

**P-CHANNEL ENHANCEMENT MODE MOSFET**
**Product Summary**

| $V_{(BR)DSS}$ | $R_{DS(on)max}$         | $I_D$<br>$T_A = 25^\circ C$ |
|---------------|-------------------------|-----------------------------|
| -20V          | 16mΩ @ $V_{GS} = -4.5V$ | -12.8A                      |
|               | 25mΩ @ $V_{GS} = -2.0V$ | -10A                        |

**Description and Applications**

This new generation MOSFET has been designed to minimize the on-state resistance ( $R_{DS(on)}$ ) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- DC-DC Converters
- Power management functions
- Notebook PC Applications
- Portable Equipment Applications

**Features and Benefits**

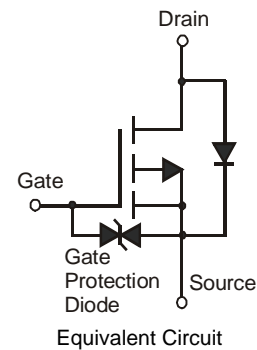
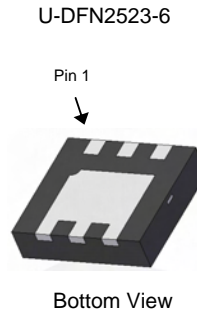
- Low On-Resistance
- Low Input Capacitance
- Low Input/Output Leakage
- **ESD Protected Gate up to 2kV**
- **Lead Free by Design, RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**
- **Qualified to AEC-Q101 Standards for High Reliability**

**Mechanical Data**

- Case: U-DFN2523-6
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.008 grams (approximate)

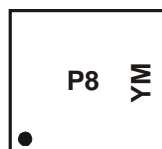


Pin 1, 2 = Source  
Pin 3 = Gate  
Pin 4, 5, 6 = Drain


**Ordering Information (Note 3)**

| Part Number   | Case        | Packaging            |
|---------------|-------------|----------------------|
| DMP2018LFK-7  | U-DFN2523-6 | 3,000 / Tape & Reel  |
| DMP2018LFK-13 | U-DFN2523-6 | 10,000 / Tape & Reel |

- Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. No purposely added lead. Halogen and Antimony free.
  2. Diodes Inc.'s "Green" policy can be found on our website at <http://www.diodes.com>.
  3. For packaging details, go to our website at <http://www.diodes.com>.

**Marking Information**


P8 = Product Type Marking Code  
YM = Date Code Marking  
Y = Year (ex: Y = 2011)  
M = Month (ex: 9 = September)

**Date Code Key**

| Year | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|------|------|------|------|------|------|------|------|
| Code | Y    | Z    | A    | B    | C    | D    | E    |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code  | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | O   | N   | D   |

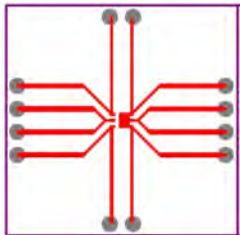
**Maximum Ratings** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

| Characteristic   |                 |  | Symbol    | Value          | Units |
|--|-----------------|--|-----------|----------------|-------|
| Drain-Source Voltage   |                 |  | $V_{DSS}$ | -20            | V     |
| Gate-Source Voltage  |                 |  | $V_{GSS}$ | $\pm 12$       | V     |
| Continuous Drain Current (Note 5) $V_{GS} = -4.5\text{V}$      | Steady State    | $T_A = 25^\circ\text{C}$<br>$T_A = 70^\circ\text{C}$ | $I_D$     | -9.2<br>-7.3   | A     |
|  | $t < 5\text{s}$ | $T_A = 25^\circ\text{C}$<br>$T_A = 70^\circ\text{C}$ | $I_D$     | -12.8<br>-10.3 | A     |
| Continuous Drain Current (Note 5) $V_{GS} = -2.0\text{V}$      | Steady State    | $T_A = 25^\circ\text{C}$<br>$T_A = 70^\circ\text{C}$ | $I_D$     | -7.1<br>-6     | A     |
|  | $t < 5\text{s}$ | $T_A = 25^\circ\text{C}$<br>$T_A = 70^\circ\text{C}$ | $I_D$     | -10<br>-8.3    | A     |
| Maximum Continuous Body Diode Forward Current (Note 5)         |                 |  | $I_S$     | -3             | A     |
| Pulsed Drain Current (10 $\mu\text{s}$ pulse, duty cycle = 1%) |                 |  | $I_{DM}$  | -90            | A     |
| Avalanche Current (Note 6)                                     |                 |  | $I_{AS}$  | 17             | A     |
| Repetitive Avalanche Energy (Note 6)                           |                 |  | $E_{AS}$  | 72             | mJ    |

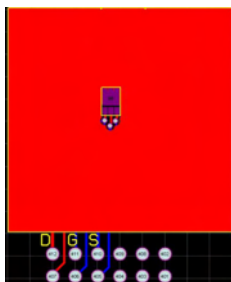
**Thermal Characteristics**

| Characteristic                                   |                          | Symbol          | Value      | Units              |
|--|--------------------------|-----------------|------------|--------------------|
| Total Power Dissipation (Note 4)                 | $T_A = 25^\circ\text{C}$ | $P_D$           | 1          | W                  |
|  | $T_A = 70^\circ\text{C}$ |                 | 0.63       |                    |
| Thermal Resistance, Junction to Ambient (Note 4) | Steady State             | $R_{\theta JA}$ | 126        | $^\circ\text{C/W}$ |
|  | $t < 5\text{s}$          |                 | 60         |                    |
| Total Power Dissipation (Note 5)                 | $T_A = 25^\circ\text{C}$ | $P_D$           | 2.1        | W                  |
|  | $T_A = 70^\circ\text{C}$ |                 | 1.3        |                    |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State             | $R_{\theta JA}$ | 61         | $^\circ\text{C/W}$ |
|  | $t < 5\text{s}$          |                 | 29         |                    |
| Thermal Resistance, Junction to Case             |                          | $R_{\theta JC}$ | 6.4        | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range          |                          | $T_J, T_{STG}$  | -55 to 150 | $^\circ\text{C}$   |

Notes: 4. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.



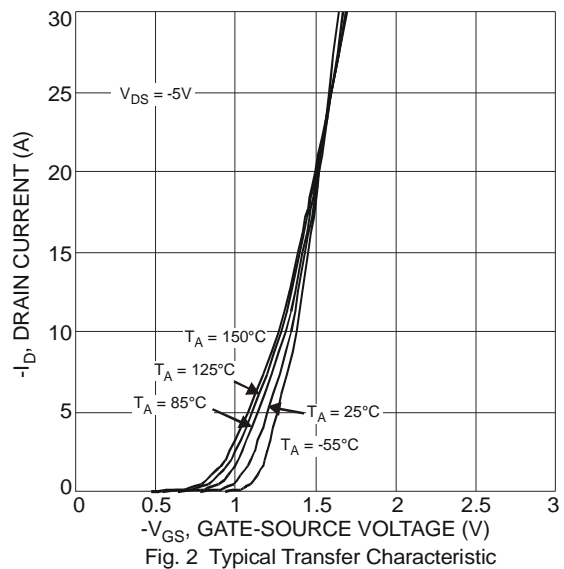
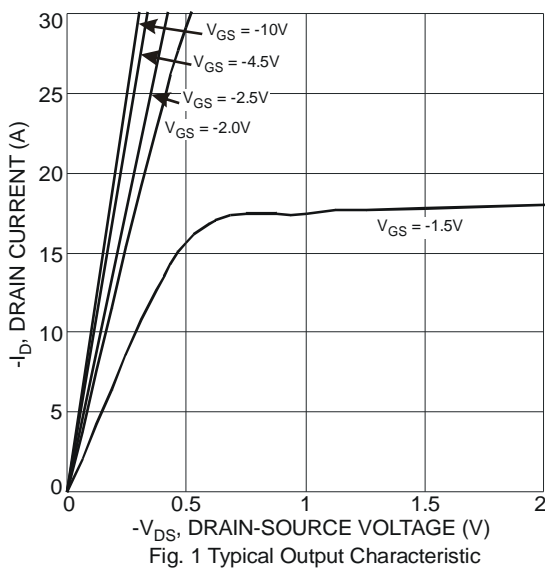
Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal vias to bottom layer 1inch square copper plate



**Electrical Characteristics** @  $T_A = 25^\circ\text{C}$  unless otherwise stated

| Characteristic   | Symbol       | Min   | Typ   | Max     | Unit          | Test Condition   |
|--|--------------|-------|-------|---------|---------------|--|
| <b>OFF CHARACTERISTICS (Note 7)</b>                      |              |       |       |         |               |  |
| Drain-Source Breakdown Voltage                           | $BV_{DSS}$   | -20   | -     | -       | V             | $V_{GS} = 0V, I_D = -10mA$   |
| Zero Gate Voltage Drain Current $T_J = 25^\circ\text{C}$ | $I_{DSS}$    | -     | -     | -1      | $\mu\text{A}$ | $V_{DS} = -20V, V_{GS} = 0V$                                       |
| Gate-Source Leakage                                      | $I_{GSS}$    | -     | -     | $\pm 2$ | $\mu\text{A}$ | $V_{GS} = \pm 10V, V_{DS} = 0V$                                    |
| <b>ON CHARACTERISTICS (Note 7)</b>                       |              |       |       |         |               |  |
| Gate Threshold Voltage                                   | $V_{GS(th)}$ | -0.45 | -     | -1.2    | V             | $V_{DS} = -10V, I_D = -200\mu\text{A}$                             |
| Static Drain-Source On-Resistance                        | $R_{DS(on)}$ | -     | 10    | 16      | m $\Omega$    | $V_{GS} = -4.5V, I_D = -3.6A$                                      |
|  |              | -     | 12    | 20      |               | $V_{GS} = -2.5V, I_D = -3.6A$                                      |
|  |              | -     | 13.6  | 25      |               | $V_{GS} = -2.0V, I_D = -1.8A$                                      |
|  |              | -     | 20    | -       |               | $V_{GS} = -1.5V, I_D = -1A$  |
|  |              | -     | -     | -       |               | -  |
| Forward Transfer Admittance                              | $ Y_{fs} $   | 10    | 17    | -       | S             | $V_{DS} = -10V, I_D = -3.6A$                                       |
| Diode Forward Voltage                                    | $V_{SD}$     | -     | 0.7   | 1.2     | V             | $V_{GS} = 0V, I_S = -3.6A$   |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b>                  |              |       |       |         |               |  |
| Input Capacitance  | $C_{iss}$    | -     | 4748  | -       | pF            | $V_{DS} = -10V, V_{GS} = 0V,$<br>$f = 1.0\text{MHz}$               |
| Output Capacitance                                       | $C_{oss}$    | -     | 833   | -       |               |  |
| Reverse Transfer Capacitance                             | $C_{rss}$    | -     | 339   | -       |               |  |
| Gate Resistance  | $R_g$        | -     | 6.2   | -       | $\Omega$      | $V_{DS} = 0V, V_{GS} = 0V, f = 1\text{MHz}$                        |
| Total Gate Charge ( $V_{GS} = -10V$ )                    | $Q_g$        | -     | 113   | -       | nC            | $V_{DS} = -16V, I_D = -7.2A$                                       |
| Total Gate Charge ( $V_{GS} = -4.5V$ )                   | $Q_g$        | -     | 53    | -       |               |  |
| Gate-Source Charge                                       | $Q_{gs}$     | -     | 7.1   | -       |               |  |
| Gate-Drain Charge  | $Q_{gd}$     | -     | 8.5   | -       |               |  |
| Turn-On Delay Time                                       | $t_{D(on)}$  | -     | 22.8  | -       |               |  |
| Turn-On Rise Time  | $t_r$        | -     | 29.8  | -       | ns            | $V_{DD} = -10V, V_{GS} = -4.5V,$<br>$R_G = 4.7\Omega, I_D = -3.6A$ |
| Turn-Off Delay Time                                      | $t_{D(off)}$ | -     | 240.8 | -       |               |  |
| Turn-Off Fall Time                                       | $t_f$        | -     | 100.6 | -       |               |  |

- Notes: 6. UIS in production with  $L = 0.5\text{mH}$ ,  $T_J = 25^\circ\text{C}$   
 7. Short duration pulse test used to minimize self-heating effect.  
 8. Guaranteed by design. Not subject to production testing.



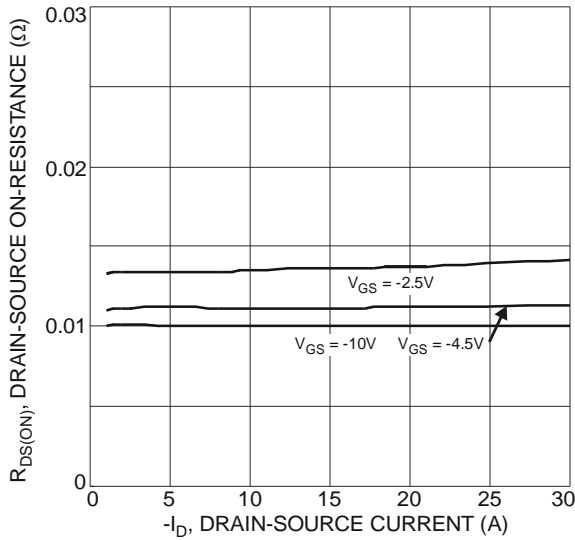


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

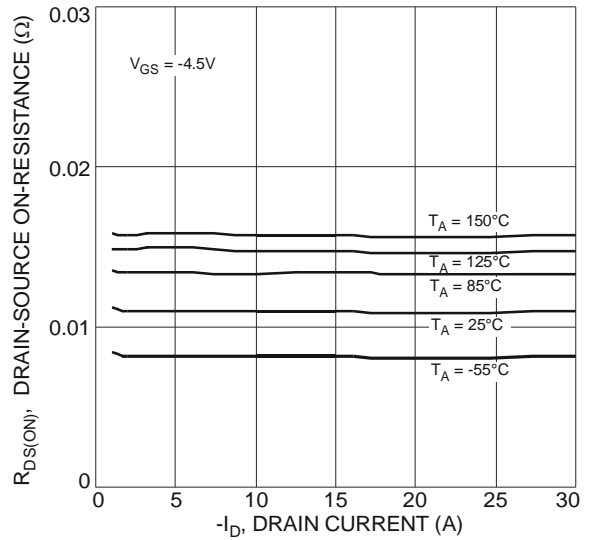


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

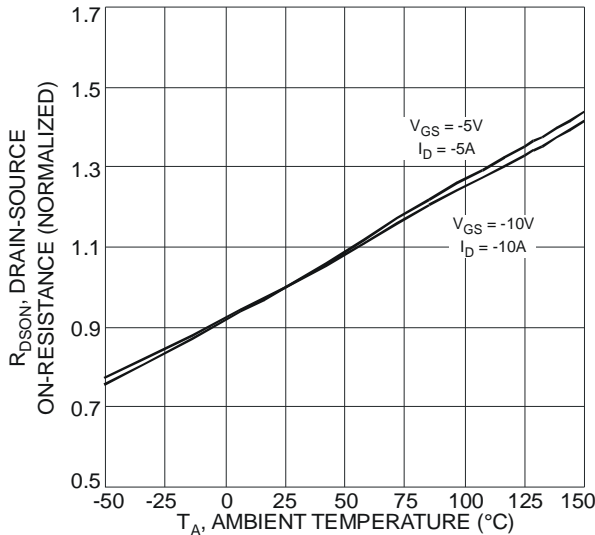


Fig. 5 On-Resistance Variation with Temperature

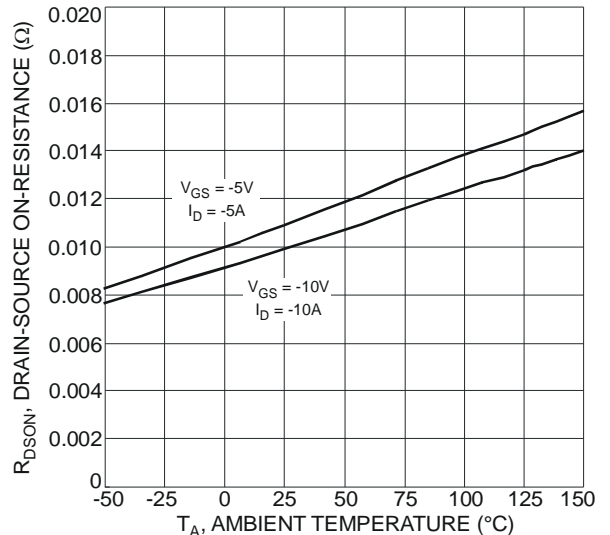


Fig. 6 On-Resistance Variation with Temperature

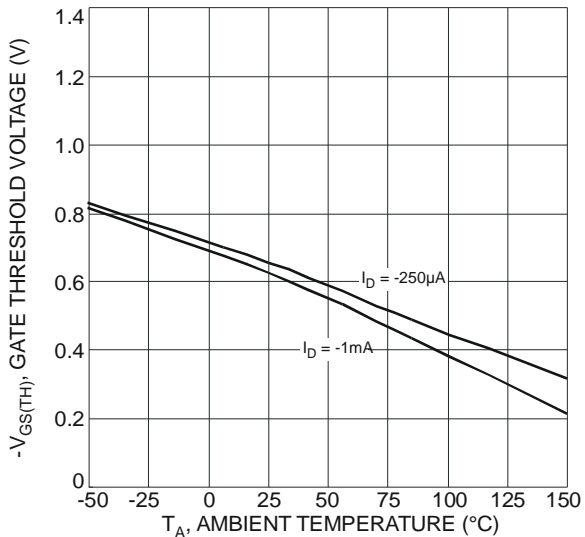


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

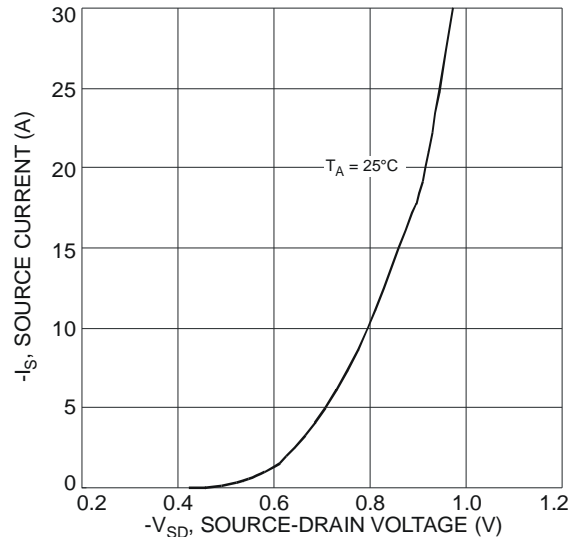


Fig. 8 Diode Forward Voltage vs. Current

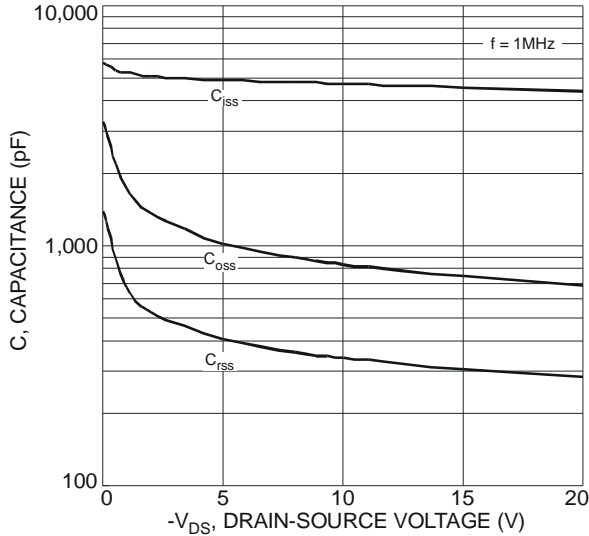


Fig. 9 Typical Total Capacitance

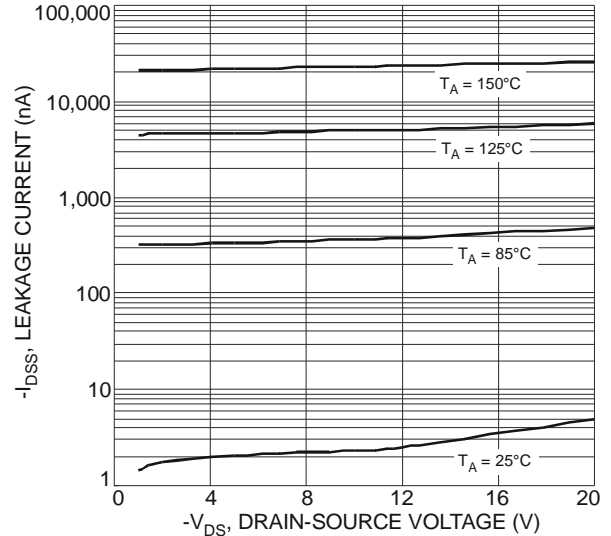


Fig. 10 Typical Leakage Current vs. Drain-Source Voltage

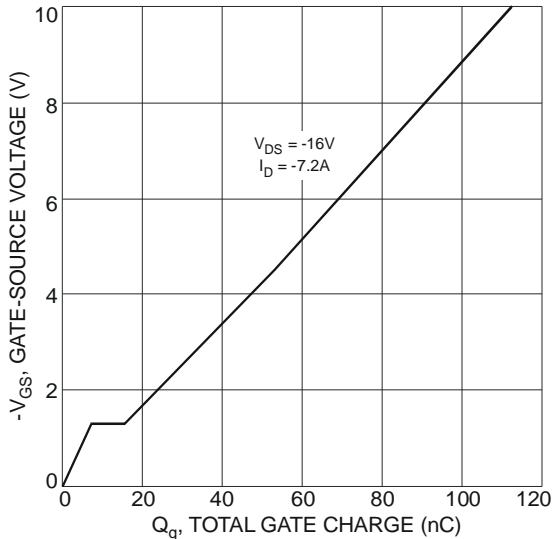


Fig. 11 Gate-Charge Characteristics

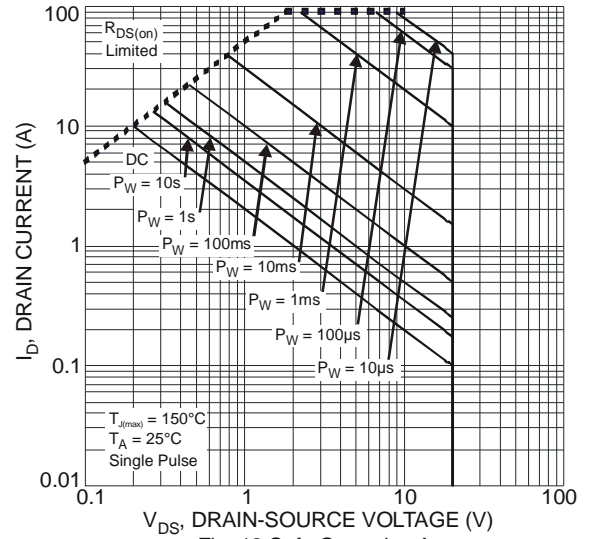


Fig. 12 Safe Operation Area

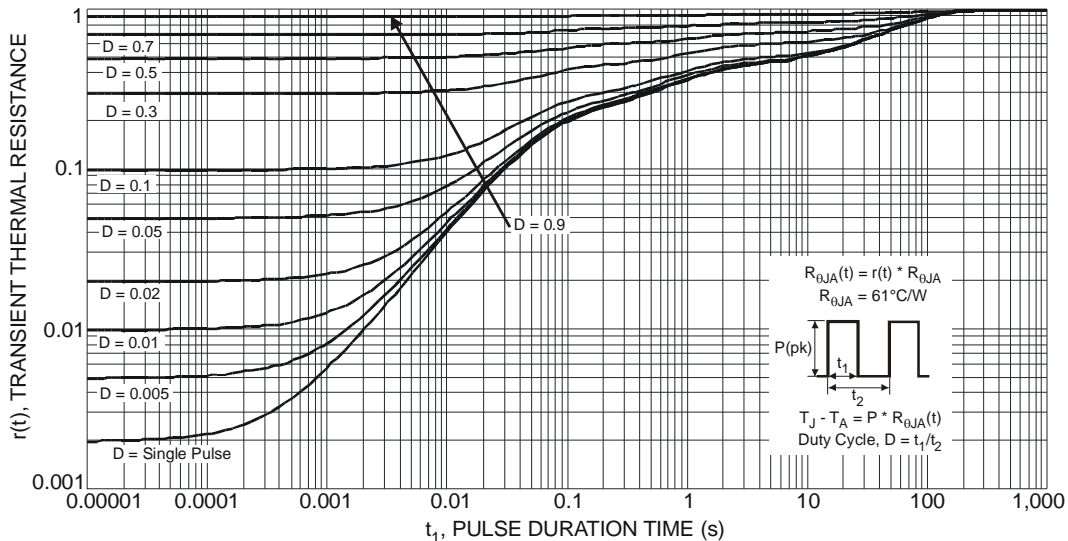
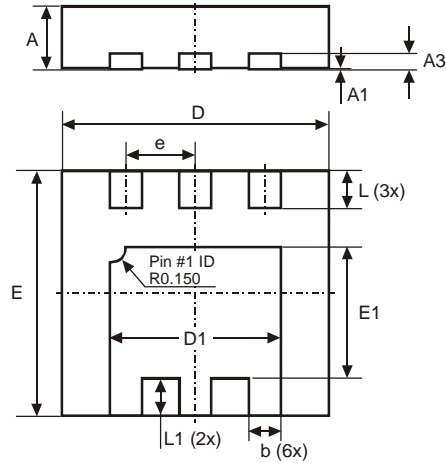


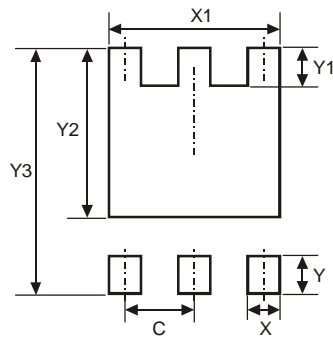
Fig. 13 Transient Thermal Response

**Package Outline Dimensions**



| U-DFN2523-6          |      |      |       |
|----------------------|------|------|-------|
| Dim                  | Min  | Max  | Typ   |
| A                    | 0.57 | 0.63 | 0.60  |
| A1                   | 0    | 0.05 | 0.02  |
| A3                   | -    | -    | 0.152 |
| b                    | 0.25 | 0.35 | 0.30  |
| D                    | 2.45 | 2.55 | 2.50  |
| D1                   | 1.55 | 1.65 | 1.60  |
| e                    | -    | -    | 0.65  |
| E                    | 2.25 | 2.35 | 2.30  |
| E1                   | 1.18 | 1.28 | 1.23  |
| L                    | 0.30 | 0.40 | 0.35  |
| L1                   | 0.30 | 0.40 | 0.35  |
| All Dimensions in mm |      |      |       |

**Suggested Pad Layout**



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.650         |
| X          | 0.400         |
| X1         | 1.700         |
| Y          | 0.650         |
| Y1         | 0.450         |
| Y2         | 1.830         |
| Y3         | 2.700         |

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