

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ Max          | $I_D$ Max<br>$T_A = +25^\circ C$ |
|------------|---------------------------|----------------------------------|
| 60V        | $7.5\Omega @ V_{GS} = 5V$ | 0.23A                            |

## Features and Benefits

- Dual N-Channel MOSFET
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Ultra-Small Surface Mount Package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen- and Antimony-Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please refer to the related automotive grade (Q-suffix) part. A listing can be found at <https://www.diodes.com/products/automotive/automotive-products/>.**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability. <https://www.diodes.com/quality/product-definitions/>**
- **An Automotive-Compliant Part is Available Under Separate Datasheet (2N7002DWQ)**

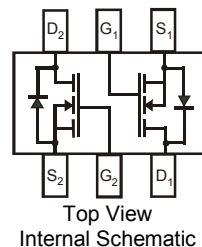
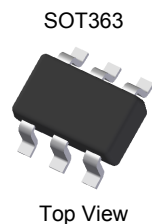
## Description and Applications

This 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.

- Motor Control
- Power Management Functions

## Mechanical Data

- Case: SOT363
- Case Material: Molded Plastic. "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Alloy 42 Lead-Frame (Lead Free Plating). Solderable per MIL-STD-202, Method 208 (E3)
- Terminal Connections: See Diagram
- Weight: 0.006 grams (Approximate)

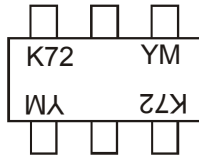


## Ordering Information (Note 4)

| Part Number   | Case   | Packaging          |
|---------------|--------|--------------------|
| 2N7002DW-7-F  | SOT363 | 3,000/Tape & Reel  |
| 2N7002DW-13-F | SOT363 | 10,000/Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> 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 <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



K72 = Product Type Marking Code  
 YM = Date Code Marking  
 Y or  $\bar{Y}$  = Year (ex: H = 2020)  
 M or  $\bar{M}$  = Month (ex: 9 = September)

### Date Code Key

| Year | 1998 | ... | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|------|------|-----|------|------|------|------|------|------|------|------|------|------|------|
| Code | J    | ... | H    | I    | J    | K    | L    | M    | N    | O    | P    | R    | S    |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code  | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | O   | N   | D   |

## Maximum Ratings (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic   | Symbol       | Value                      | Unit       |
|--|--------------|----------------------------|------------|
| Drain-Source Voltage                                     | $V_{DS}$     | 60                         | V          |
| Drain-Gate Voltage $R_{GS} \leq 1.0M\Omega$              | $V_{DGR}$    | 60                         | V          |
| Gate-Source Voltage                                      | Continuous   | $V_{GS}$                   | $\pm 20$ V |
|  | Pulsed       | $V_{GS}$                   | $\pm 40$ V |
| Continuous Drain Current (Note 6) $V_{GS} = 5V$          | Steady State | $T_A = +25^\circ\text{C}$  | 0.23 A     |
|  |              | $T_A = +70^\circ\text{C}$  | 0.18 A     |
|  |              | $T_A = +100^\circ\text{C}$ | 0.14 A     |
| Maximum Continuous Body Diode Forward Current (Note 6)   | $I_S$        | 0.23                       | A          |
| Pulsed Drain Current (10 $\mu$ s Pulse, Duty Cycle = 1%) | $I_{DM}$     | 0.8                        | A          |

## Thermal Characteristics (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

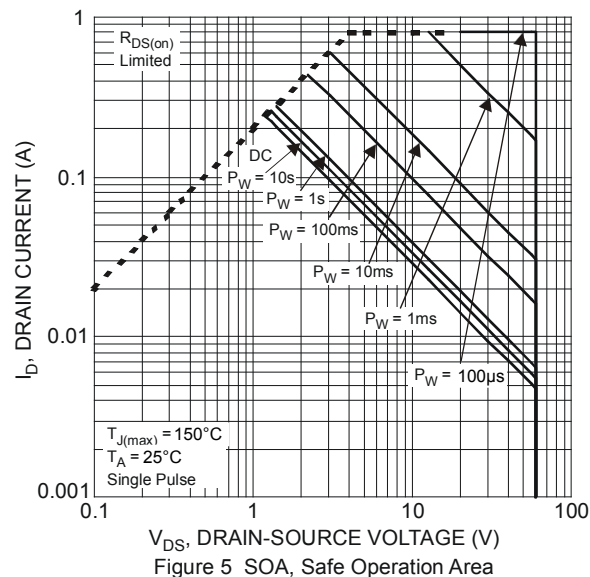
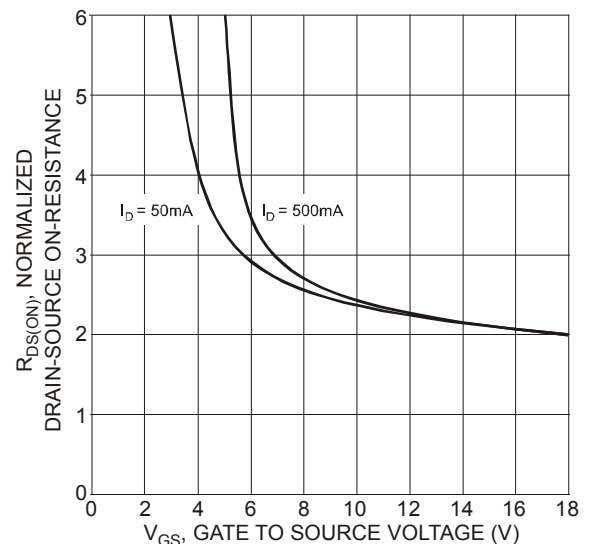
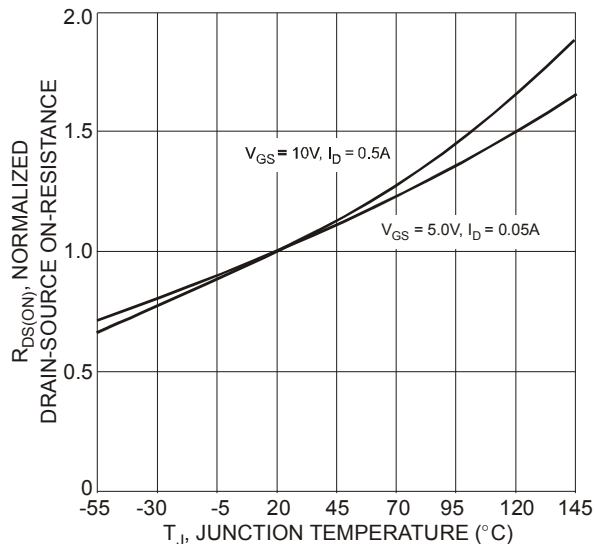
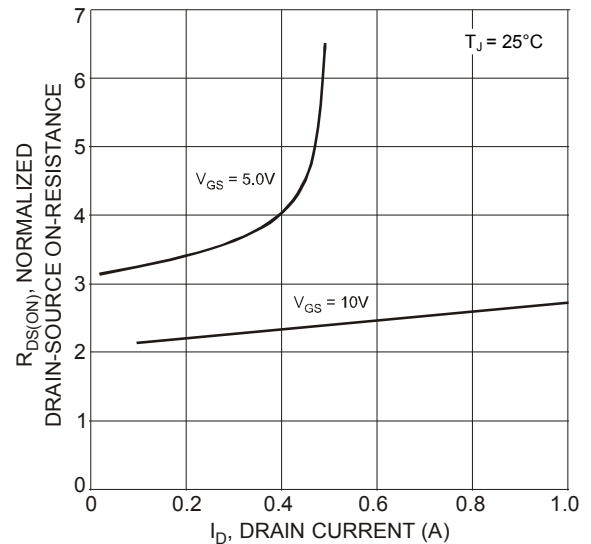
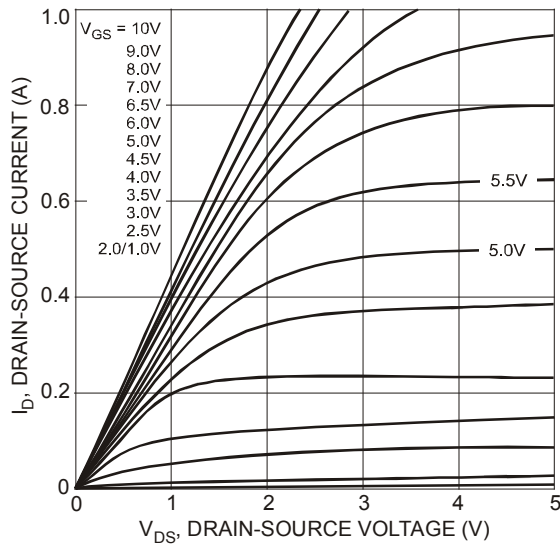
| Characteristic                                   | Symbol         | Value                      | Unit                   |
|--|----------------|----------------------------|------------------------|
| Total Power Dissipation (Note 5)                 | $P_D$          | $T_A = +25^\circ\text{C}$  | 0.31 W                 |
|  |                | $T_A = +70^\circ\text{C}$  | 0.2 W                  |
|  |                | $T_A = +100^\circ\text{C}$ | 0.12 W                 |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State   | $R_{\theta JA}$            | 410 $^\circ\text{C/W}$ |
| Total Power Dissipation (Note 6)                 | $P_D$          | $T_A = +25^\circ\text{C}$  | 0.4 W                  |
|  |                | $T_A = +70^\circ\text{C}$  | 0.25 W                 |
|  |                | $T_A = +100^\circ\text{C}$ | 0.15 W                 |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State   | $R_{\theta JA}$            | 318 $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case (Note 6)    | Steady State   | $R_{\theta JC}$            | 135 $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range          | $T_J, T_{STG}$ | -55 to +150                | $^\circ\text{C}$       |

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 thermal vias to bottom layer 1inch square copper plate.

**Electrical Characteristics** (@  $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic   | Symbol       | Min | Typ        | Max         | Unit     | Test Condition   |
|--|--------------|-----|------------|-------------|----------|--|
| <b>OFF CHARACTERISTICS (Note 7)</b>  |              |     |            |             |          |  |
| Drain-Source Breakdown Voltage   | $BV_{DSS}$   | 60  | 70         | —           | V        | $V_{GS} = 0V, I_D = 10\mu A$   |
| Zero Gate Voltage Drain Current<br>@ $T_C = +25^\circ\text{C}$<br>@ $T_C = +125^\circ\text{C}$   | $I_{DSS}$    | —   | —          | 1.0<br>500  | $\mu A$  | $V_{DS} = 60V, V_{GS} = 0V$  |
| Gate-Body Leakage  | $I_{GSS}$    | —   | —          | $\pm 10$    | nA       | $V_{GS} = \pm 20V, V_{DS} = 0V$  |
| <b>ON CHARACTERISTICS (Note 7)</b>   |              |     |            |             |          |  |
| Gate Threshold Voltage   | $V_{GS(TH)}$ | 1.0 | —          | 2.0         | V        | $V_{DS} = V_{GS}, I_D = 250\mu A$  |
| Static Drain-Source On-Resistance<br>@ $T_J = +25^\circ\text{C}$<br>@ $T_J = +125^\circ\text{C}$ | $R_{DS(ON)}$ | —   | 3.2<br>4.4 | 7.5<br>13.5 | $\Omega$ | $V_{GS} = 5.0V, I_D = 0.05A$<br>$V_{GS} = 10V, I_D = 0.5A$                               |
| On-State Drain Current   | $I_{D(ON)}$  | 0.5 | 1.0        | —           | A        | $V_{GS} = 10V, V_{DS} = 7.5V$  |
| Forward Transconductance   | $g_{FS}$     | 80  | —          | —           | mS       | $V_{DS} = 10V, I_D = 0.2A$   |
| Diode Forward Voltage  | $V_{SD}$     | —   | 0.78       | 1.5         | V        | $V_{GS} = 0V, I_S = 115mA$   |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b>  |              |     |            |             |          |  |
| Input Capacitance  | $C_{iss}$    | —   | 22         | 50          | pF       | $V_{DS} = 25V, V_{GS} = 0V$<br>$f = 1.0MHz$  |
| Output Capacitance   | $C_{oss}$    | —   | 11         | 25          | pF       |  |
| Reverse Transfer Capacitance   | $C_{rss}$    | —   | 2.0        | 5.0         | pF       |  |
| Turn-On Delay Time   | $t_{D(ON)}$  | —   | 7.0        | 20          | ns       | $V_{DD} = 30V, I_D = 0.2A,$<br>$R_L = 150\Omega, V_{GEN} = 10V,$<br>$R_{GEN} = 25\Omega$ |
| Turn-Off Delay Time  | $t_{D(OFF)}$ | —   | 11.0       | 20          |          |  |

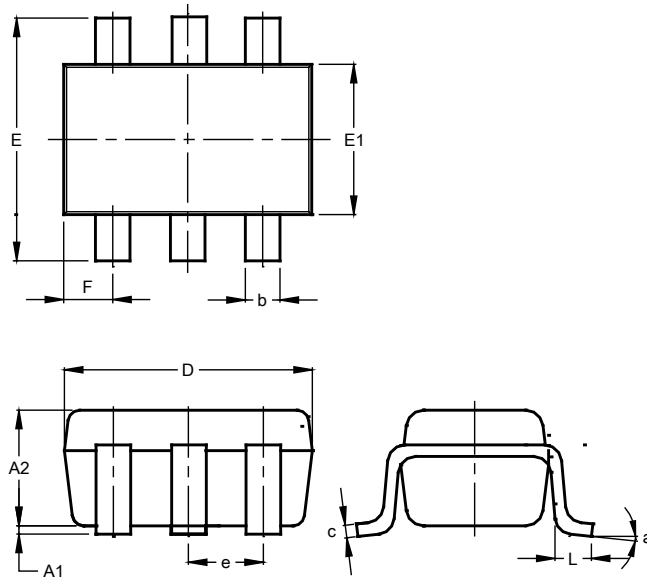
Notes: 7. Short duration pulse test used to minimize self-heating effect.  
8. Guaranteed by design. Not subject to product testing.



## Package Outline Dimensions

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

SOT363

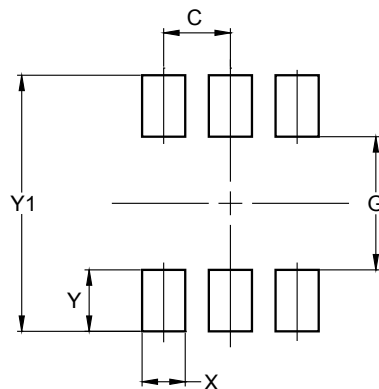


| SOT363               |           |      |       |
|----------------------|-----------|------|-------|
| Dim                  | Min       | Max  | Typ   |
| A1                   | 0.00      | 0.10 | 0.05  |
| A2                   | 0.90      | 1.00 | 0.95  |
| b                    | 0.10      | 0.30 | 0.25  |
| c                    | 0.10      | 0.22 | 0.11  |
| D                    | 1.80      | 2.20 | 2.15  |
| E                    | 2.00      | 2.20 | 2.10  |
| E1                   | 1.15      | 1.35 | 1.30  |
| e                    | 0.650 BSC |      |       |
| F                    | 0.40      | 0.45 | 0.425 |
| L                    | 0.25      | 0.40 | 0.30  |
| a                    | 0°        | 8°   | --    |
| All Dimensions in mm |           |      |       |

## Suggested Pad Layout

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

SOT363



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.650         |
| G          | 1.300         |
| X          | 0.420         |
| Y          | 0.600         |
| Y1         | 2.500         |

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