

Digital FET, N-Channel

FDV303N

General Description

These N-Channel enhancement mode field effect transistors are produced using ON Semiconductor's proprietary, high cell density, DMOS technology. This very high density process is tailored to minimize on-state resistance at low gate drive conditions. This device is designed especially for application in battery circuits using either one lithium or three cadmium or NMH cells. It can be used as an inverter or for high-efficiency miniature discrete DC/DC conversion in compact portable electronic devices like cellular phones and pagers. This device has excellent on-state resistance even at gate drive voltages as low as 2.5 V.

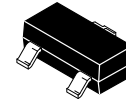
Features

- 25 V, 0.68 A Continuous, 2 A Peak
 - ◆ $R_{DS(ON)} = 0.45 \Omega @ V_{GS} = 4.5 V$
 - ◆ $R_{DS(ON)} = 0.6 \Omega @ V_{GS} = 2.7 V$
- Very Low Level Gate Drive Requirements Allowing Direct Operation in 3 V Circuits, $V_{GS(th)} < 1 V$
- Gate-Source Zener for ESD Ruggedness, > 6 kV Human Body Model
- Compact Industry Standard SOT-23 Surface Mount Package
- This Device is Pb-Free, Halogen Free/BFR Free and is RoHS Compliant



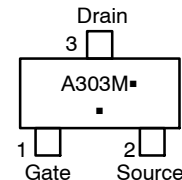
ON Semiconductor®

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SOT-23 (TO-236)
CASE 318-08
STYLE 21

MARKING DIAGRAM



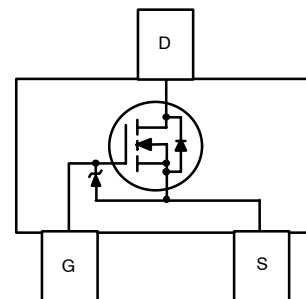
A or blank = One/two character Location Code
303 = Specific Device Code
M = Date Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)

* Location code can be blank or with characters indicating manufacturing location

* Date Code orientation and overbar may vary depending upon manufacturing location.

PIN ASSIGNMENT



SOT-23

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

FDV303N

MOSFET MAXIMUM RATINGS $T_A = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | FDV303N | Units |
|----------------|---|------------|------------------|
| V_{DSS} | Drain–Source Voltage, Power Supply Voltage | 25 | V |
| V_{GSS} | Gate–Source Voltage, V_{IN} | 8 | V |
| I_D | Drain/Output Current – Continuous – Pulsed | 0.68 2 | A |
| P_D | Maximum Power Dissipation | 0.35 | W |
| T_J, T_{STG} | Operating and Storage Temperature Range | –55 to 150 | $^\circ\text{C}$ |
| ESD | Electrostatic Discharge Rating MIL–STD–883D Human Body Model (100 pf / 1500 Ω) | 6.0 | kV |

THERMAL CHARACTERISTICS

| Symbol | Parameter | Ratings | Units |
|-----------------|---|---------|---------------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction–to–Ambient | 357 | $^\circ\text{C}/\text{W}$ |

ORDERING INFORMATION

| Device | Package | Shipping† |
|---------|-----------------------|--------------------|
| FDV303N | SOT–23 Case 318–08 | 3000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

FDV303N

ELECTRICAL CHARACTERISTICS $T_J = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|--------|-----------|------------|-----|-----|-----|-------|
|--------|-----------|------------|-----|-----|-----|-------|

OFF CHARACTERISTICS

| | | | | | | |
|--------------------------------------|-------------------------------------|--|----|----|-----|-------|
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} = 0 V, I _D = 250 μA | 25 | | | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temp. Coefficient | I _D = 250 μA, Referenced to 25°C | | 26 | | mV/°C |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} = 20 V, V _{GS} = 0 V | | | 1 | μA |
| | | | | | 10 | μA |
| I _{GSS} | Gate - Body Leakage Current | V _{GS} = 8 V, V _{DS} = 0 V | | | 100 | nA |

ON CHARACTERISTICS (Note 1)

| | | | | | | | |
|--|--|---|------|------|------|-------|-----|
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate Threshold Voltage Temperature Coefficient | I _D = 250 μA, Referenced to 25°C | | -2.6 | | mV/°C | |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} = V _{GS} , I _D = 250 μA | 0.65 | 0.8 | 1 | V | |
| R _{DS(on)} | Static Drain-Source On-Resistance | V _{GS} = 4.5 V, I _D = 0.5 A | | 0.33 | 0.45 | Ω | |
| | | | | | 0.52 | | 0.8 |
| | | | | | 0.44 | | 0.6 |
| I _{D(on)} | On-State Drain Current | V _{GS} = 2.7 V, V _{DS} = 5 V | 0.5 | | | A | |
| g _{FS} | Forward Transconductance | V _{DS} = 5 V, I _D = 0.5 A | | 1.45 | | S | |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|------------------|------------------------------|--|--|----|--|----|
| C _{iss} | Input Capacitance | V _{DS} = 10 V, V _{GS} = 0 V, f = 1.0 MHz | | 50 | | pF |
| C _{oss} | Output Capacitance | | | 28 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 9 | | pF |

SWITCHING CHARACTERISTICS (Note 1)

| | | | | | | |
|---------------------|-----------------------|---|--|------|-----|----|
| t _{D(on)} | Turn - On Delay Time | V _{DD} = 6 V, I _D = 0.5 A, V _{GS} = 4.5 V, R _{GEN} = 50 Ω | | 3 | 6 | ns |
| t _r | Turn - On Rise Time | | | 8.5 | 18 | ns |
| t _{D(off)} | Turn - Off Delay Time | | | 17 | 30 | ns |
| t _f | Turn - Off Fall Time | | | 13 | 25 | ns |
| Q _g | Total Gate Charge | V _{DS} = 5 V, I _D = 0.5 A, V _{GS} = 4.5 V | | 1.64 | 2.3 | nC |
| Q _{gs} | Gate-Source Charge | | | 0.38 | | nC |
| Q _{gd} | Gate-Drain Charge | | | 0.45 | | nC |

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS

| | | | | | | |
|-----------------|---|--|--|------|-----|---|
| I _S | Maximum Continuous Drain-Source Diode Forward Current | | | | 0.3 | A |
| V _{SD} | Drain-Source Diode Forward Voltage | V _{GS} = 0 V, I _S = 0.5 A (Note 1) | | 0.83 | 1.2 | V |

1. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%.

TYPICAL CHARACTERISTICS

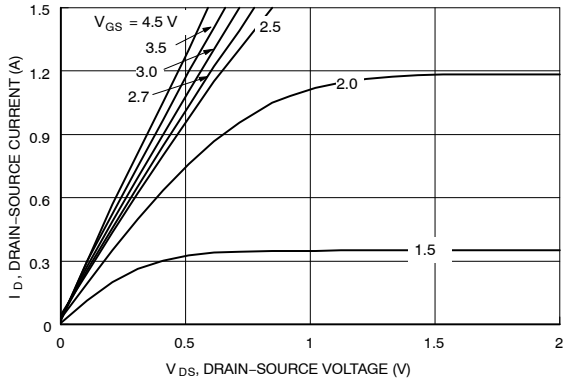


Figure 1. On-Region Characteristics

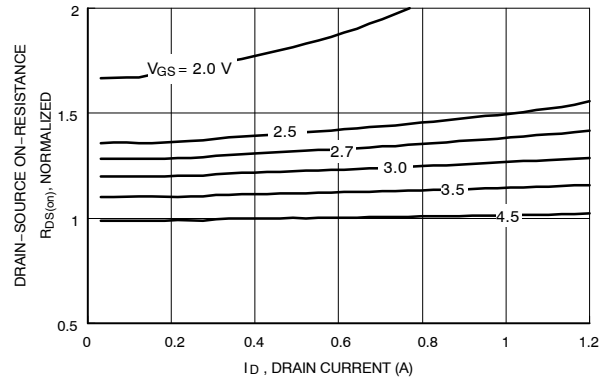


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

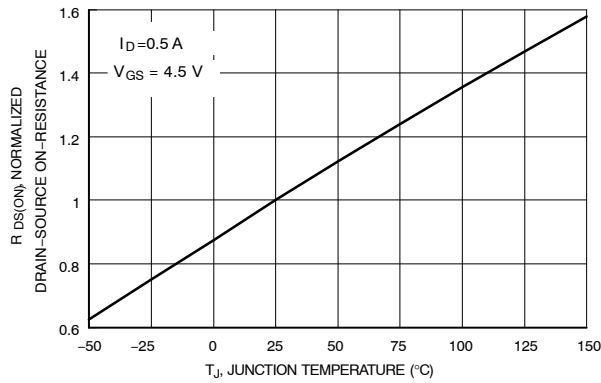


Figure 3. On-Resistance Variation with Temperature

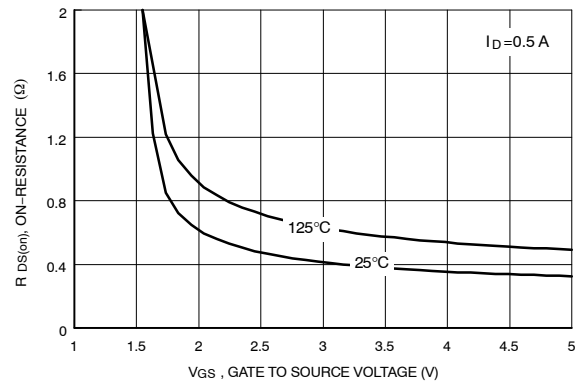


Figure 4. On Resistance Variation with Gate-To-Source Voltage

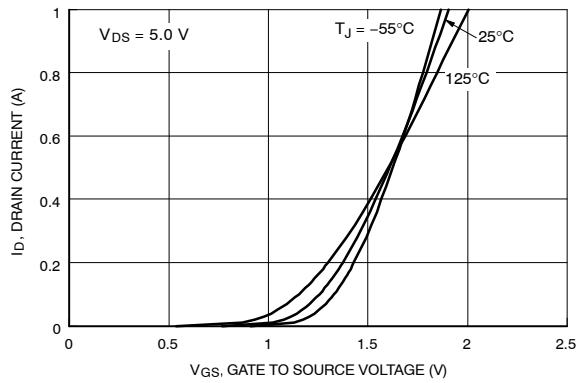


Figure 5. Transfer Characteristics

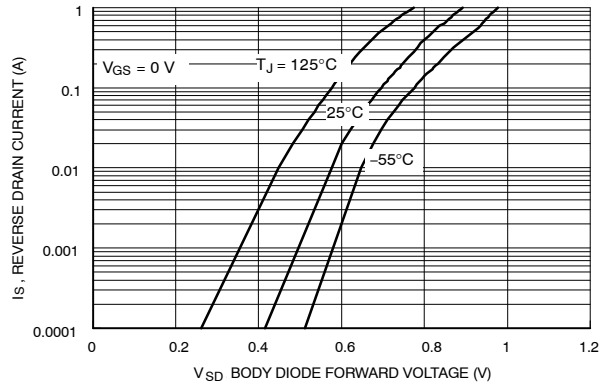


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

TYPICAL CHARACTERISTICS $T_J = 25^\circ\text{C}$ Unless Otherwise Noted (continued)

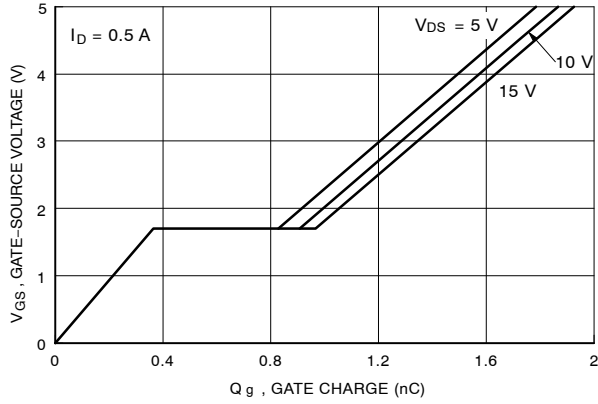


Figure 7. Gate Charge Characteristics

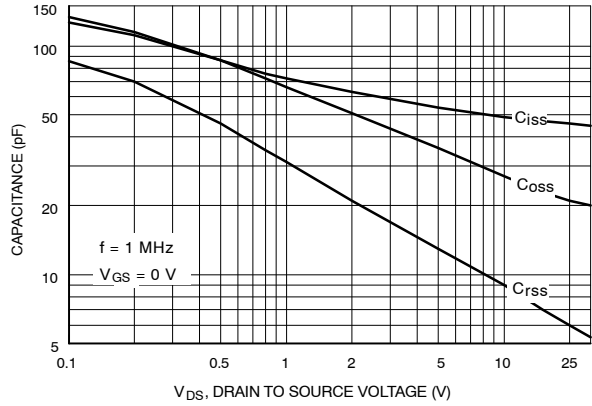


Figure 8. Capacitance Characteristics

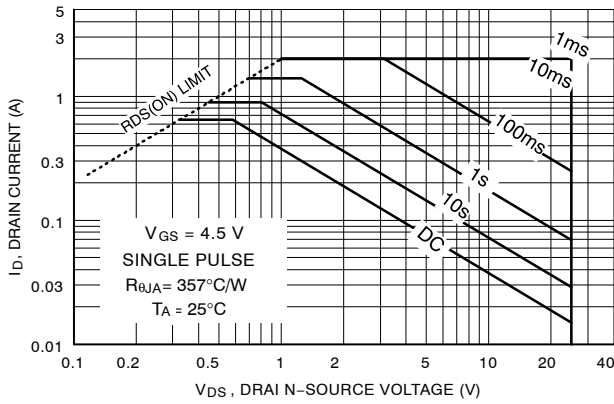


Figure 9. Maximum Safe Operating Area

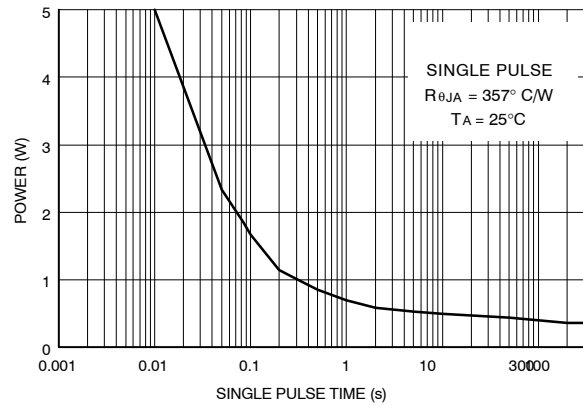


Figure 10. Single Pulse Maximum Power Dissipation

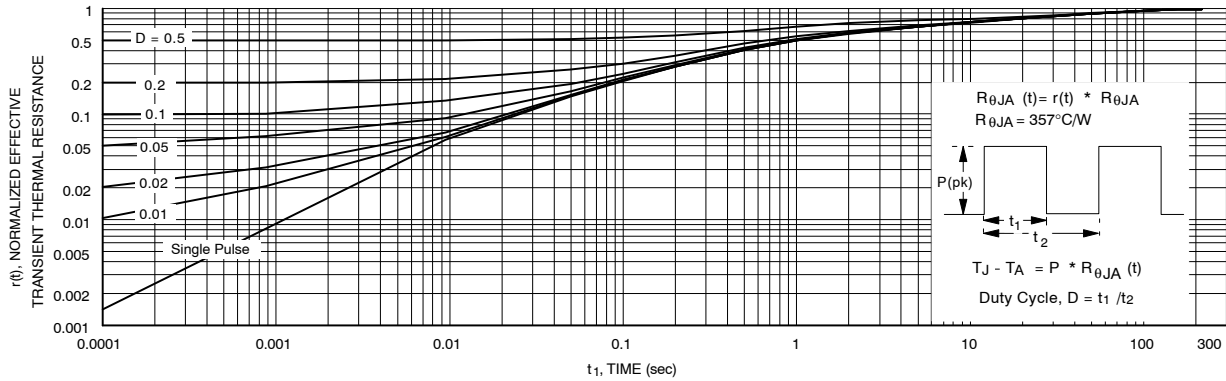


Figure 11. Transient Thermal Response Curve

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

ON Semiconductor®



SOT-23 (TO-236) CASE 318-08 ISSUE AS

DATE 30 JAN 2018

SCALE 4:1



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|--------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.89 | 1.00 | 1.11 | 0.035 | 0.039 | 0.044 |
| A1 | 0.01 | 0.06 | 0.10 | 0.000 | 0.002 | 0.004 |
| b | 0.37 | 0.44 | 0.50 | 0.015 | 0.017 | 0.020 |
| c | 0.08 | 0.14 | 0.20 | 0.003 | 0.006 | 0.008 |
| D | 2.80 | 2.90 | 3.04 | 0.110 | 0.114 | 0.120 |
| E | 1.20 | 1.30 | 1.40 | 0.047 | 0.051 | 0.055 |
| e | 1.78 | 1.90 | 2.04 | 0.070 | 0.075 | 0.080 |
| L | 0.30 | 0.43 | 0.55 | 0.012 | 0.017 | 0.022 |
| L1 | 0.35 | 0.54 | 0.69 | 0.014 | 0.021 | 0.027 |
| HE | 2.10 | 2.40 | 2.64 | 0.083 | 0.094 | 0.104 |
| T | 0° | --- | 10° | 0° | --- | 10° |

RECOMMENDED SOLDERING FOOTPRINT



GENERIC MARKING DIAGRAM*



XXX = Specific Device Code
M = Date Code
▪ = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

STYLE 1 THRU 5:
CANCELLED

STYLE 6:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

STYLE 7:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

STYLE 8:
PIN 1. ANODE
2. NO CONNECTION
3. CATHODE

STYLE 9:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 10:
PIN 1. DRAIN
2. SOURCE
3. GATE

STYLE 11:
PIN 1. ANODE
2. CATHODE
3. CATHODE-ANODE

STYLE 12:
PIN 1. CATHODE
2. CATHODE
3. ANODE

STYLE 13:
PIN 1. SOURCE
2. DRAIN
3. GATE

STYLE 14:
PIN 1. CATHODE
2. GATE
3. ANODE

STYLE 15:
PIN 1. GATE
2. CATHODE
3. ANODE

STYLE 16:
PIN 1. ANODE
2. CATHODE
3. CATHODE

STYLE 17:
PIN 1. NO CONNECTION
2. ANODE
3. CATHODE

STYLE 18:
PIN 1. NO CONNECTION
2. CATHODE
3. ANODE

STYLE 19:
PIN 1. CATHODE
2. ANODE
3. CATHODE-ANODE

STYLE 20:
PIN 1. CATHODE
2. ANODE
3. GATE

STYLE 21:
PIN 1. GATE
2. SOURCE
3. DRAIN

STYLE 22:
PIN 1. RETURN
2. OUTPUT
3. INPUT

STYLE 23:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 24:
PIN 1. GATE
2. DRAIN
3. SOURCE

STYLE 25:
PIN 1. ANODE
2. CATHODE
3. GATE

STYLE 26:
PIN 1. CATHODE
2. ANODE
3. NO CONNECTION

STYLE 27:
PIN 1. CATHODE
2. CATHODE
3. CATHODE

STYLE 28:
PIN 1. ANODE
2. ANODE
3. ANODE

| | | |
|-------------------------|------------------------|--|
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| DESCRIPTION: | SOT-23 (TO-236) | PAGE 1 OF 1 |

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