

Product Summary

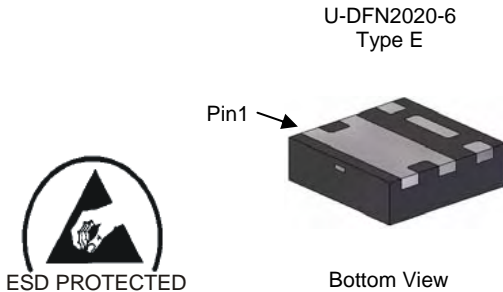
| $V_{(BR)DSS}$ | $R_{DS(ON) max}$ | Package | I_D $T_A = +25^\circ C$ |
|---------------|---------------------------------|-----------------------|------------------------------|
| -25V | 27m Ω @ $V_{GS} = -4.5V$ | U-DFN2020-6 Type E | -6.7A |
| | 40m Ω @ $V_{GS} = -1.8V$ | | -5.4A |

Description

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.

Applications

- Load Switching
- Battery Management Application
- Power Management Functions

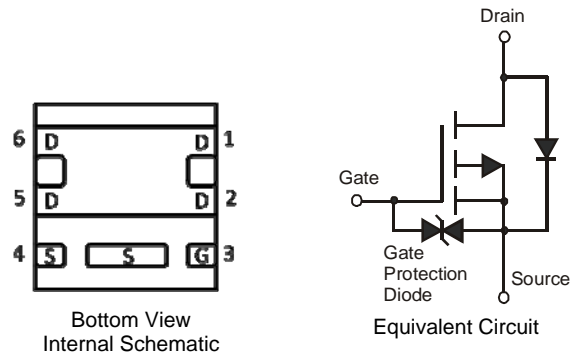


Features

- Low $R_{DS(ON)}$ – Ensures on State Losses are Minimized
- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm²
- **ESD Protected Gate**
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Mechanical Data

- Case: U-DFN2020-6 Type E
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208 ⁽³⁾
- Weight: 0.001 grams (approximate)

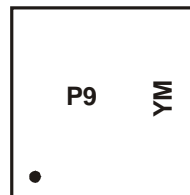


Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---------------|--------------------|-------------------|
| DMP2039UFDE-7 | U-DFN2020-6 Type E | 3,000/Tape & Reel |

- Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
 2. See <http://www.diodes.com> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 4. For packaging details, go to our website at <http://www.diodes.com>.

Marking Information



P9 = 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°C, unless otherwise specified.)

| Characteristic | | | Symbol | Value | Units |
|-----------------------------------------------------------|--------------|--------------------------------------------------|------------------|--------------|-------|
| Drain-Source Voltage | | | V _{DSS} | -25 | V |
| Gate-Source Voltage | | | V _{GSS} | ±8 | V |
| Continuous Drain Current (Note 5) V _{GS} = -4.5V | Steady State | T _A = +25°C T _A = +70°C | I _D | -6.7 -5.3 | A |
| | t < 5s | T _A = +25°C T _A = +70°C | I _D | -8.3 -6.6 | A |
| Continuous Drain Current (Note 5) V _{GS} = -1.8V | Steady State | T _A = +25°C T _A = +70°C | I _D | -5.4 -4.3 | A |
| | t < 5s | T _A = +25°C T _A = +70°C | I _D | -6.6 -5.2 | A |
| Pulsed Drain Current (10μs pulse, duty cycle = 1%) | | | I _{DM} | -60 | A |
| Continuous Source-Drain Diode Current | | | I _S | -2.0 | A |

Thermal Characteristics

| Characteristic | | Symbol | Value | Units |
|--------------------------------------------------|------------------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 5) | T _A = +25°C | P _D | 0.8 | W |
| | T _A = +70°C | | 1.2 | |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state | R _{θJA} | 160 | °C/W |
| | t < 5s | | 104 | |
| Total Power Dissipation (Note 6) | T _A = +25°C | P _D | 2.0 | W |
| | T _A = +70°C | | 2.9 | |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady state | R _{θJA} | 63 | °C/W |
| | t < 5s | | 42 | |
| Thermal Resistance, Junction to Case (Note 6) | | R _{θJC} | 10.8 | °C/W |
| Operating and Storage Temperature Range | | T _J , T _{STG} | -55 to +150 | °C |

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---------------------------------------------|---------------------|------|-------|------|------|-------------------------------------------------------------------------------------------------|
| OFF CHARACTERISTICS (Note 7) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | -25 | — | — | V | V _{GS} = 0V, I _D = -250μA |
| Zero Gate Voltage Drain Current | I _{DSS} | — | — | -1 | μA | V _{DS} = -25V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±10 | μA | V _{GS} = ±8.0V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | -0.4 | — | -1.0 | V | V _{DS} = V _{GS} , I _D = -250μA |
| Static Drain-Source On-Resistance | R _{DS(on)} | — | 20 | 27 | mΩ | V _{GS} = -4.5V, I _D = -6.4A |
| | | — | 24 | 34 | | V _{GS} = -2.5V, I _D = -4.8A |
| | | — | 28 | 40 | | V _{GS} = -1.8V, I _D = -2.5A |
| | | — | 33 | 70 | | V _{GS} = -1.5V, I _D = -1.5A |
| Forward Transfer Admittance | Y _{fs} | — | 16 | — | S | V _{DS} = -5V, I _D = -4A |
| Diode Forward Voltage | V _{SD} | — | -0.7 | -1.0 | V | V _{GS} = 0V, I _S = -1A |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C _{iSS} | — | 2530 | — | pF | V _{DS} = -15V, V _{GS} = 0V f = 1.0MHz |
| Output Capacitance | C _{oSS} | — | 203 | — | pF | |
| Reverse Transfer Capacitance | C _{rSS} | — | 177 | — | pF | |
| Gate Resistance | R _g | — | 9.1 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1.0MHz |
| Total Gate Charge (V _{GS} = -4.5V) | Q _g | — | 28.2 | — | nC | V _{DS} = -15V, I _D = -4.0A |
| Total Gate Charge (V _{GS} = -8V) | Q _g | — | 48.7 | — | nC | |
| Gate-Source Charge | Q _{gs} | — | 3.2 | — | nC | |
| Gate-Drain Charge | Q _{gd} | — | 5.0 | — | nC | |
| Turn-On Delay Time | t _{D(on)} | — | 15.1 | — | ns | V _{DD} = -15V, V _{GS} = -4.5V, R _G = 1Ω, I _D = -4.0A |
| Turn-On Rise Time | t _r | — | 23.5 | — | ns | |
| Turn-Off Delay Time | t _{D(off)} | — | 137.6 | — | ns | |
| Turn-Off Fall Time | t _f | — | 80.5 | — | ns | |

- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate
 - Short duration pulse test used to minimize self-heating effect
 - Guaranteed by design. Not subject to production testing.

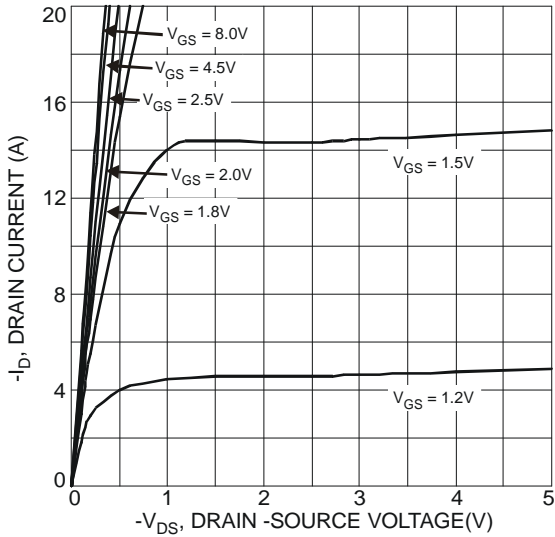


Fig. 1 Typical Output Characteristics

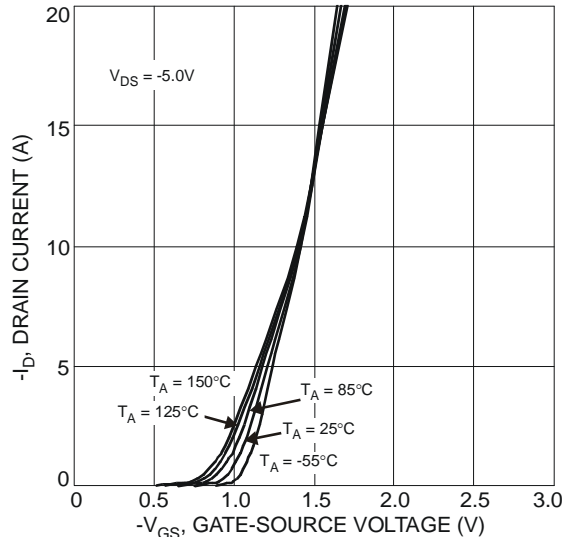


Fig. 2 Typical Transfer Characteristics

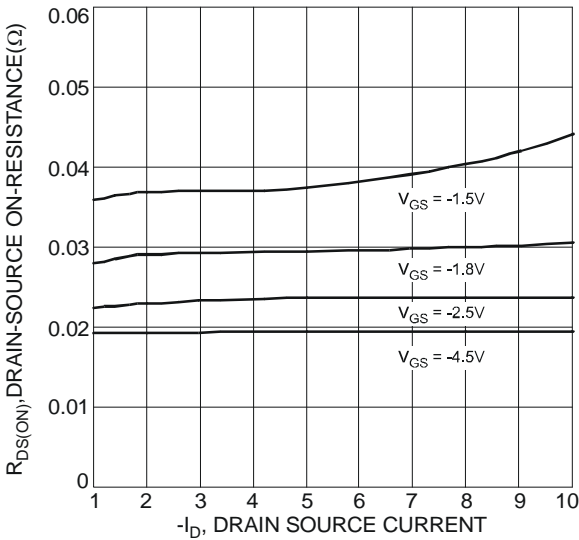


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

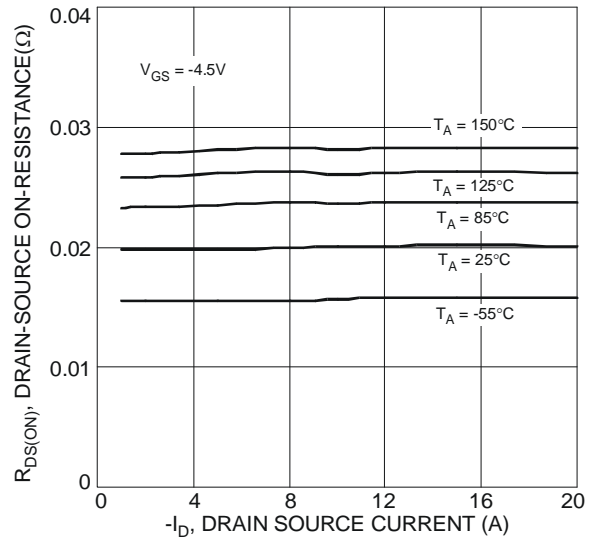


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

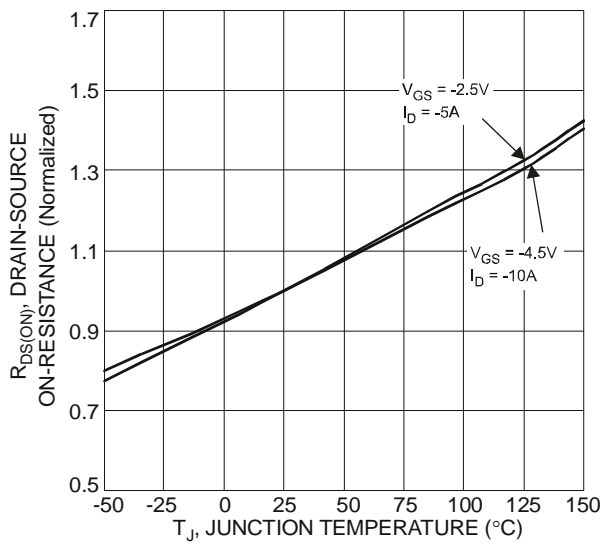


Fig. 5 On-Resistance Variation with Temperature

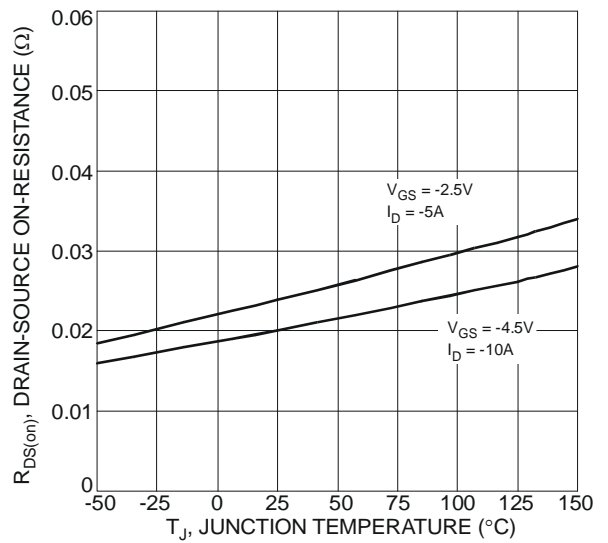


Fig. 6 On-Resistance Variation with Temperature

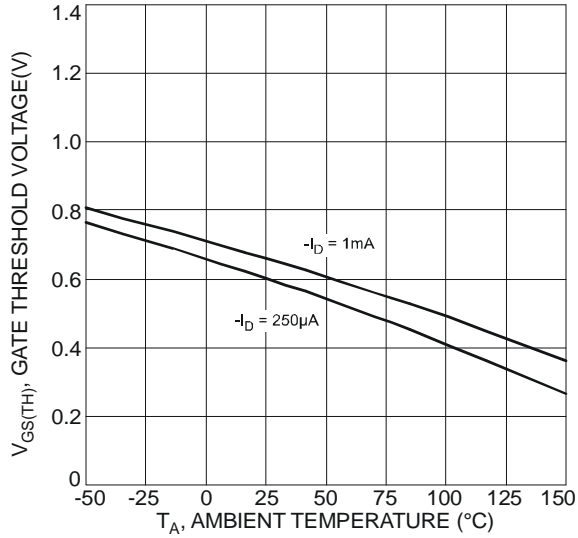


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

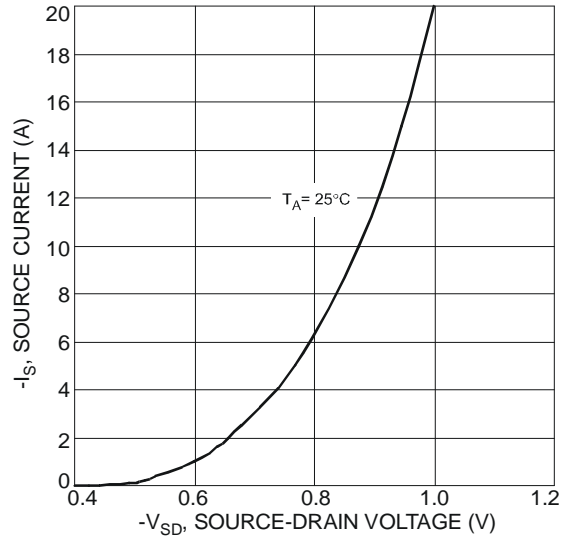


Fig. 8 Diode Forward Voltage vs. Current

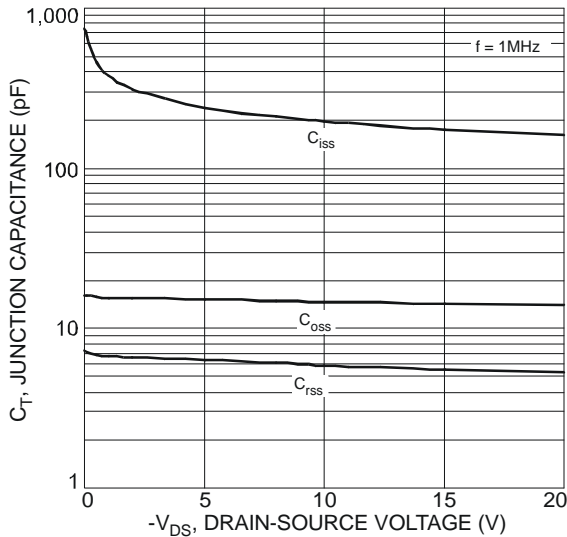


Fig. 9 Typical Junction Capacitance

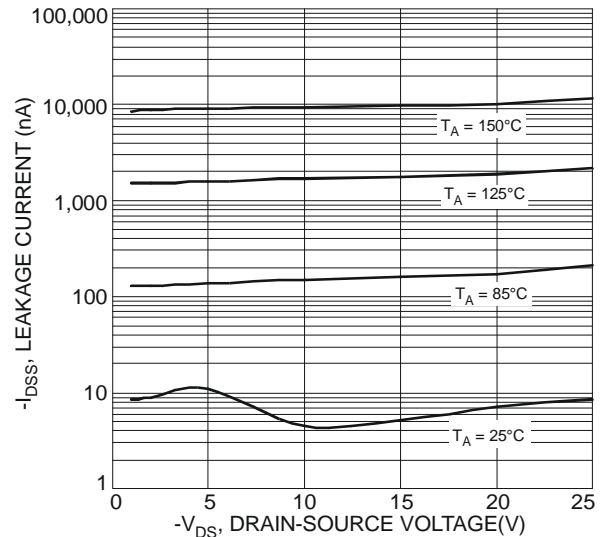


Fig. 10 Typical Drain-Source Leakage Current vs. Voltage

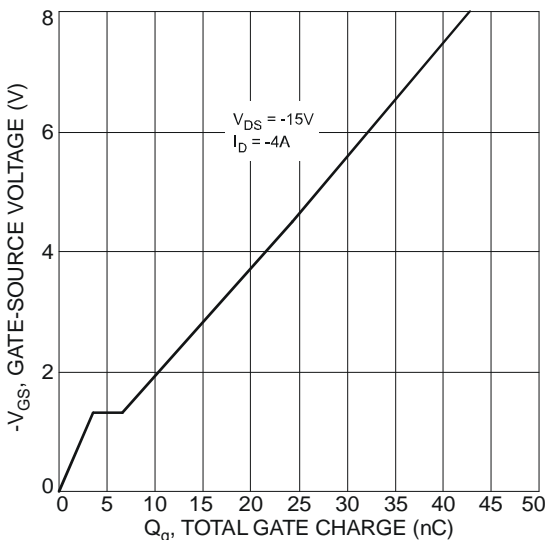


Fig. 11 Gate-Charge Characteristics

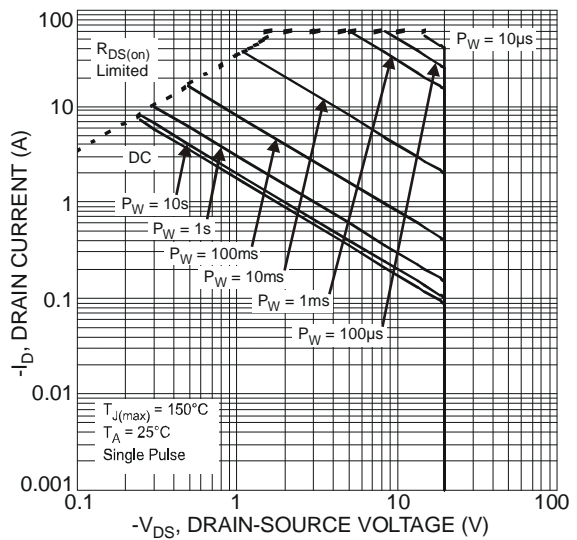
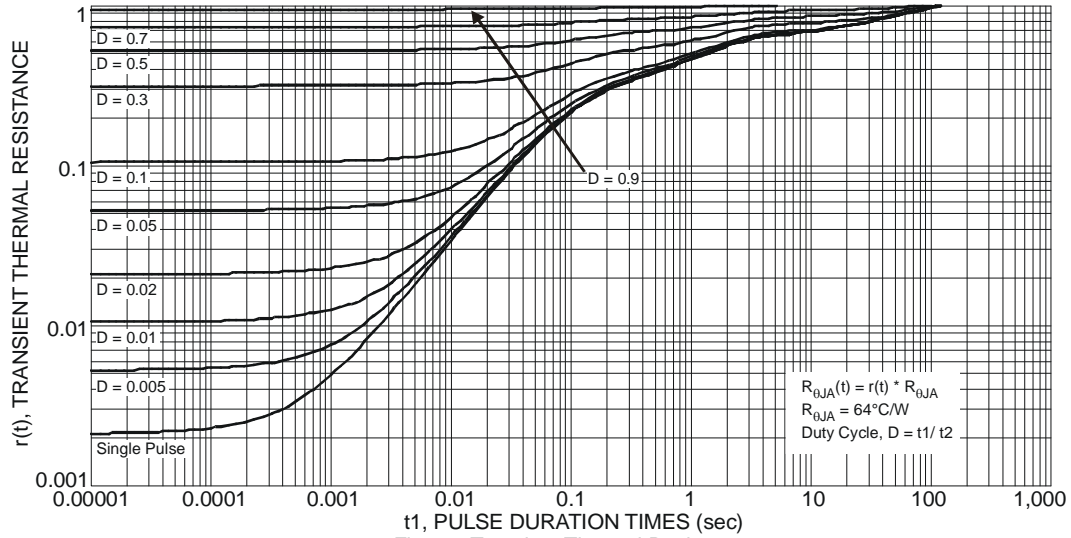
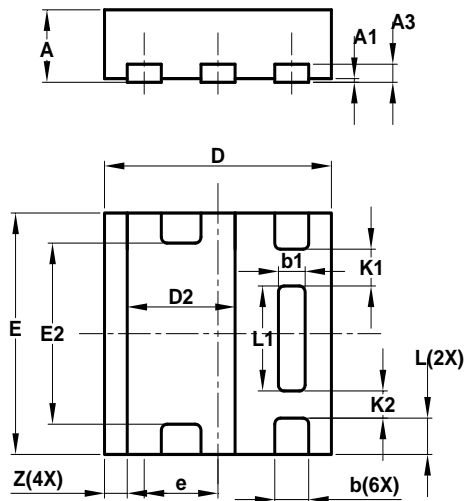


Fig. 12 SOA, Safe Operation Area



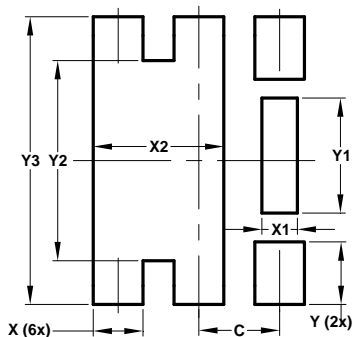
Package Outline Dimensions



| U-DFN2020-6 Type E | | | |
|-----------------------|-------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.57 | 0.63 | 0.60 |
| A1 | 0 | 0.05 | 0.03 |
| A3 | — | — | 0.15 |
| b | 0.25 | 0.35 | 0.30 |
| b1 | 0.185 | 0.285 | 0.235 |
| D | 1.95 | 2.05 | 2.00 |
| D2 | 0.85 | 1.05 | 0.95 |
| E | 1.95 | 2.05 | 2.00 |
| E2 | 1.40 | 1.60 | 1.50 |
| e | — | — | 0.65 |
| L | 0.25 | 0.35 | 0.30 |
| L1 | 0.82 | 0.92 | 0.87 |
| K1 | — | — | 0.305 |
| K2 | — | — | 0.225 |
| Z | — | — | 0.20 |

All Dimensions in mm

Suggested Pad Layout



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 0.650 |
| X | 0.400 |
| X1 | 0.285 |
| X2 | 1.050 |
| Y | 0.500 |
| Y1 | 0.920 |
| Y2 | 1.600 |
| Y3 | 2.300 |

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