

## 1.Features

- $V_{DS(V)}=30V$
- $R_{DS(ON)}<27m\Omega(V_{GS}=5V)$
- Power Supplies
- Inductive Loads
- PWM Motor Controls

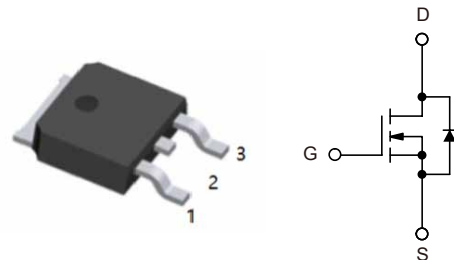
## 2.Applications

- SPICE Parameters Available
- Diode is Characterized for use in Bridge Circuits
- Ultra-Low  $R_{DS(ON)}$ , Single Base, Advanced Technology
- High Avalanche Energy Specified
- $IDSS$  and  $V_{(on)}$  Specified at Elevated Temperatures

## 3.Pinning information

| Pin | Symbol | Description |
|-----|--------|-------------|
| 1   | G      | GATE        |
| 2   | D      | SOURCE      |
| 3   | S      | DRAIN       |

TO-252(DPAK)  
top view



## 4.Absolute Maximum Ratings $T_c=25^{\circ}C$

| Parameter                                      | Symbol    | Rating   | Units |
|------------------------------------------------|-----------|----------|-------|
| Drain-to-Source Voltage                        | $V_{DSS}$ | 30       | Vdc   |
| Drain-to-Gate Voltage ( $R_{GS}=1M\Omega$ )    | $V_{DGR}$ | 30       | Vdc   |
| Gate-to-Source Voltage - Continuous            | $V_{GS}$  | $\pm 20$ | Vdc   |
| - Non-Repetitive ( $t_p \leq 10$ ms)           | $V_{GS}$  | $\pm 24$ | Vdc   |
| Drain Current - Continuous @ $T_A=25^{\circ}C$ | $I_D$     | 20       | Adc   |
| - Continuous @ $T_A=100^{\circ}C$              | $I_D$     | 16       | Adc   |
| - Single Pulse ( $t_p \leq 10$ $\mu s$ )       | $I_{DM}$  | 60       | Apk   |



|                                                                                                                                                                                                          |                 |            |                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|-----------------------|
| Total Power Dissipation @ $T_A=25^{\circ}\text{C}$                                                                                                                                                       | $P_D$           | 74         | W                     |
| Derate above $25^{\circ}\text{C}$                                                                                                                                                                        |                 | 0.6        | W/ $^{\circ}\text{C}$ |
| Total Power Dissipation @ $T_C=25^{\circ}\text{C}$ (Note 1)                                                                                                                                              |                 | 1.75       | W                     |
| Storage Temperature Range                                                                                                                                                                                | $T_J, T_{STG}$  | -55 to 150 | $^{\circ}\text{C}$    |
| Single Pulse Drain-to-Source Avalanche<br>Energy-Starting $T_J=25^{\circ}\text{C}$<br>( $V_{DD}=30\text{Vdc}$ , $V_{GS}=5\text{Vdc}$ , $I_{L(pk)}=24\text{A}$ , $L=1\text{mH}$ , $V_{DS}=34\text{Vdc}$ ) | $E_{AS}$        | 288        | mJ                    |
| Thermal Resistance-Junction-to-Case                                                                                                                                                                      | $R_{\theta JC}$ | 1.67       | $^{\circ}\text{C/W}$  |
| -Junction-to-Ambient                                                                                                                                                                                     | $R_{\theta JA}$ | 100        | $^{\circ}\text{C/W}$  |
| -Junction-to-Ambient (Note 1)                                                                                                                                                                            | $R_{\theta JA}$ | 71.4       | $^{\circ}\text{C/W}$  |
| Maximum Lead Temperature for Soldering Purposes,<br>1/8 in. from case for 10 seconds                                                                                                                     | $T_L$           | 260        | $^{\circ}\text{C}$    |

## Notes:

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. When surface mounted to an FR4 board using the minimum recommended pad size and repetitive rating; pulse width limited by maximum junction temperature.



## 5. Electrical Characteristics @ $T_c = 25^\circ\text{C}$ (unless otherwise specified)

| Parameter                                                                        | Symbol        | Conditions                                                         | Min | Typ  | Max       | Units     |
|----------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------|-----|------|-----------|-----------|
| OFF CHARACTERISTICS                                                              |               |                                                                    |     |      |           |           |
| Drain-to-Source Breakdown Voltage<br>(Temperature Coefficient Positive) (Note 2) | $V_{(BR)DSS}$ | $V_{GS}=0Vdc, I_D=250\mu Adc$                                      | 30  |      |           | Vdc       |
|                                                                                  |               |                                                                    |     | 43   |           | mV/°C     |
| Zero Gate Voltage Drain Current                                                  | $I_{DSS}$     | $V_{DS}=30Vdc, V_{GS}=0Vdc$                                        |     |      | 10        | $\mu Adc$ |
|                                                                                  |               | $V_{DS}=30Vdc, V_{GS}=0Vdc, T_J=150^{\circ}C$                      |     |      | 100       | $\mu Adc$ |
| Gate-Body Leakage Current                                                        | $I_{GSS}$     | $V_{GS}=\pm 20Vdc, V_{DS}=0Vdc$                                    |     |      | $\pm 100$ | nAdc      |
| ON CHARACTERISTICS                                                               |               |                                                                    |     |      |           |           |
| Gate Threshold Voltage (Note 2)                                                  | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=250\mu Adc$                                    | 1   | 1.7  | 2.5       | Vdc       |
| Threshold Temperature Coefficient                                                |               |                                                                    |     | 5    |           | mV/°C     |
| Static Drain-to-Source<br>On-Voltage (Note 2)                                    | $R_{DS(ON)}$  | $V_{GS}=4Vdc, I_D=10Adc$                                           |     | 28   | 31        | mΩ        |
|                                                                                  |               | $V_{GS}=5Vdc, I_D=10Adc$                                           |     | 23   | 27        | mΩ        |
| Static Drain-to-Source<br>On-Voltage (Note 2)                                    | $V_{DS(ON)}$  | $V_{GS}=5Vdc, I_D=20Adc$                                           |     | 0.48 | 0.54      | Vdc       |
|                                                                                  |               | $V_{DS}=5Vdc, I_D=10Adc, T_J=150^{\circ}C$                         |     | 0.4  |           | Vdc       |
| Forward Transconductance (Note 2)                                                | $g_{FS}$      | $V_{DS}=5Vdc, I_D=10Adc$                                           |     | 21   |           | Mhos      |
| DYNAMIC CHARACTERISTICS                                                          |               |                                                                    |     |      |           |           |
| Input Capacitance                                                                | $C_{iss}$     | $V_{DS}=25Vdc, V_{GS}=0Vdc$<br>$f=1MHz$                            |     | 1005 | 1260      | pF        |
| Output Capacitance                                                               | $C_{oss}$     |                                                                    |     | 271  | 420       | pF        |
| Transfer Capacitance                                                             | $C_{rss}$     |                                                                    |     | 87   | 112       | pF        |
| SWITCHING CHARACTERISTICS                                                        |               |                                                                    |     |      |           |           |
| Turn-On Delay Time                                                               | $t_{D(on)}$   | $V_{DD}=20Vdc, I_D=20Adc$<br>$V_{GS}=5Vdc, R_G=9.1\Omega$ (Note 2) |     | 17   | 25        | ns        |
| Rise Time                                                                        | $t_r$         |                                                                    |     | 137  | 160       | ns        |
| Turn-Off Delay Time                                                              | $t_{D(off)}$  |                                                                    |     | 38   | 45        | ns        |
| Fall Time                                                                        | $t_f$         |                                                                    |     | 31   | 40        | ns        |
| Gate Charge                                                                      | $Q_T$         | $V_{DS}=48Vdc, I_D=15Adc$<br>$V_{GS}=10Vdc$ (Note 2)               |     | 13.8 | 18.9      | nC        |
|                                                                                  | $Q_1$         |                                                                    |     | 2.8  |           | nC        |
|                                                                                  | $Q_2$         |                                                                    |     | 6.6  |           | nC        |



| DRAIN-SOURCE DIODE CHARACTERISTICS |                 |                                                                                                |  |       |      |                 |
|------------------------------------|-----------------|------------------------------------------------------------------------------------------------|--|-------|------|-----------------|
| Forward On-Voltage                 | V <sub>SD</sub> | I <sub>S</sub> =20A <sub>dc</sub> , V <sub>GS</sub> =0V(Note 2)                                |  | 1     | 1.15 | V <sub>dc</sub> |
|                                    |                 | I <sub>S</sub> =20A <sub>dc</sub> , V <sub>GS</sub> =0V, T <sub>J</sub> =125°C                 |  | 0.9   |      | V <sub>dc</sub> |
| Reverse Recovery Time              | t <sub>rr</sub> | I <sub>S</sub> =15A, dI <sub>S</sub> /dt=100 A/μs(Note 2)<br>V <sub>GS</sub> =0V <sub>dc</sub> |  | 23    |      | ns              |
|                                    | t <sub>a</sub>  |                                                                                                |  | 13    |      | ns              |
|                                    | t <sub>b</sub>  |                                                                                                |  | 10    |      | ns              |
| Reverse Recovery Stored Charge     | Q <sub>rr</sub> |                                                                                                |  | 0.017 |      | μC              |

- Notes:
- Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.
2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperature.



## 6.1 Typical Characteristics

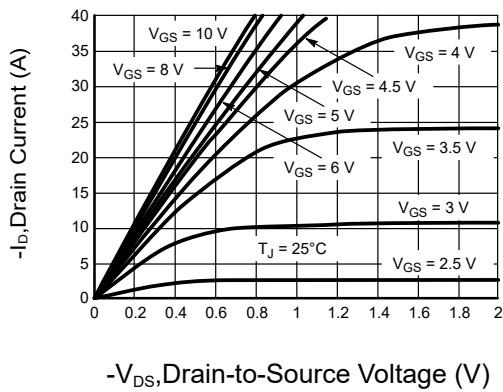


Figure 1: Output Characteristics

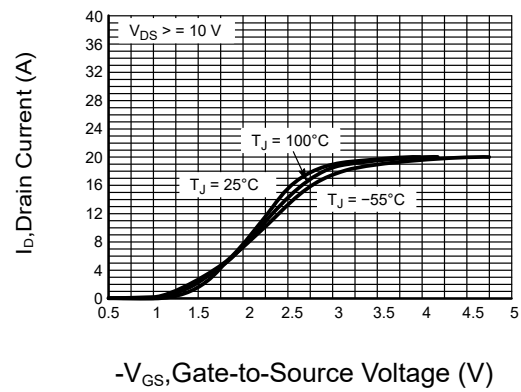


Figure 2: Transfer Characteristics

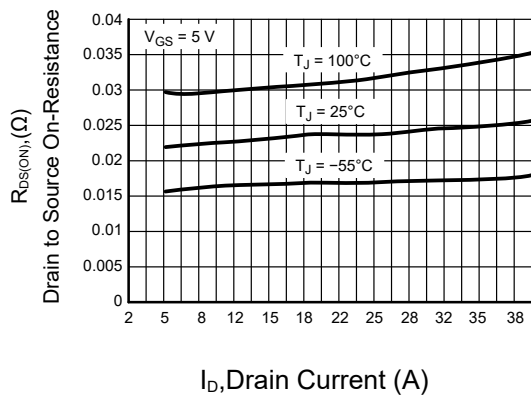


Figure 3: On-Resistance vs. Drain Current and Temperature

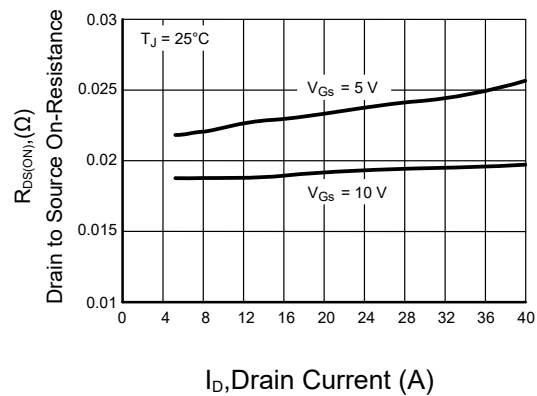


Figure 4: On-Resistance vs. Drain Current and Gate Voltage

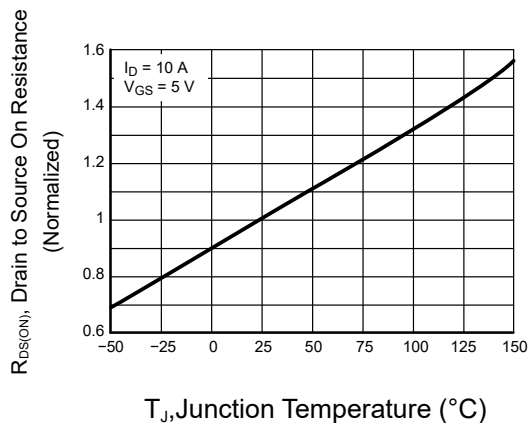


Figure 5: On-Resistance Variation with Temperature

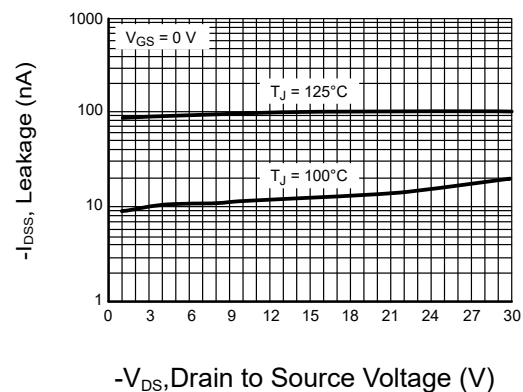
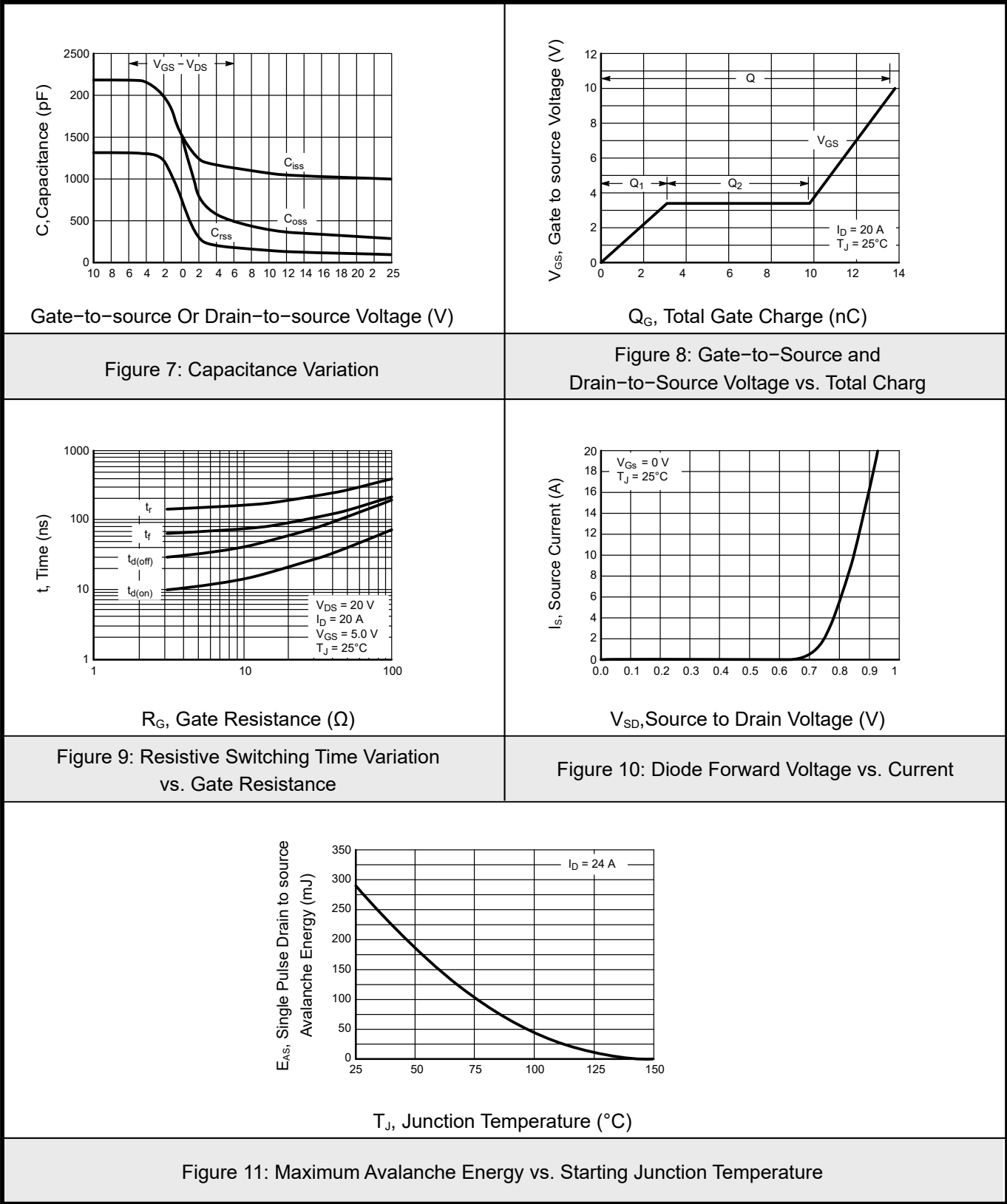


Figure 6: Drain-to-Source Leakage Current vs. Voltage

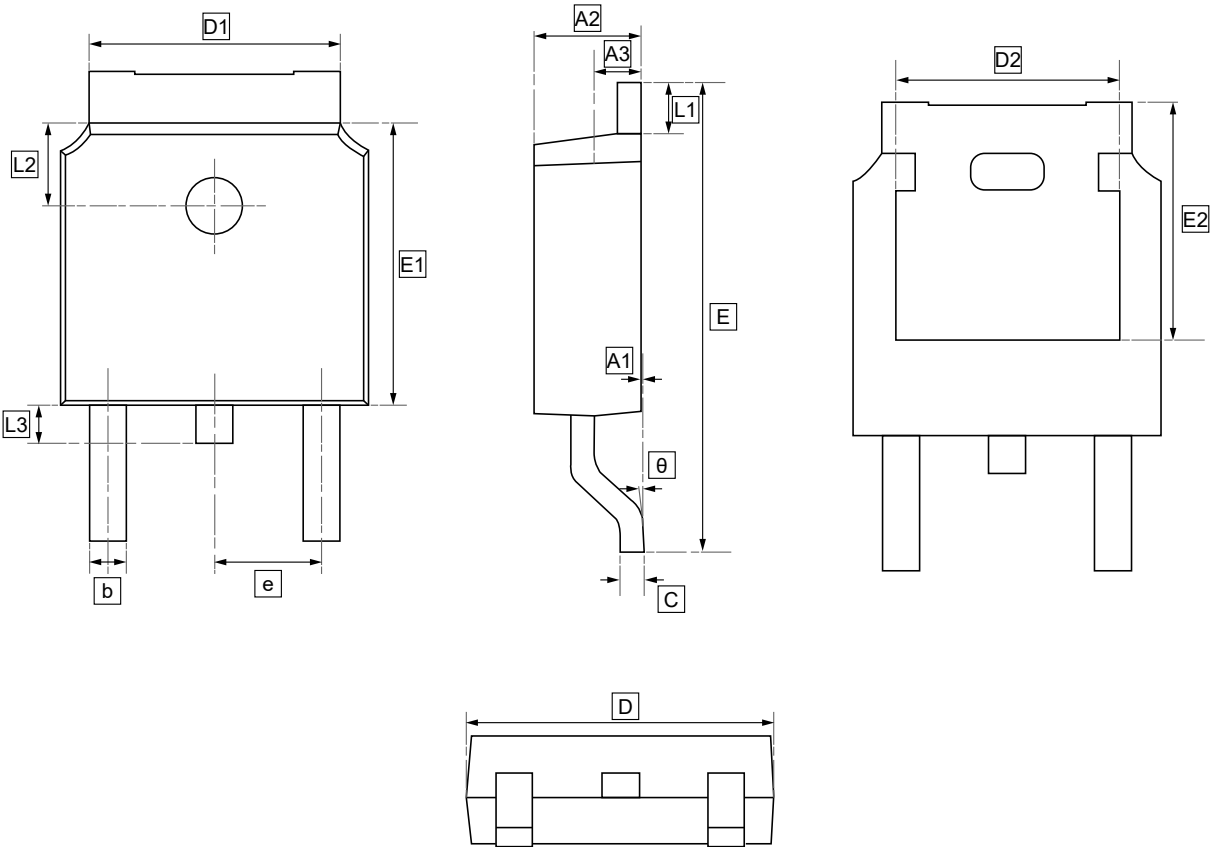


6.2Typical Characteristics





7.TO-252 Package Outline Dimensions

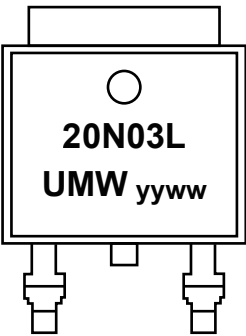


DIMENSIONS (mm are the original dimensions)

| Symbol | A1   | A2   | A3   | b    | c    | D    | D1   | D2   | E     | E1   | E2   | e            | L1   | L2   | L3   | θ    |
|--------|------|------|------|------|------|------|------|------|-------|------|------|--------------|------|------|------|------|
| Min    | 0.00 | 2.18 | 0.90 | 0.65 | 0.46 | 6.35 | 4.95 | 4.32 | 9.40  | 5.97 | 5.21 | 2.286<br>BSC | 0.89 | 1.70 | 0.60 | 0.00 |
| Max    | 0.13 | 2.39 | 1.10 | 0.85 | 0.61 | 6.73 | 5.46 | 4.90 | 10.41 | 6.22 | 5.38 |              | 1.27 | 1.90 | 1.00 | 8.00 |



8.Ordering information



yy: Year Code  
ww: Week Code

| Order Code         | Package | Base QTY | Delivery Mode |
|--------------------|---------|----------|---------------|
| UMW NTD20N03L27T4G | TO-252  | 2500     | Tape and reel |



## 9.Disclaimer

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