

# 2N7002KDW

## 60V N-Channel Enhancement Mode MOSFET - ESD Protected

### FEATURES

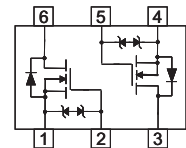
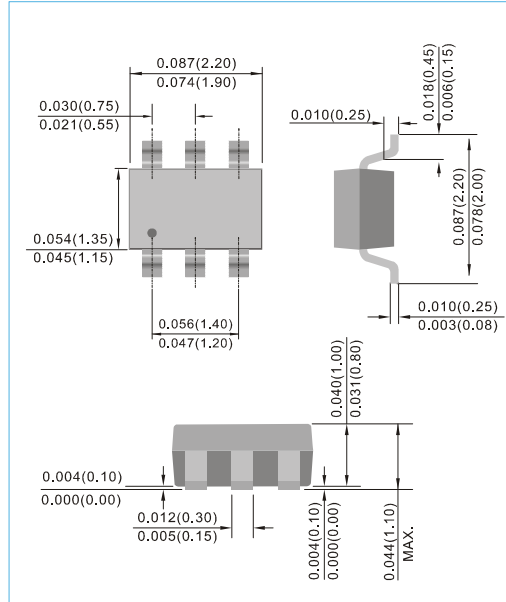
- $R_{DS(ON)}$ ,  $V_{GS}@10V, I_{DS}@500mA=3\Omega$
- $R_{DS(ON)}$ ,  $V_{GS}@4.5V, I_{DS}@200mA=4\Omega$
- Advanced Trench Process Technology
- High Density Cell Design For Ultra Low On-Resistance
- Very Low Leakage Current In Off Condition
- Specially Designed for Battery Operated Systems, Solid-State Relays Drivers : Relays, Displays, Lamps, Solenoids, Memories, etc.
- ESD Protected 2KV HBM
- Lead free in compliance with EU RoHS 2011/65/EU directive
- Green molding compound as per IEC61249 Std. . (Halogen Free)

### MECHANICAL DATA

- Case: SOT-363 Package
- Terminals: Solderable per MIL-STD-750, Method 2026
- Approx. Weight: 0.0002 ounces, 0.006 grams
- Marking: K27

### SOT-363

Unit : inch(mm)



### Maximum RATINGS and Thermal Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

| Parameter   | Symbol          | Limit                  | Units              |
|---|-----------------|------------------------|--------------------|
| Drain-Source Voltage  | $V_{DS}$        | 60                     | V                  |
| Gate-Source Voltage   | $V_{GS}$        | $\pm 20$               | V                  |
| Continuous Drain Current  | $I_D$           | 115                    | mA                 |
| Pulsed Drain Current <sup>1)</sup>                                | $I_{DM}$        | 800                    | mA                 |
| Maximum Power Dissipation   | $P_D$           | $T_A=25^\circ\text{C}$ | 200                |
|   |                 | $T_A=75^\circ\text{C}$ | 120                |
| Operating Junction and Storage Temperature Range                  | $T_J, T_{STG}$  | -55 to +150            | $^\circ\text{C}$   |
| Junction-to Ambient Thermal Resistance (PCB mounted) <sup>2</sup> | $R_{\theta JA}$ | 625                    | $^\circ\text{C/W}$ |

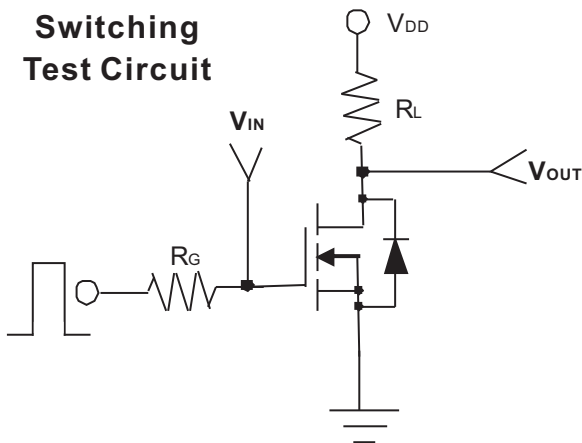
Note: 1. Maximum DC current limited by the package  
 2. Surface mounted on FR4 board,  $t \leq 10$  sec  
 3. Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$

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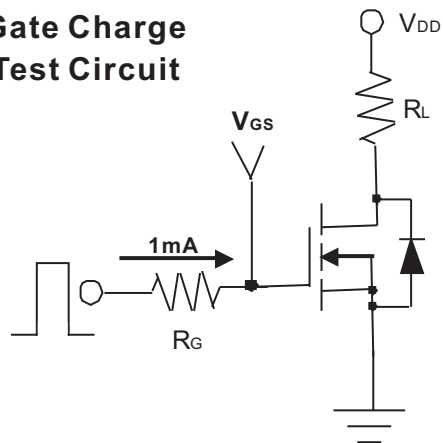
## ELECTRICAL CHARACTERISTICS

| Parameter                        | Symbol       | Test Condition  | Min. | Typ. | Max.     | Units    |
|----------------------------------|--------------|---|------|------|----------|----------|
| <b>Static</b>                    |              |   |      |      |          |          |
| Drain-Source Breakdown Voltage   | $BV_{DSS}$   | $V_{GS}=0V, I_D=10\mu A$  | 60   | -    | -        | V        |
| Gate Threshold Voltage           | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$   | 1    | -    | 2.5      | V        |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS}=4.5V, I_D=200mA$  | -    | -    | 4.0      | $\Omega$ |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS}=10V, I_D=500mA$   | -    | -    | 3.0      |          |
| Zero Gate Voltage Drain Current  | $I_{DSS}$    | $V_{DS}=60V, V_{GS}=0V$   | -    | -    | 1        | $\mu A$  |
| Gate Body Leakage                | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$   | -    | -    | $\pm 10$ | $\mu A$  |
| Forward Transconductance         | $g_{fs}$     | $V_{DS}=15V, I_D=250mA$   | 100  | -    | -        | mS       |
| <b>Dynamic</b>                   |              |   |      |      |          |          |
| Total Gate Charge                | $Q_g$        | $V_{DS}=15V, I_D=200mA$<br>$V_{GS}=4.5V$                                  | -    | -    | 0.8      | nC       |
| Turn-On Delay Time               | $t_{on}$     | $V_{DD}=30V, R_L=150\Omega$<br>$I_D=200mA, V_{GEN}=10V$<br>$R_G=10\Omega$ | -    | -    | 20       | ns       |
| Turn-Off Delay Time              | $t_{off}$    |   | -    | -    | 40       |          |
| Input Capacitance                | $C_{iss}$    | $V_{DS}=25V, V_{GS}=0V$<br>$f=1.0MHz$                                     | -    | -    | 35       | pF       |
| Output Capacitance               | $C_{oss}$    |   | -    | -    | 10       |          |
| Reverse Transfer Capacitance     | $C_{rss}$    |   | -    | -    | 5        |          |
| <b>Source-Drain Diode</b>        |              |   |      |      |          |          |
| Diode Forward Voltage            | $V_{SD}$     | $I_S=200mA, V_{GS}=0V$  | -    | 0.82 | 1.3      | V        |
| Continuous Diode Forward Current | $I_S$        | -   | -    | -    | 115      | mA       |
| Pulsed Diode Forward Current     | $I_{SM}$     | -   | -    | -    | 800      | mA       |

**Switching Test Circuit**



**Gate Charge Test Circuit**



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Typical Characteristics Curves ( $T_A=25^\circ\text{C}$ , unless otherwise noted)

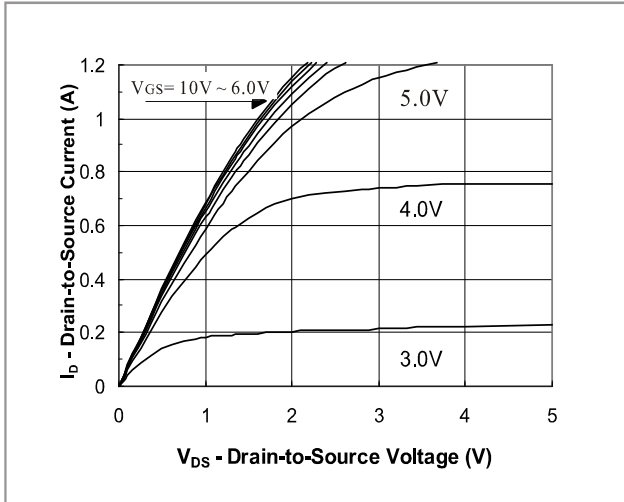


FIG.1- Output Characteristic

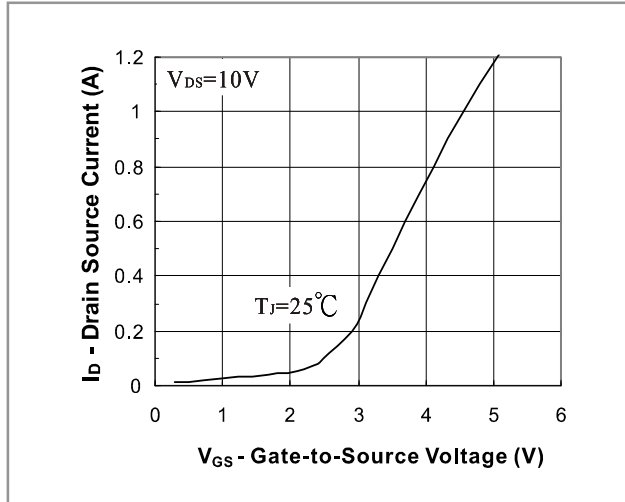


FIG.2- Transfer Characteristic

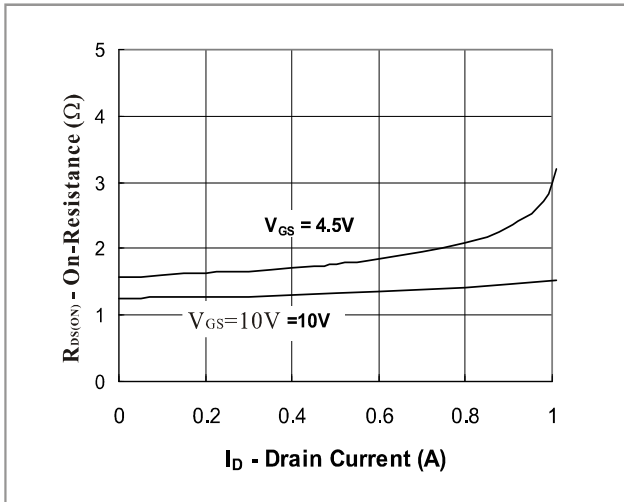


FIG.3- On Resistance vs Drain Current

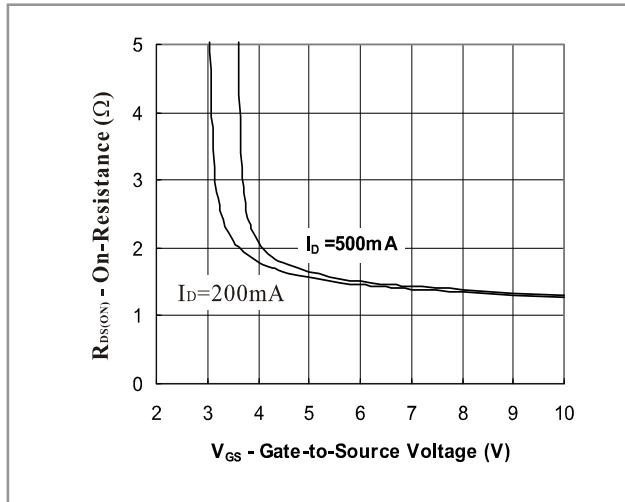


FIG.4- On Resistance vs Gate to Source Voltage

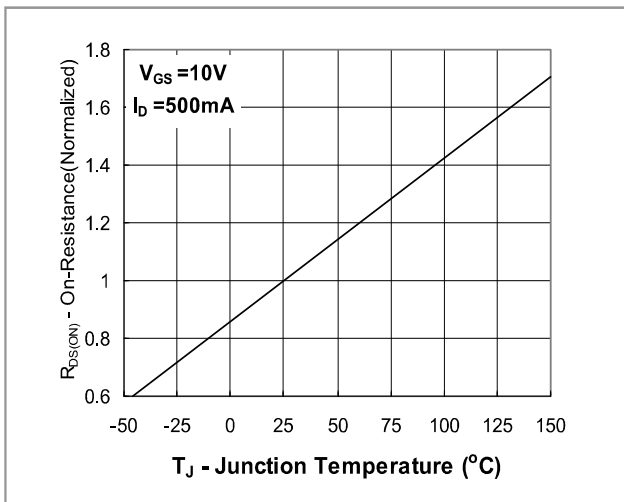
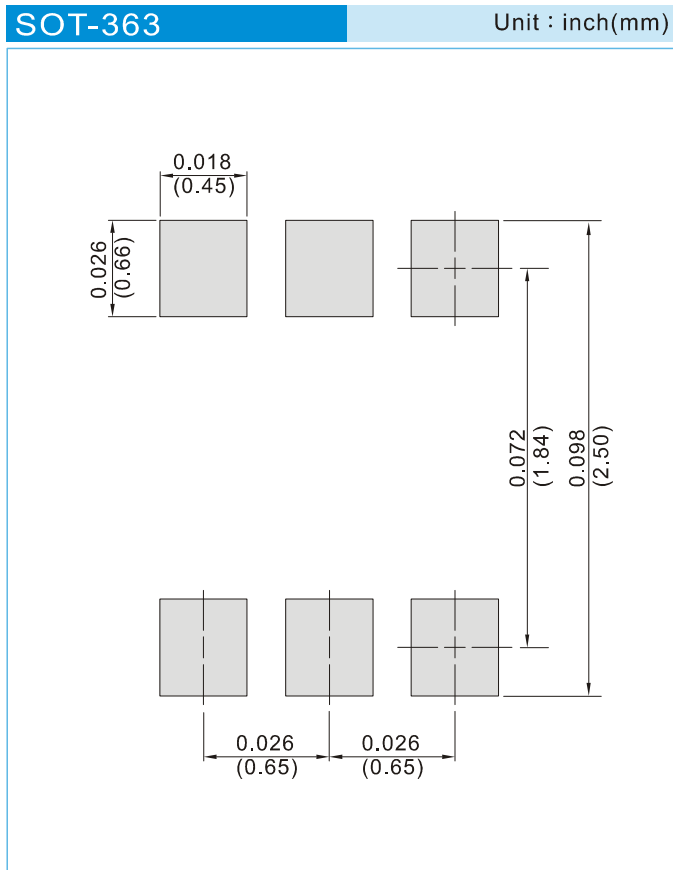


FIG.5- On Resistance vs Junction Temperature



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## MOUNTING PAD LAYOUT



## ORDER INFORMATION

- Packing information  
T/R - 10K per 13" plastic Reel  
T/R - 3K per 7" plastic Reel

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