

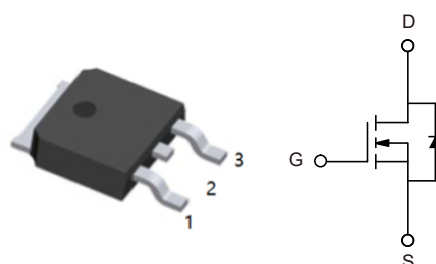
## 1.Description

- Very Low  $R_{DS(ON)}$  at 4.5V<sub>GS</sub>
- Low Gate Charge
- High Current Capability
- RoHS and Halogen-Free Compliant

## 3.Pinning information

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

TO-252(DPAK)  
top view



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

| Parameter                                      |                             | Symbol         | Rating     | Units              |
|------------------------------------------------|-----------------------------|----------------|------------|--------------------|
| Drain-Source Voltage                           |                             | $V_{DS}$       | 30         | V                  |
| Gate-Source Voltage                            |                             | $V_{GS}$       | $\pm 20$   |                    |
| Continuous Drain Current <sup>G</sup>          | $T_C = 25^{\circ}\text{C}$  | $I_D$          | 70         | A                  |
|                                                | $T_C = 100^{\circ}\text{C}$ |                | 54         |                    |
| Pulsed Drain Current <sup>C</sup>              |                             | $I_{DM}$       | 280        |                    |
| Continuous Drain Current                       | $T_A = 25^{\circ}\text{C}$  | $I_{DSM}$      | 45         |                    |
|                                                | $T_A = 70^{\circ}\text{C}$  |                | 37         |                    |
| Avalanche Current <sup>C</sup>                 |                             | $I_{AS}$       | 45         |                    |
| Avalanche energy $L=0.1\text{mH}$ <sup>C</sup> |                             | $E_{AS}$       | 101        | mJ                 |
| $V_{DS}$ Spike                                 | 100ns                       | $V_{SPIKE}$    | 36         | V                  |
| Power Dissipation <sup>B</sup>                 | $T_C = 25^{\circ}\text{C}$  | $P_D$          | 60         | W                  |
|                                                | $T_C = 100^{\circ}\text{C}$ |                | 30         |                    |
| Power Dissipation <sup>A</sup>                 | $T_A = 25^{\circ}\text{C}$  | $P_{DSM}$      | 7.5        |                    |
|                                                | $T_A = 70^{\circ}\text{C}$  |                | 5.2        |                    |
| Junction and Storage Temperature Range         |                             | $T_J, T_{STG}$ | -55 to 175 | $^{\circ}\text{C}$ |



5.Thermal Characteristics

| Parameter                                  |              | Symbol           | Typ | Max | Units |
|--------------------------------------------|--------------|------------------|-----|-----|-------|
| Maximum Junction-to-Ambient <sup>A</sup>   | t ≤ 10s      | R <sub>θJA</sub> | 16  | 20  | °C/W  |
| Maximum Junction-to-Ambient <sup>A D</sup> | Steady-State |                  | 41  | 50  | °C/W  |
| Maximum Junction-to-Case                   | Steady-State | R <sub>θJC</sub> | 1.9 | 2.5 | °C/W  |



## 6. Electrical Characteristic ( $T_J=25^{\circ}\text{C}$ unless otherwise noted)

| Parameter                                          | Symbol             | Conditions                                                                        | Min | Typ  | Max       | Units         |
|----------------------------------------------------|--------------------|-----------------------------------------------------------------------------------|-----|------|-----------|---------------|
| Drain-Source Breakdown Voltage                     | $BV_{DSS}$         | $I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$                                         | 30  |      |           | V             |
| Zero Gate Voltage Drain Current                    | $I_{DSS}$          | $V_{DS}=30\text{V}$ , $V_{GS}=0\text{V}$                                          |     |      | 1         | $\mu\text{A}$ |
|                                                    |                    | $T_J=55^{\circ}\text{C}$                                                          |     |      | 5         | $\mu\text{A}$ |
| Gate-Body leakage current                          | $I_{GSS}$          | $V_{DS}=0\text{V}$ , $V_{GS}=\pm 20\text{V}$                                      |     |      | $\pm 100$ | nA            |
| Gate Threshold Voltage                             | $V_{GS(th)}$       | $V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$                                            | 1.2 | 1.7  | 2.2       | V             |
| Static Drain-Source On-Resistance                  | $R_{DS(on)}$       | $V_{GS}=10\text{V}$ , $I_D=20\text{A}$                                            |     | 2.1  | 2.6       | m $\Omega$    |
|                                                    |                    | $V_{GS}=4.5\text{V}$ , $I_D=20\text{A}$                                           |     | 3.2  | 4         | m $\Omega$    |
| Forward Transconductance                           | $g_{FS}$           | $V_{DS}=5\text{V}$ , $I_D=20\text{A}$                                             |     | 85   |           | S             |
| Diode Forward Voltage                              | $V_{SD}$           | $I_S=1\text{A}$ , $V_{GS}=0\text{V}$                                              |     | 0.7  | 1         | V             |
| Maximum Body-Diode Continuous Current <sup>G</sup> | $I_S$              |                                                                                   |     |      | 70        | A             |
| Input Capacitance                                  | $C_{iss}$          | $V_{GS}=0\text{V}$ , $V_{DS}=15\text{V}$ , $f=1\text{MHz}$                        |     | 2719 |           | pF            |
| Output Capacitance                                 | $C_{oss}$          |                                                                                   |     | 1204 |           | pF            |
| Reverse Transfer Capacitance                       | $C_{rss}$          |                                                                                   |     | 169  |           | pF            |
| Gate resistance                                    | $R_g$              | $V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$                         | 0.9 | 2    | 3         | $\Omega$      |
| Total Gate Charge                                  | $Q_g(10\text{V})$  | $V_{GS}=10\text{V}$ , $V_{DS}=15\text{V}$<br>$I_D=20\text{A}$                     |     | 44   | 60        | nC            |
| Total Gate Charge                                  | $Q_g(4.5\text{V})$ |                                                                                   |     | 21   | 28        | nC            |
| Gate Source Charge                                 | $Q_{gs}$           |                                                                                   |     | 9    |           | nC            |
| Gate Drain Charge                                  | $Q_{gd}$           |                                                                                   |     | 7    |           | nC            |
| Turn-On DelayTime                                  | $t_{D(on)}$        | $V_{GS}=10\text{V}$ , $V_{DS}=15\text{V}$<br>$R_L=0.75\Omega$ , $R_{GEN}=3\Omega$ |     | 9.7  |           | ns            |
| Turn-On Rise Time                                  | $t_r$              |                                                                                   |     | 5.2  |           | ns            |
| Turn-Off DelayTime                                 | $t_{D(off)}$       |                                                                                   |     | 32.5 |           | ns            |
| Turn-Off Fall Time                                 | $t_f$              |                                                                                   |     | 10.3 |           | ns            |
| Body Diode Reverse Recovery Time                   | $t_{rr}$           | $I_F=20\text{A}$ , $dI/dt=500\text{A}/\mu\text{s}$                                |     | 19.6 |           | ns            |
| Body Diode Reverse Recovery Charge                 | $Q_{rr}$           | $I_F=20\text{A}$ , $dI/dt=500\text{A}/\mu\text{s}$                                |     | 42.7 |           | nC            |



- A. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^\circ\text{C}$ . The Power dissipation  $P_{DSM}$  is based on  $R_{\theta JA}$  and the maximum allowed junction temperature of  $150^\circ\text{C}$ . The value in any given application depends on the user's specific board design, and the maximum temperature of  $175^\circ\text{C}$  may be used if the PCB allows it.
- B. The power dissipation  $P_D$  is based on  $T_{J(MAX)} = 175^\circ\text{C}$ , using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.
- C. Single pulse width limited by junction temperature  $T_{J(MAX)} = 175^\circ\text{C}$ .
- D. The  $R_{\theta JA}$  is the sum of the thermal impedance from junction to case  $R_{\theta JC}$  and case to ambient.
- E. The static characteristics in Figures 1 to 6 are obtained using  $<300\mu\text{s}$  pulses, duty cycle 0.5% max.
- F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of  $T_{J(MAX)} = 175^\circ\text{C}$ . The SOA curve provides a single pulse rating.
- G. The maximum current rating is package limited.
- H. These tests are performed with the device mounted on 1 in <sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^\circ\text{C}$ .



## 7.1 Typical characteristic

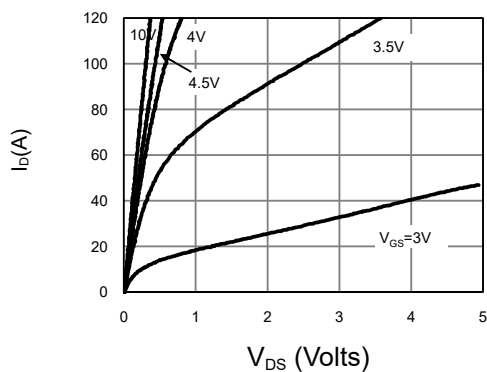


Fig 1: On-Region Characteristics (Note E)

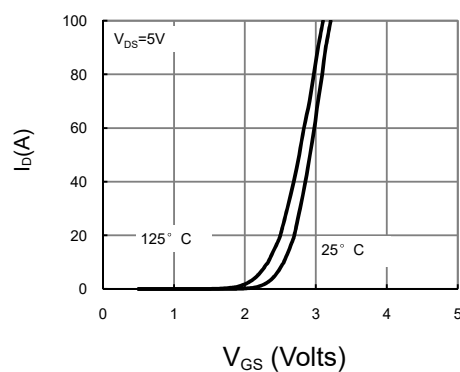


Figure 2: Transfer Characteristics (Note E)

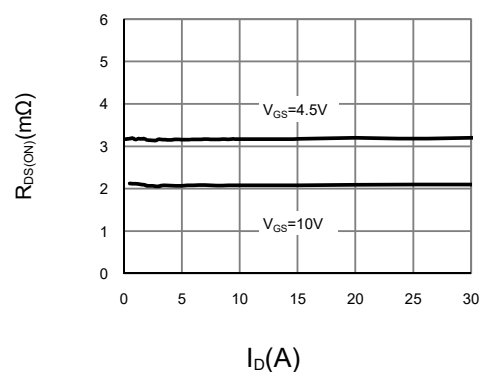


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

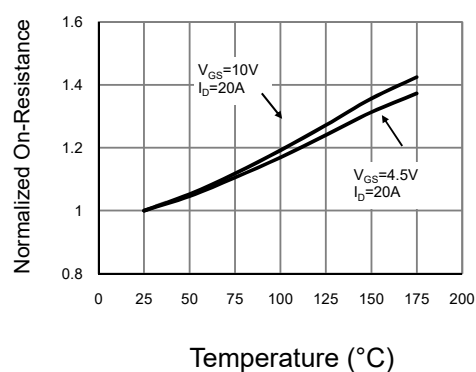


Figure 4: On-Resistance vs. Junction Temperature (Note E)

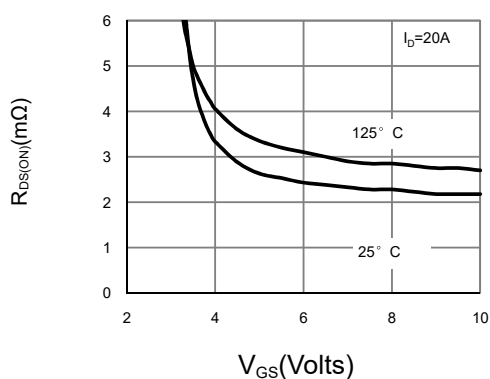


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

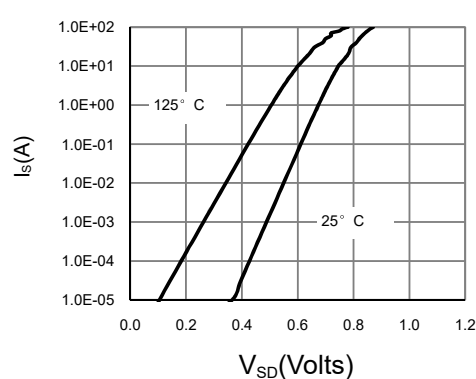


Figure 6: Body-Diode Characteristics (Note E)



## 7.2 Typical characteristic

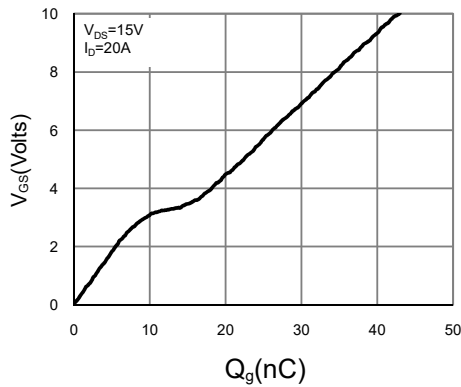


Figure 7: Gate-Charge Characteristics

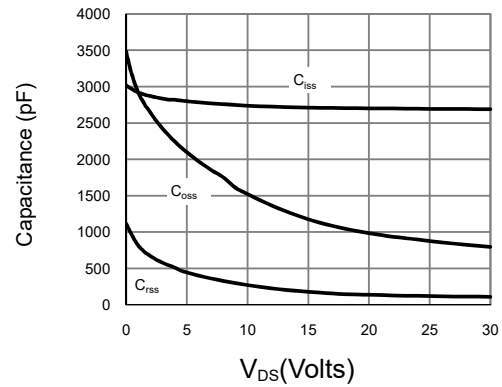


Figure 8: Capacitance Characteristics

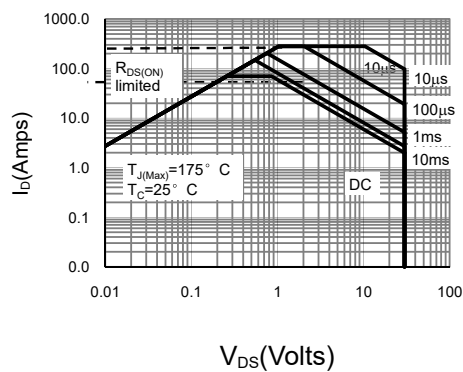


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

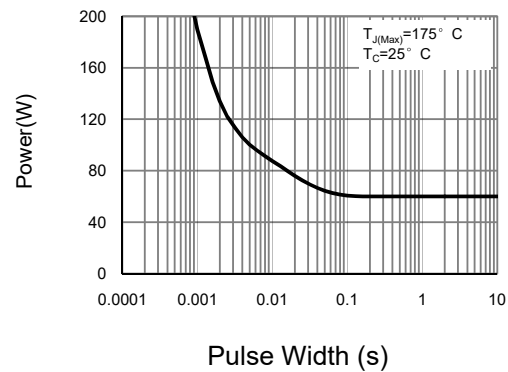


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

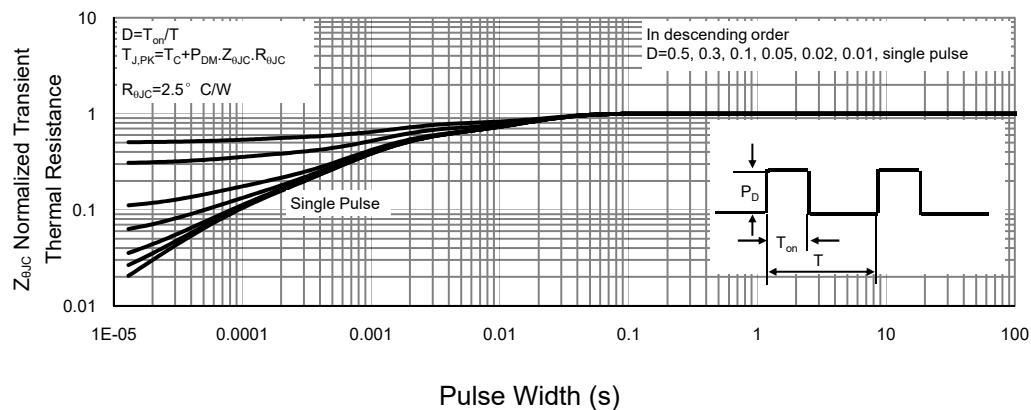


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)



### 7.3 Typical characteristic

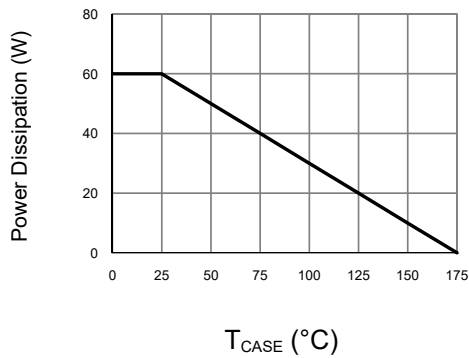


Figure 12: Power De-rating (Note F)

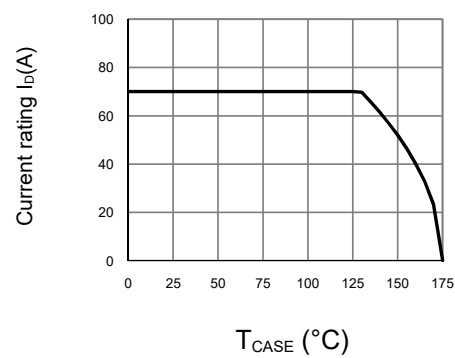


Figure 13: Current De-rating (Note F)

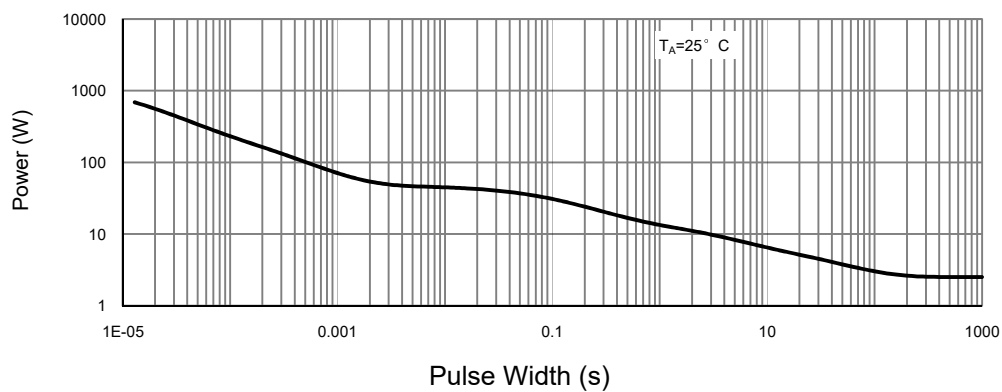


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

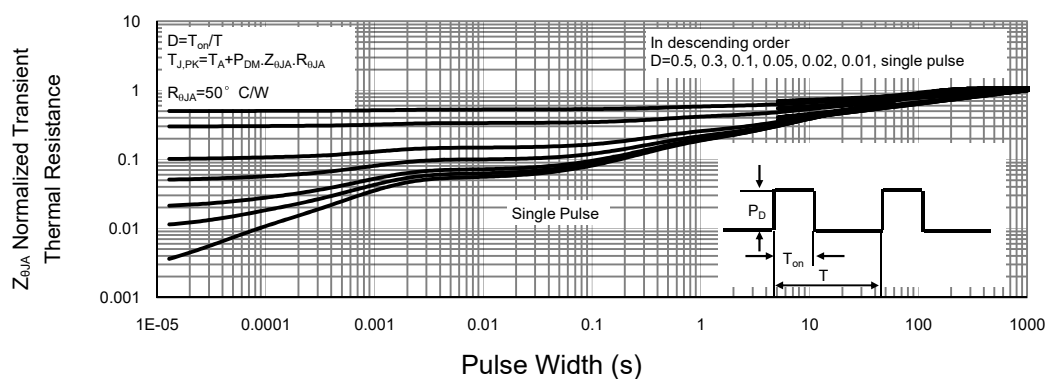
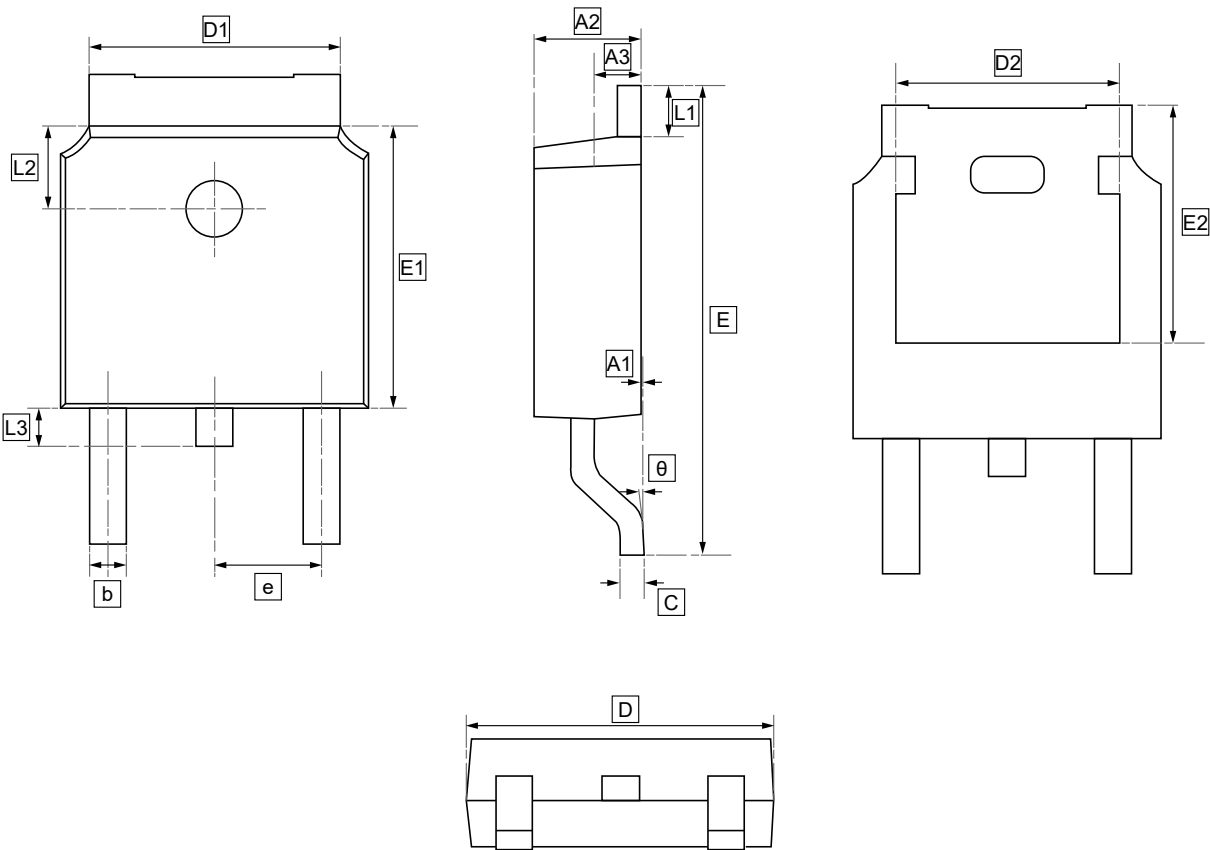


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)



8.TO-252 Package Outline Dimensions



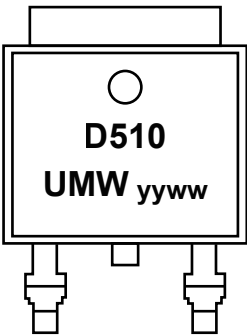
DIMENSIONS (mm are the original dimensions)

| 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 |





9.Ordering information



yy: Year Code  
ww: Week Code

| Order Code | Package | Base QTY | Delivery Mode |
|------------|---------|----------|---------------|
| UMW AOD510 | TO-252  | 2500     | Tape and reel |



## 10.Disclaimer

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