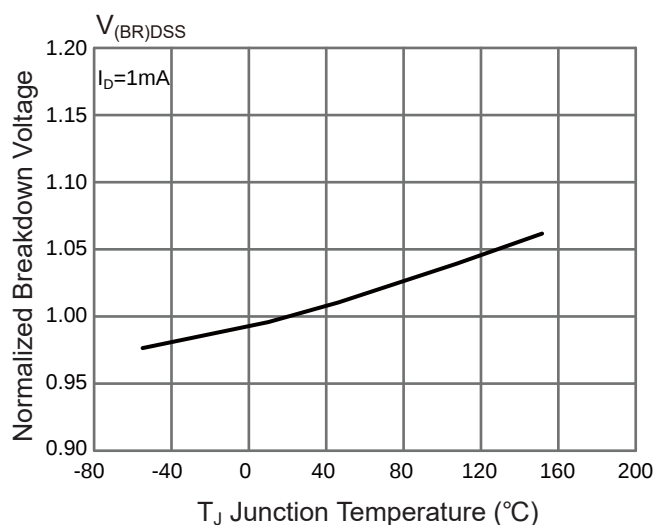
### Typical Characteristic Curves





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### Test Circuit

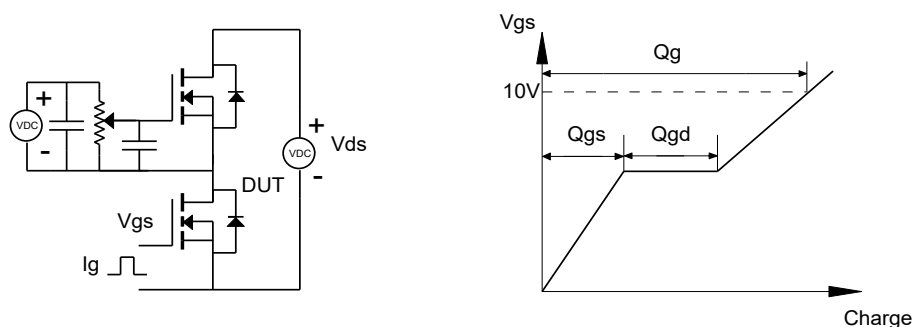


Figure 1: Gate Charge Test Circuit & Waveform

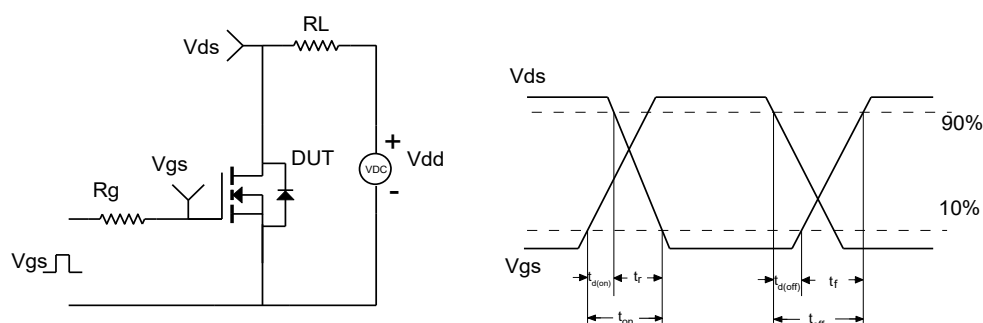


Figure 2: Resistive Switching Test Circuit & Waveform

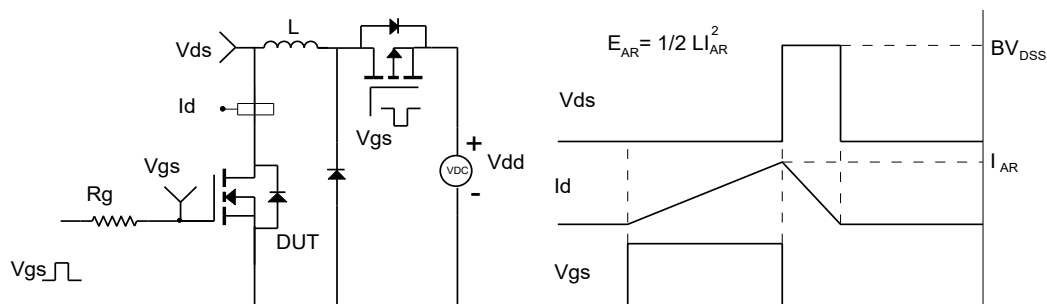


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

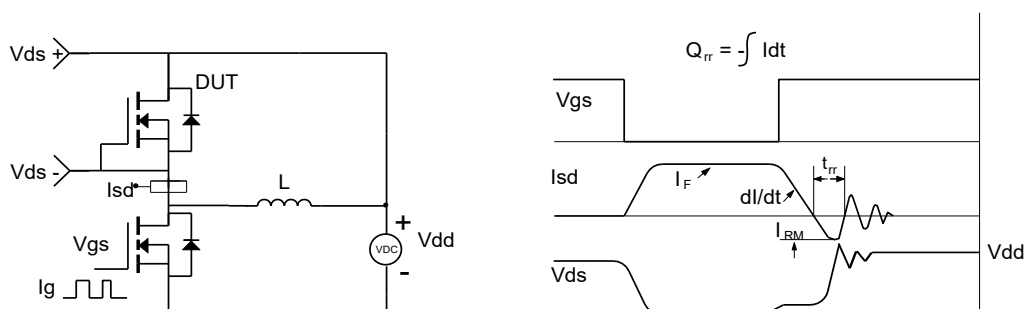


Figure 4: Diode Recovery Test Circuit & Waveform



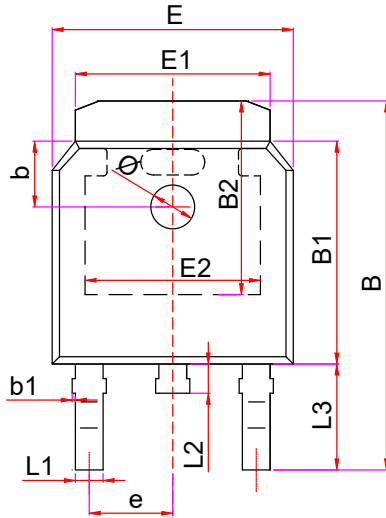
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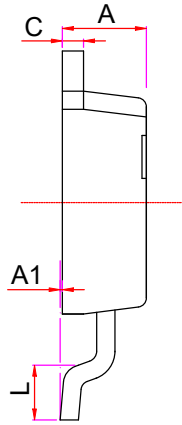
### Package Outline

TO-252S

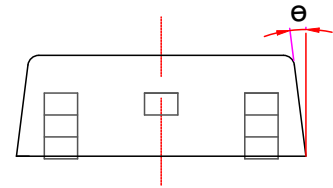
Dimensions in mm



TOP VIEW



SIDE VIEW

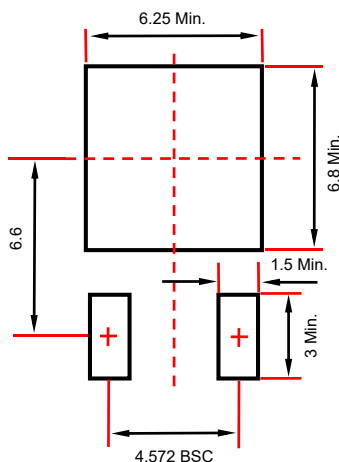


BOTTOM VIEW

| Symbol | Dimensions in Millimeters |        |        | Dimensions in Inches |       |       |
|--------|---------------------------|--------|--------|----------------------|-------|-------|
|        | Min.                      | Nom.   | Max.   | Min.                 | Nom.  | Max.  |
| A      | 2.200                     | 2.300  | 2.400  | 0.087                | 0.090 | 0.094 |
| A1     | 0.000                     | -      | 0.130  | 0.000                | -     | 0.005 |
| Ø      | 1.100                     | 1.200  | 1.300  | 0.043                | 0.047 | 0.051 |
| C      | 0.400                     | 0.500  | 0.600  | 0.016                | 0.020 | 0.024 |
| L      | 1.550                     | 1.650  | 1.750  | 0.061                | 0.065 | 0.069 |
| E      | 6.500                     | 6.600  | 6.700  | 0.256                | 0.260 | 0.264 |
| E1     | 5.200                     | 5.300  | 5.400  | 0.205                | 0.209 | 0.213 |
| E2     | 4.650                     | 4.800  | 4.950  | 0.183                | 0.189 | 0.195 |
| B      | 9.900                     | 10.100 | 10.300 | 0.390                | 0.398 | 0.406 |
| B1     | 5.800                     | 6.000  | 6.200  | 0.228                | 0.236 | 0.244 |
| B2     | 5.100                     | 5.250  | 5.400  | 0.200                | 0.207 | 0.213 |
| b      | 1.500                     | 1.600  | 1.700  | 0.059                | 0.063 | 0.067 |
| b1     | 0.100MAX                  |        |        | 0.0039MAX            |       |       |
| L1     | 0.600                     | 0.700  | 0.800  | 0.024                | 0.028 | 0.032 |
| L2     | 0.700                     | 0.800  | 0.900  | 0.028                | 0.032 | 0.036 |
| L3     | 3.000                     | 3.100  | 3.200  | 0.118                | 0.122 | 0.126 |
| e      | 2.230                     | 2.280  | 2.330  | 0.088                | 0.090 | 0.092 |
| θ      | 9°                        |        |        | 9°                   |       |       |

### Suggested Pad Layout

TO-252S



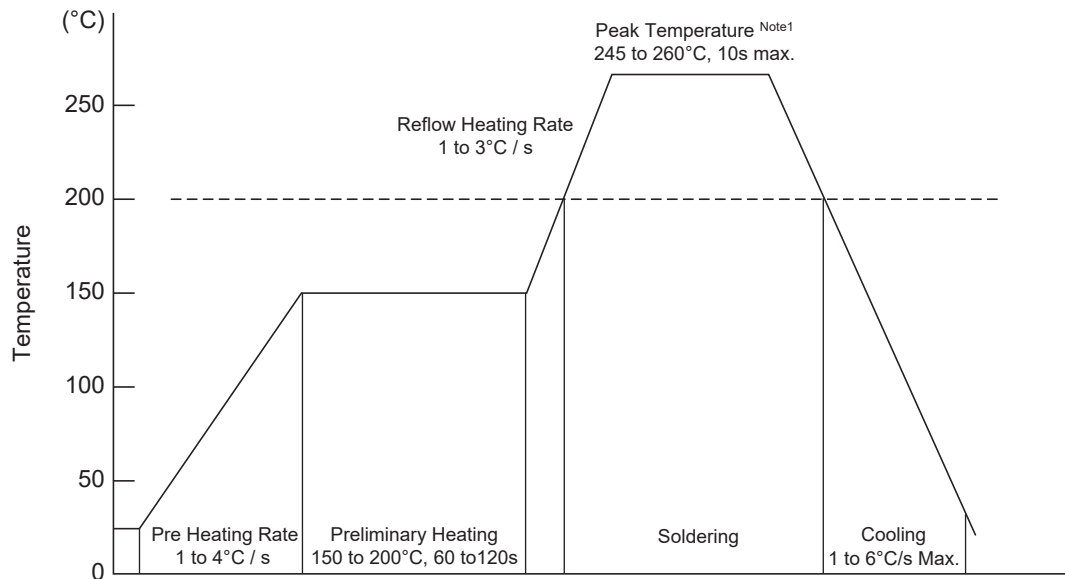
Note:

1. Package Body Sizes Exclude Mold Flash and Gate Burrs
2. Controlling Dimension: In millimeters
3. General Tolerance:  $\pm 0.1\text{mm}$
4. The Pad Layout is for reference purposes only



### Conditions of Soldering and Storage

#### ◆ Recommended condition of Reflow Soldering(Pb-Free Solder)



Recommended peak temperature is over 245°C. If peak temperature is below 245°C, you may adjust the following parameters:

- Time length of peak temperature (longer)
- Time length of soldering (longer)
- Thickness of solder paste (thicker)

Note1:

Maximum thermal excursion allowed during the reflow assembly is as follow:

- Temperature: 255°C~260°C
- Duration at peak soak : 30 seconds
- Number of reflow: 3
- **Conditions of hand soldering** <sup>Note2</sup>

- Temperature: 320±10°C
- Time: 3s max.
- Times: one time

Note2: Not recommended for mass production, an engineering project, or re-work, it is allowed. It should be used with caution

#### ● **Storage conditions**

##### ● **Temperature**

5 to 30°C

##### ● **Humidity**

≤ 60% RH

##### ● **Floor Life**

168 Hours

##### ● **Recommended period**

Five year after manufacturing(Depends on storage conditions)

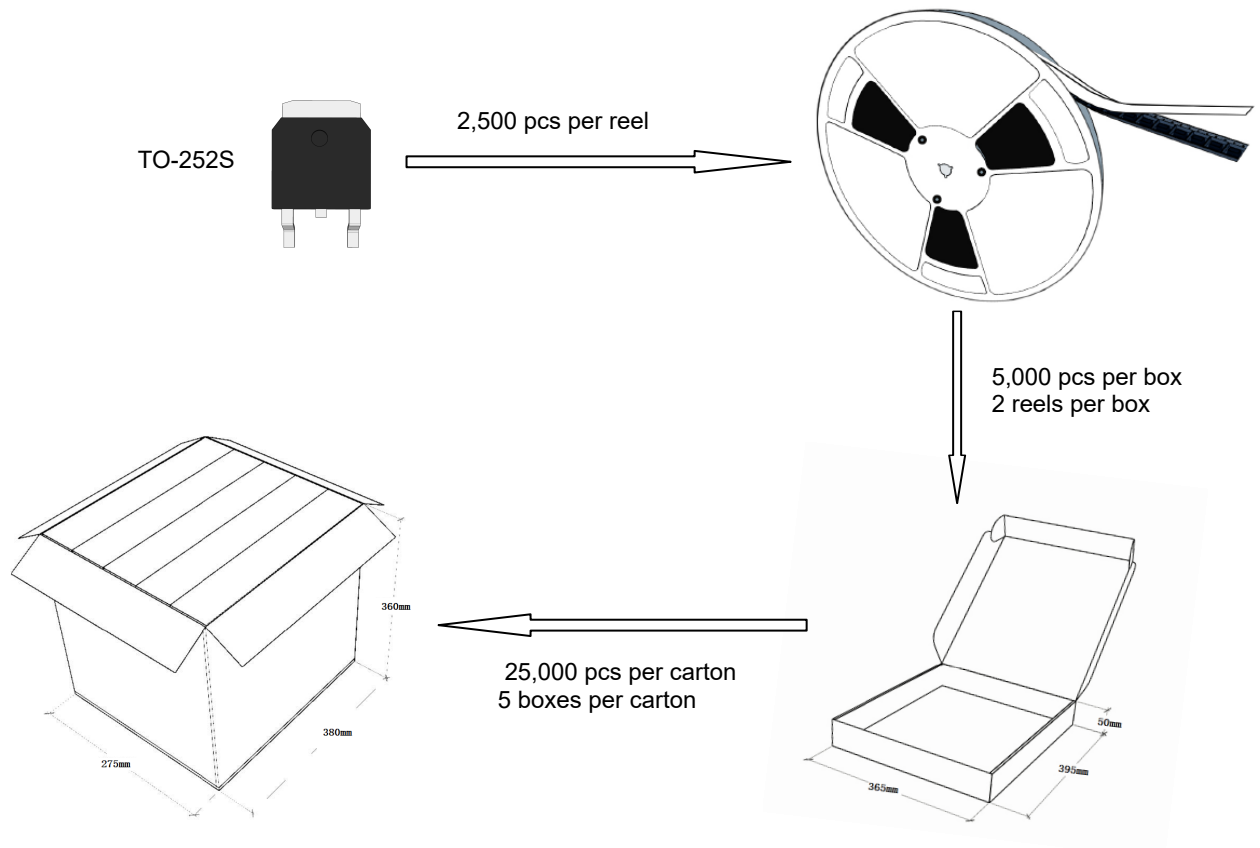


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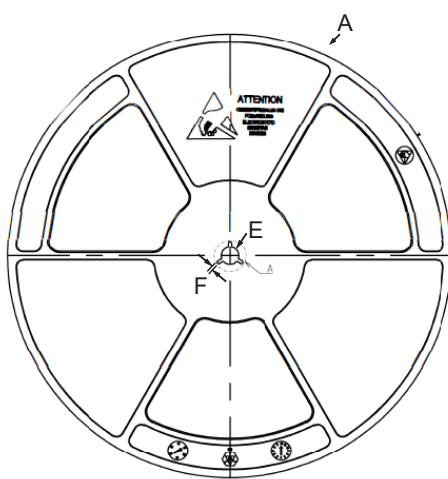
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### Package Specifications

- The method of packaging



### ◆ reel data



| Symbol | Value(unit:mm)      |
|--------|---------------------|
| A      | $\Phi 330.2 \pm 1$  |
| B      | $17 \pm 0.5$        |
| C      | $21.2 \pm 2$        |
| D      | $\Phi 100 \pm 0.5$  |
| E      | $\Phi 13.4 \pm 0.2$ |
| F      | $2.3 \pm 0.2$       |
| T      | $2.1 \pm 0.2$       |

[illegible]