

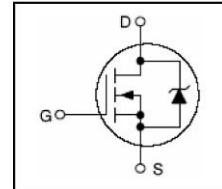
## N-Channel Enhancement Mode Field Effect Transistor

### Features

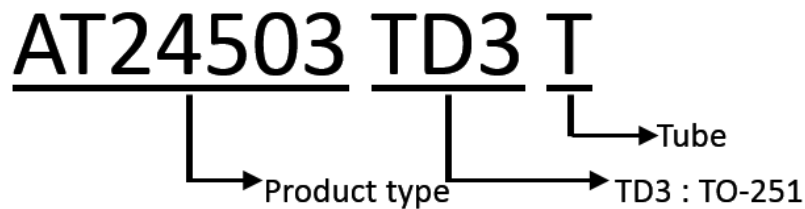
|               |              |       |
|---------------|--------------|-------|
| $V_{(BR)DSS}$ | $R_{DS(ON)}$ | $I_D$ |
| 400V          | 2.8Ω         | 3A    |

### Application

- High efficiency switch mode power supplies
- Electronic lamp ballasts based on half bridge
- UPS



### Order information:



### ABSOLUTE MAXIMUM RATINGS

| PARAMETERS/TEST CONDITIONS  | SYMBOL         | LIMITS     | UNITS |
|---|----------------|------------|-------|
| Drain-Source Voltage  | $V_{DS}$       | 400        | V     |
| Drain Current –continuous @25°C   | $I_D$          | 3          | A     |
| Drain Current –continuous @100°C  | $I_D$          | 1.8        | A     |
| Pulsed Drain Current <sup>1</sup>                                       | $I_{DM}$       | 12         | A     |
| Gate-Source Voltage   | $V_{GS}$       | ±30        | V     |
| Single Pulse Avalanche <sup>2</sup>                                     | $E_{AS}$       | 45         | mJ    |
| Pulsed Avalanche Rating <sup>2</sup>                                    | $I_{AS}$       | 3          | A     |
| Operating Junction & Storage Temperature                                | $T_j, T_{stg}$ | -55 to 150 | °C    |
| Lead Temperature ( <sup>1</sup> / <sub>16</sub> " from case for 10sec.) | $T_L$          | 300        | °C    |

### Note:

1. Pulse width limited by maximum junction temperature.
2.  $V_{DD} = 50V, V_{DS} = 400V, R_G = 25 \Omega, T_J: 25^\circ C$

## N-Channel Enhancement Mode Field Effect Transistor

### ELECTRICAL CHARACTERISTICS

| PARAMETER   | SYMBOL          | TEST CONDITIONS                                 | LIMITS |     |           | UNIT         |
|---|-----------------|---|--------|-----|-----------|--------------|
|   |                 |   | MIN    | TYP | MAX       |              |
| <b>STATIC</b>   |                 |   |        |     |           |              |
| Drain-Source Breakdown Voltage  | $V_{(BR)DSS}$   | $V_{GS} = 0V, I_D = 250\mu A$                   | 400    |     |           | V            |
| Gate Threshold Voltage  | $V_{GS(th)}$    | $V_{DS} = V_{GS}, I_D = 250\mu A$               | 3.0    |     | 4.5       |              |
| Gate-Body Leakage   | $I_{GSS}$       | $V_{DS} = 0V, V_{GS} = \pm 30V$                 |        |     | $\pm 100$ | nA           |
| Zero Gate Voltage Drain Current   | $I_{DSS}$       | $V_{DS} = 400V, V_{GS} = 0V$                    |        |     | 1         | $\mu A$      |
|   |                 | $V_{DS} = 400V, V_{GS} = 0V, T_J = 150^\circ C$ |        |     | 10        |              |
| On-State Drain Current  | $R_{DS(ON)}$    | $V_{GS} = 10V, I_D = 1.5A$                      |        | 2.8 | 3.5       | $\Omega$     |
| Forward Transconductance  | $G_{FS}$        | $V_{DS} = 40V, I_D = 1.5A$                      |        | 2.5 |           | S            |
| <b>DYNAMIC</b>  |                 |   |        |     |           |              |
| Input Capacitance   | $C_{iss}$       | $V_{GS} = 0V, V_{DS} = 25V, f = 1MHz$           |        | 175 |           | pF           |
| Output Capacitance  | $C_{oss}$       |   |        | 34  |           |              |
| Reverse Transfer Capacitance  | $C_{rss}$       |   |        | 11  |           |              |
| Total Gate Charge   | $Q_g$           | $V_{DD} = 400V, I_D = 3A, V_{GS} = 10V$         |        | 8.0 |           | nC           |
| Gate-Source Charge  | $Q_{gs}$        |   |        | 2.9 |           |              |
| Gate-Drain Charge   | $Q_{gd}$        |   |        | 3.9 |           |              |
| <b>SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (<math>T_C = 25^\circ C</math>)</b> |                 |   |        |     |           |              |
| Continuous Current  | $I_S$           |   |        |     | 3         | A            |
| Forward Voltage   | $V_{SD}$        | $I_F = I_S, V_{GS} = 0V$                        |        |     | 1.5       | V            |
| Reverse Recovery Time   | $t_{rr}$        | $I_S = 3A, di_F/dt = 100A / \mu S$              |        | 170 |           | nS           |
| Reverse Recovery Charge   | $Q_{rr}$        | $V_{GS} = 0V$                                   |        | 845 |           | nC           |
| <b>THERMAL DATA</b>   |                 |   |        |     |           |              |
| Thermal Resistance Junction to Case   | $R_{\theta JC}$ | AT24503 (TO-251)                                |        |     | 3.5       | $^\circ C/W$ |
| Thermal Resistance Junction to Ambient  | $R_{\theta JA}$ | AT24503 (TO-251)                                |        |     | 100       | $^\circ C/W$ |

## N-Channel Enhancement Mode Field Effect Transistor

### Typical Characteristics

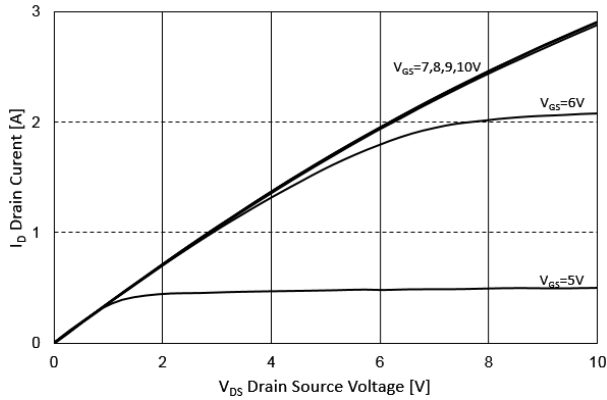


Figure 1. On-Region Characteristics

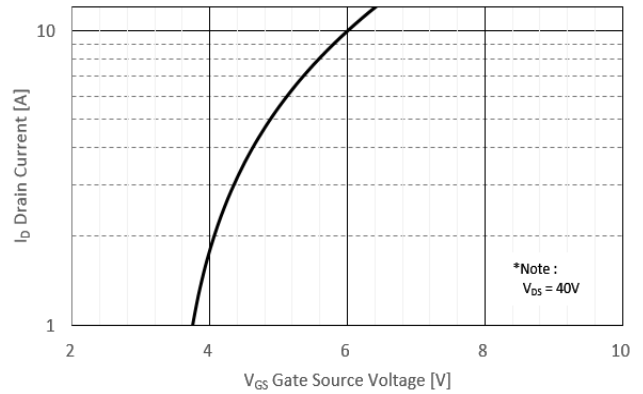


Figure 2.  $G_{FS}$  Characteristics

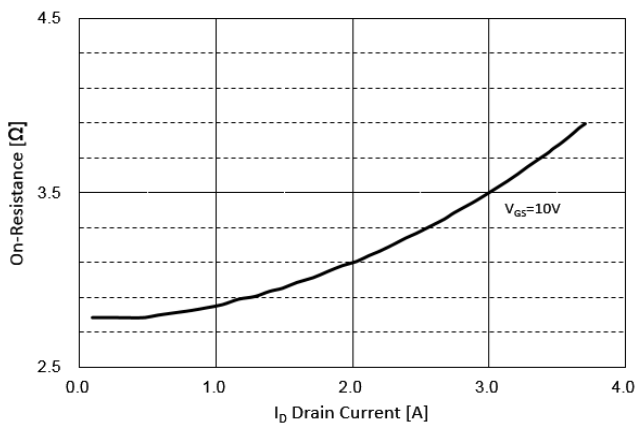


Figure 3. On-Resistance Variation vs Drain Current

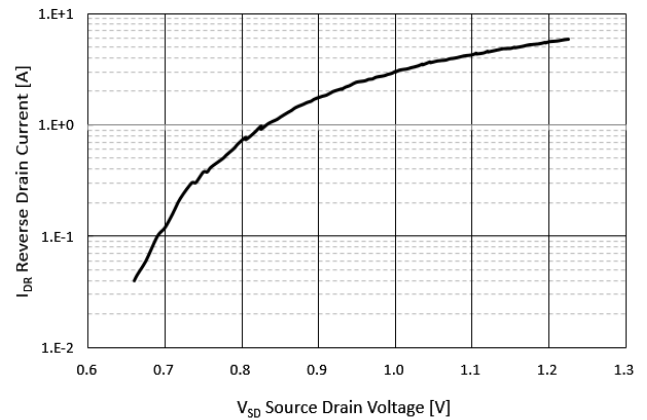


Figure 4. Body diode Forward Voltage

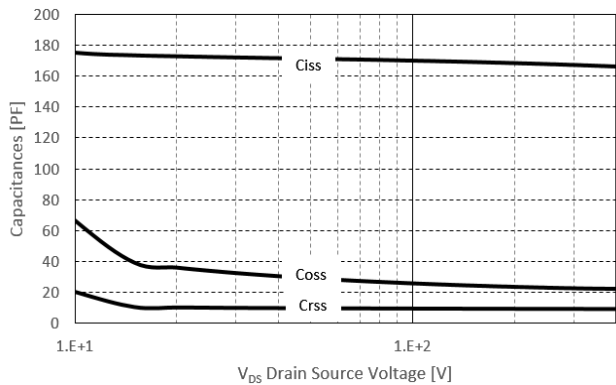


Figure 5. Capacitance Characteristics

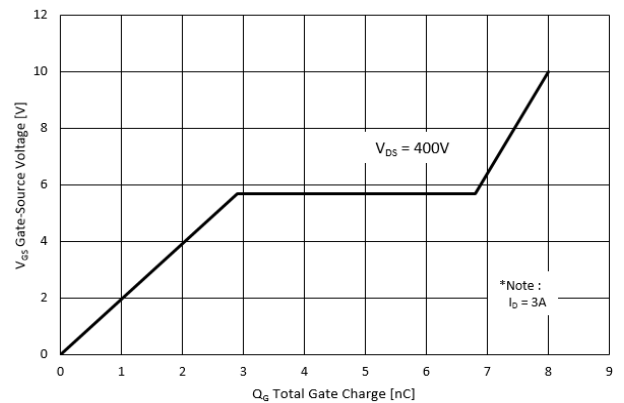
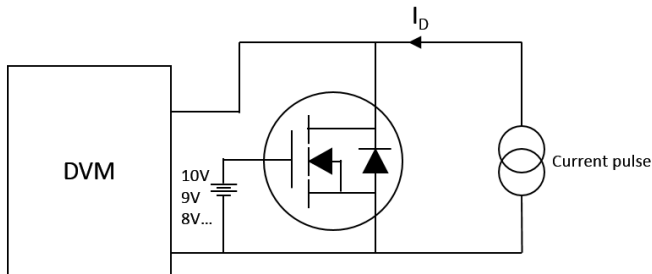


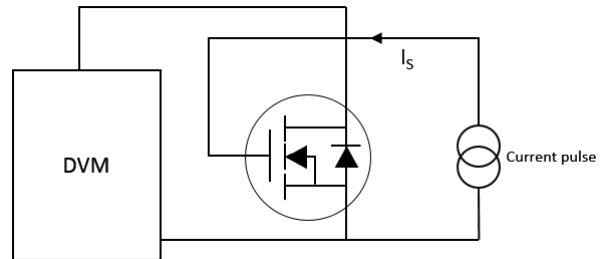
Figure 6. Gate Charge Characteristics

## N-Channel Enhancement Mode Field Effect Transistor

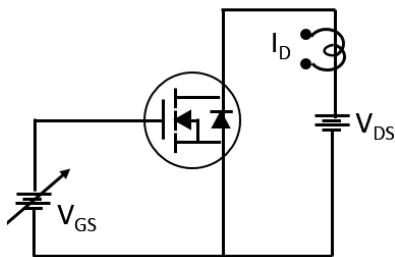
**On-Region Characteristics Test Circuit**



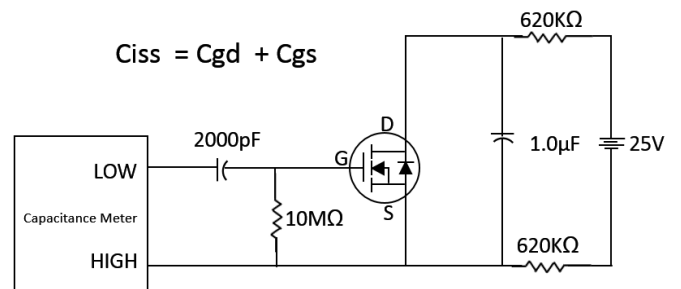
**$V_{SD}$  Characteristics Test Circuit**



**$G_{FS}$  Characteristics Test Circuit**

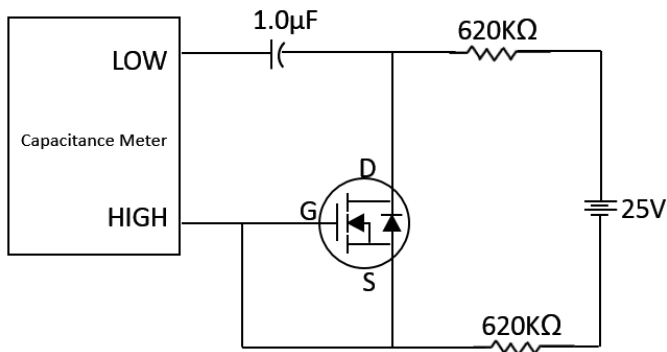


**Input Capacitance Characteristics Test Circuit**



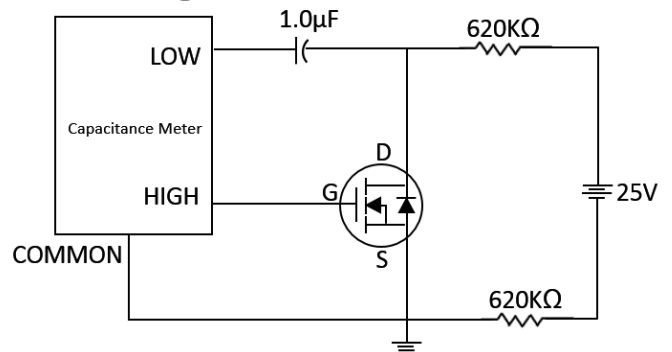
**Output Capacitance Characteristics Test Circuit**

$$C_{oss} = C_{gd} + C_{ds}$$



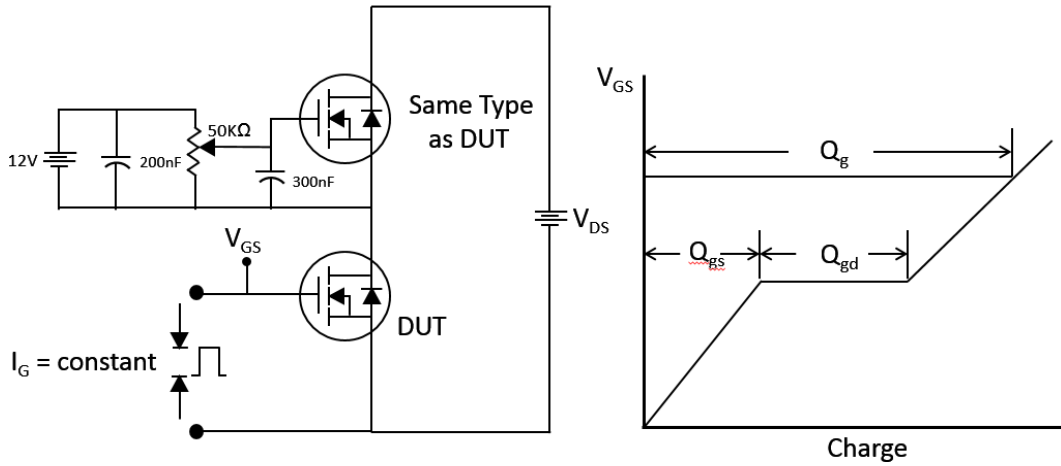
**Reverse Capacitance Characteristics Test Circuit**

$$C_{rss} = C_{gd}$$

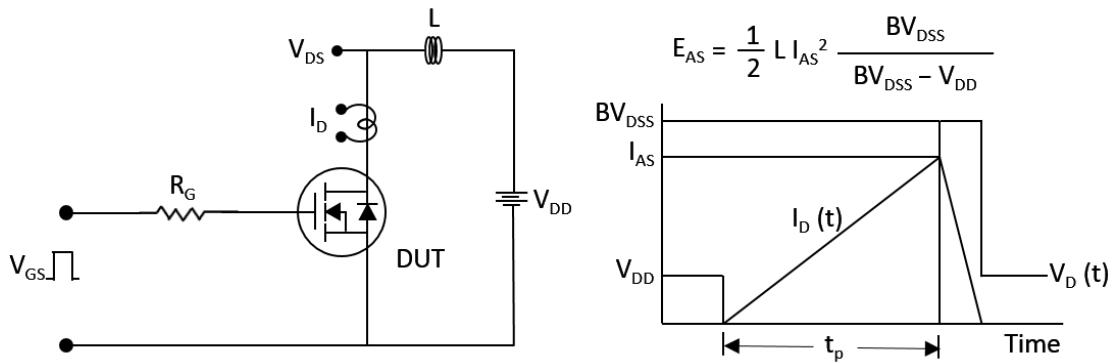


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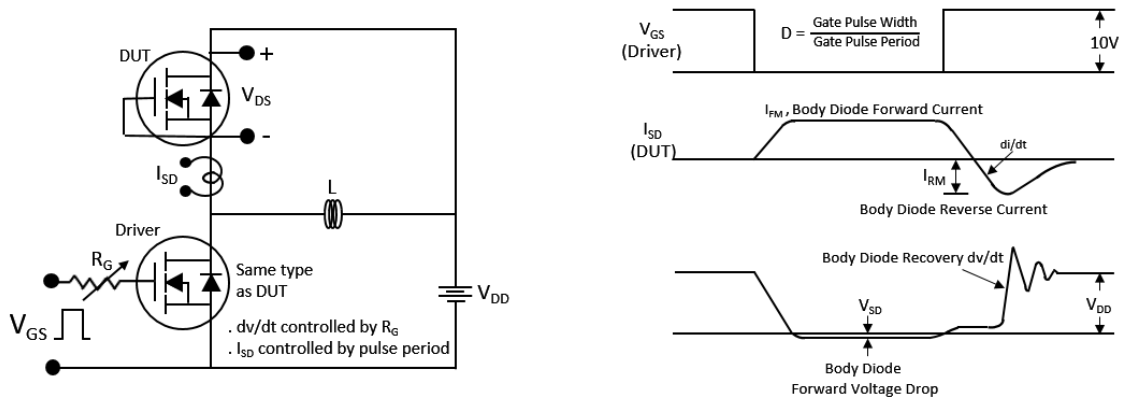
### Gate Charge Characteristics Test Circuit



### Avalanche Characteristics Test Circuit



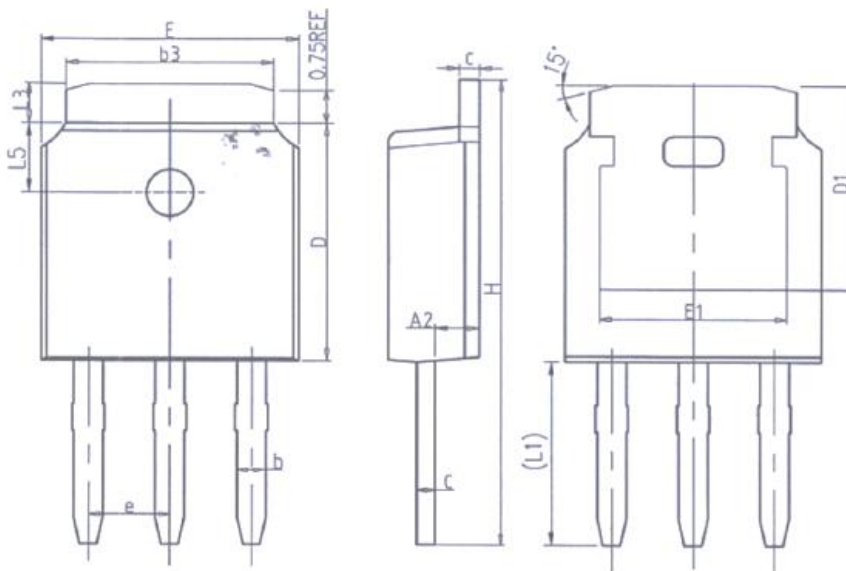
### Diode Reverse recovery Characteristics Test Circuit



## N-Channel Enhancement Mode Field Effect Transistor

### Mechanical Dimensions

### TO-251



| SYMBOL | MM       |       |       |
|--------|----------|-------|-------|
|        | MIN      | NOM   | MAX   |
| A      | 2.20     | 2.30  | 2.40  |
| A2     | 0.97     | 1.07  | 1.17  |
| b      | 0.68     | 0.78  | 0.90  |
| b3     | 5.20     | 5.33  | 5.50  |
| c      | 0.43     | 0.53  | 0.63  |
| D      | 5.98     | 6.10  | 6.22  |
| D1     | 5.30REF  |       |       |
| E      | 6.40     | 6.60  | 6.80  |
| E1     | 4.63     | -     | -     |
| e      | 2.286BSC |       |       |
| H      | 10.00    | 11.22 | 11.44 |
| L1     | 3.90     | 4.10  | 4.30  |
| L3     | 0.88     | 1.02  | 1.28  |
| L5     | 1.65     | 1.80  | 1.95  |