# SINGLE P-CHANNEL ENHANCEMENT MODE MOSFET

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ max | $I_D$ max $T_A$ = +25°C |
|---|---|---|
| -30V | 14mΩ @ $V_{GS}$ = -10V | -12.0A |
| | 25mΩ @ $V_{GS}$ = -4.5V | -8.5A |

## Description

This MOSFET is 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

- Backlighting
- Power Management Functions
- DC-DC Converters

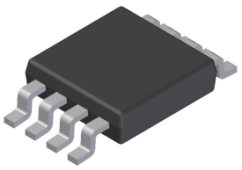
## Features

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **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**

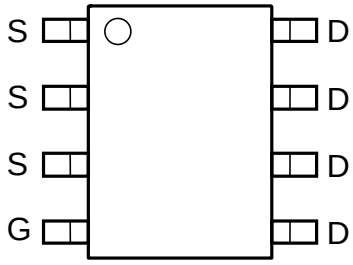
## Mechanical Data

- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See Diagram
- Terminals: Finish - Matte Tin Annealed over Copper Lead Frame. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.074g (Approximate)

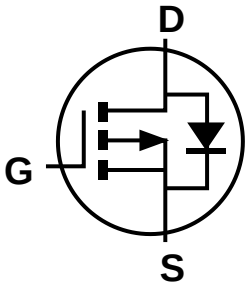
SO-8



Top View




Top View
Internal Schematic



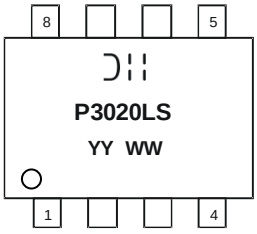

Equivalent Circuit

## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| DMP3020LSS-13 | SO-8 | 2500/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




= Manufacturer's Marking
P3020LS = Product Type Marking Code
YYWW = Date Code Marking
YY or YY = Year (ex: 16 = 2016)
WW = Week (01 to 53)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## Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | -30 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±25 | V |
| Drain Current (Note 5) | Steady State | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | -12<br>-9 | A |
| Pulsed Drain Current (Note 6) | | | $I_{DM}$ | -80 | A |

## Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Total Power Dissipation (Note 5) | $P_D$ | 2.5 | W |
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | 50 | °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 | $BV_{DSS}$ | -30 | — | — | V | $V_{GS}$ = 0V, $I_D$ = -250µA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | -1 | µA | $V_{DS}$ = -30V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±100 | nA | $V_{GS}$ = ±20V, $V_{DS}$ = 0V |
| | | — | — | ±800 | | $V_{GS}$ = ±25V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 7)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | -1 | — | -2 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = -250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | —<br>— | 11.6<br>18.6 | 14<br>25 | mΩ | $V_{GS}$ = -10V, $I_D$ = -8A<br>$V_{GS}$ = -4.5V, $I_D$ = -5A |
| Forward Transconductance | $g_{fs}$ | — | 12 | — | S | $V_{DS}$ = -10V, $I_D$ = -12A |
| Diode Forward Voltage (Note 7) | $V_{SD}$ | -0.5 | — | -1.1 | V | $V_{GS}$ = 0V, $I_S$ = -2A |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 1802 | — | pF | $V_{DS}$ = -15V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 415 | — | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 295 | — | pF | |
| Gate Resistance | $R_G$ | — | 2.3 | — | Ω | $V_{GS}$ = 0V, $V_{DS}$ = 0V, f = 1MHz |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| Total Gate Charge | $Q_g$ | — | 15.3<br>30.7 | — | nC | $V_{DS}$ = -15V, $V_{GS}$ = -4.5V, $I_D$ = -8A<br>$V_{DS}$ = -15V, $V_{GS}$ = -10V, $I_D$ = -8A |
| Gate-Source Charge | $Q_{gs}$ | — | 3.5 | — | | $V_{DS}$ = -15V, $V_{GS}$ = -10V, $I_D$ = -8A |
| Gate-Drain Charge | $Q_{gd}$ | — | 7.9 | — | | $V_{DS}$ = -15V, $V_{GS}$ = -10V, $I_D$ = -8A |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 5.1 | — | ns | $V_{GS}$ = -10V, $V_{DS}$ = -15V, $R_D$ = 15Ω, $R_G$ = 6Ω |
| Rise Time | $t_R$ | — | 8 | — | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 46 | — | | |
| Fall Time | $t_F$ | — | 30 | — | | |

Notes: 5. Device mounted on 2 oz. copper pads on FR-4 PCB with $R_{\theta JA}$ = 50°C/W.
6. Pulse width ≤10µs, Duty Cycle ≤1%.
7. Short duration pulse test used to minimize self-heating effect.


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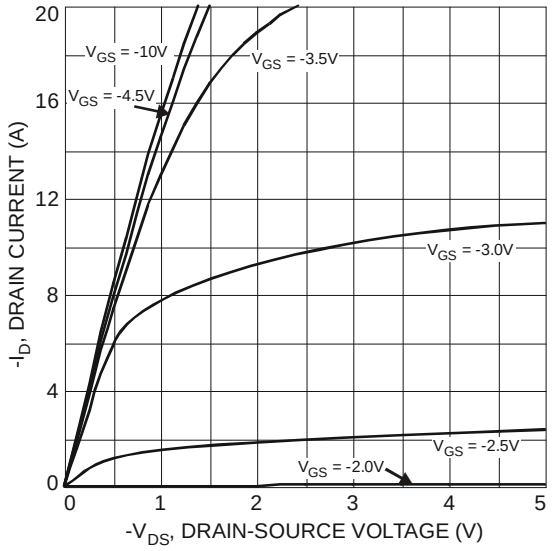


Fig. 1 Typical Output Characteristic

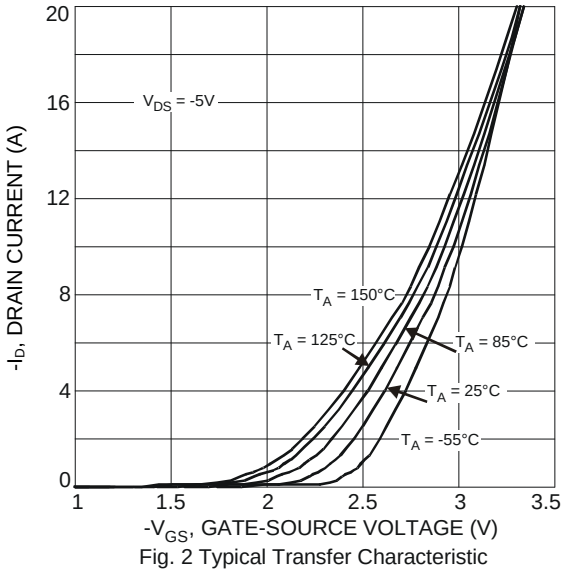


Fig. 2 Typical Transfer Characteristic

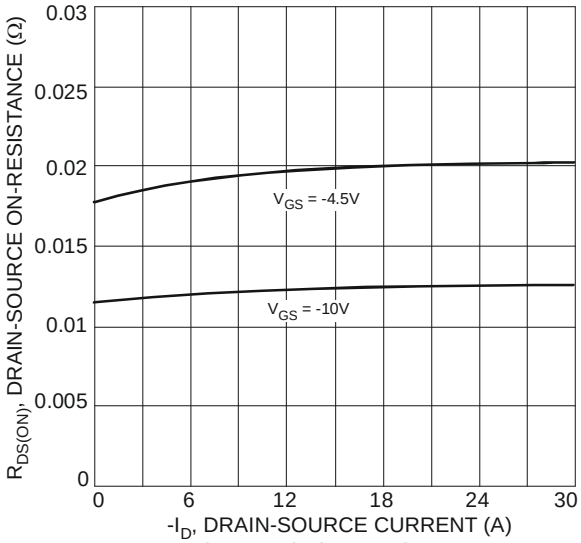


Fig. 3 Typical On-Resistance
vs. Drain Current and Gate Voltage

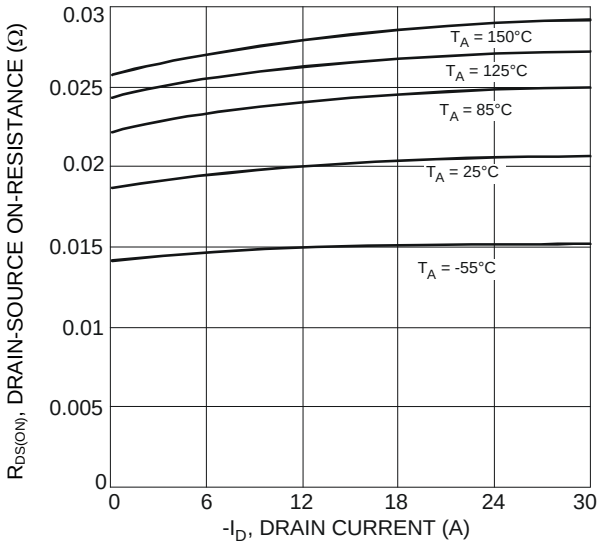


Fig. 4 Typical On-Resistance
vs. Drain Current and Temperature

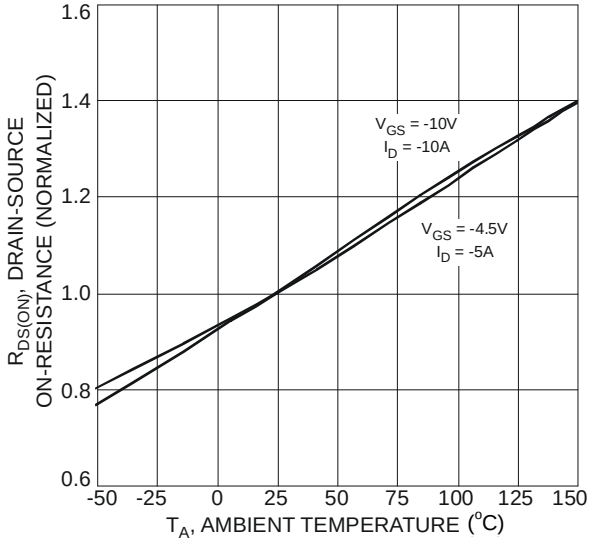


Fig. 5 Normalized On-Resistance vs. Ambient Temperature

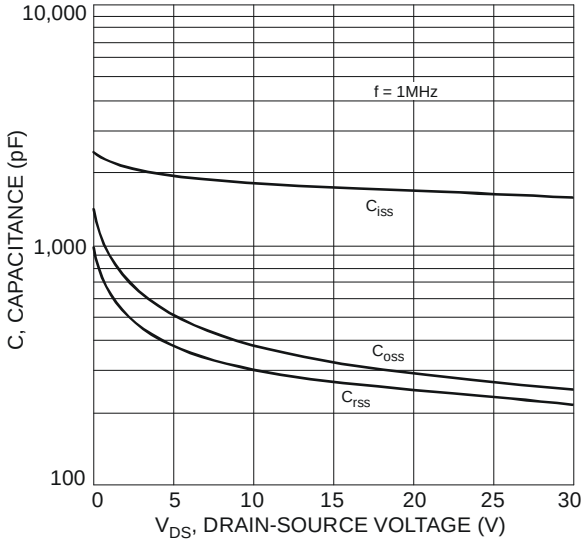


Fig. 6 Typical Total Capacitance


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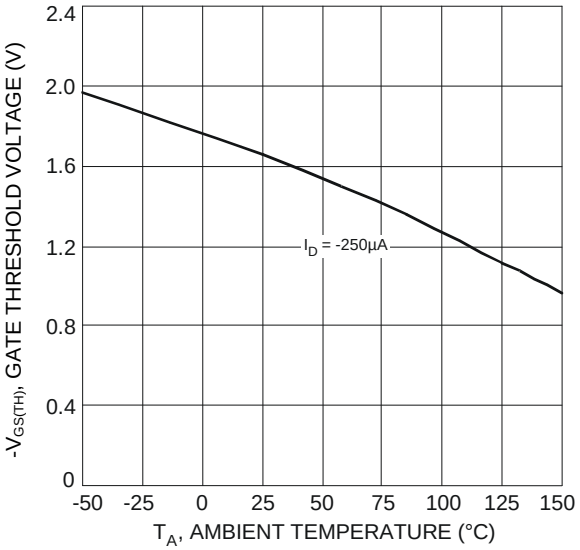


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

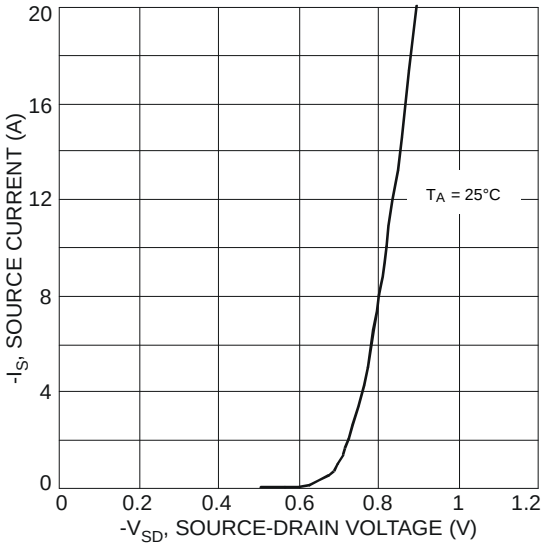


Fig. 8 Diode Forward Voltage vs. Current

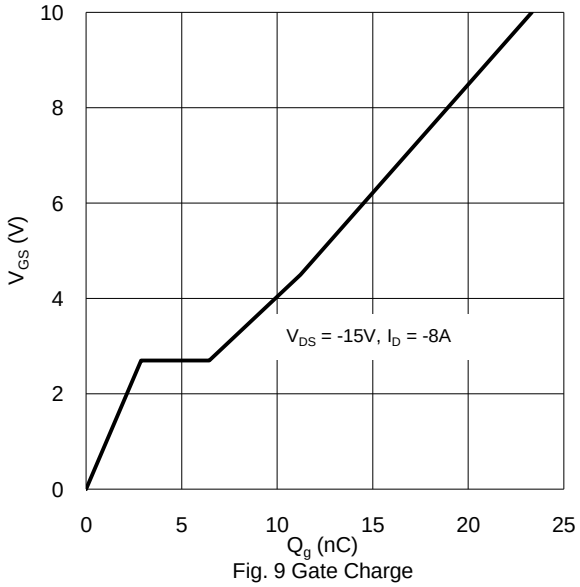


Fig. 9 Gate Charge

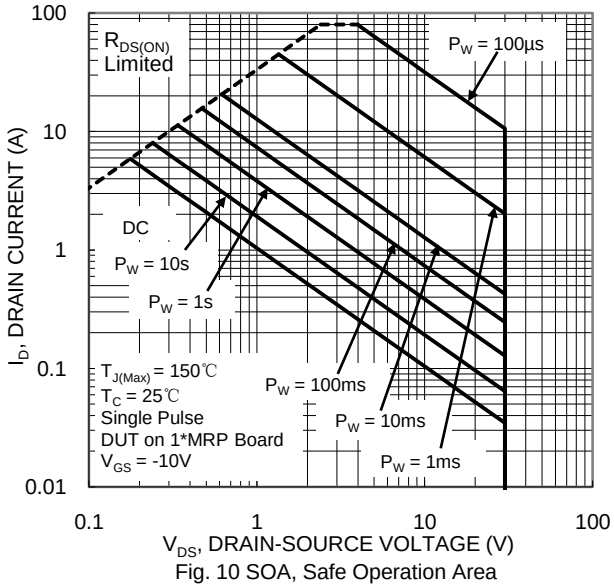


Fig. 10 SOA, Safe Operation Area

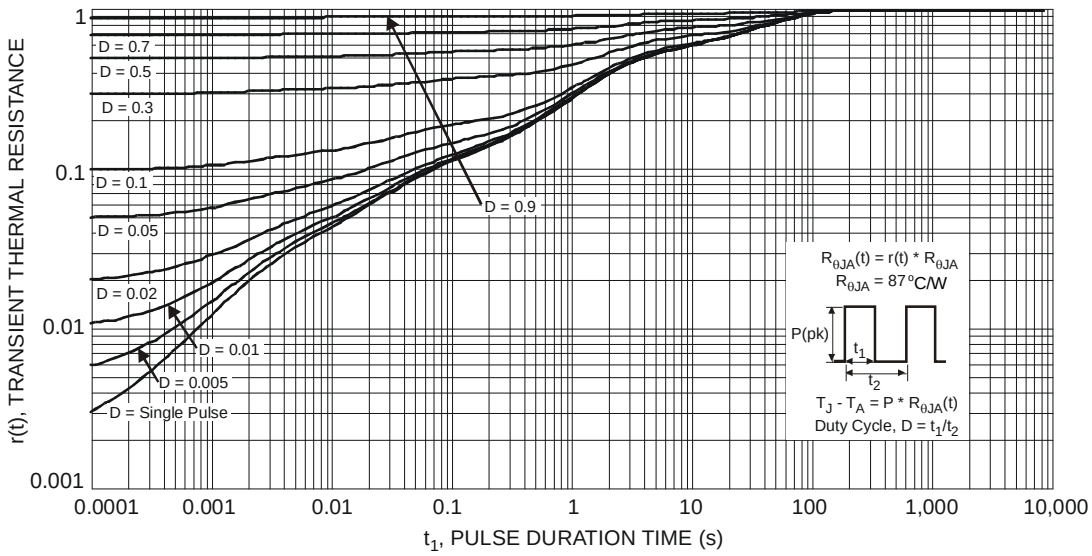


Fig. 11 Transient Thermal Response


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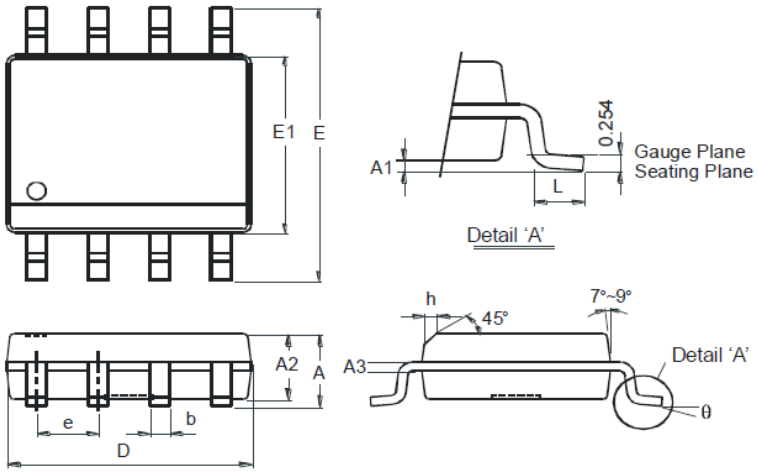
## Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

**SO-8**

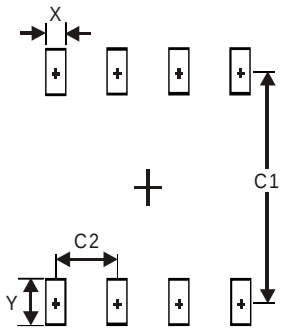



| SO-8 | | |
|---|---|---|
| **Dim** | **Min** | **Max** |
| **A** | - | 1.75 |
| **A1** | 0.10 | 0.20 |
| **A2** | 1.30 | 1.50 |
| **A3** | 0.15 | 0.25 |
| **b** | 0.3 | 0.5 |
| **D** | 4.85 | 4.95 |
| **E** | 5.90 | 6.10 |
| **E1** | 3.85 | 3.95 |
| **e** | 1.27 Typ | |
| **h** | - | 0.35 |
| **L** | 0.62 | 0.82 |
| **θ** | 0° | 8° |
| All Dimensions in mm | | |

## Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

**SO-8**




| Dimensions | Value (in mm) |
|---|---|
| **X** | 0.60 |
| **Y** | 1.55 |
| **C1** | 5.4 |
| **C2** | 1.27 |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