# DUAL N-CHANNEL ENHANCEMENT MODE MOSFET

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)\ max}$ | $I_D$ $T_A$ = +25°C |
|---|---|---|
| 20V | 13mΩ @ $V_{GS}$ = 4.5V | 9.0A |
| | 14mΩ @ $V_{GS}$ = 4.0V | 8.7A |
| | 17mΩ @ $V_{GS}$ = 3.1V | 8.0A |
| | 18mΩ @ $V_{GS}$ = 2.5V | 6.7A |
| | 28mΩ @ $V_{GS}$ = 1.8V | 6.3A |

## 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

- Power Management Functions
- Battery Pack
- Load Switch

## Features

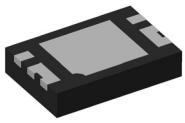
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- **ESD Protected Gate**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Mechanical Data

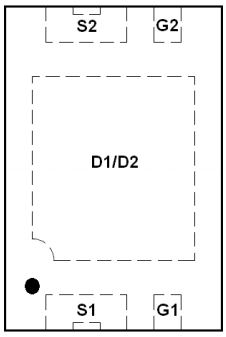
- Case: U-DFN2030-6
- Case Material: Molded Plastic, "Green" Molding Compound UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram Below
- Weight: 0.012 grams (approximate)

ESD PROTECTED TO 2kV

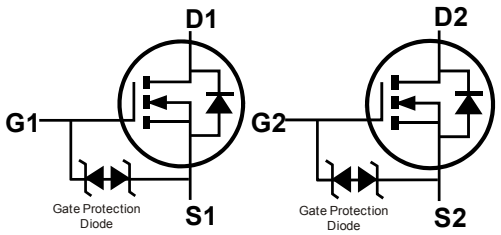
U-DFN2030-6



Bottom View




Top View



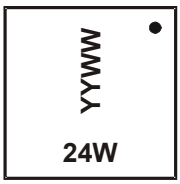

Equivalent Circuit

## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| DMN2014LHAB-7 | U-DFN2030-6 | 3,000 / Tape & Reel |
| DMN2014LHAB-13 | U-DFN2030-6 | 10,000 / Tape & Reel |

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html 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/products/packages.html.

## Marking Information




24W = Product Type Marking Code
YYWW = Date Code Marking
YY = Last digit of year (ex: 14 for 2014)
WW = Week code (01 to 53)

## Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 20 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±12 | V |
| Continuous Drain Current (Note 6) $V_{GS}$ = 4.5V | Steady State | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | 9.0<br>7.1 | A |
| | t < 10s | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | 9.3<br>7.4 | A |
| Pulsed Drain Current (10µs pulse, duty cycle = 1% ) | | | $I_{DM}$ | 45 | 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 | | 0.5 | |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | $R_{\theta JA}$ | 157 | °C/W |
| | t < 10s | | 148 | |
| Total Power Dissipation (Note 6) | $T_A$ = +25°C | $P_D$ | 1.7 | W |
| | $T_A$ = +70°C | | 1.1 | |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | $R_{\theta JA}$ | 73.7 | °C/W |
| | t < 10s | | 68 | |
| Thermal Resistance, Junction to Case | | $R_{\theta JC}$ | 9.4 | |
| 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 | $BV_{DSS}$ | 20 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250µA |
| Zero Gate Voltage Drain Current $T_J$ = +25°C | $I_{DSS}$ | — | — | 1.0 | µA | $V_{DS}$ = 20V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±10 | µA | $V_{GS}$ = ±8V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 7)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | 0.3 | 0.71 | 1.1 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| Static Drain-Source On-Resistance | $R_{DS\ (ON)}$ | — | 10 | 13 | mΩ | $V_{GS}$ = 4.5V, $I_D$ = 4.0A |
| | | | 11 | 14 | | $V_{GS}$ = 4.0V, $I_D$ = 4.0A |
| | | | 12 | 17 | | $V_{GS}$ = 3.1V, $I_D$ = 4.0A |
| | | | 13 | 18 | | $V_{GS}$ = 2.5V, $I_D$ = 4.0A |
| | | | 19 | 28 | | $V_{GS}$ = 1.8V, $I_D$ = 3.5A |
| Forward Transfer Admittance | $\|Y_{fs}\|$ | — | 25 | — | S | $V_{DS}$ = 5V, $I_D$ = 6A |
| Diode Forward Voltage | $V_{SD}$ | — | 0.75 | 1.0 | V | $V_{GS}$ = 0V, $I_S$ = 1A |
| **DYNAMIC CHARACTERISTICS (Note 8)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 1550 | — | pF | $V_{DS}$ = 10V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 166 | — | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 145 | — | pF | |
| Gate Resistance | $R_g$ | — | 1.37 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge ($V_{GS}$ = 2.5V) | $Q_g$ | — | 8.4 | — | nC | $V_{DS}$ = 10V, $I_D$ = 6A |
| Total Gate Charge ($V_{GS}$ = 4.5V) | $Q_g$ | — | 16 | — | nC | |
| Gate-Source Charge | $Q_{gs}$ | — | 2.3 | — | nC | |
| Gate-Drain Charge | $Q_{gd}$ | — | 2.5 | — | nC | |
| Turn-On Delay Time | $t_{D(on)}$ | — | 6.9 | — | ns | $V_{DD}$ = 10V, $R_L$ = 1.7Ω, $V_{GS}$ = 5.0V, $R_G$ = 3Ω |
| Turn-On Rise Time | $t_r$ | — | 15.5 | — | ns | |
| Turn-Off Delay Time | $t_{D(off)}$ | — | 40.9 | — | ns | |
| Turn-Off Fall Time | $t_f$ | — | 12 | — | ns | |

Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout
6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper pad
7. Repetitive rating, pulse width limited by junction temperature
8. Guaranteed by design. Not subject to product testing

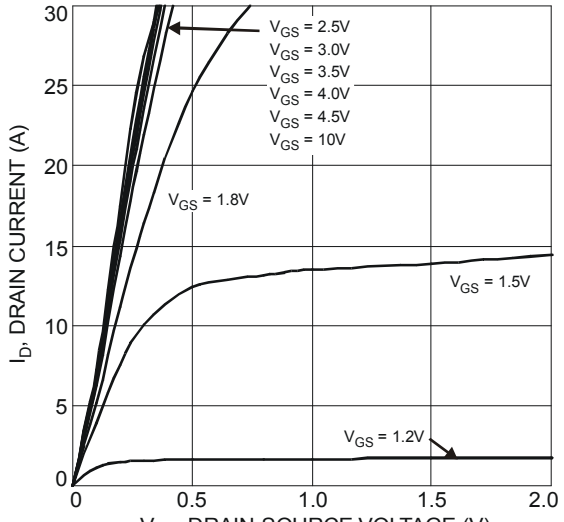



Figure 1 Typical Output Characteristic

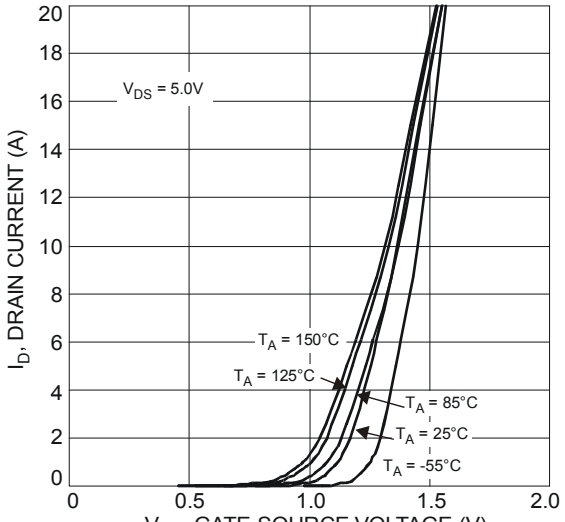



Figure 2 Typical Transfer Characteristics

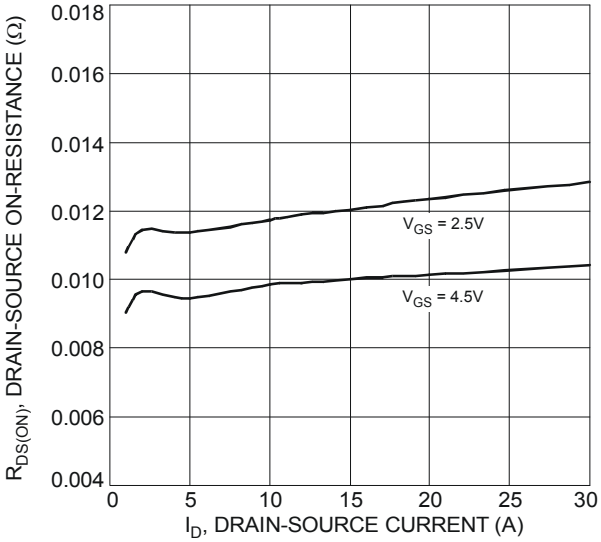



Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

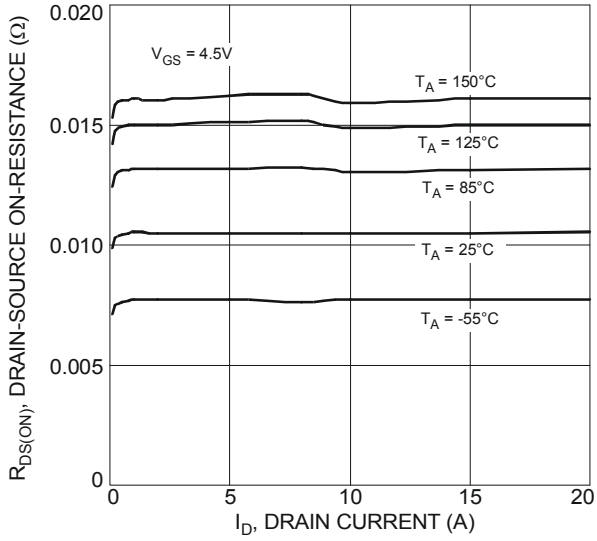



Figure 4 Typical On-Resistance vs. Drain Current and Temperature

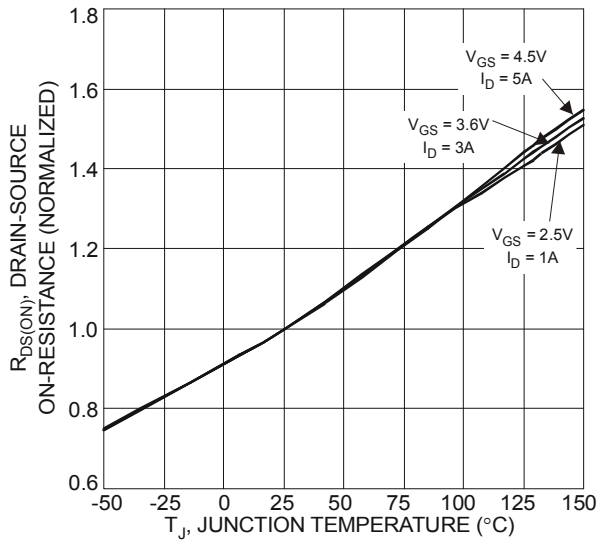



Figure 5 On-Resistance Variation with Temperature

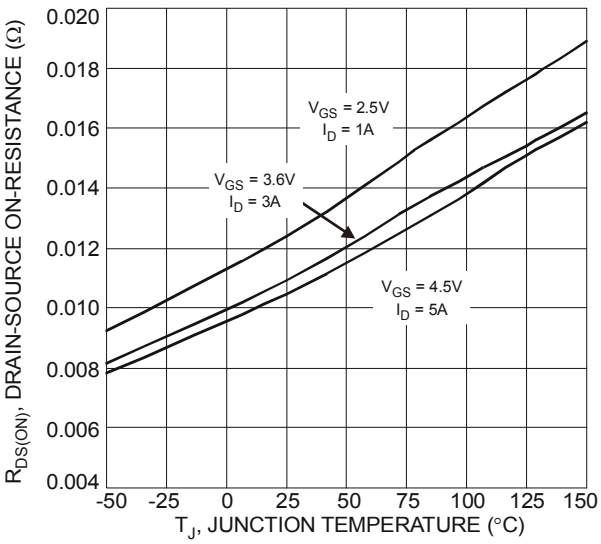



Figure 6 On-Resistance Variation with Temperature

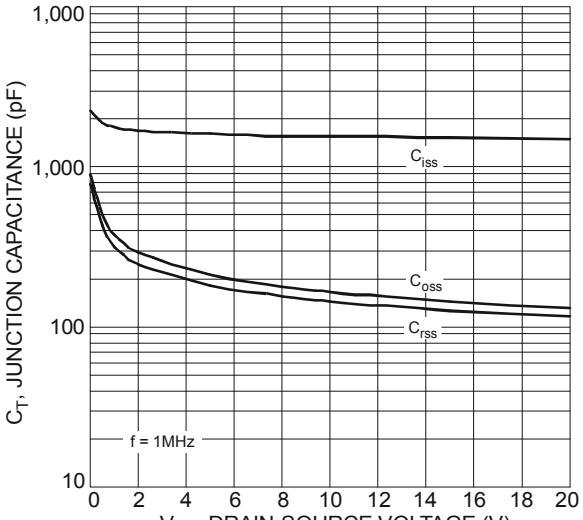



Figure 7 Typical Junction Capacitance

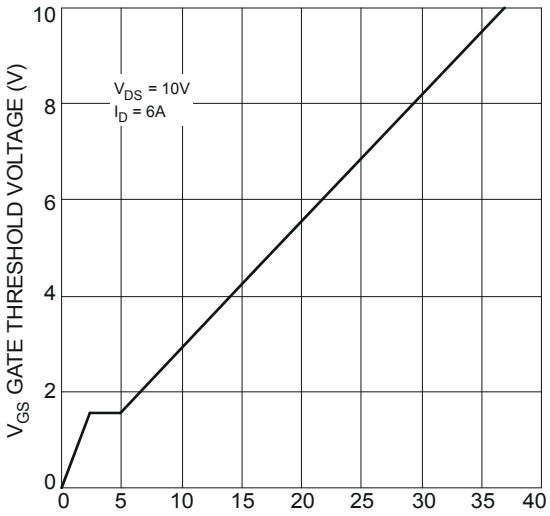



Figure 8 Gate Charge

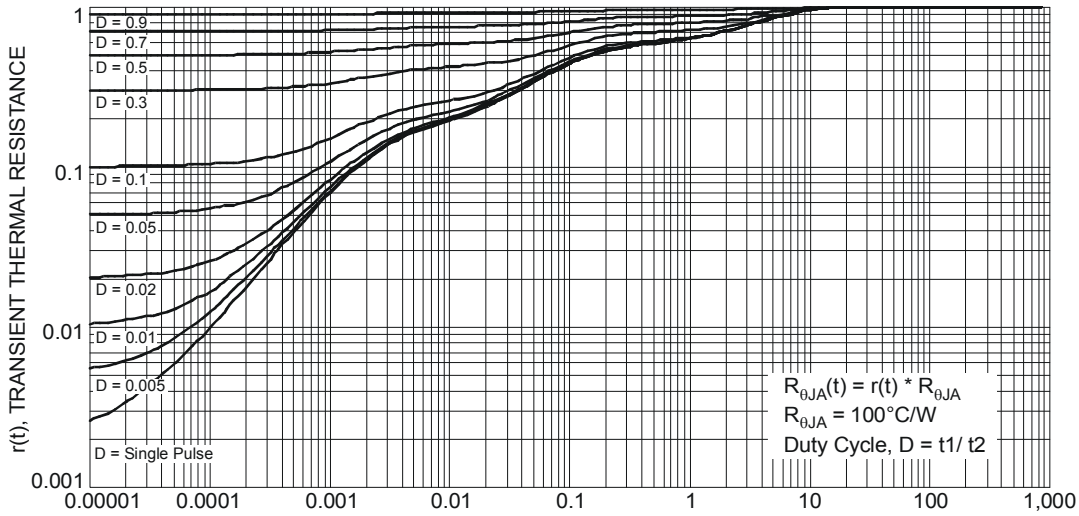
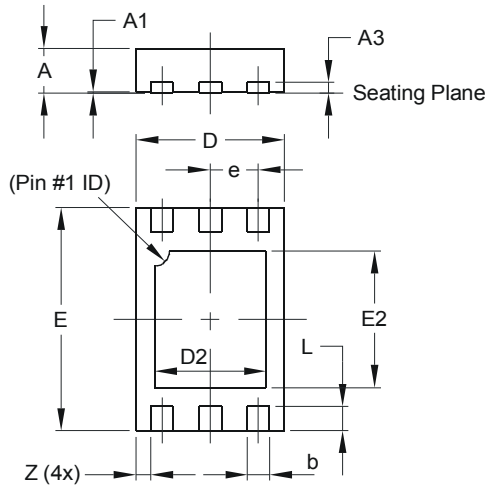



Figure 11 Transient Thermal Resistance

## Package Outline Dimensions

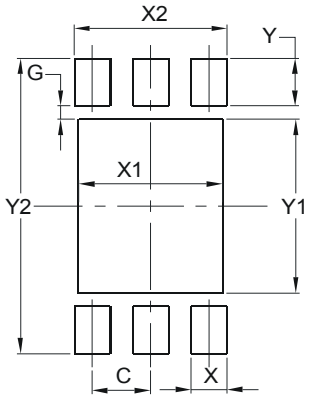
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.




| U-DFN2030-6 Type B | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.55 | 0.65 | 0.60 |
| **A1** | 0 | 0.05 | 0.02 |
| **A3** | - | - | 0.15 |
| **b** | 0.25 | 0.35 | 0.30 |
| **D** | 1.95 | 2.05 | 2.00 |
| **D2** | 1.40 | 1.60 | 1.50 |
| **E** | 2.95 | 3.05 | 3.00 |
| **E2** | 1.74 | 1.94 | 1.84 |
| **e** | - | - | 0.65 |
| **L** | 0.28 | 0.38 | 0.33 |
| **Z** | - | - | 0.20 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.




| Dimensions | Value (in mm) |
|---|---|
| **C** | 0.650 |
| **G** | 0.150 |
| **X** | 0.400 |
| **X1** | 1.600 |
| **X2** | 1.700 |
| **Y** | 0.530 |
| **Y1** | 1.940 |
| **Y2** | 3.300 |

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