# 2N7002KDW6-Q1

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# 2N7002KDW6-Q1

## 300mA, 60V Dual N - Channel MOSFET

## Features

- High density cell design for low $R_{DS(on)}$.
- Voltage controlled small signal switch.
- Rugged and reliable.
- High saturation current capability.
- ESD protected.
- We declare that the material of product are Halogen Free and compliance with RoHS requirements.
- Qualified to AEC-Q101 standards for high reliability.
- Suffix "-H" indicates Halogen-free part, ex. 2N7002KDW6-Q1-H.

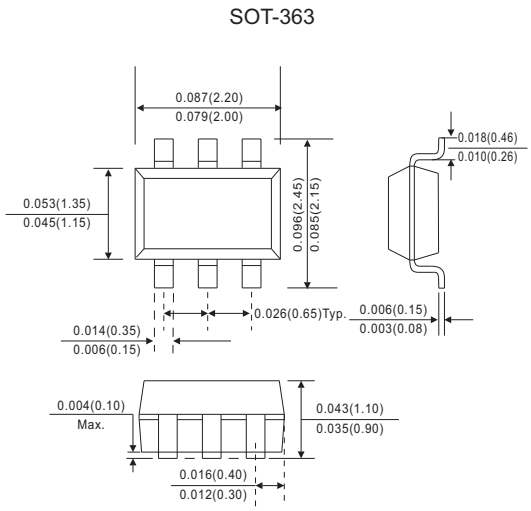
## Applications

- Load switch for portable devices.
- DC/DC Converter.

## Mechanical data

- Epoxy:UL94-V0 rated flame retardant
- Case : Molded plastic, SOT-363
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026
- Polarity : See Diagram
- Mounting Position : Any
- Weight : Approximated 0.006 gram

## Package outline




Dimensions in inches and (millimeters)

## Maximum ratings ($T_A$=25°C unless otherwise noted)

| Parameter | Symbol | Ratings | Unit |
|---|---|---|---|
| Drain-source voltage | $V_{DS}$ | 60 | V |
| Gate-source voltage | $V_{GS}$ | ±20 | V |
| Continuous drain current | $I_D$ | 300 | mA |
| Power dissipation | $P_D$ | 0.15 | W |
| Operating Junction temperature range | $T_j$ | +150 | ℃ |
| Storage temperature range | $T_{STG}$ | -55 to +150 | ℃ |
| Thermal resistance Junction to ambient | $R\theta_{JA}$ | 833 | ℃/W |

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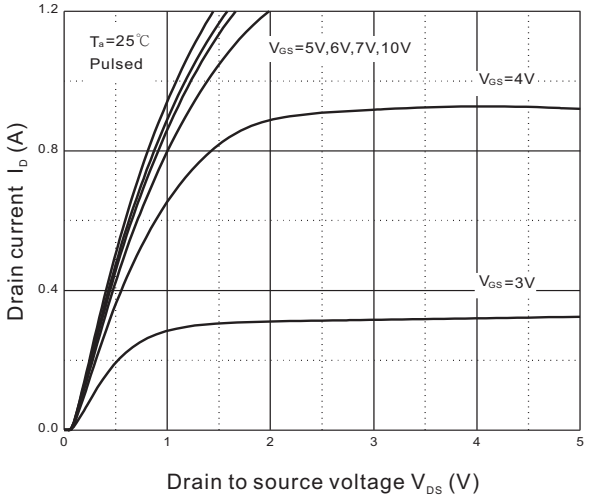
## Electrical characteristics (At $T_j$=25°C unless otherwise specified)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Off characteristics** | | | | | | |
| Drain-source breakdown voltage | $BV_{DSS}$ | $I_D$=250μA, $V_{GS}$=0V | 60 | | | V |
| Drain-source leakage current | $I_{DSS}$ | $V_{DS}$=48V, $V_{GS}$=0V | | | 1 | μA |
| Gate-source leakage current | $I_{GSS}$ | $V_{GS}$=±20V, $V_{DS}$=0V | | | ±10 | μA |
| **On characteristics** | | | | | | |
| Gate threshold voltage | $V_{GS(TH)}$ | $V_{DS}$=$V_{GS}$, $I_D$=1mA | 1 | 1.3 | 2.5 | V |
| Diode forward voltage | $V_{SD}$ | $V_{GS}$=0V, $I_S$=300mA | | | 1.5 | V |
| Static drain-source on-resistance (Note 1) | $R_{DS(ON)}$ | $V_{GS}$=4.5V, $I_D$=200mA | | 1.1 | 5.3 | Ω |
| | | $V_{GS}$=10V, $I_D$=500mA | | 0.9 | 5 | |
| **Dynamic Parameters (Note 2)** | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=10V, f=1.0MHz | | | 40 | pF |
| Output capacitance | $C_{oss}$ | | | | 30 | |
| Reverse transfer capacitance | $C_{rss}$ | | | | 10 | |
| **Switching parameters (Note 2)** | | | | | | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=50V, $V_{GS}$=10V, $R_G$=50Ω, $R_L$=250Ω | | | 10 | ns |
| Turn-off delay time | $t_{d(off)}$ | | | | 15 | |
| Reverse recovery time | $t_{rr}$ | $V_{GS}$=0V, $I_S$=300mA, $V_R$=25V, $dI_S$ / $d_t$ =100A/μs | | 30 | | ns |
| Reverse charge | $Q_r$ | | | 30 | | nC |
| **Gate-source zener diode** | | | | | | |
| Gate-source breakdown voltage | $BV_{GSO}$ | $I_{gs}$=±1mA, (Open drain) | ±21.5 | | ±30 | V |

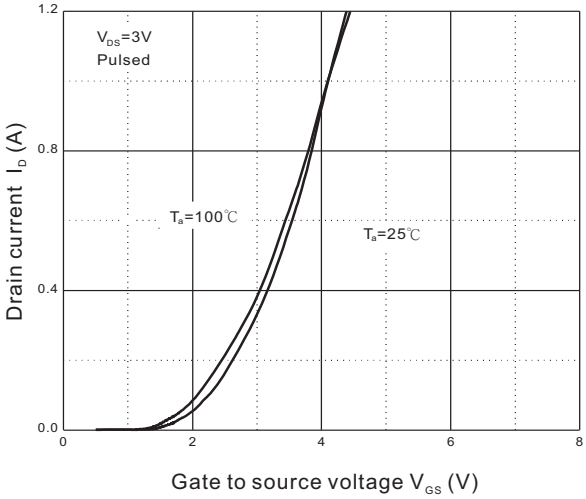
Note : 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%.
2. These parameters have no way to verify.

# Rating and characteristic curves (FMOS2N7002KDW6-Q1)

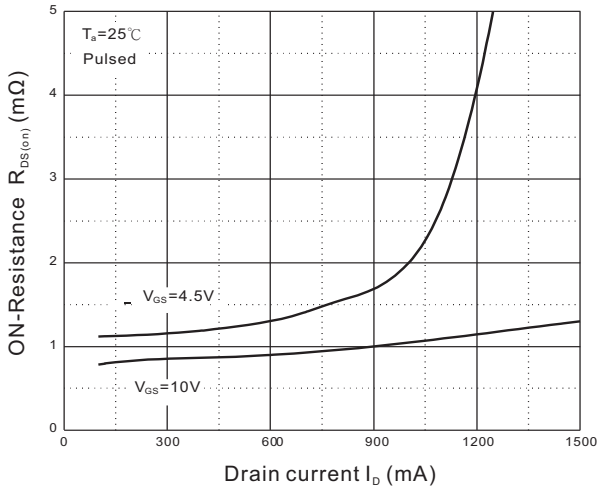
**Output Characteristics**



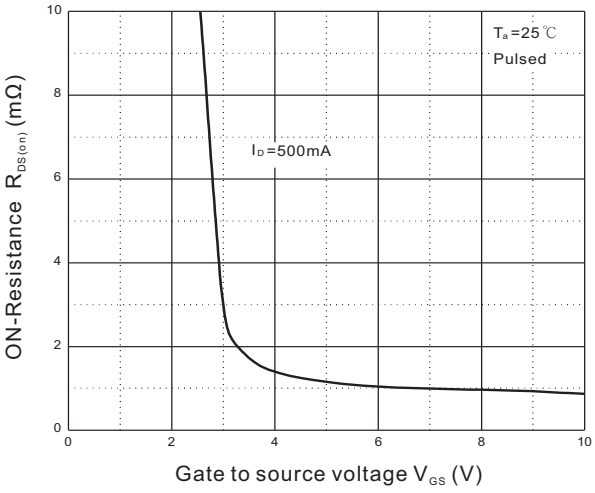

**Transfer Characteristics**



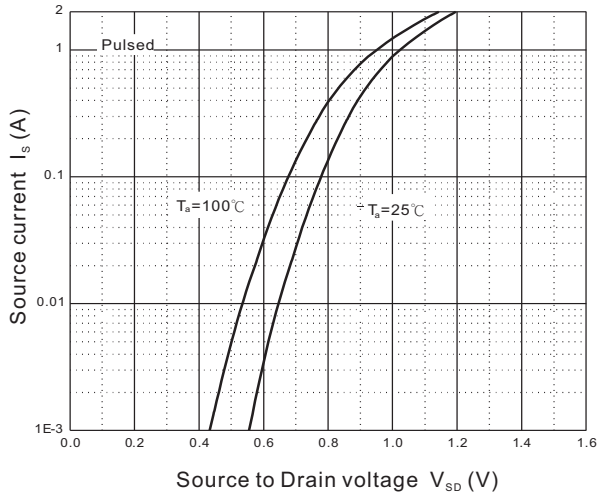

**$R_{DS(ON)}$ —— $I_D$**



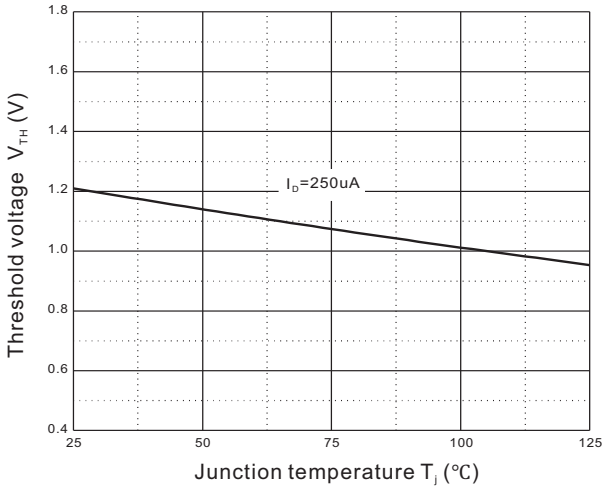

**$R_{DS(ON)}$ —— $V_{GS}$**




**$I_S$—— $V_{SD}$**

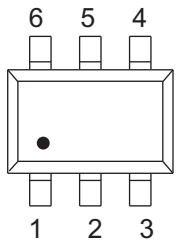
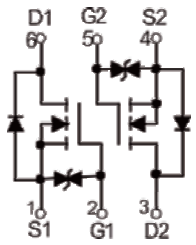



**Threshold Voltage**



# 2N7002KDW6-Q1

## Pinning information

| Simplified outline | Symbol |
|---|---|
|  |  |

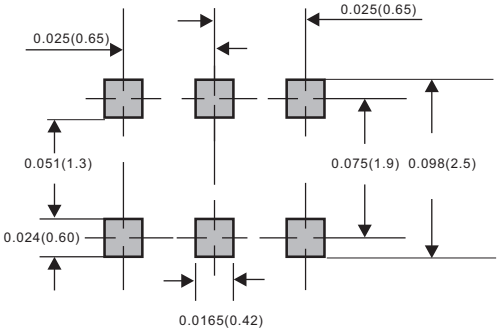


## Marking

| Type Number | Marking Code |
|---|---|
| 2N7002KDW6-Q1 | 72K |

## Suggested solder pad layout

SOT-363

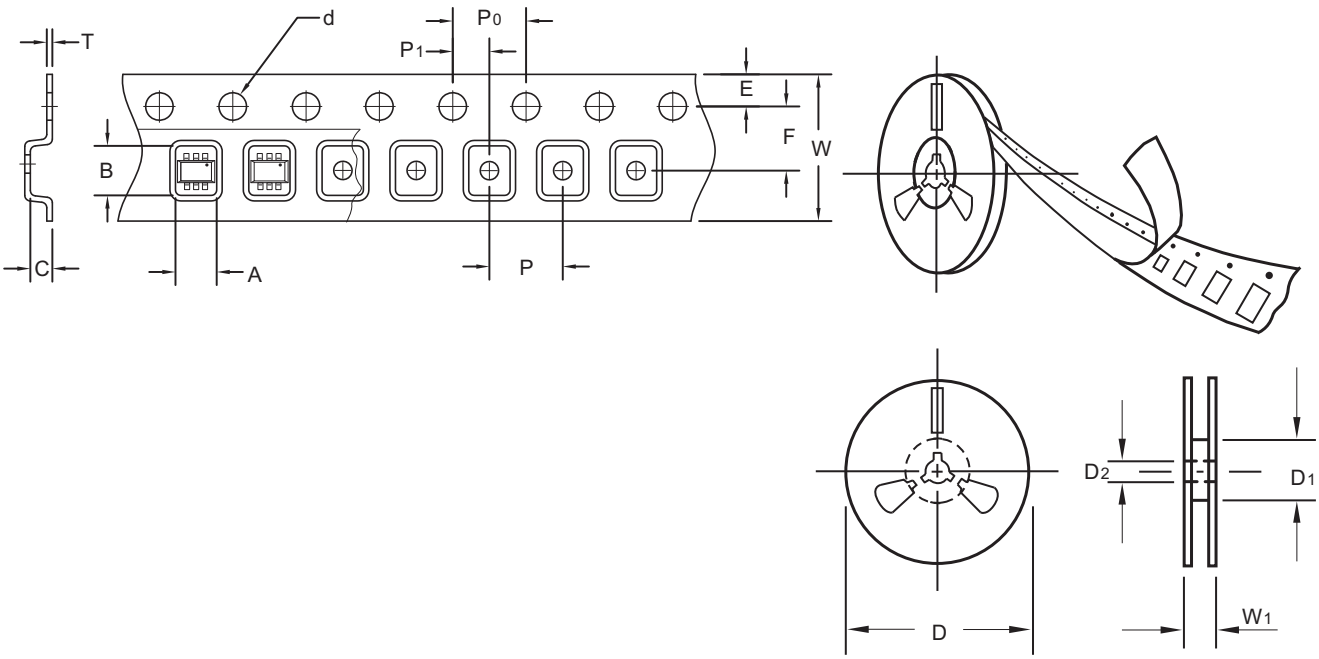




Dimensions in inches and (millimeters)

# 2N7002KDW6-Q1

## Packing information




unit:mm

| Item | Symbol | Tolerance | SOT-363 |
|---|---|---|---|
| Carrier width | A | 0.1 | 2.36 |
| Carrier length | B | 0.1 | 2.40 |
| Carrier depth | C | 0.1 | 1.20 |
| Sprocket hole | d | 0.1 | 1.50 |
| 13" Reel outside diameter | D | 2.0 | - |
| 13" Reel inner diameter | $D_1$ | min | - |
| 7" Reel outside diameter | D | 2.0 | 178.00 |
| 7" Reel inner diameter | $D_1$ | min | 62.00 |
| Feed hole diameter | $D_2$ | 0.5 | 13.00 |
| Sprocket hole position | E | 0.1 | 1.75 |
| Punch hole position | F | 0.1 | 3.50 |
| Punch hole pitch | P | 0.1 | 4.00 |
| Sprocket hole pitch | $P_0$ | 0.1 | 4.00 |
| Embossment center | $P_1$ | 0.1 | 2.00 |
| Overall tape thickness | T | 0.1 | 0.23 |
| Tape width | W | 0.3 | 8.00 |
| Reel width | $W_1$ | 1.0 | 11.40 |

Note:Devices are packed in accor dance with EIA standar RS-481-A and specifications listed above.

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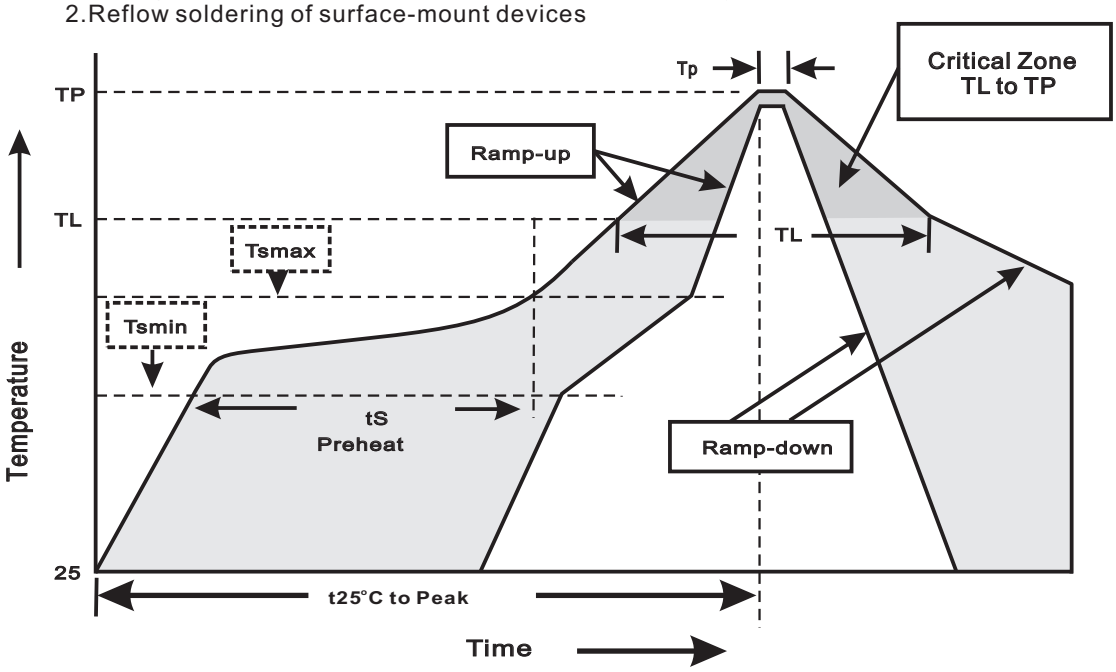
## Reel packing

| PACKAGE | REEL SIZE | REEL (pcs) | COMPONENT SPACING (m/m) | BOX (pcs) | INNER BOX (m/m) | REEL DIA, (m/m) | CARTON SIZE (m/m) | CARTON (pcs) | APPROX. GROSS WEIGHT (kg) |
|---|---|---|---|---|---|---|---|---|---|
| SOT-363 | 7" | 3,000 | 4.0 | 30,000 | 183*123*183 | 178 | 382*257*387 | 240,000 | 9.50 |

## Suggested thermal profiles for soldering processes

1.Storage environment: Temperature=5°C~40°C Humidity=55%±25%

2.Reflow soldering of surface-mount devices




3.Reflow soldering

| Profile Feature | Soldering Condition |
|---|---|
| Average ramp-up rate($T_L$ to $T_P$) | <3°C/sec |
| Preheat<br>-Temperature Min(Tsmin)<br>-Temperature Max(Tsmax)<br>-Time(min to max)($t_s$) | <br>150°C<br>200°C<br>60~120sec |
| Tsmax to $T_L$<br>-Ramp-upRate | <br><3°C/sec |
| Time maintained above:<br>-Temperature($T_L$)<br>-Time($t_L$) | <br>217°C<br>60~260sec |
| Peak Temperature($T_P$) | 255°C-0/+5°C |
| Time within 5°C of actual Peak Temperature($t_P$) | 10~30sec |
| Ramp-down Rate | <6°C/sec |
| Time 25°C to Peak Temperature | <6minutes |