



# STM7821

## N-Channel Enhancement Mode Field Effect Transistor

| PRODUCT SUMMARY  |                |                                |
|------------------|----------------|--------------------------------|
| V <sub>DSS</sub> | I <sub>D</sub> | R <sub>DS(ON)</sub> ( mΩ ) Max |
| 25V              | 10A            | 9.5 @ V <sub>GS</sub> = 10V    |
|                  |                | 20 @ V <sub>GS</sub> = 4.5V    |

### FEATURES

- Super high dense cell design for low R<sub>DS(ON)</sub>.
- Rugged and reliable.
- Surface Mount Package.



### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C unless otherwise noted)

| Parameter  | Symbol                            | Limit      | Unit |
|--|-----------------------------------|------------|------|
| Drain-Source Voltage Rating  | V <sub>spike</sub> <sup>d</sup>   | 30         | V    |
| Drain-Source Voltage   | V <sub>DS</sub>                   | 25         | V    |
| Gate-Source Voltage  | V <sub>GS</sub>                   | ±20        | V    |
| Drain Current-Continuous <sup>a</sup> @ T <sub>c</sub> =25°C<br>-Pulsed <sup>b</sup> | I <sub>D</sub>                    | 10         | A    |
|  | I <sub>DM</sub>                   | 40         | A    |
| Drain-Source Diode Forward Current <sup>a</sup>                                      | I <sub>S</sub>                    | 10         | A    |
| Maximum Power Dissipation <sup>a</sup>   | P <sub>D</sub>                    | 2.5        | W    |
| Operating Junction and Storage Temperature Range                                     | T <sub>J</sub> , T <sub>STG</sub> | -55 to 150 | °C   |

### THERMAL CHARACTERISTICS

|  |                  |    |      |
|--|------------------|----|------|
| Thermal Resistance, Junction-to-Ambient <sup>a</sup> | R <sub>θJA</sub> | 50 | °C/W |
|--|------------------|----|------|

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ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted)

| Parameter                              | Symbol              | Condition   | Min | Typ <sup>c</sup> | Max  | Unit  |
|--|---------------------|---|-----|------------------|------|-------|
| OFF CHARACTERISTICS                    |                     |   |     |                  |      |       |
| Drain-Source Breakdown Voltage         | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA  | 25  |                  |      | V     |
| Zero Gate Voltage Drain Current        | I <sub>DSS</sub>    | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V   |     |                  | 1    | uA    |
| Gate-Body Leakage                      | I <sub>GSS</sub>    | V <sub>GS</sub> = ±20V, V <sub>DS</sub> =0V   |     |                  | ±100 | nA    |
| ON CHARACTERISTICS <sup>b</sup>        |                     |   |     |                  |      |       |
| Gate Threshold Voltage                 | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> = 250uA   | 1   | 1.8              | 3    | V     |
| Drain-Source On-State Resistance       | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> = 9A   |     | 8.5              | 9.5  | m ohm |
|  |                     | V <sub>GS</sub> =4.5V, I <sub>D</sub> = 3A  |     | 14.5             | 20   | m ohm |
| On-State Drain Current                 | I <sub>D(ON)</sub>  | V <sub>DS</sub> = 10V, V <sub>GS</sub> = 10V  | 30  |                  |      | A     |
| Forward Transconductance               | g <sub>FS</sub>     | V <sub>DS</sub> = 10V, I <sub>D</sub> =9A   |     | 13               |      | S     |
| DYNAMIC CHARACTERISTICS <sup>c</sup>   |                     |   |     |                  |      |       |
| Input Capacitance                      | C <sub>ISS</sub>    | V <sub>DS</sub> =15V, V <sub>GS</sub> = 0V<br>f=1.0MHz  |     | 1480             |      | pF    |
| Output Capacitance                     | C <sub>OSS</sub>    |   |     | 435              |      | pF    |
| Reverse Transfer Capacitance           | C <sub>RSS</sub>    |   |     | 275              |      | pF    |
| SWITCHING CHARACTERISTICS <sup>c</sup> |                     |   |     |                  |      |       |
| Turn-On Delay Time                     | t <sub>D(ON)</sub>  | V <sub>DD</sub> = 15V<br>I <sub>D</sub> = 1A<br>V <sub>GS</sub> = 10V<br>R <sub>GEN</sub> = 6 ohm |     | 29.5             |      | ns    |
| Rise Time                              | t <sub>r</sub>      |   |     | 9                |      | ns    |
| Turn-Off Delay Time                    | t <sub>D(OFF)</sub> |   |     | 48.2             |      | ns    |
| Fall Time                              | t <sub>f</sub>      |   |     | 27.8             |      | ns    |
| Total Gate Charge                      | Q <sub>g</sub>      | V <sub>DS</sub> =15V, I <sub>D</sub> = 9A, V <sub>GS</sub> =10V                                   |     | 30.5             |      | nC    |
|  |                     | V <sub>DS</sub> =15V, I <sub>D</sub> = 9A, V <sub>GS</sub> =4.5V                                  |     | 15.3             |      | nC    |
| Gate-Source Charge                     | Q <sub>gs</sub>     | V <sub>DS</sub> =15V, I <sub>D</sub> = 9A<br>V <sub>GS</sub> =10V                                 |     | 6.5              |      | nC    |
| Gate-Drain Charge                      | Q <sub>gd</sub>     |   |     | 6.7              |      | nC    |

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## ELECTRICAL CHARACTERISTICS ( $T_A=25^{\circ}\text{C}$ unless otherwise noted)

| Parameter   | Symbol   | Condition                | Min | Typ <sup>c</sup> | Max | Unit |
|---|----------|--------------------------|-----|------------------|-----|------|
| <b>DRAIN-SOURCE DIODE CHARACTERISTICS<sup>b</sup></b> |          |                          |     |                  |     |      |
| Diode Forward Voltage                                 | $V_{SD}$ | $V_{GS} = 0V, I_s = 10A$ |     | 0.845            | 1.2 | V    |

### Notes

- a. Surface Mounted on FR4 Board,  $t \leq 10\text{sec}$ .
- b. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
- c. Guaranteed by design, not subject to production testing.
- d. Guaranteed when external  $R_g=6\text{ ohm}$  and  $t_f < t_{f\text{ max}}$

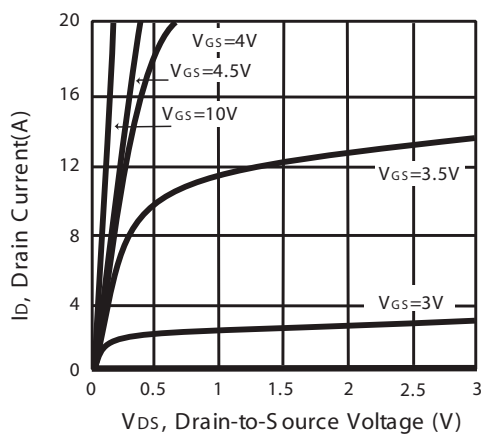


Figure 1. Output Characteristics

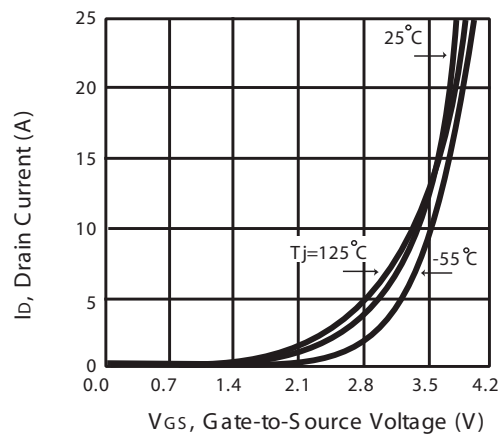


Figure 2. Transfer Characteristics

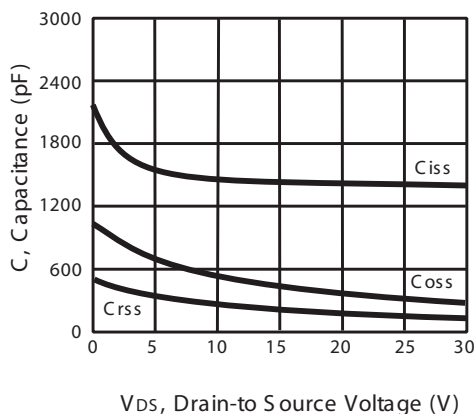


Figure 3. Capacitance

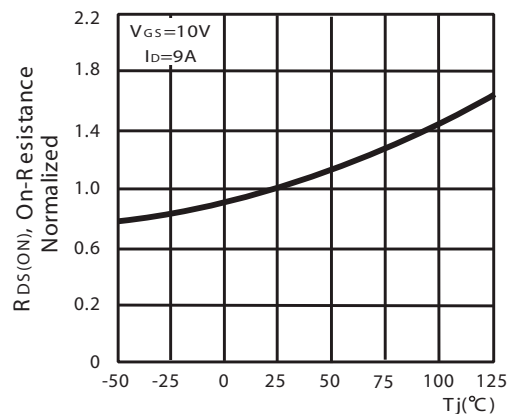
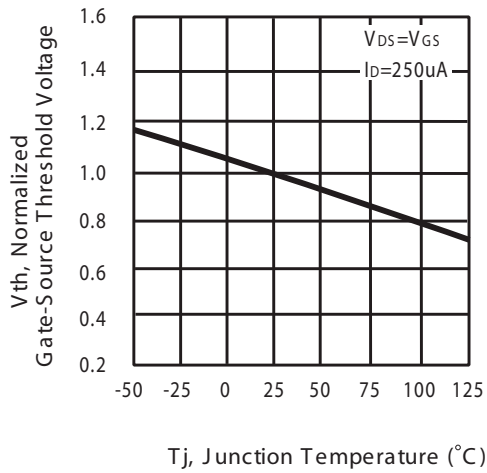


Figure 4. On-Resistance Variation with Temperature

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with Temperature

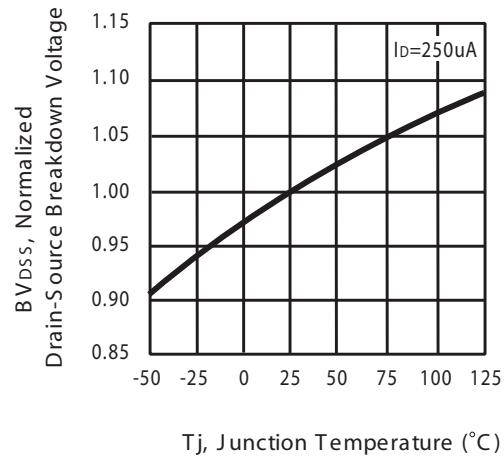


Figure 6. Breakdown Voltage Variation with Temperature

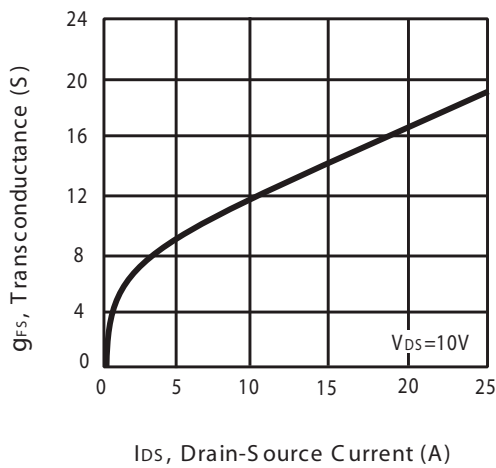


Figure 7. Transconductance Variation with Drain Current

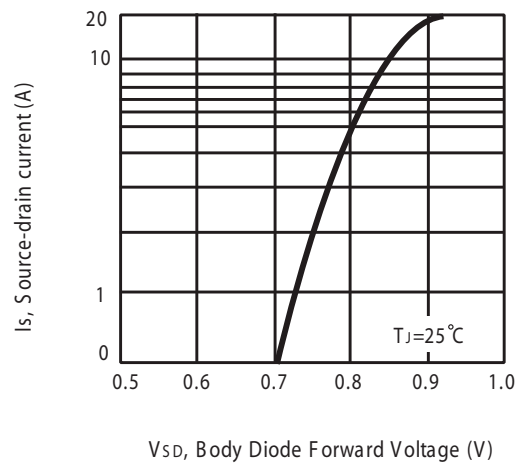


Figure 8. Body Diode Forward Voltage Variation with Source Current

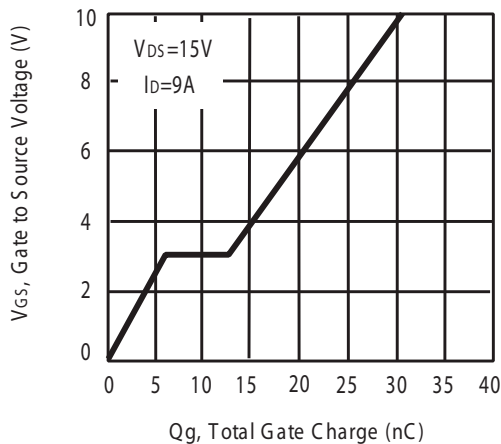


Figure 9. Gate Charge

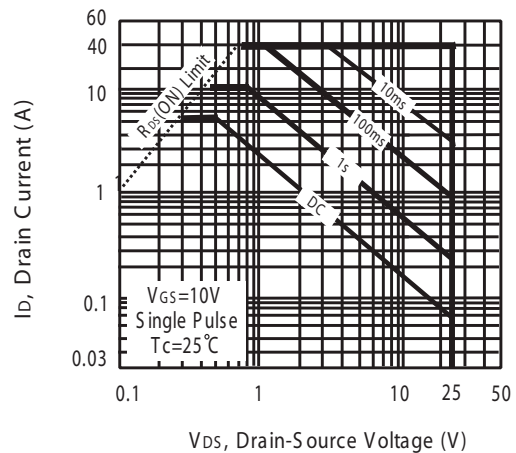


Figure 10. Maximum Safe Operating Area

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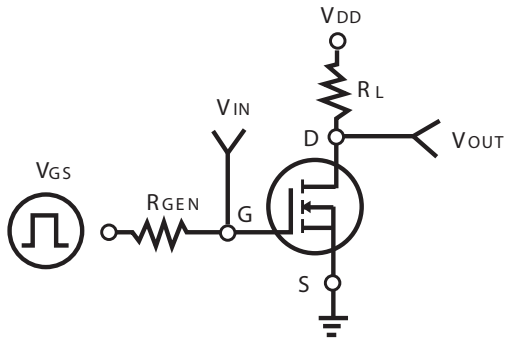


Figure 11. Switching Test Circuit

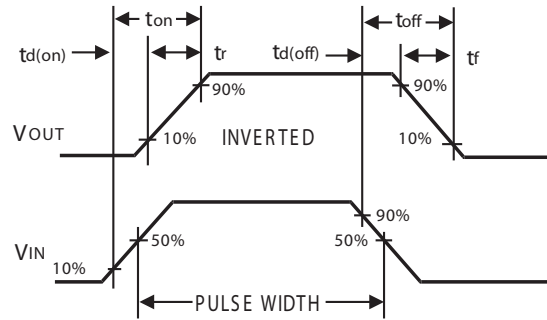


Figure 12. S switching Waveforms

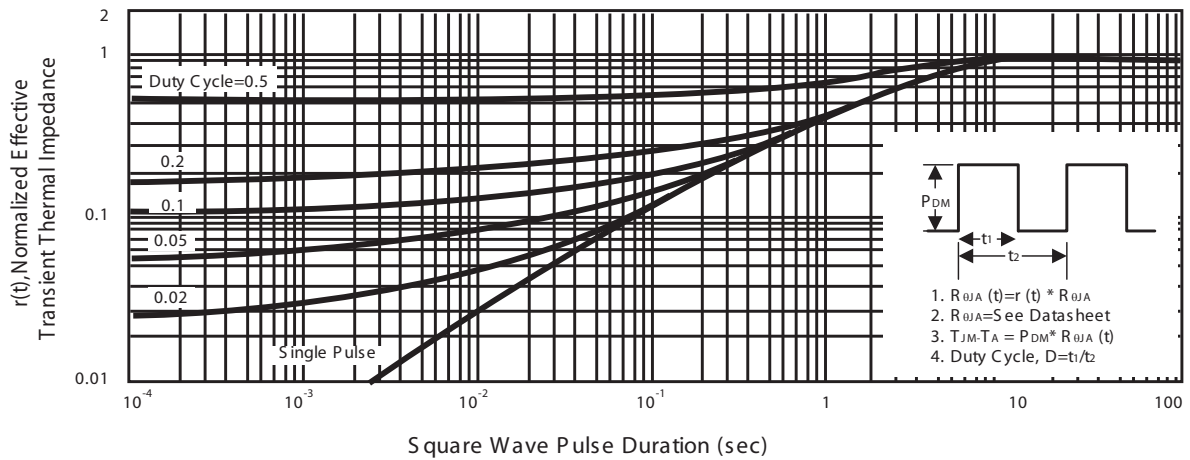
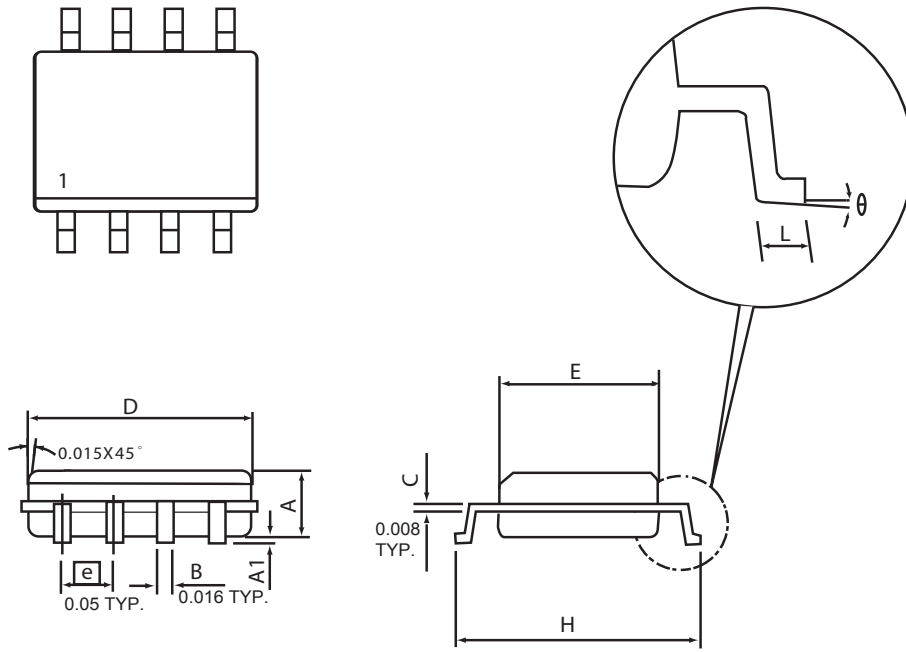


Figure 13. Normalized Thermal Transient Impedance Curve

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## PACKAGE OUTLINE DIMENSIONS

SO-8

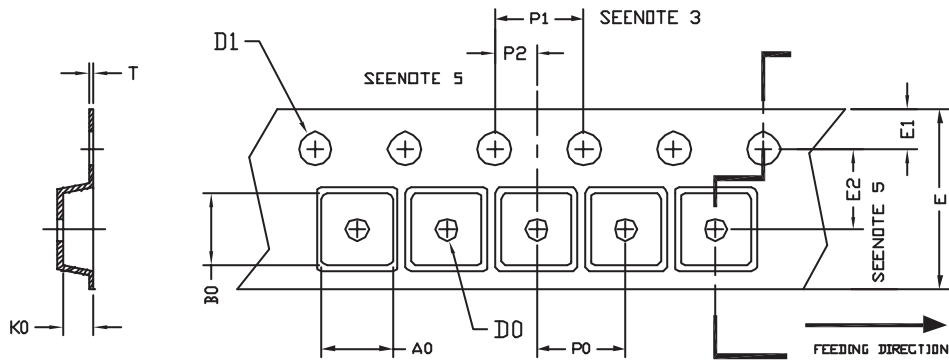


| SYMBOLS  | MILLIMETERS |      | INCHES |       |
|----------|-------------|------|--------|-------|
|          | MIN         | MAX  | MIN    | MAX   |
| A        | 1.35        | 1.75 | 0.053  | 0.069 |
| A1       | 0.10        | 0.25 | 0.004  | 0.010 |
| D        | 4.80        | 4.98 | 0.189  | 0.196 |
| E        | 3.81        | 3.99 | 0.150  | 0.157 |
| H        | 5.79        | 6.20 | 0.228  | 0.244 |
| L        | 0.41        | 1.27 | 0.016  | 0.050 |
| $\theta$ | 0°          | 8°   | 0°     | 8°    |

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## SO-8 Tape and Reel Data

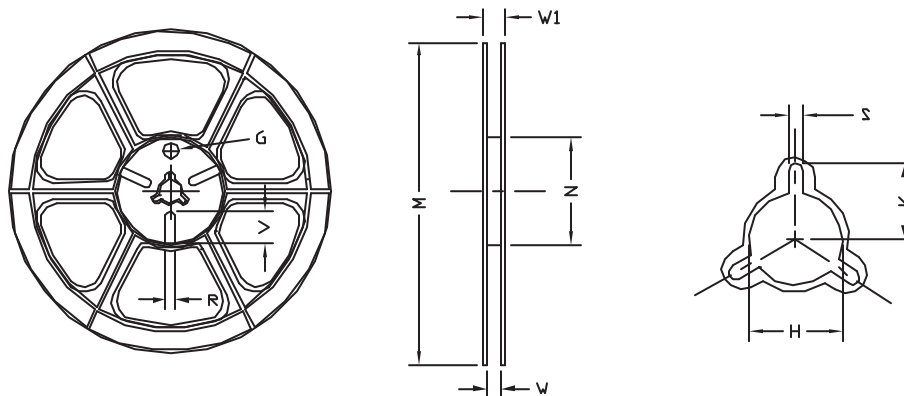
### SO-8 Carrier Tape



unit:mm

| PACKAGE          | A0   | B0   | K0   | D0                  | D1                           | E                 | E1   | E2                | P0  | P1  | P2                | T                 |
|------------------|------|------|------|---------------------|------------------------------|-------------------|------|-------------------|-----|-----|-------------------|-------------------|
| SOP 8N<br>150mil | 6.40 | 5.20 | 2.10 | $\phi$ 1.5<br>(MIN) | $\phi$ 1.5<br>+ 0.1<br>- 0.0 | 12.0<br>$\pm$ 0.3 | 1.75 | 5.5<br>$\pm$ 0.05 | 8.0 | 4.0 | 2.0<br>$\pm$ 0.05 | 0.3<br>$\pm$ 0.05 |

### SO-8 Reel



UNIT:mm

| TAPE SIZE | REEL SIZE  | M              | N               | W             | W1            | H                      | K   | S                 | G   | R   | V   |
|-----------|------------|----------------|-----------------|---------------|---------------|------------------------|-----|-------------------|-----|-----|-----|
| 12 mm     | $\phi$ 330 | 330<br>$\pm$ 1 | 62<br>$\pm$ 1.5 | 12.4<br>+ 0.2 | 16.8<br>- 0.4 | $\phi$ 12.75<br>+ 0.15 | --- | 2.0<br>$\pm$ 0.15 | --- | --- | --- |