Lead-free Green

# HTMN5130SSD

## 55V DUAL N-CHANNEL 175°C MOSFET

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)\ max}$ | $I_D$ $T_A$ = +25°C |
|---|---|---|
| 55V | 130mΩ @ $V_{GS}$ = 10V | 2.86 A |
| | 200mΩ @ $V_{GS}$ = 4.5V | 2.3 A |

## Features and Benefits

- Low Input Capacitance
- Low On-Resistance
- Fast Switching Speed
- **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**

## Description

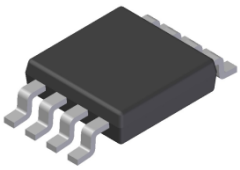
This new generation MOSFET has been designed to minimize the on-state resistance ($R_{DS(ON)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

## Mechanical Data

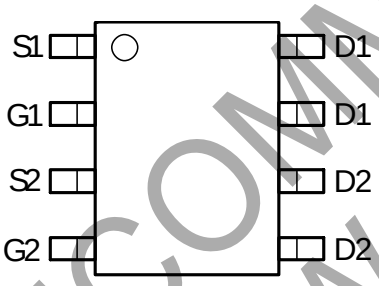
- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Tin Finish annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.074 grams (approximate)

## Applications

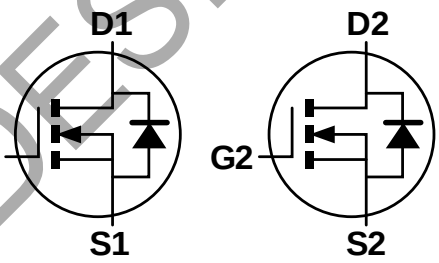
- DC-DC Converters
- Power Management Functions
- Backlighting



Top View




Top View
Pin Configuration



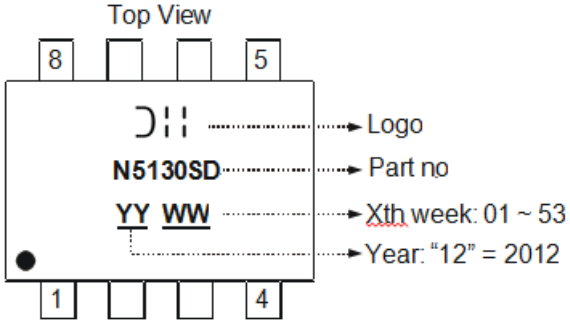

Equivalent Circuit

## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| HTMN5130SSD-13 | SO-8 | 2,500/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



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

| Characteristic | | | Symbol | Value | Units |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 55 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current (Note 6) $V_{GS}$ = 10V | Steady State | $T_A$ = +25°C | $I_D$ | 2.6 | A |
| | t<10s | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | 2.86<br>2.3 | A |
| Pulsed Drain Current (10µs pulse, duty cycle = 1%) | | | $I_{DM}$ | 8 | A |
| Continuous Source Current (Body Diode) (Note 6) | | | $I_S$ | 2.8 | A |
| Pulsed Source Current (Body Diode) | | | $I_{SM}$ | 8 | A |
| Avalanche Current (Note 5) L =4.9mH | | | $I_{AS}$ | 6 | A |
| Avalanche Energy (Note 5) L = 4.9mH | | | $E_{AS}$ | 89 | mJ |

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

| Characteristic | | Symbol | Value | Units |
|---|---|---|---|---|
| Total Power Dissipation (Note 6) | $T_A$ = +25°C<br>$T_A$ = +70°C | $P_D$ | 1.7<br>1.1 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady state | $R_{\theta JA}$ | 72 | °C/W |
| | t<10s | | 50 | |
| Thermal Resistance, Junction to Case (Note 6) | | $R_{\theta JC}$ | 11.2 | |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +175 | °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 | $BV_{DSS}$ | 55 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250µA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 100 | nA | $V_{DS}$ = 55V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±100 | nA | $V_{GS}$ = ±20V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 7)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | 1 | — | 3 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | — | 130 | mΩ | $V_{GS}$ = 10V, $I_D$ = 3 A |
| | | — | — | 200 | | $V_{GS}$ = 4.5V, $I_D$ = 1.5A |
| Diode Forward Voltage | $V_{SD}$ | — | — | 1.0 | V | $V_{GS}$ = 0V, $I_S$ = 1.5A |
| **DYNAMIC CHARACTERISTICS (Note 8)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 218.7 | — | pF | $V_{DS}$ = 25V, $V_{GS}$ = 0V<br>f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 97.8 | — | | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 22.4 | — | | |
| Gate Resistance | $R_G$ | — | 3.75 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1.0MHz |
| Total Gate Charge ($V_{GS}$ = 10V) | $Q_g$ | — | 8.9 | — | nC | $V_{DS}$ = 40V, $I_D$ = 2A |
| Total Gate Charge ($V_{GS}$ = 4.5V) | $Q_g$ | — | 4.7 | — | | |
| Gate-Source Charge | $Q_{gs}$ | — | 1.0 | — | | |
| Gate-Drain Charge | $Q_{gd}$ | — | 2.9 | — | | |
| Turn-On Delay Time | $t_{D(on)}$ | — | 3 | — | nS | $V_{GS}$ = 10V, $V_{DD}$ = 25V, $R_G$ = 6Ω,<br>$I_D$ = 1A |
| Turn-On Rise Time | $t_r$ | — | 2.5 | — | | |
| Turn-Off Delay Time | $t_{D(off)}$ | — | 13.5 | — | | |
| Turn-Off Fall Time | $t_f$ | — | 6.1 | — | | |
| Body Diode Reverse Recovery Time | $t_{rr}$ | — | 30.8 | — | nS | $I_F$ = 1.5A, dI/dt = 100A/µs |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | — | 35.4 | — | nC | $I_F$ = 1.5A, dI/dt = 100A/µs |

Notes:
5. $I_{AR}$ and $E_{AR}$ rating are based on low frequency and duty cycles to keep $T_J$ = +25°C.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

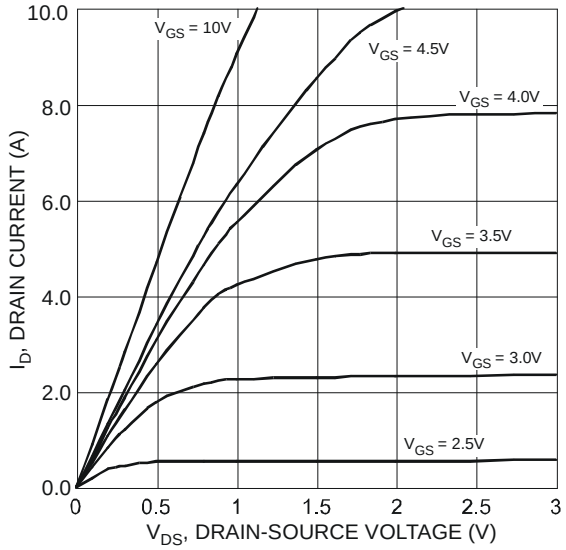



Figure 1 Typical Output Characteristics

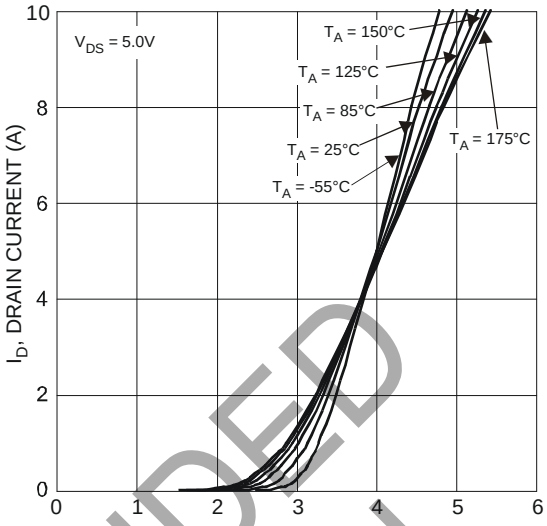



Figure 2 Typical Transfer Characteristics

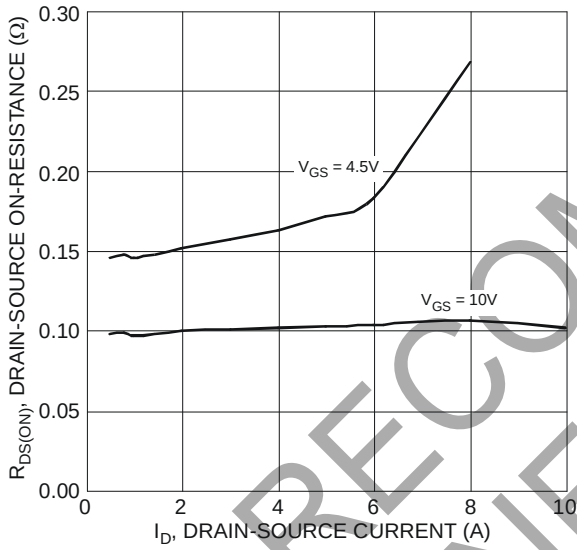



Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

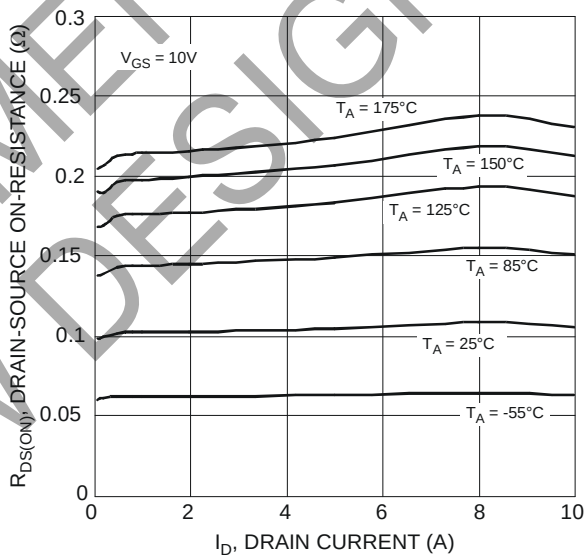



Figure 4 Typical On-Resistance vs. Drain Current and Temperature

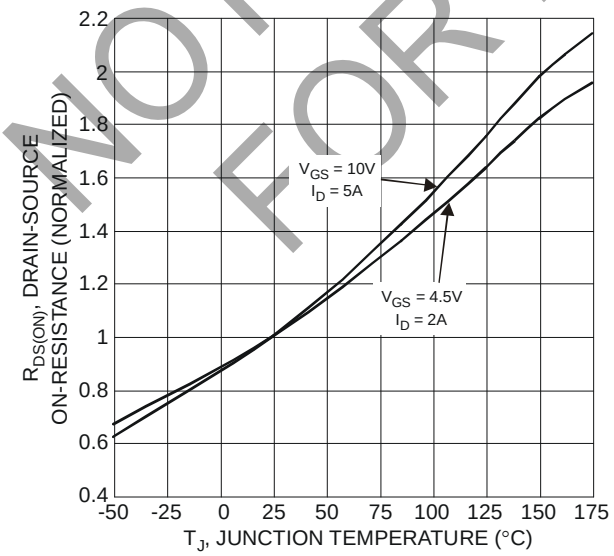



Figure 5 On-Resistance Variation with Temperature

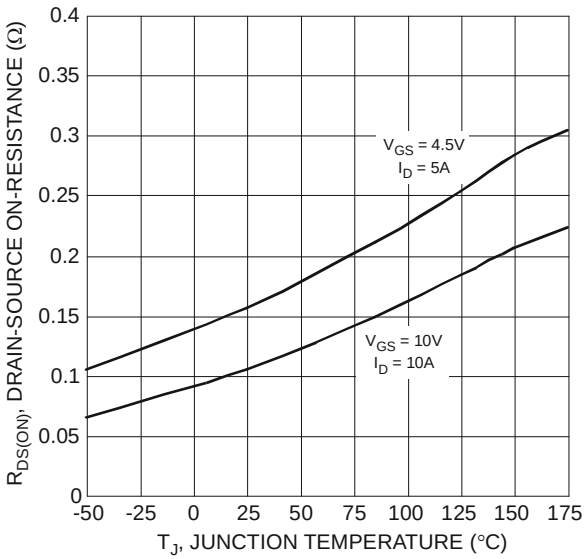



Figure 6 On-Resistance Variation with Temperature

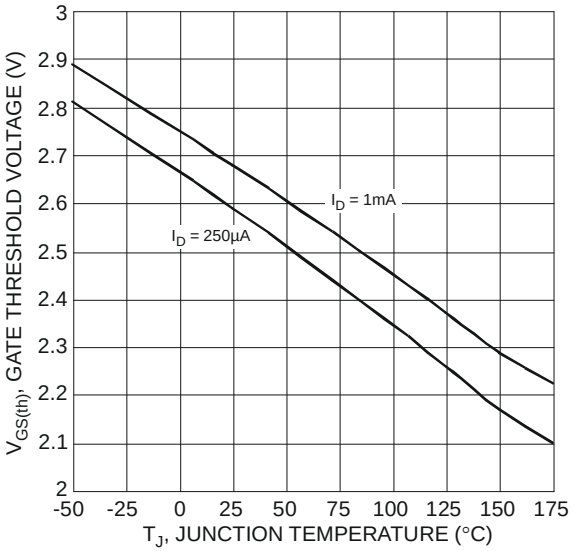



Figure 7 Gate Threshold Variation vs. Ambient Temperature

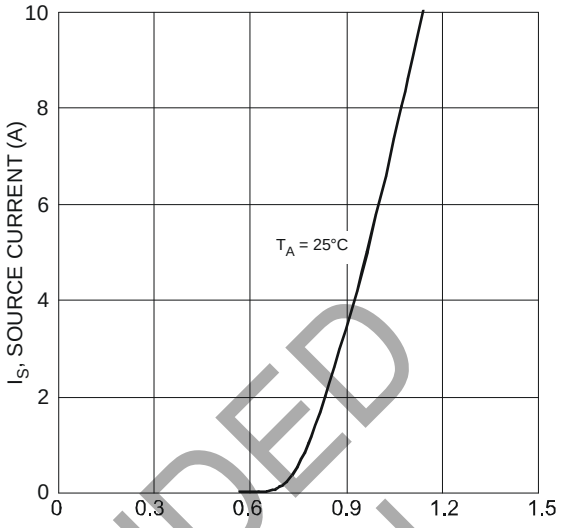



Figure 8 Diode Forward Voltage vs. Current

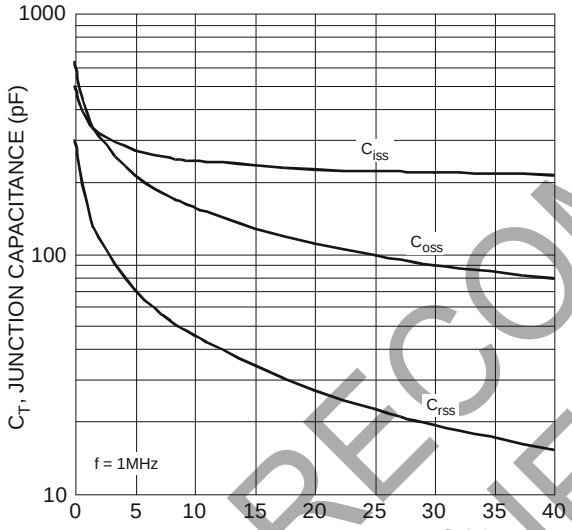



Figure 9 Typical Junction Capacitance

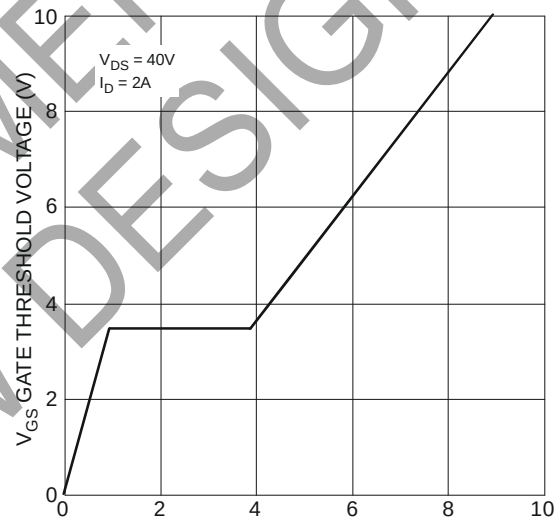
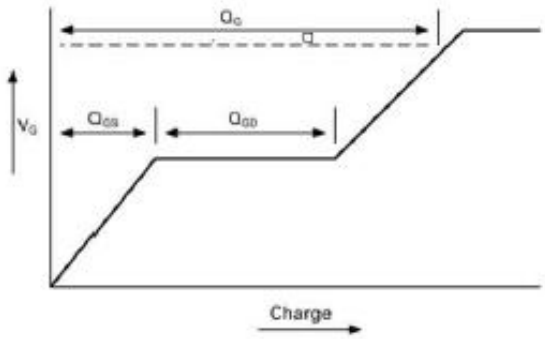
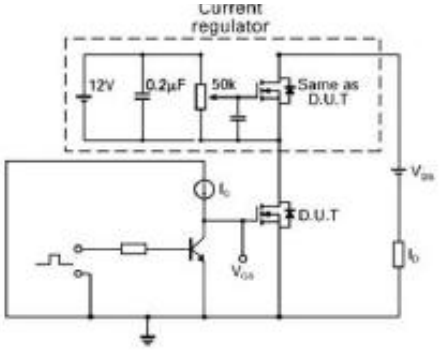



Figure 10 Gate Charge

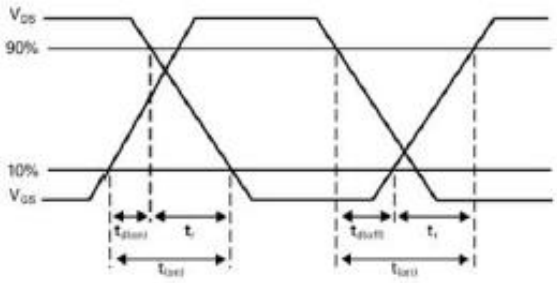
## Test Circuits



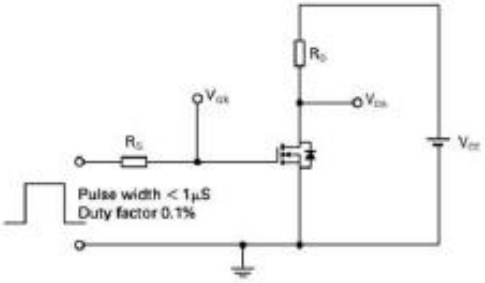

Basic gate charge waveform




Gate charge test circuit



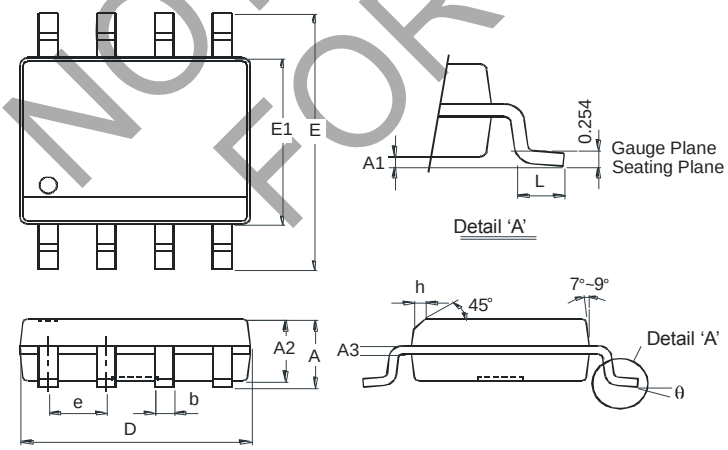

Switching time waveforms




Switching time test circuit

## Package Outline Dimensions

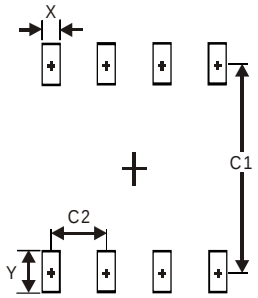
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.




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




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



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