



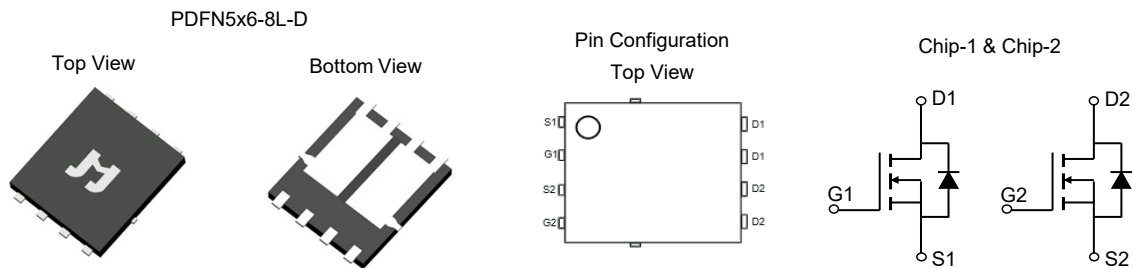
# 100V 28mΩ Dual N-Ch Power MOSFET

## Features

- Low ON-resistance,  $R_{DS(ON)}$
- Low Gate Charge,  $Q_g$
- 100% UIS and Rg Tested
- Pb-free Lead Plating
- Halogen-free and RoHS-compliant
- AEC-Q101 Qualified for Automotive Applications

## Product Summary

| Parameter                                | Value | Unit |
|------------------------------------------|-------|------|
| $V_{DS}$                                 | 100   | V    |
| $V_{GS(th\_Typ)}$                        | 1.9   | V    |
| $I_D$ (@ $V_{GS} = 10V$ ) <sup>(1)</sup> | 22    | A    |
| $R_{DS(ON\_Typ)}$ (@ $V_{GS} = 10V$ )    | 28    | mΩ   |

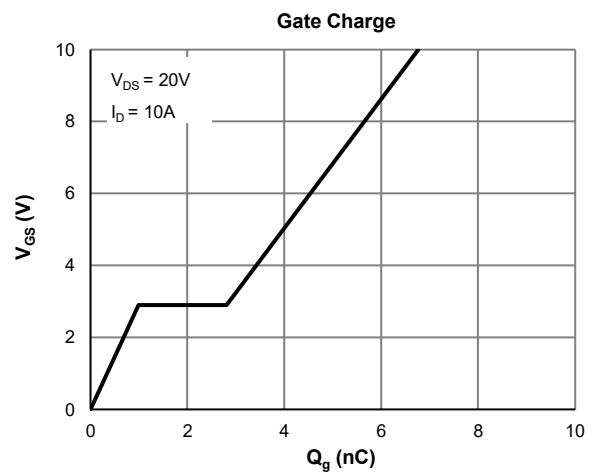
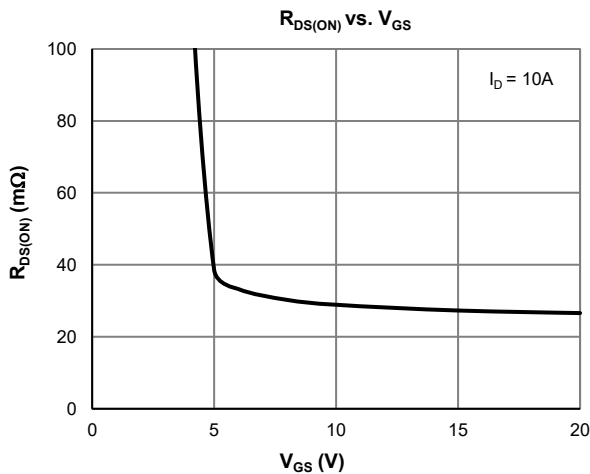


## Ordering Information

| Device          | Package      | # of Pins | Marking  | MSL | $T_J$ (°C) | Media        | Quantity (pcs) |
|-----------------|--------------|-----------|----------|-----|------------|--------------|----------------|
| JMSL1040AGDQ-13 | PDFN5x6-8L-D | 8         | L1040ADQ | 1   | -55 to 175 | 13-inch Reel | 5000           |

## Absolute Maximum Ratings (@ $T_A = 25^\circ C$ unless otherwise specified)

| Parameter                               | Symbol         | Value               | Unit |
|-----------------------------------------|----------------|---------------------|------|
| Drain-to-Source Voltage                 | $V_{DS}$       | 100                 | V    |
| Gate-to-Source Voltage                  | $V_{GS}$       | ±20                 | V    |
| Continuous Drain Current <sup>(1)</sup> | $I_D$          | $T_C = 25^\circ C$  | 22   |
|                                         |                | $T_C = 100^\circ C$ | 15.4 |
| Pulsed Drain Current <sup>(2)</sup>     | $I_{DM}$       | 87                  | A    |
| Avalanche Current <sup>(3)</sup>        | $I_{AS}$       | 15.0                | A    |
| Avalanche Energy <sup>(3)</sup>         | $E_{AS}$       | 11.3                | mJ   |
| Power Dissipation <sup>(4)</sup>        | $P_D$          | $T_C = 25^\circ C$  | 36   |
|                                         |                | $T_C = 100^\circ C$ | 18   |
| Junction & Storage Temperature Range    | $T_J, T_{STG}$ | -55 to 175          | °C   |





**Electrical Characteristics** (@  $T_J = 25^\circ\text{C}$  unless otherwise specified)

| Parameter                         | Symbol        | Conditions                                                            | Min. | Typ. | Max.       | Unit             |
|-----------------------------------|---------------|-----------------------------------------------------------------------|------|------|------------|------------------|
| <b>STATIC PARAMETERS</b>          |               |                                                                       |      |      |            |                  |
| Drain-Source Breakdown Voltage    | $V_{(BR)DSS}$ | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$                            | 100  |      |            | V                |
| Zero Gate Voltage Drain Current   | $I_{DSS}$     | $V_{DS} = 80\text{V}, V_{GS} = 0\text{V}$<br>$T_J = 55^\circ\text{C}$ |      |      | 1.0<br>5.0 | $\mu\text{A}$    |
| 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  | 1.9  | 2.5        | V                |
| Static Drain-Source ON-Resistance | $R_{DS(ON)}$  | $V_{GS} = 10\text{V}, I_D = 10\text{A}$                               |      | 28   | 36         | $\text{m}\Omega$ |
| Static Drain-Source ON-Resistance | $R_{DS(ON)}$  | $V_{GS} = 4.5\text{V}, I_D = 6\text{A}$                               |      | 40   | 52         | $\text{m}\Omega$ |
| Forward Transconductance          | $g_{FS}$      | $V_{DS} = 5\text{V}, I_D = 20\text{A}$                                |      | 28   |            | S                |
| Diode Forward Voltage             | $V_{SD}$      | $I_S = 1\text{A}, V_{GS} = 0\text{V}$                                 |      | 0.68 | 1.0        | V                |
| Diode Continuous Current          | $I_S$         | $T_C = 25^\circ\text{C}$                                              |      |      | 22         | A                |

**DYNAMIC PARAMETERS** <sup>(5)</sup>

|                              |           |                                                            |  |     |  |          |
|------------------------------|-----------|------------------------------------------------------------|--|-----|--|----------|
| Input Capacitance            | $C_{iss}$ | $V_{GS} = 0\text{V}, V_{DS} = 50\text{V}, f = 1\text{MHz}$ |  | 363 |  | pF       |
| Output Capacitance           | $C_{oss}$ |                                                            |  | 85  |  | pF       |
| Reverse Transfer Capacitance | $C_{rss}$ |                                                            |  | 3.0 |  | pF       |
| Gate Resistance              | $R_g$     | $V_{GS} = 0\text{V}, V_{DS} = 0\text{V}, f = 1\text{MHz}$  |  | 2.6 |  | $\Omega$ |

**SWITCHING PARAMETERS** <sup>(5)</sup>

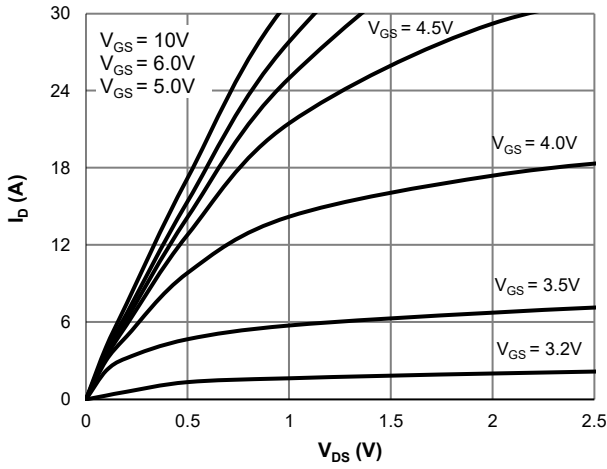
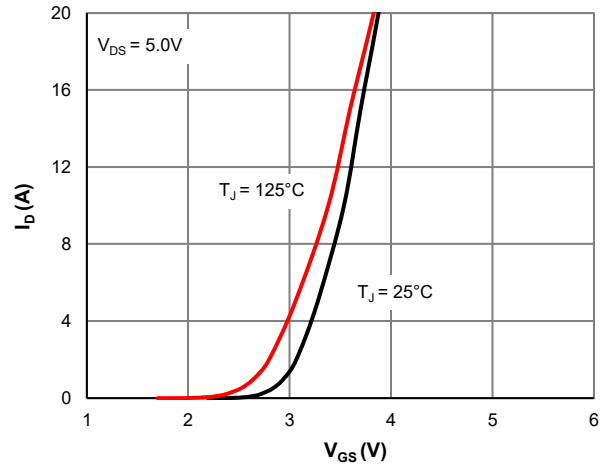
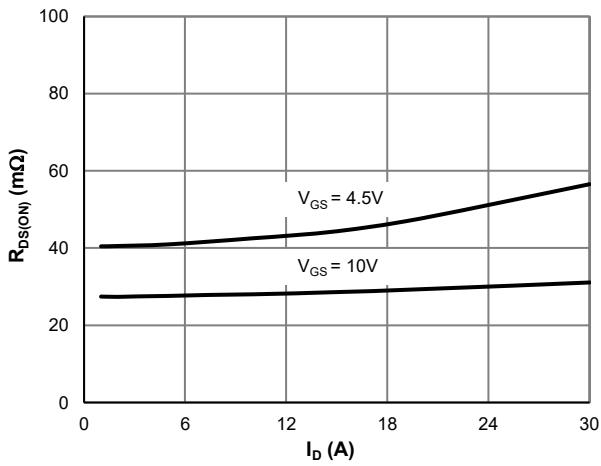
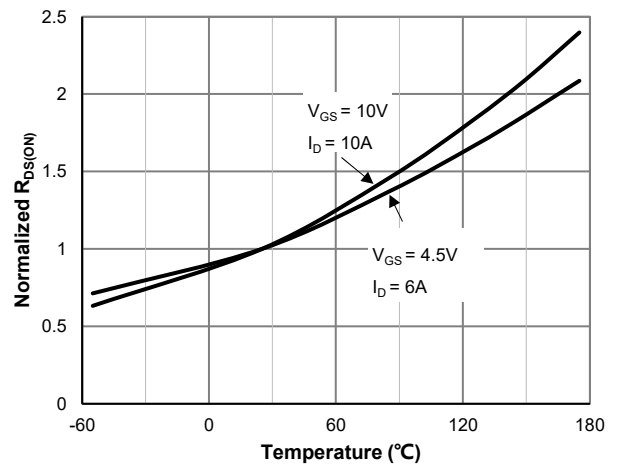
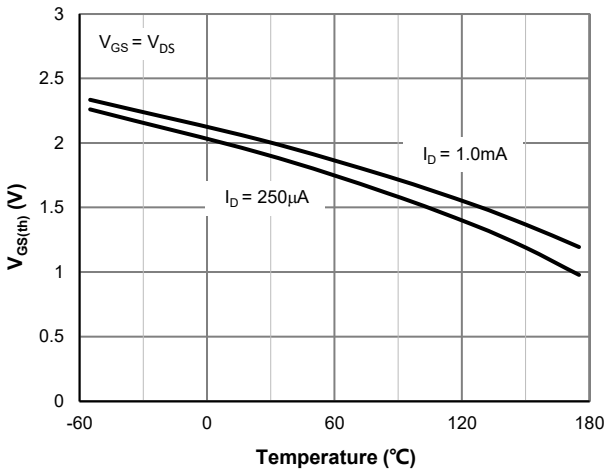
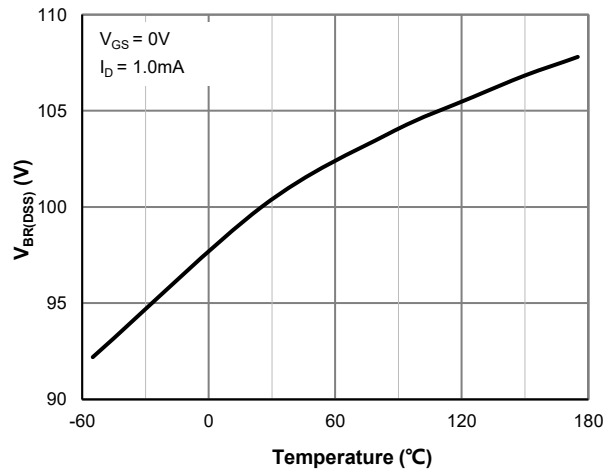
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|-----------------------------------------------|--------------|------------------------------------------------------------------------------------|-------------------------------------------------------|------|----|----|
| Total Gate Charge (@ $V_{GS} = 10\text{V}$ )  | $Q_g$        | $V_{GS} = 0 \text{ to } 10\text{V}$<br>$V_{DS} = 50\text{V}, I_D = 20\text{A}$     |                                                       | 6.8  |    | nC |
| Total Gate Charge (@ $V_{GS} = 6.0\text{V}$ ) | $Q_g$        |                                                                                    |                                                       | 3.7  |    | nC |
| Gate Source Charge                            | $Q_{gs}$     |                                                                                    |                                                       | 1.0  |    | nC |
| Gate Drain Charge                             | $Q_{gd}$     |                                                                                    |                                                       | 1.8  |    | nC |
| Turn-On DelayTime                             | $t_{D(on)}$  | $V_{GS} = 10\text{V}, V_{DS} = 50\text{V}$<br>$R_L = 2.5\Omega, R_{GEN} = 6\Omega$ |                                                       | 4.9  |    | ns |
| Turn-On Rise Time                             | $t_r$        |                                                                                    |                                                       | 16.6 |    | ns |
| Turn-Off DelayTime                            | $t_{D(off)}$ |                                                                                    |                                                       | 11.2 |    | ns |
| Turn-Off Fall Time                            | $t_f$        |                                                                                    |                                                       | 4.9  |    | ns |
| Body Diode Reverse Recovery Time              | $t_{rr}$     |                                                                                    | $I_F = 15\text{A}, di_F/dt = 100\text{A}/\mu\text{s}$ |      | 33 |    |
| Body Diode Reverse Recovery Charge            | $Q_{rr}$     | $I_F = 15\text{A}, di_F/dt = 100\text{A}/\mu\text{s}$                              |                                                       | 45   |    | nC |

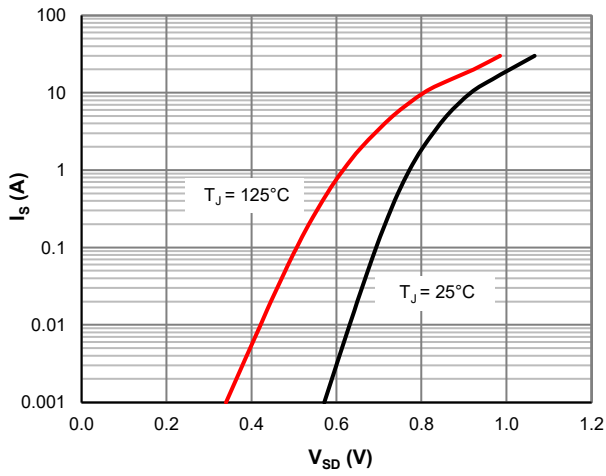
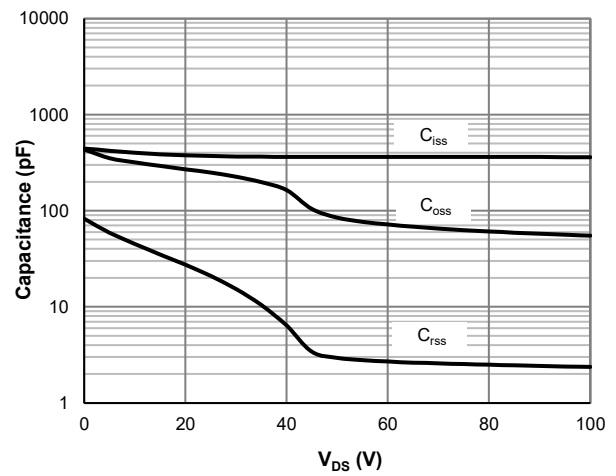
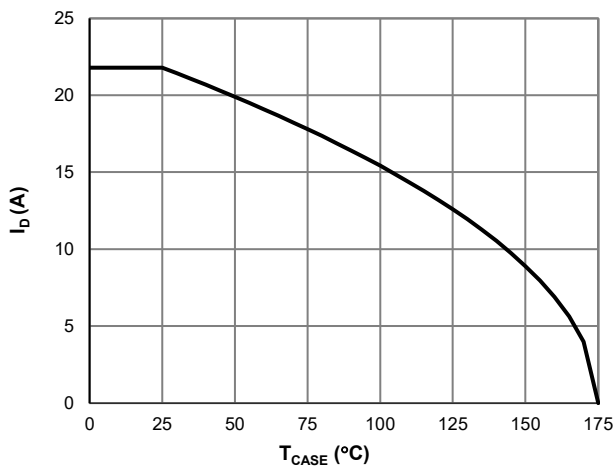
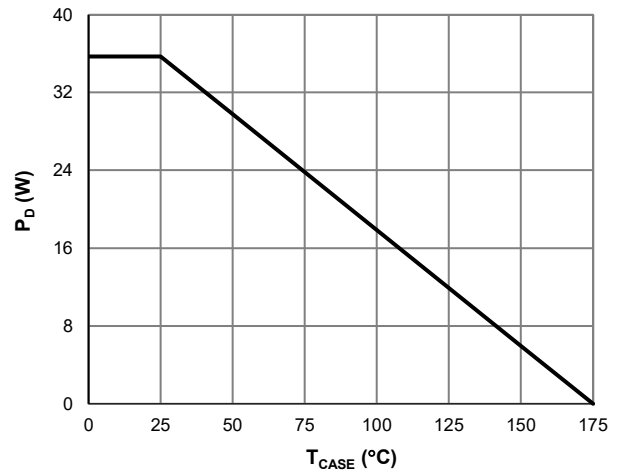
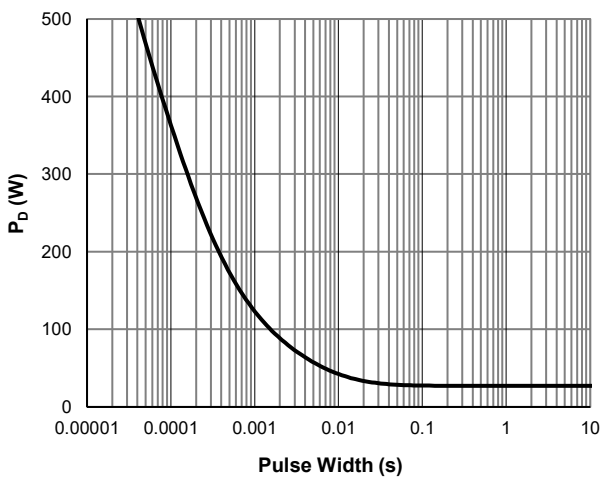
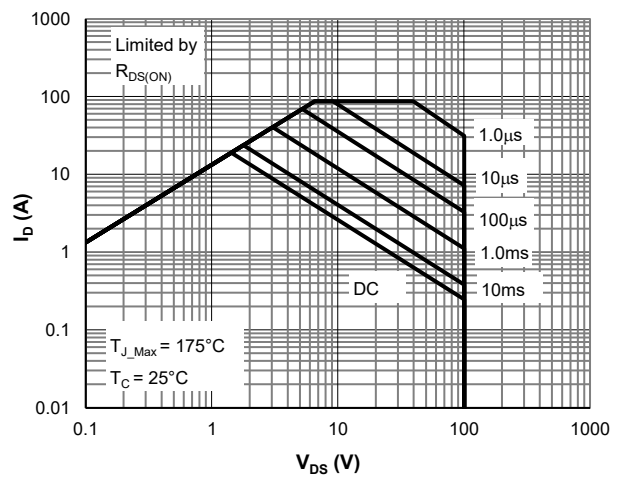
**Thermal Performance**

| Parameter                               | Symbol          | Typ. | Max. | Unit                      |
|-----------------------------------------|-----------------|------|------|---------------------------|
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 48   | 58   | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$ | 4.2  | 5.5  | $^\circ\text{C}/\text{W}$ |

**Notes:**

1. Computed continuous current assumes the condition of  $T_{J\_Max}$  while the actual continuous current depends on the thermal & electro-mechanical application board design.
2. This single-pulse measurement was taken under  $T_{J\_Max} = 175^\circ\text{C}$ .
3. This single-pulse measurement was taken under the following condition [ $L = 100\mu\text{H}, V_{GS} = 10\text{V}, V_{DS} = 50\text{V}$ ] while its value is limited by  $T_{J\_Max} = 175^\circ\text{C}$ .
4. The power dissipation  $P_D$  is based on  $T_{J\_Max} = 175^\circ\text{C}$ .
5. This value is guaranteed by design hence it is not included in the production test.

**Typical Electrical & Thermal Characteristics**

**Figure 1: Saturation Characteristics**

**Figure 2: Transfer Characteristics**

**Figure 3:  $R_{DS(ON)}$  vs. Drain Current**

**Figure 4:  $R_{DS(ON)}$  vs. Junction Temperature**

**Figure 5:  $V_{GS(th)}$  vs. Junction Temperature**

**Figure 6:  $V_{BR(DSS)}$  vs. Junction Temperature**

**Typical Electrical & Thermal Characteristics**

**Figure 7: Body-Diode Characteristics**

**Figure 8: Capacitance Characteristics**

**Figure 9: Current De-rating**

**Figure 10: Power De-rating**

**Figure 11: Single Pulse Power Rating, Junction-to-Case**

**Figure 12: Maximum Safe Operating Area**



### Typical Electrical & Thermal Characteristics

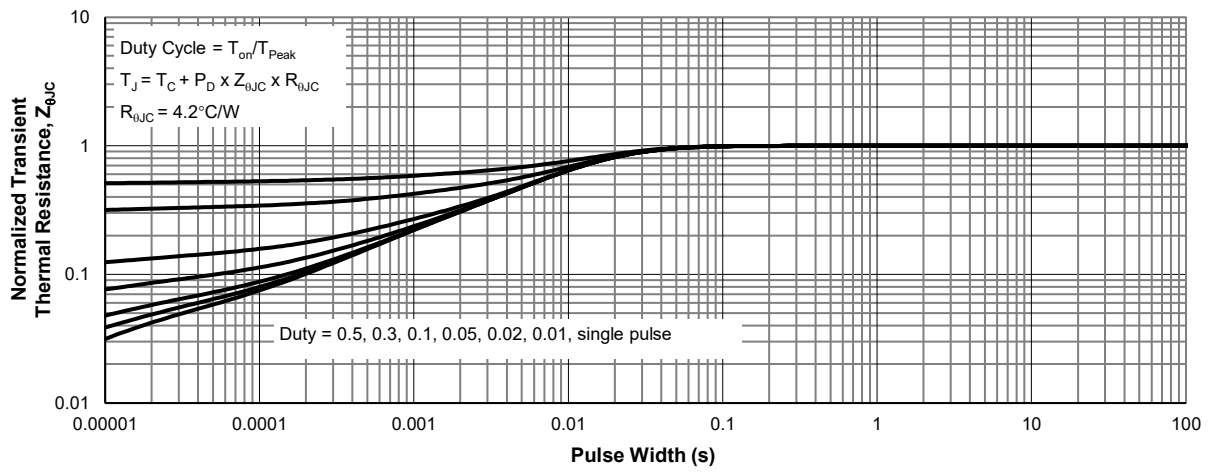
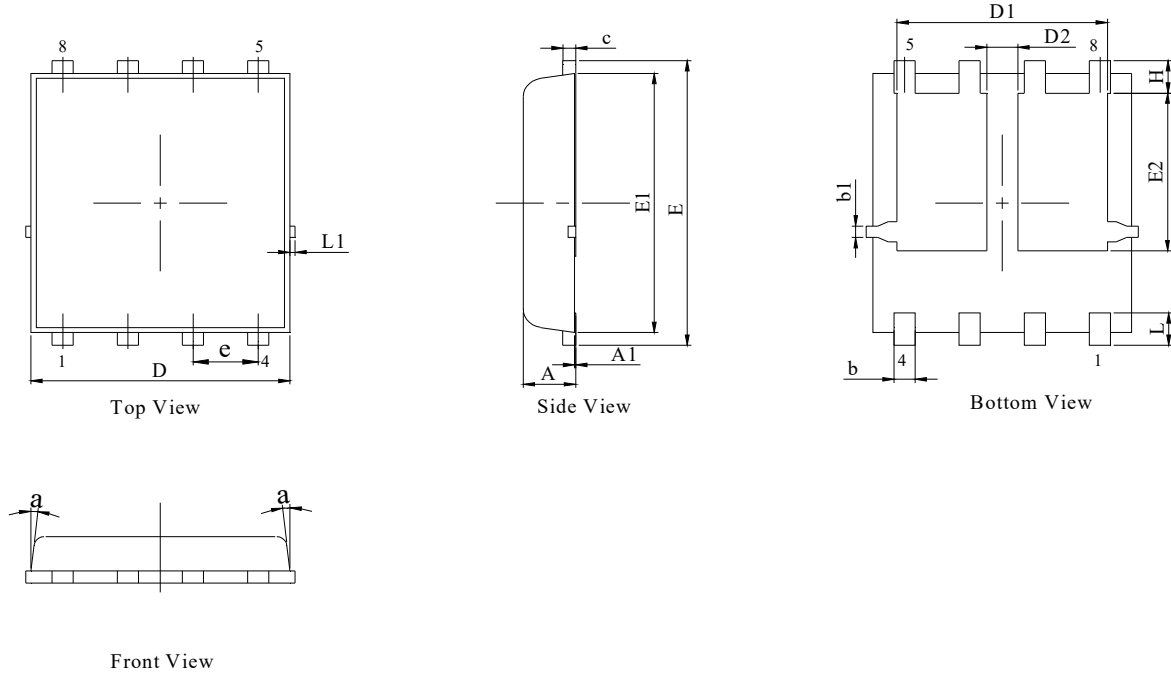
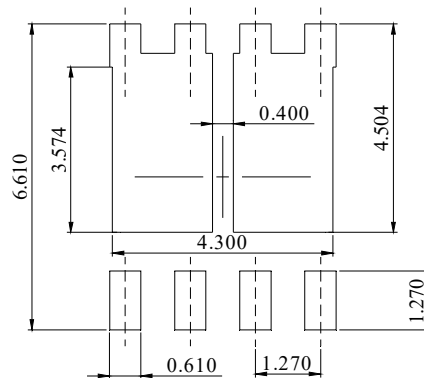


Figure 13: Normalized Maximum Transient Thermal Impedance

**PDFN5x6-8L-D Package Information**
**Package Outline**

**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M,1994.
2. ALL DIMNESIONS IN MILLIMETER (ANNGL E IN DEGREE).
3. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

| DIM. | MILLIMETER |      |       |
|------|------------|------|-------|
|      | MIN.       | NOM. | MAX.  |
| A    | 0.90       | 1.00 | 1.10  |
| A1   | 0.00       | -    | 0.10  |
| b    | 0.31       | 0.41 | 0.51  |
| b1   | 0.15       | 0.25 | 0.35  |
| c    | 0.23       | -    | 0.33  |
| D    | 4.95       | 5.05 | 5.15  |
| D1   | 4.00       | 4.10 | 4.20  |
| D2   | 0.50       | 0.60 | 0.70  |
| E    | 6.05       | 6.15 | 6.25  |
| E1   | 5.50       | 5.60 | 5.70  |
| E2   | 3.31       | 3.41 | 3.51  |
| e    | 1.27BSC    |      |       |
| H    | 0.60       | 0.70 | 0.80  |
| L    | 0.50       | 0.70 | 0.80  |
| L1   | -          | -    | 0.125 |
| a    | -          | -    | 12°   |

**Recommended Soldering Footprint**


DIMENSIONS: MILLIMETERS