# LND01

## Lateral N-Channel Depletion-Mode MOSFET

### Features

- Bi-directional
- Low On-resistance
- Low Input Capacitance
- Fast Switching Speeds
- High Input Impedance and High Gain
- Low Power Drive Requirement
- Ease of Paralleling

### Applications

- Normally-on Switches
- Solid-state Relays
- Converters
- Constant Current Sources
- Analog Switches

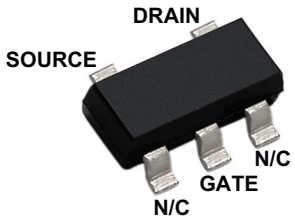
### General Description

The LND01 is a low-threshold, Depletion-mode (normally-on) transistor that uses an advanced lateral DMOS structure and a well-proven silicon gate manufacturing process. This combination produces a device with the power handling capabilities of bipolar transistors as well as the high input impedance and positive temperature coefficient inherent in MOS devices. Characteristic of all MOS structures, this device is free from thermal runaway and thermally induced secondary breakdown.

The body of the transistor is connected to the gate pin. The channel is therefore being pinched off by both the gate and body. The gate pin has a diode connected to the drain terminal and another diode connected to the source terminal.

### Package Type

**5-lead SOT-23**




See Table 2-1 for pin information.

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## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings†

Drain-to-source Voltage ..... $BV_{DSX}$
Source-to-drain Voltage..... $BV_{SDX}$
Gate-to-source Voltage ..... –12V to +0.6V
Gate-to-drain Voltage ..... –12V to +0.6V
Operating Ambient Temperature, $T_A$ ..... –25°C to +125°C

**† Notice:** Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only, and functional operation of the device at those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability.

## DC ELECTRICAL CHARACTERISTICS

**Electrical Specifications**: $T_A$ = 25°C unless otherwise specified. (**Note 1**)

| Parameter | Sym. | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Drain-to-source Breakdown Voltage | $BV_{DSX}$ | 9 | — | — | V | $V_{GS}$ = –3V, $I_{DS}$ = 10 µA |
| Source-to-drain Breakdown Voltage | $BV_{SDX}$ | 9 | — | — | V | $V_{GD}$ = –3V, $I_{SD}$ = 10 µA |
| Gate-to-source Off Voltage | $V_{GS(OFF)}$ | –0.8 | — | –3 | V | $V_{DS}$ = 9V, $I_{DS}$ = 1 µA |
| Source-to-gate Off Voltage | $V_{SG(OFF)}$ | –0.8 | — | –3 | V | $V_{SD}$ = 9V, $I_{SD}$ = 1 µA |
| Gate-to-source Diode | $V_{GS}$ | –12 | — | 0.6 | V | $I_{GS}$ = ±1 µA |
| Gate-to-drain Diode | $V_{GD}$ | –12 | — | 0.6 | V | $I_{GD}$ = ±1 µA |
| Drain-to-source Leakage Current | $I_{DS(OFF)}$ | — | — | 1 | µA | $V_{GS}$ = –3V, $V_{DS}$ = 9V |
| Source-to-drain Leakage Current | $I_{SD(OFF)}$ | — | — | 1 | µA | $V_{GD}$ = –3V, $V_{SD}$ = 9V |
| Saturated Drain-to-source Current | $I_{DSS}$ | 300 | — | — | mA | $V_{GS}$ = 0V, $V_{DS}$ = 9V |
| Saturated Source-to-drain Current | $I_{SDD}$ | 300 | — | — | mA | $V_{GD}$ = 0V, $V_{SD}$ = 9V |
| Static Drain-to-source On-state Resistance | $R_{DS(ON)}$ | — | 0.9 | 1.4 | Ω | $V_{GS}$ = 0V, $I_{DS}$ = 100 mA |
| Static Source-to-drain On-state Resistance | $R_{SD(ON)}$ | — | 0.9 | 1.4 | Ω | $V_{GD}$ = 0V, $I_{SD}$ = 100 mA |

**Note 1:** All DC parameters are 100% tested at 25°C unless otherwise stated. (Pulse test: 300 µs pulse, 2% duty cycle)
**2:** Specification is obtained by characterization and is not 100% tested.

## AC ELECTRICAL CHARACTERISTICS

**Electrical Specifications**: $T_A$ = 25°C unless otherwise specified. (**Note 2**)

| Parameter | Sym. | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Forward Transconductance | $G_{FS}$ | 200 | — | — | mmho | $V_{DS}$ = 9V, $I_{DS}$ = 50 mA |
| Input Capacitance | $C_{ISS}$ | — | 46 | — | pF | $V_{GS}$ = –3V, $V_{DS}$ = 5V, f = 1 MHz |
| Common Source Output Capacitance | $C_{OSS}$ | — | 32 | — | pF | |
| Reverse Transfer Capacitance | $C_{RSS}$ | — | 23 | — | pF | |
| Turn-on Delay Time | $t_{d(ON)}$ | — | 3.8 | — | ns | $V_{DD}$ = 9V, $I_{DS}$ = 100 mA, $R_{GEN}$ = 25Ω |
| Rise Time | $t_r$ | — | 11 | — | ns | |
| Turn-off Delay Time | $t_{d(OFF)}$ | — | 1 | — | ns | |
| Fall Time | $t_f$ | — | 6.4 | — | ns | |

**Note 1:** All DC parameters are 100% tested at 25°C unless otherwise stated. (Pulse test: 300 µs pulse, 2% duty cycle)
**2:** Specification is obtained by characterization and is not 100% tested.


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## TEMPERATURE SPECIFICATIONS

| **Electrical Characteristics:** Unless otherwise specified, for all specifications $T_A = T_J$ = +25°C. | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Sym.** | **Min.** | **Typ.** | **Max.** | **Unit** | **Conditions** |
| **TEMPERATURE RANGE** | | | | | | |
| Operating Ambient Temperature | $T_A$ | –25 | — | +125 | °C | |
| **PACKAGE THERMAL RESISTANCE** | | | | | | |
| 5-lead SOT-23 | $\theta_{JA}$ | — | 253 | — | °C/W | |

## THERMAL CHARACTERISTICS

| **Package** | **$I_D$ (1) (Continuous) (mA)** | **$I_D$ (Pulsed) (mA)** | **Power Dissipation at $T_C$ = 25°C (W)** |
|---|---|---|---|
| 5-lead SOT-23 | 330 | 600 | 0.36 |

**Note 1:** $I_D$ (continuous) is limited by maximum $T_J$.

## 2.0 PIN DESCRIPTION

Table 2-1 shows the description of pins in LND01.
Refer to **Package Type** for the location of pins.

**TABLE 2-1: PIN FUNCTION TABLE**

| Pin Number | Pin Name | Description |
|---|---|---|
| 1 | N/C | Not connected |
| 2 | Gate | Gate |
| 3 | N/C | Not connected |
| 4 | Drain | Drain |
| 5 | Source | Source |


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## 3.0 FUNCTIONAL DESCRIPTION

Figure 3-1 illustrates the switching waveforms and test circuit for LND01.

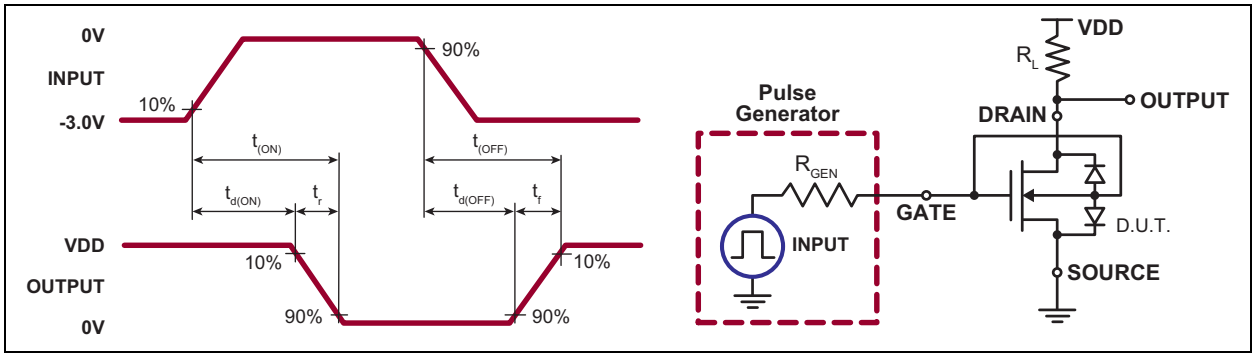



***FIGURE 3-1:*** *Switching Waveforms and Test Circuit.*

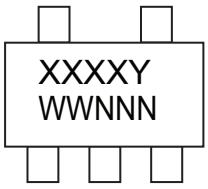
**TABLE 3-1: PRODUCT SUMMARY**

| $BV_{DSX}/BV_{SDX}$ (V) | $R_{DS(ON)}/R_{SD(ON)}$ (Maximum) (Ω) | $I_{DSS}/I_{SSD}$ (Maximum) (mA) |
|---|---|---|
| 9 | 1.4 | 300 |

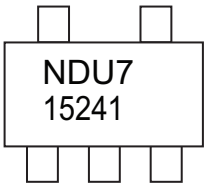
## 4.0 PACKAGING INFORMATION

### 4.1 Package Marking Information

5-lead SOT-23




Example



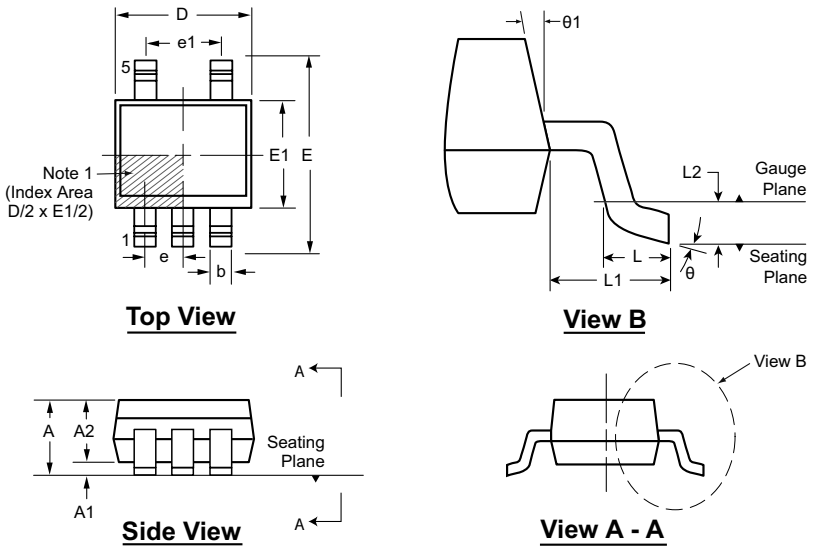

| | | |
|---|---|---|
| **Legend:** | XX...X | Product Code or Customer-specific information |
| | Y | Year code (last digit of calendar year) |
| | YY | Year code (last 2 digits of calendar year) |
| | WW | Week code (week of January 1 is week '01') |
| | NNN | Alphanumeric traceability code |
| | (e3) | Pb-free JEDEC® designator for Matte Tin (Sn) |
| | * | This package is Pb-free. The Pb-free JEDEC designator ((e3)) can be found on the outer packaging for this package. |
| | (e4) | Pre-plated |

**Note**: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for product code or customer-specific information. Package may or not include the corporate logo.


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## 5-Lead SOT-23 Package Outline (K1)

***2.90x1.60mm body, 1.45mm height (max), 0.95mm pitch***




Note: For the most current package drawings, see the Microchip Packaging Specification at www.microchip.com/packaging.

***Note:***

1. *A Pin 1 identifier must be located in the index area indicated. The Pin 1 identifier can be: a molded mark/identifier; an embedded metal marker; or a printed indicator.*

| Symbol | | A | A1 | A2 | b | D | E | E1 | e | e1 | L | L1 | L2 | θ | θ1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dimension (mm) | MIN | 0.90* | 0.00 | 0.90 | 0.30 | 2.75* | 2.60* | 1.45* | 0.95 BSC | 1.90 BSC | 0.30 | 0.60 REF | 0.25 BSC | 0° | 5° |
| | NOM | - | - | 1.15 | - | 2.90 | 2.80 | 1.60 | | | 0.45 | | | 4° | 10° |
| | MAX | 1.45 | 0.15 | 1.30 | 0.50 | 3.05* | 3.00* | 1.75* | | | 0.60 | | | 8° | 15° |

*JEDEC Registration MO-178, Variation AA, Issue C, Feb. 2000.*
** This dimension is not specified in the JEDEC drawing.*
***Drawings not to scale.***

**NOTES:**


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## APPENDIX A: REVISION HISTORY

### Revision A (June 2017)

- Converted Supertex Doc# DSFP-LND01 to Microchip DS20005696A
- Changed the package marking format
- Changed the quantity of the 5-lead SOT-23 K1 package from 2500/Reel to 3000/Reel
- Made minor text changes throughout the document

## PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

| PART NO. | XX | - | X | - | X |
|---|---|---|---|---|---|
| Device | Package Options | | Environmental | | Media Type |

| | | | |
|---|---|---|---|
| Device: | LND01 | = | Lateral N-Channel Depletion-Mode MOSFET |
| Package: | K1 | = | 5-lead SOT-23 |
| Environmental: | G | = | Lead (Pb)-free/RoHS-compliant Package |
| Media Type: | (blank) | = | 3000/Reel for a K1 Package |

**Example:**

a) LND01K1-G: Lateral N-Channel Depletion-Mode MOSFET, 5-lead SOT-23, 3000/Reel


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