

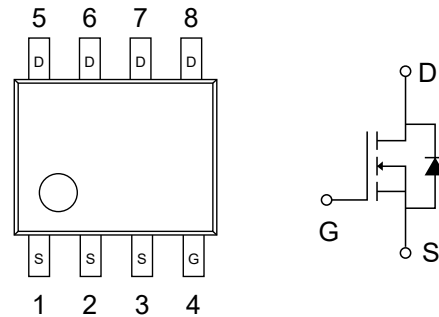
## 1.Features

- $V_{DS(V)}=30V$
- $I_D=11A$
- $R_{DS(ON)}<10m\Omega(V_{GS}=10V)$
- $R_{DS(ON)}<16m\Omega(V_{GS}=4.5V)$
- Low Capacitance to Minimize Driver Losses
- Low  $R_{DS(ON)}$  to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses

## 2.Pinning information

| Pin     | Symbol | Description |
|---------|--------|-------------|
| 4       | G      | GATE        |
| 1,2,3   | S      | SOURCE      |
| 5,6,7,8 | D      | DRAIN       |

SOP-8



## 3.Absolute Maximum Ratings $T_J=25^{\circ}C$ unless otherwise noted

| Parameter                                                          |              |                                | Symbol    | Maximum  | Units |
|--------------------------------------------------------------------|--------------|--------------------------------|-----------|----------|-------|
| Drain-Source Voltage                                               |              |                                | $V_{DSS}$ | 30       | V     |
| Gate-Source Voltage                                                |              |                                | $V_{GSS}$ | $\pm 20$ |       |
| Continuous Drain Current $R_{\theta JA}$ (Note 1)                  | Steady State | $T_A=25^{\circ}C$              | $I_D$     | 9        | A     |
|                                                                    |              | $T_A=70^{\circ}C$              |           | 7.2      |       |
| Power Dissipation $R_{\theta JA}$ (Note 1)                         | Steady State | $T_A=25^{\circ}C$              | $P_D$     | 1.37     | W     |
| Continuous Drain Current $R_{\theta JA}$ (Note 2)                  | Steady State | $T_A=25^{\circ}C$              | $I_D$     | 6.8      | A     |
|                                                                    |              | $T_A=70^{\circ}C$              |           | 5.4      |       |
| Power Dissipation $R_{\theta JA}$ (Note 2)                         | Steady State | $T_A=25^{\circ}C$              | $P_D$     | 0.78     | W     |
| Continuous Drain Current $R_{\theta JA}$<br>$t \leq 10$ s (Note 1) | Steady State | $T_A=25^{\circ}C$              | $I_D$     | 11       | A     |
|                                                                    |              | $T_A=70^{\circ}C$              |           | 8.8      |       |
| Power Dissipation $R_{\theta JA}$ , $t \leq 10$ s (Note 1)         | Steady State | $T_A=25^{\circ}C$              | $P_D$     | 2.04     | W     |
| Pulsed Drain Current                                               | Steady State | $T_A=25^{\circ}C, T_P=10\mu s$ | $I_{DM}$  | 33       | A     |



|                                                                                                                                                                                |                |            |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|----|
| Operating Junction and Storage Temperature                                                                                                                                     | $T_J, T_{STG}$ | -55 to 150 | °C |
| Source Current (Body Diode)                                                                                                                                                    | $I_S$          | 2.7        | A  |
| Single Pulse Drain-to-Source Avalanche Energy( $T_J=25^{\circ}\text{C}$ , $V_{DD}=30\text{V}$ , $V_{GS}=10\text{V}$ , $I_L=12.5\text{A}$ , $L=1\text{mH}$ , $R_G=25\ \Omega$ ) | $E_{AS}$       | 78         | mJ |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s)                                                                                                              | $T_L$          | 260        | °C |

#### 4. Thermal resistance rating

| Parameter                                          | Symbol     | Value | Units |
|----------------------------------------------------|------------|-------|-------|
| Junction-to-Ambient – Steady State (Note 1)        | $R_{thJA}$ | 91.5  | °C/W  |
| Junction-to-Ambient – $t \leq 10\text{s}$ (Note 1) |            | 61.3  | °C/W  |
| Junction-to-Foot (Drain)                           | $R_{thJF}$ | 22.5  | °C/W  |
| Junction-to-Ambient – Steady State (Note 2)        | $R_{thJA}$ | 159.5 | °C/W  |

1. Surfacemounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq[1 oz] including traces).
2. Surfacemounted on FR4 board using the minimum recommended pad size.



## 5. Electrical Characteristics $T_J=25^{\circ}\text{C}$

| Parameter                                                 | Symbol            | Conditions                                                   | Min | Typ  | Max       | Units                  |
|-----------------------------------------------------------|-------------------|--------------------------------------------------------------|-----|------|-----------|------------------------|
| <b>OFF CHARACTERISTICS</b>                                |                   |                                                              |     |      |           |                        |
| Drain-to-Source Breakdown Voltage                         | $V_{(BR)DSS}$     | $I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$                    | 30  |      |           | V                      |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ |                                                              |     | 26   |           | mV/ $^{\circ}\text{C}$ |
| Zero Gate Voltage Drain Current                           | $I_{DSS}$         | $V_{GS}=0\text{V}$ , $T_J=25^{\circ}\text{C}$                |     |      | 1         | $\mu\text{A}$          |
|                                                           |                   | $V_{DS}=24\text{V}$ , $T_J=100^{\circ}\text{C}$              |     |      | 10        | $\mu\text{A}$          |
| Gate-to-Source Leakage Current                            | $I_{GSS}$         | $V_{DS}=0\text{V}$ , $V_{GS}=\pm 20\text{V}$                 |     |      | $\pm 100$ | nA                     |
| Gate Threshold Voltage                                    | $V_{GS(th)}$      | $V_{GS}=V_{DS}$ , $I_D=250\mu\text{A}$                       | 1.5 |      | 3         | V                      |
| <b>ON CHARACTERISTICS</b>                                 |                   |                                                              |     |      |           |                        |
| Negative Threshold Temperature Coefficient                | $V_{GS(th)}/T_J$  |                                                              |     | 6    |           | mV/ $^{\circ}\text{C}$ |
| Drain-to-Source On Resistance                             | $R_{DS(on)}$      | $V_{GS}=10\text{V}$ , $I_D=9\text{A}$                        |     | 8.2  | 10        | m $\Omega$             |
|                                                           |                   | $V_{GS}=4.5\text{V}$ , $I_D=7.2\text{A}$                     |     | 12.7 | 16        | m $\Omega$             |
| Forward Transconductance                                  | $g_{FS}$          | $V_{DS}=1.5\text{V}$ , $I_D=9\text{A}$                       |     | 26   |           | S                      |
| <b>CHARGES, CAPACITANCES AND GATE RESISTANCE</b>          |                   |                                                              |     |      |           |                        |
| Input Capacitance                                         | $C_{iss}$         | $V_{DS}=25\text{V}$ , $V_{GS}=0\text{V}$ , $f=1\text{MHz}$   |     | 1060 |           | pF                     |
| Output Capacitance                                        | $C_{oss}$         |                                                              |     | 220  |           | pF                     |
| Reverse Transfer Capacitance                              | $C_{rss}$         |                                                              |     | 126  |           | pF                     |
| Total Gate Charge                                         | $Q_{g(TOT)}$      | $V_{GS}=4.5\text{V}$ , $V_{DS}=15\text{V}$ , $I_D=9\text{A}$ |     | 9.2  |           | nC                     |
| Threshold Gate Charge                                     | $Q_{g(TH)}$       |                                                              |     | 2.4  |           | nC                     |
| Gate-to-Source Charge                                     | $Q_{gs}$          |                                                              |     | 4.4  |           | nC                     |
| Gate-to-Drain Charge                                      | $Q_{gd}$          |                                                              |     | 3.8  |           | nC                     |
| Total Gate Charge                                         | $Q_{g(TOT)}$      | $V_{GS}=10\text{V}$ , $V_{DS}=15\text{V}$ , $I_D=9\text{A}$  |     | 18.3 |           | nC                     |



| SWITCHING CHARACTERISTICS          |                     |                                                                                       |                       |      |      |    |   |
|------------------------------------|---------------------|---------------------------------------------------------------------------------------|-----------------------|------|------|----|---|
| Turn-On Delay Time                 | t <sub>D(on)</sub>  | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V<br>I <sub>D</sub> =1A, R <sub>g</sub> =6Ω  |                       | 8    |      | ns |   |
| Rise Time                          | t <sub>r</sub>      |                                                                                       |                       | 3.8  |      | ns |   |
| Turn-Off Delay Time                | t <sub>D(off)</sub> |                                                                                       |                       | 21.6 |      | ns |   |
| Fall Time                          | t <sub>f</sub>      |                                                                                       |                       | 8    |      | ns |   |
| DRAIN-SOURCE DIODE CHARACTERISTICS |                     |                                                                                       |                       |      |      |    |   |
| Forward Diode Voltage              | V <sub>SD</sub>     | V <sub>GS</sub> =0V                                                                   | T <sub>J</sub> =25°C  |      | 0.75 | 1  | V |
|                                    |                     | I <sub>S</sub> =2.7A                                                                  | T <sub>J</sub> =125°C |      | 0.55 |    | V |
| Reverse Recovery Time              | t <sub>rr</sub>     | V <sub>GS</sub> =0V, d <sub>IS</sub> /d <sub>t</sub> =100A/μs<br>I <sub>S</sub> =2.7A |                       | 20   |      | ns |   |
| Charge Time                        | t <sub>a</sub>      |                                                                                       |                       | 9    |      | ns |   |
| Discharge Time                     | t <sub>b</sub>      |                                                                                       |                       | 11   |      | ns |   |
| Reverse Recovery Charge            | Q <sub>rr</sub>     |                                                                                       |                       | 9    |      | nC |   |
| PACKAGE PARASITIC VALUES           |                     |                                                                                       |                       |      |      |    |   |
| Source Inductance                  | L <sub>S</sub>      | T <sub>A</sub> =25°C                                                                  |                       | 0.66 |      | nH |   |
| Drain Inductance                   | L <sub>D</sub>      |                                                                                       |                       | 0.2  |      | nH |   |
| Gate Inductance                    | L <sub>G</sub>      |                                                                                       |                       | 1.5  |      | nH |   |
| Gate Resistance                    | R <sub>G</sub>      |                                                                                       |                       | 1.5  | 2.3  | Ω  |   |

3. Pulse Test: pulse width = 300  $\mu s$ , duty cycle  $\leq 2\%$ .

4. Switching characteristics are independent of operating junction temperatures.



## 6.1 Typical Characteristics

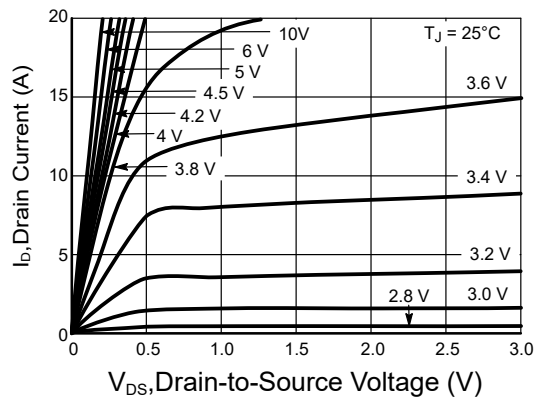


Figure 1: Output Characteristics

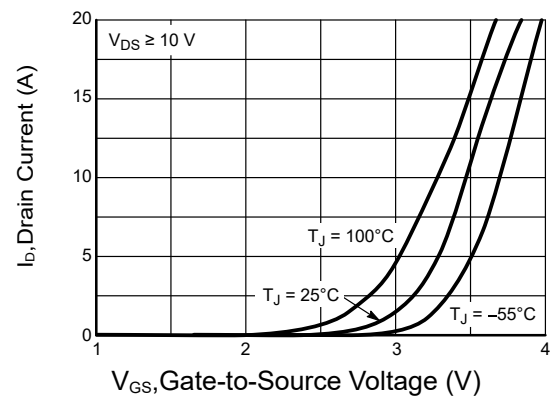


Figure 2: Transfer Characteristics

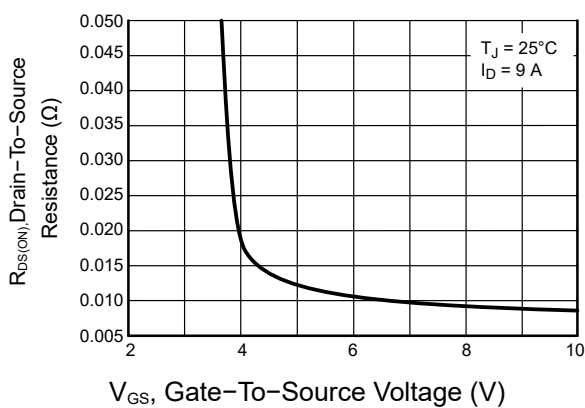


Figure 3: On-Resistance vs. Gate-to-Source Voltage

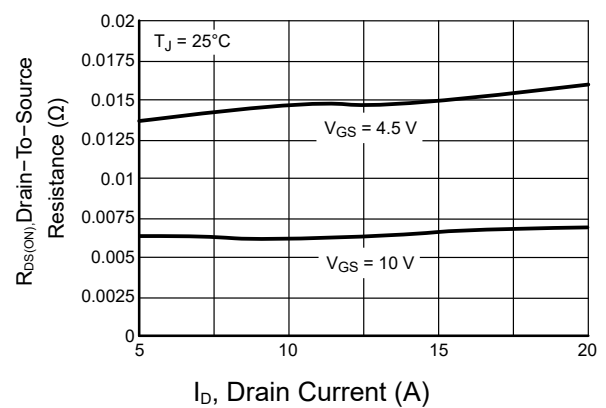


Figure 4: On-Resistance vs. Drain Current and Gate Voltage

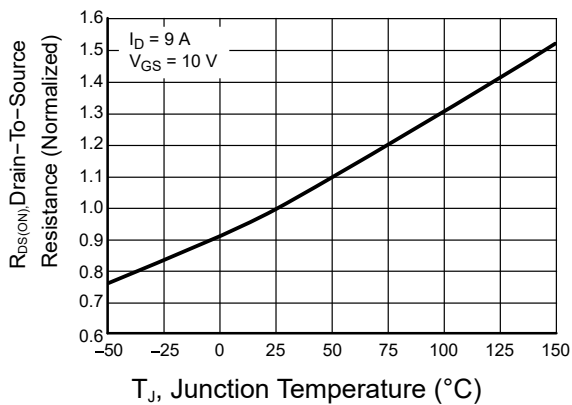


Figure 5: On-Resistance Variation with Temperature

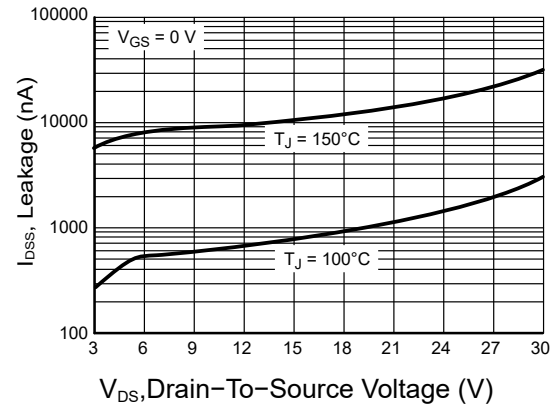
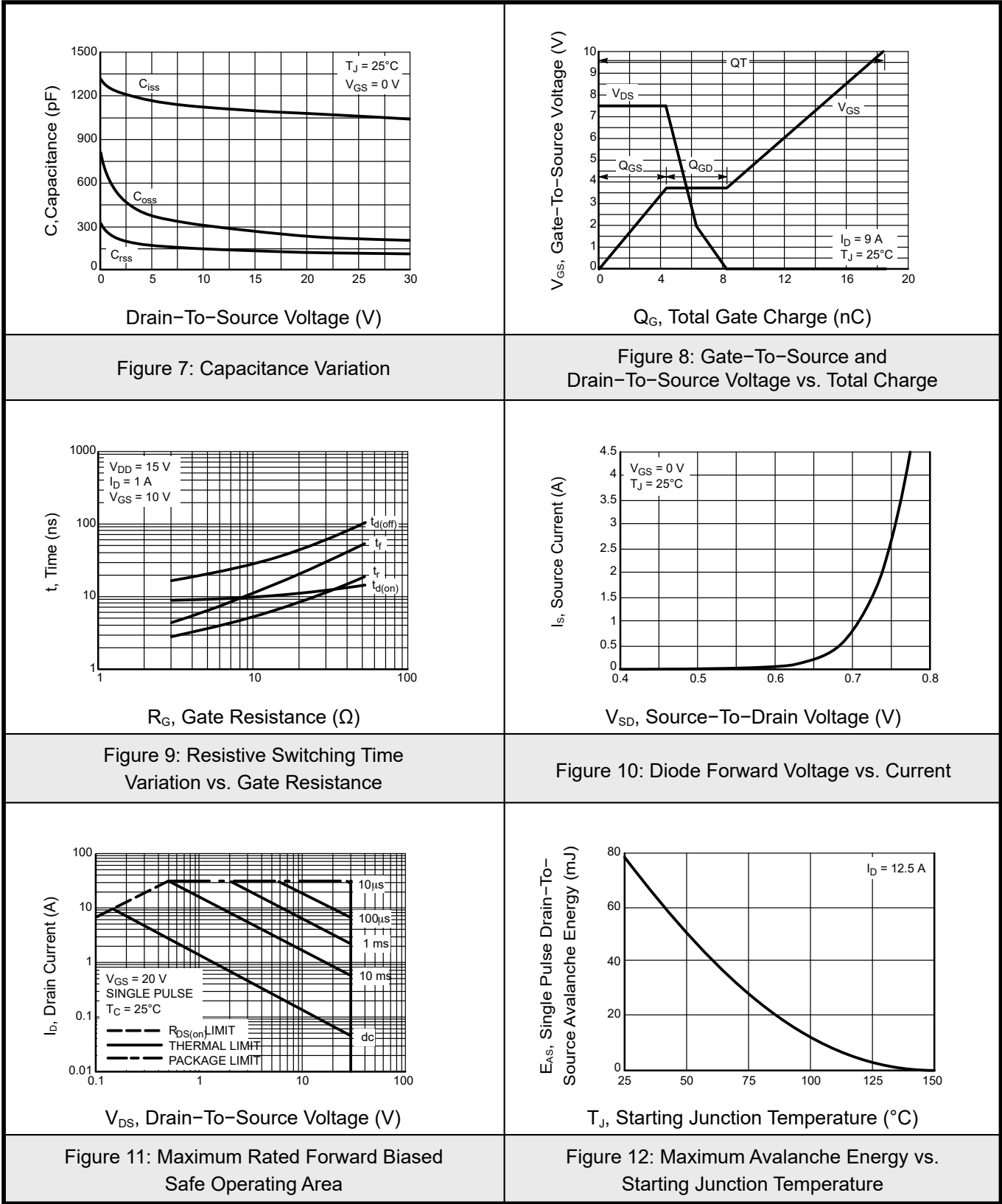


Figure 6: Drain-to-Source Leakage Current vs. Voltage

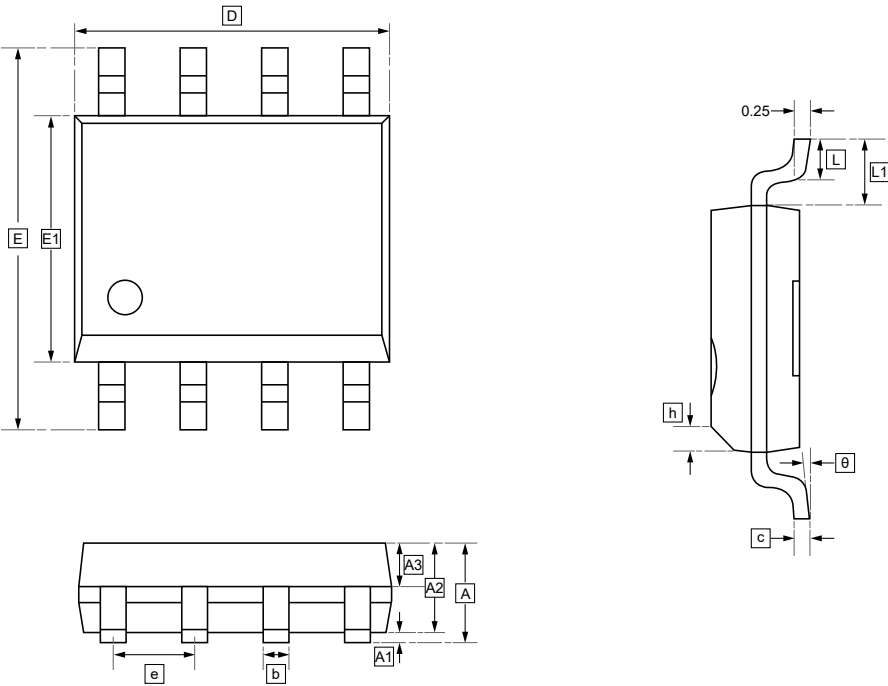


6.2 Typical Characteristics





7.SOP-8 Package Outline Dimensions



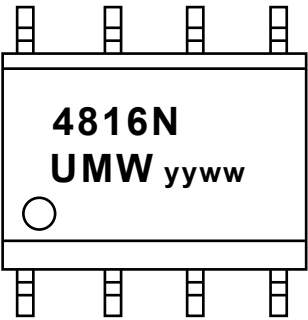
DIMENSIONS (mm are the original dimensions)

| Symbol | A    | A1   | A2   | A3   | b    | c    | D    | E    | E1   | e    | h    | L    |
|--------|------|------|------|------|------|------|------|------|------|------|------|------|
| Min    | -    | 0.05 | 1.30 | 0.60 | 0.39 | 0.20 | 4.80 | 5.80 | 3.80 | 1.24 | 0.30 | 0.50 |
| Max    | 1.75 | 0.20 | 1.50 | 0.70 | 0.47 | 0.24 | 5.00 | 6.20 | 4.00 | 1.30 | 0.50 | 0.80 |

| Symbol | L1   | θ  |
|--------|------|----|
| Min    | 1.00 | 0° |
| Max    | 1.10 | 8° |



8.Ordering information



yy: Year Code  
ww: Week Code

| Order Code       | Package | Base QTY | Delivery Mode |
|------------------|---------|----------|---------------|
| UMW NTMS4816NR2G | SOP-8   | 3000     | Tape and reel |



## 9.Disclaimer

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