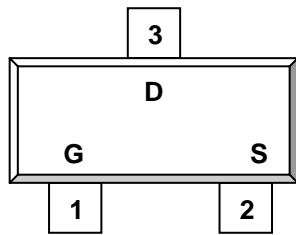


**PIN CONFIGURATION**  
SOT-23

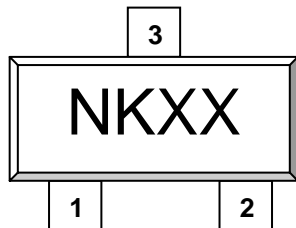


1.Gate 2.Source 3.Drain

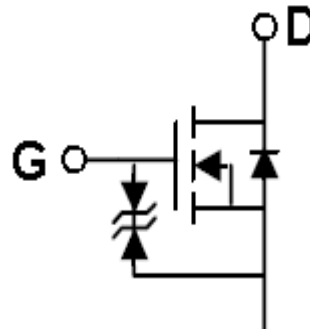
**FEATURE**

- 60V/0.50A,  $R_{DS(ON)} = 2\Omega @ V_{GS} = 10V$
- 60V/0.20A,  $R_{DS(ON)} = 4\Omega @ V_{GS} = 4.5V$
- Super high density cell design for extremely low  $R_{DS(ON)}$
- Exceptional on-resistance and Maximum DC current capability
- ESD capability: 2000V
- SOT-23 package design

**PART MARKING**  
SOT-23



X : Year Code X : Process Code





**2N7002K**



N Channel Enhancement Mode MOSFET

**500mA**

**ABSOLUTE MAXIMUM RATINGS** (Ta = 25°C Unless otherwise noted )

| Parameter  | Symbol               | Typical | Unit |
|--|----------------------|---------|------|
| Drain-Source Voltage                             | V <sub>DSS</sub>     | 60      | V    |
| Gate-Source Voltage                              | V <sub>GSS</sub>     | ±20     | V    |
| Continuous Drain Current (T <sub>J</sub> =150°C) | I <sub>D</sub>       | 0.3     | A    |
|  | T <sub>A</sub> =25°C |         |      |
| Pulsed Drain Current                             | I <sub>DM</sub>      | 0.8     | A    |
| Power Dissipation                                | P <sub>D</sub>       | 0.35    | W    |
|  | T <sub>A</sub> =25°C |         |      |
| Operation Junction Temperature                   | T <sub>J</sub>       | 150     | °C   |
| Storage Temperature Range                        | T <sub>STG</sub>     | -55/150 | °C   |
| Thermal Resistance-Junction to Ambient           | R <sub>θJA</sub>     | 350     | °C/W |



**2N7002K**  Lead-free

N Channel Enhancement Mode MOSFET

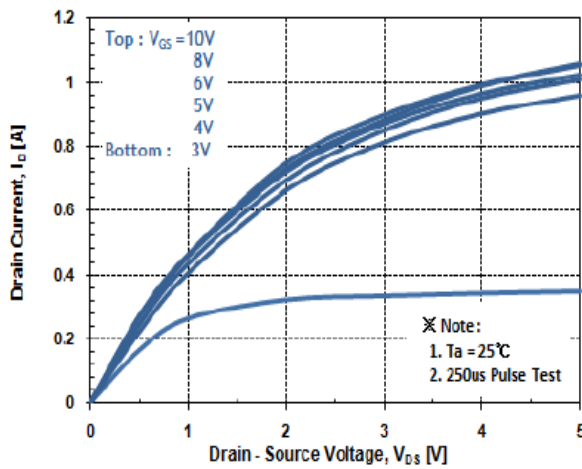
**500mA**

**ELECTRICAL CHARACTERISTICS ( Ta = 25°C Unless otherwise noted )**

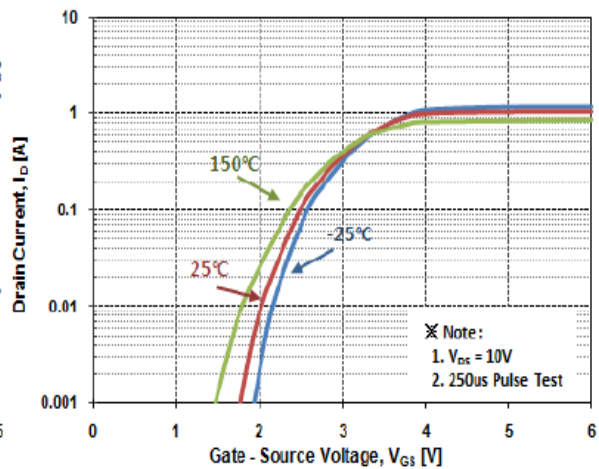
| Parameter                       | Symbol                | Condition  | Min | Typ  | Max      | Unit     |
|---------------------------------|-----------------------|--|-----|------|----------|----------|
| <b>Static</b>                   |                       |  |     |      |          |          |
| Drain-Source Breakdown Voltage  | $V_{(BR)DSS}$         | $V_{GS}=0V, I_D= 250\mu A$                                     | 60  |      |          | V        |
| Gate Threshold Voltage          | $V_{GS(th)}$          | $V_{DS}=V_{GS}, I_D= 250\mu A$                                 | 0.8 |      | 2.5      | V        |
| Gate Leakage Current            | $I_{GSS}$             | $V_{DS}=0V, V_{GS}=\pm 20V$                                    |     |      | $\pm 30$ | nA       |
| Zero Gate Voltage Drain Current | $I_{DSS}$             | $V_{DS}= 60V, V_{GS}=0V$                                       |     |      | 1        | uA       |
|                                 |                       | $V_{DS}= 48V, V_{GS}=0V$<br>$T_J=70^\circ C$                   |     |      | 100      |          |
| Drain-source On-Resistance      | $R_{DS(on)}$          | $V_{GS}=10.0V, I_D=0.50A$                                      |     | 2.0  | 3.0      | $\Omega$ |
|                                 |                       | $V_{GS}=4.5V, I_D= 0.25A$                                      |     | 3.0  | 3.5      |          |
| Forward Transconductance        | $G_{fs(1)}$           | $V_{DS}=10V, I_D= 0.5A$  |     | 0.08 |          | S        |
| Diode Forward Voltage           | $V_{SD(1)}$           | $I_S=0.12A, V_{GS}=0V$   |     |      | 1.3      | V        |
| <b>Dynamic</b>                  |                       |  |     |      |          |          |
| Total Gate Charge               | $Q_g$                 | $V_{DS}=30V, V_{GS}=4.5V$<br>$I_D=1.0A$                        |     | 0.6  | 0.8      | nC       |
| Gate-Source Charge              | $Q_{gs}$              |  |     | 0.2  |          |          |
| Gate-Drain Charge               | $Q_{gd}$              |  |     | 0.2  |          |          |
| Input Capacitance               | $C_{iss}$             | $V_{DS}=25V, f=1MHz,$<br>$V_{GS}=0$                            |     | 30   | 50       | pF       |
| Output Capacitance              | $C_{oss}$             |  |     | 7    |          |          |
| Reverse Transfer Capacitance    | $C_{rss}$             |  |     | 4    |          |          |
| Turn-On Time                    | $t_{d(on)}$<br>$t_r$  | $V_{DD}=30V$<br>$I_D=0.5A$<br>$V_{GS}=4.5V$<br>$R_G=4.7\Omega$ |     | 2    |          | nS       |
|                                 |                       |  |     | 15   |          |          |
| Turn-Off Time                   | $t_{d(off)}$<br>$t_f$ |  |     | 8    |          |          |
|                                 |                       |  |     | 11   |          |          |

**TYPICAL CHARACTERISTICS (25°C Unless noted)**

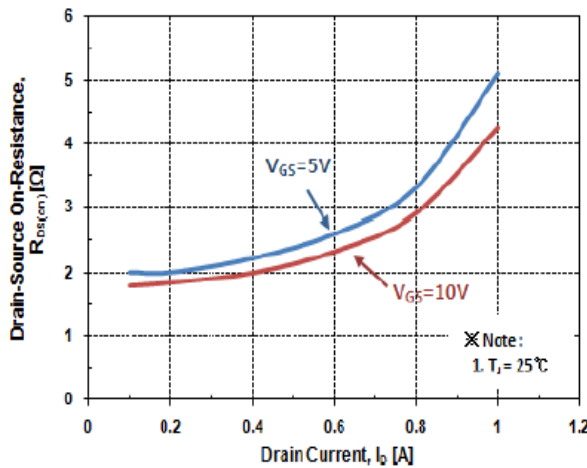
**Fig. 1  $I_D - V_{DS}$**



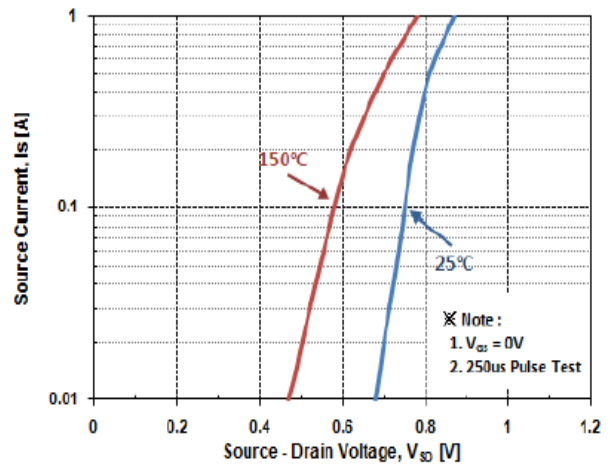
**Fig. 2  $I_D - V_{GS}$**



**Fig. 3  $R_{DS(ON)} - I_D$**

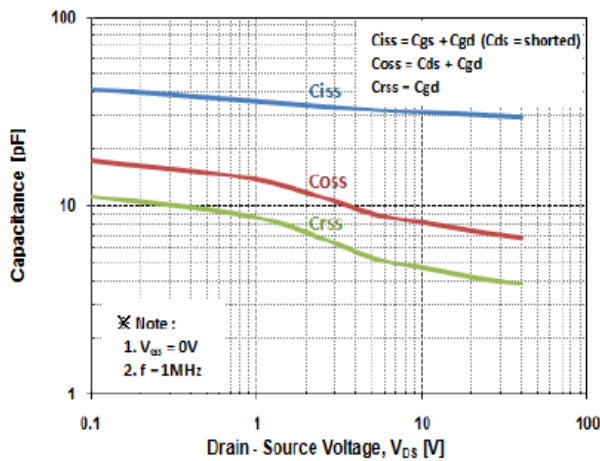


**Fig. 4  $I_S - V_{SD}$**

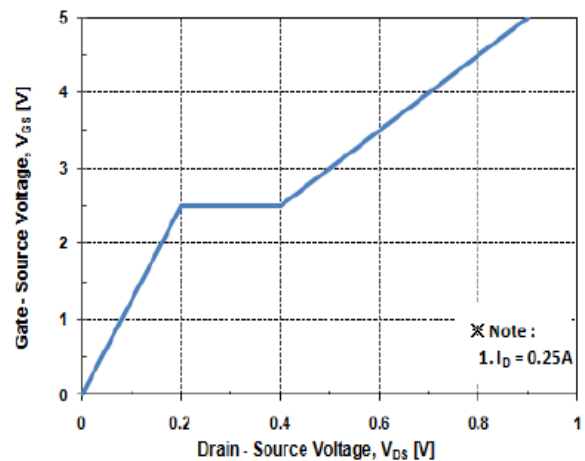


**TYPICAL CHARACTERISTICS**

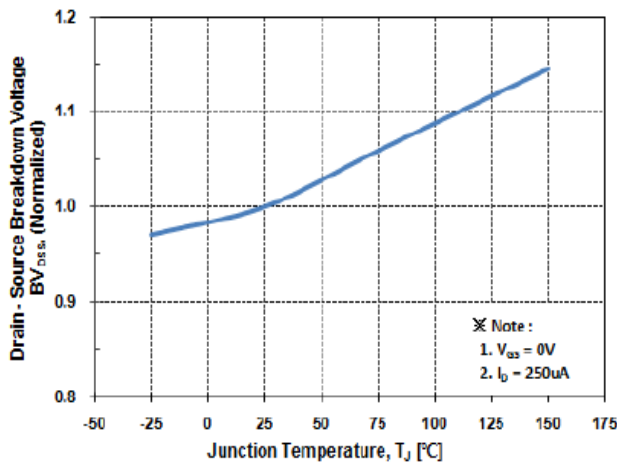
**Fig. 5 Capacitance -  $V_{DS}$**



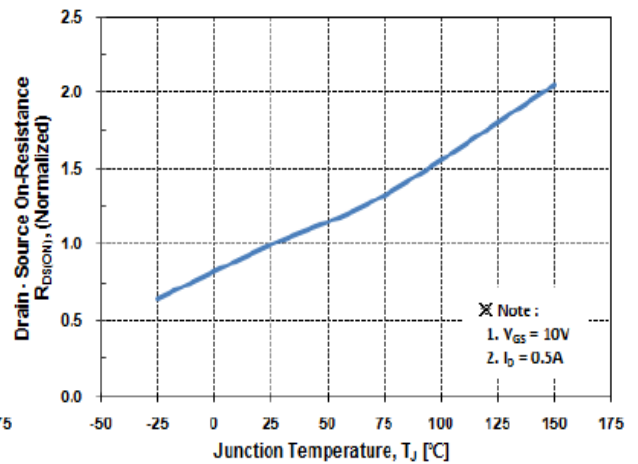
**Fig. 6  $V_{GS} - Q_G$**



**Fig. 7  $V_{DSS} - T_J$**

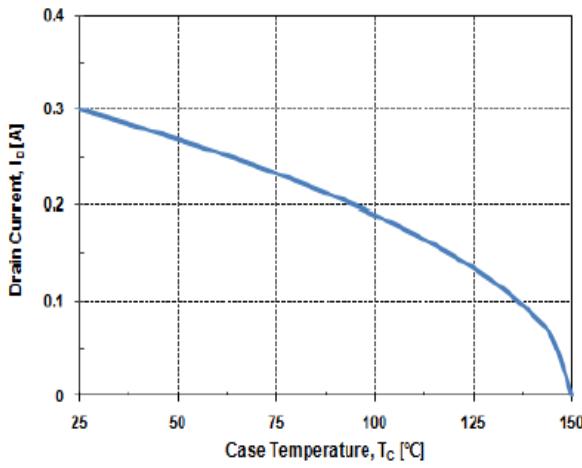


**Fig. 8  $R_{DS(on)} - T_J$**

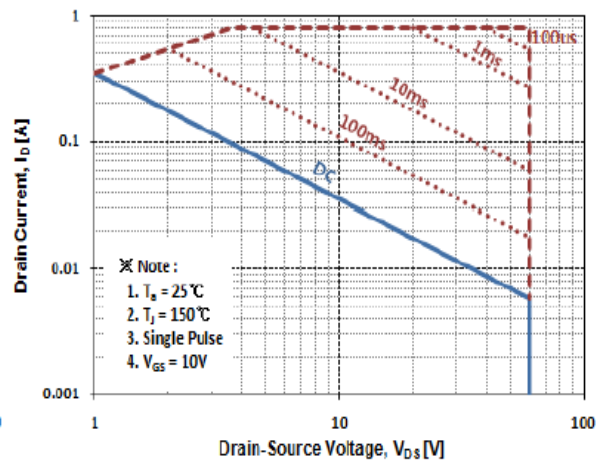


**TYPICAL CHARACTERISTICS**

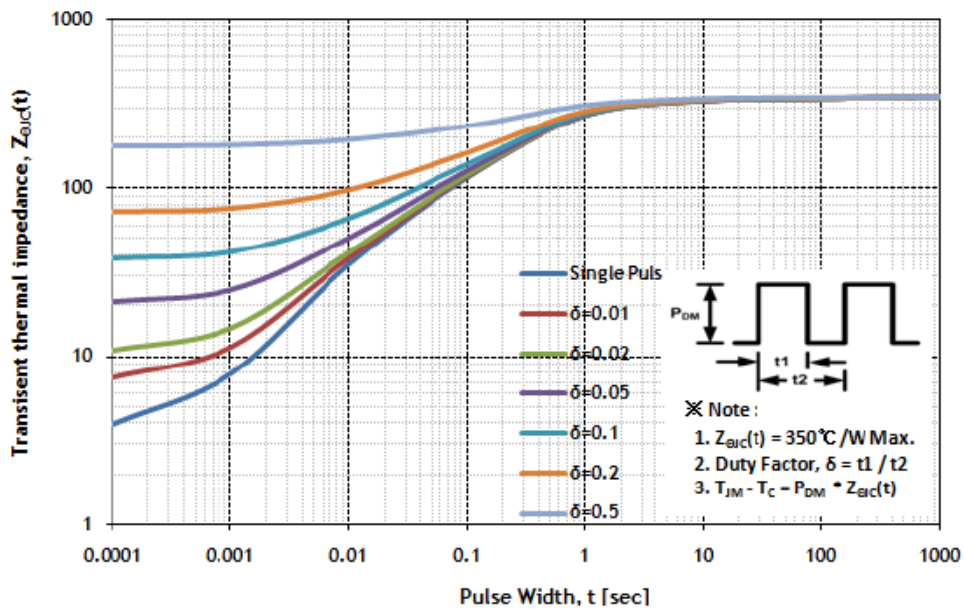
**Fig. 9  $I_D - T_C$**

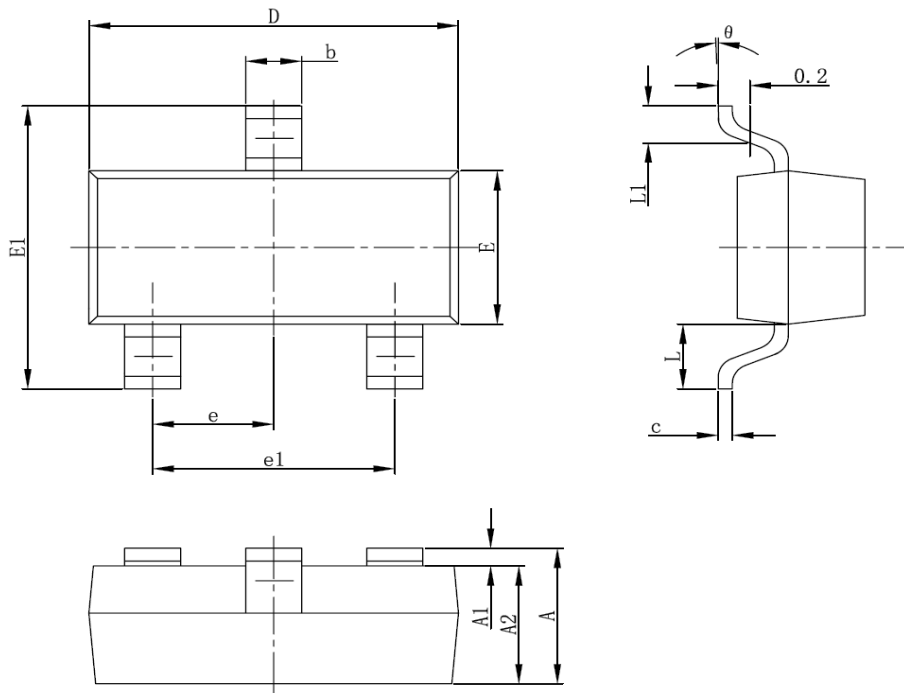


**Fig. 10 Safe Operating Area**



**Fig. 11 Transient Thermal Impedance**



**SOT-23 PACKAGE OUTLINE**


| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 0.900                     | 1.100 | 0.035                | 0.043 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 0.900                     | 1.000 | 0.035                | 0.039 |
| b      | 0.300                     | 0.500 | 0.012                | 0.020 |
| c      | 0.080                     | 0.150 | 0.003                | 0.006 |
| D      | 2.800                     | 3.000 | 0.110                | 0.118 |
| E      | 1.200                     | 1.400 | 0.047                | 0.055 |
| E1     | 2.250                     | 2.550 | 0.089                | 0.100 |
| e      | 0.950TYP                  |       | 0.037TYP             |       |
| e1     | 1.800                     | 2.000 | 0.071                | 0.079 |
| L      | 0.550REF                  |       | 0.022REF             |       |
| L1     | 0.300                     | 0.500 | 0.012                | 0.020 |
| theta  | 0°                        | 8°    | 0°                   | 8°    |