



2N7002K

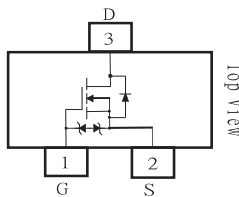
60V N-Channel Enhancement Mode MOSFET - ESD Protected

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 2.0
- Green molding compound as per IEC 61249 standard

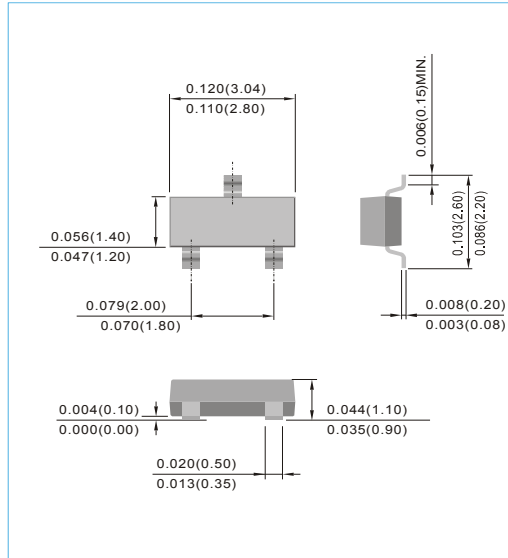
MECHANICAL DATA

- Case: SOT-23 Package
- Terminals: Solderable per MIL-STD-750, Method 2026
- Marking: K72
- Approx. Weight: 0.0003 ounce, 0.0084 gram



SOT-23

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} | ± 20 | V |
| Continuous Drain Current | I_D | 300 | mA |
| Pulsed Drain Current ¹⁾ | I_{DM} | 2000 | mA |
| Maximum Power Dissipation | P_D | 350 210 | mW |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 to + 150 | $^\circ\text{C}$ |
| Junction-to Ambient Thermal Resistance(PCB mounted) ² | $R_{\theta JA}$ | 357 | $^\circ\text{C}/\text{W}$ |

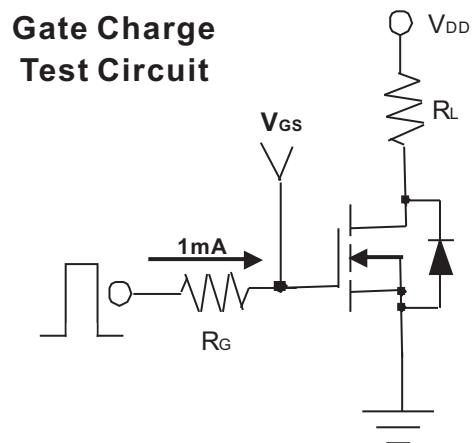
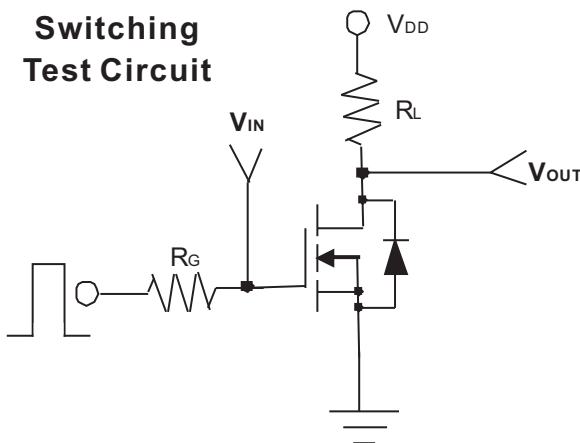
- Note: 1. Maximum DC current limited by the package
 2. Surface mounted on FR4 board, $t \leq 10$ sec
 3. Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$



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ELECTRICAL CHARACTERISTICS

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Units |
|----------------------------------|--------------|---|------|------|----------|----------|
| Static | | | | | | |
| 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 | Ω |
| 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 | μA |
| Gate Body Leakage | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | - | - | ± 10 | μA |
| Forward Transconductance | g_{fs} | $V_{DS}=15V, I_D=250mA$ | 100 | - | - | mS |
| Dynamic | | | | | | |
| Total Gate Charge | Q_g | $V_{DS}=15V, I_D=200mA$ $V_{GS}=5V$ | - | - | 0.8 | nC |
| Turn-On Time | t_{on} | $V_{DD}=30V, R_L=150\Omega$ $I_D=200mA, V_{GEN}=10V$ $R_G=10\Omega$ | - | - | 20 | ns |
| Turn-Off Time | t_{off} | | - | - | 40 | |
| Input Capacitance | C_{iss} | $V_{DS}=25V, V_{GS}=0V$ $f=1.0MHz$ | - | - | 35 | pF |
| Output Capacitance | C_{oss} | | - | - | 10 | |
| Reverse Transfer Capacitance | C_{rss} | | - | - | 5 | |
| Source-Drain Diode | | | | | | |
| Diode Forward Voltage | V_{SD} | $I_S=200mA, V_{GS}=0V$ | - | 0.82 | 1.3 | V |
| Continuous Diode Forward Current | I_S | - | - | - | 300 | mA |
| Pulse Diode Forward Current | I_{SM} | - | - | - | 2000 | mA |





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

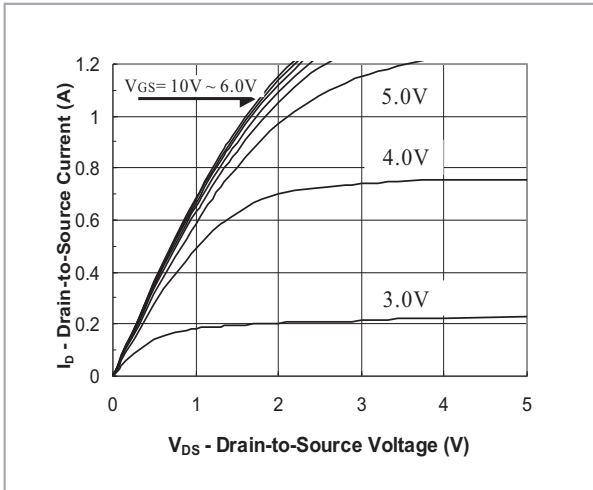


FIG.1- Output Characteristic

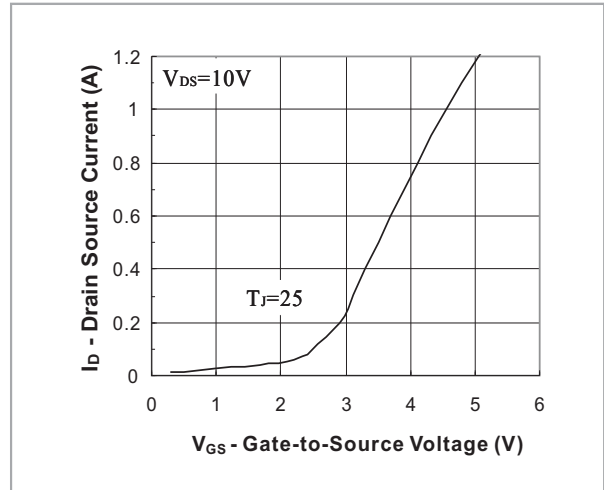


FIG.2- Transfer Characteristic

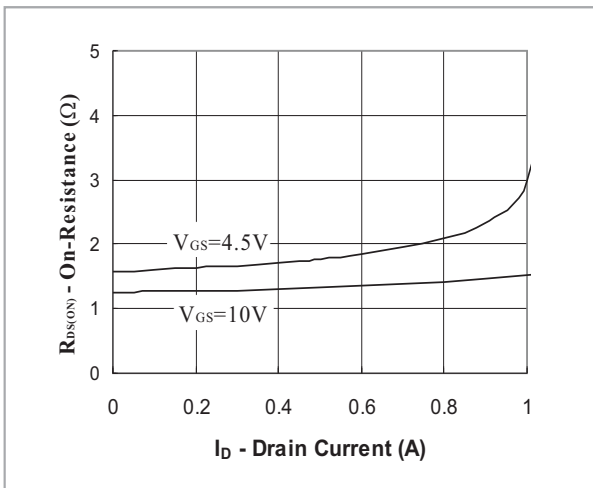


FIG.3- On Resistance vs Drain Current

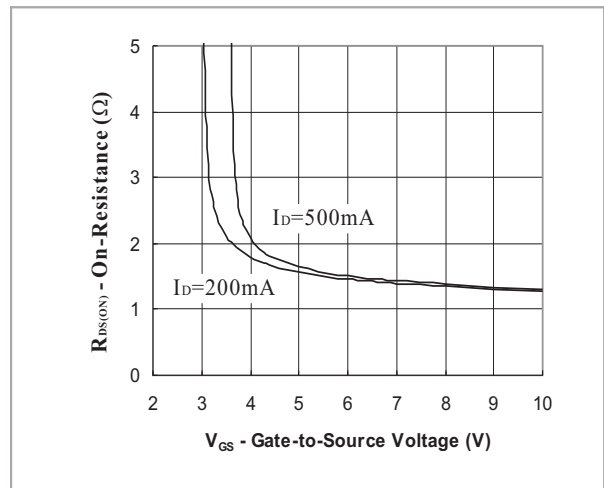


FIG.4- On Resistance vs Gate to Source Voltage

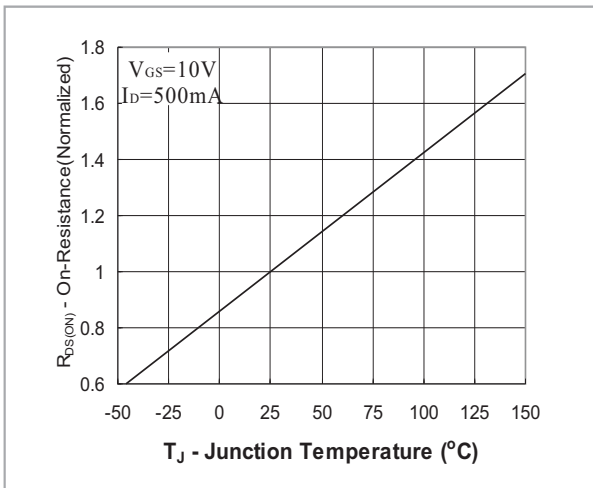


FIG.5- On Resistance vs Junction Temperature



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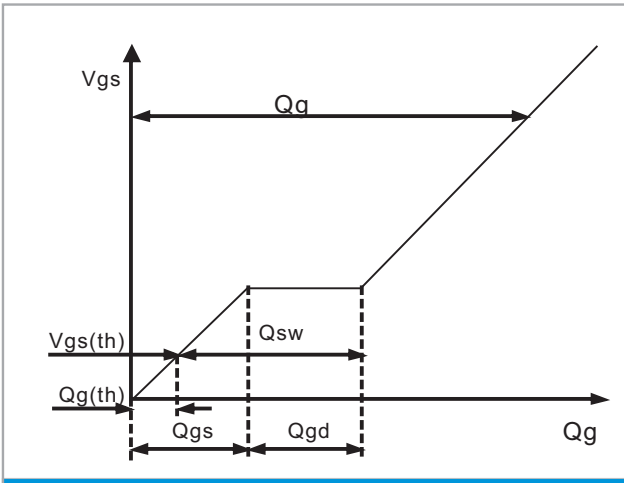


Fig.6 - Gate Charge Waveform

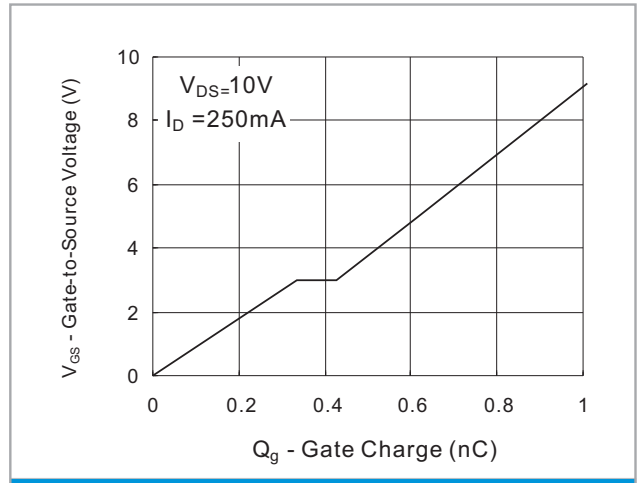


Fig.7 - Gate Charge

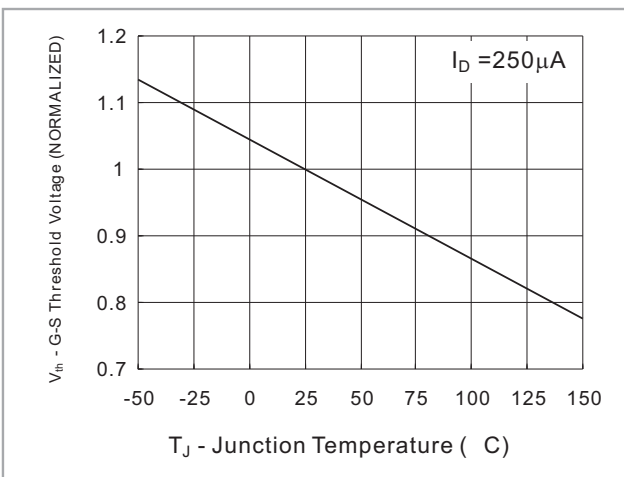


Fig.8 - Threshold Voltage vs Temperature

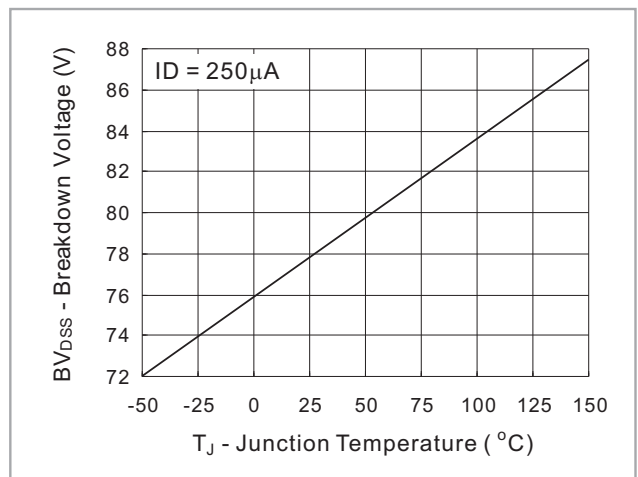


Fig.9 - Breakdown Voltage vs Junction Temperature

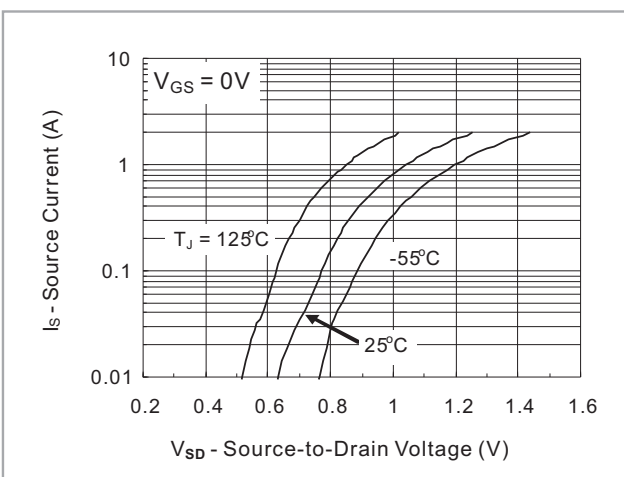


Fig.10 - Source-Drain Diode Forward Voltage

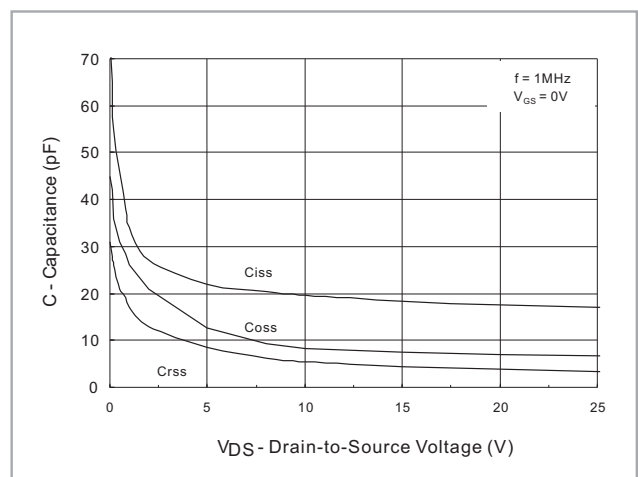
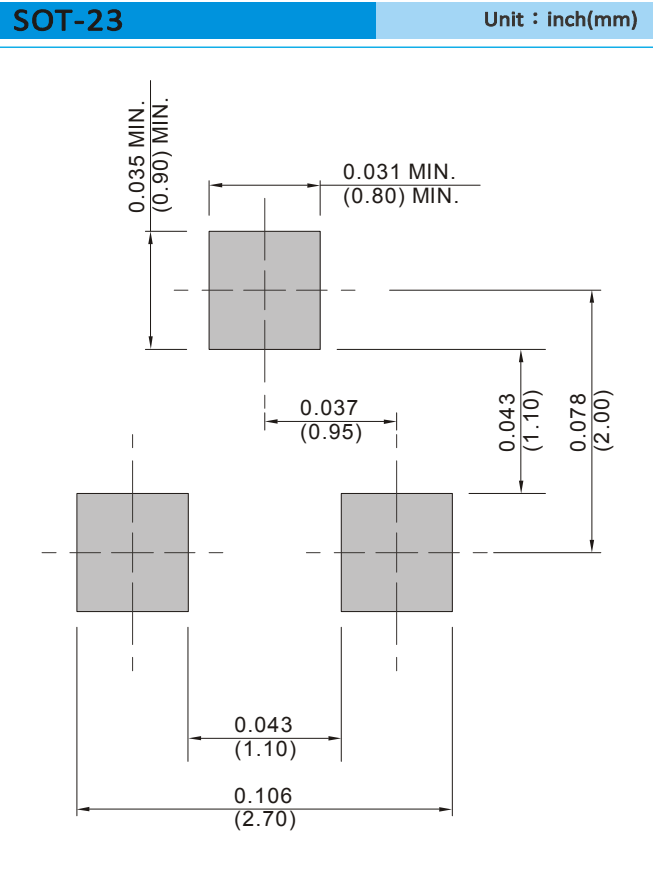


Fig.11 - Capacitance vs Drain to Source Voltage



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MOUNTING PAD LAYOUT



ORDER INFORMATION

- Packing information
 - T/R - 12K per 13" plastic Reel
 - T/R - 3K per 7" plastic Reel



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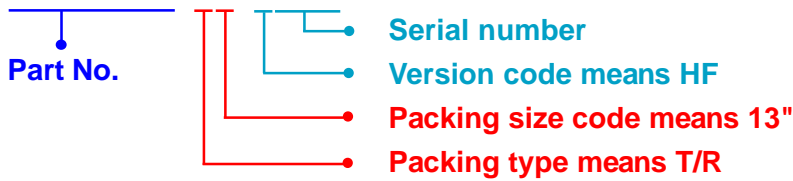
Part No_packing code_Version

2N7002K_R1_00001

2N7002K_R2_00001

For example :

RB500V-40_R2_00001



| Packing Code XX | | | | Version Code XXXXX | | |
|--------------------------------------|----------------------|----------------------------------|----------------------|---------------------------|----------------------|---------------------------------------|
| Packing type | 1 st Code | Packing size code | 2 nd Code | HF or RoHS | 1 st Code | 2 nd ~5 th Code |
| Tape and Ammunition Box (T/B) | A | N/A | 0 | HF | 0 | serial number |
| Tape and Reel (T/R) | R | 7" | 1 | RoHS | 1 | serial number |
| Bulk Packing (B/P) | B | 13" | 2 | | | |
| Tube Packing (T/P) | T | 26mm | X | | | |
| Tape and Reel (Right Oriented) (TRR) | S | 52mm | Y | | | |
| Tape and Reel (Left Oriented) (TRL) | L | PANASERT T/B CATHODE UP (PBCU) | U | | | |
| FORMING | F | PANASERT T/B CATHODE DOWN (PBCD) | D | | | |



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