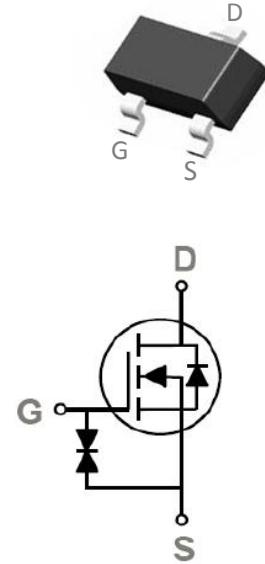


Description:

This N-Channel MOSFET uses advanced trench technology and design to provide excellent $R_{DS(on)}$ with low gate charge. It can be used in a wide variety of applications.

Features:

- 1) $V_{DS}=60V, I_D=0.3A, R_{DS(ON)}<2.3\ \Omega @V_{GS}=10V$
- 2) Low gate charge.
- 3) Green device available.
- 4) Advanced high cell density trench technology for ultra low $R_{DS(ON)}$.
- 5) Excellent package for good heat dissipation.6)
- 6) ESD Protection



Package Marking and Ordering Information:

| Part NO. | Marking | Package | Packing |
|----------|---------|---------|---------------|
| 2N7002K | 72K | SOT-23 | 3000 pcs/Reel |

Absolute Maximum Ratings: ($T_A=25^\circ\text{C}$ unless otherwise noted)

| Symbol | Parameter | Ratings | Units |
|----------------|--|----------|------------------|
| V_{DS} | Drain-Source Voltage | 60 | V |
| V_{GS} | Gate-Source Voltage | ± 20 | V |
| I_D | Continuous Drain Current | 0.3 | A |
| I_{DM} | Pulsed Drain Current ¹ | 0.2 | |
| P_D | Power Dissipation | 1.2 | W |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55-+150 | $^\circ\text{C}$ |

Thermal Characteristics:

| Symbol | Parameter | Max | Units |
|-----------------|--|-----|---------------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient ² | 357 | $^\circ\text{C}/\text{W}$ |

Electrical Characteristics: ($T_A=25^\circ\text{C}$ unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|--|-------|-----------|---------------|
| Off Characteristics | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_D=250\ \mu\text{A}$ | 60 | --- | --- | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{GS}=0V, V_{DS}=60V$ | --- | --- | 1 | μA |
| I_{GSS} | Gate-Source Leakage Current | $V_{GS}=\pm 20V, V_{DS}=0A$ | --- | --- | ± 100 | nA |
| On Characteristics | | | | | | |
| $V_{GS(th)}$ | GATE-Source Threshold Voltage | $V_{GS}=V_{DS}, I_D=250\ \mu\text{A}$ | 1 | 1.6 | 2.5 | V |
| $R_{DS(ON)}$ | Drain-Source On Resistance ³ | $V_{GS}=10V, I_D=0.3A$ | --- | 1.8 | 2.3 | Ω |
| | | $V_{GS}=4.5V, I_D=0.2A$ | --- | 2.2 | 3 | Ω |
| Dynamic Characteristics | | | | | | |
| C_{iss} | Input Capacitance | $V_{DS}=25V, V_{GS}=0V, f=1\text{MHz}$ | --- | 29 | --- | pF |
| C_{oss} | Output Capacitance | | --- | 11 | -- | |
| C_{rss} | Reverse Transfer Capacitance | | --- | 3.8 | --- | |
| Switching Characteristics | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DS}=10V, I_D=0.2A,$ $R_{ENG}=10\ \Omega, V_{GS}=10V$ | --- | 2.1 | --- | ns |
| t_r | Rise Time | | --- | 15.75 | --- | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | --- | 7.35 | --- | ns |
| t_f | Fall Time | | --- | 19 | --- | ns |
| Q_g | Total Gate Charge | | $V_{GS}=4.5V, V_{DS}=10V,$ $I_D=0.3A$ | --- | 1.785 | --- |
| Q_{gs} | Gate-Source Charge | --- | | 0.315 | --- | nc |
| Q_{gd} | Gate-Drain "Miller" Charge | --- | | 0.63 | --- | nc |
| Drain-Source Diode Characteristics | | | | | | |
| V_{SD} | Diode Forward Voltage | $V_{GS}=0V, I_{SD}=0.3A$ | --- | --- | 1.2 | V |
| I_S | Continuous Drain Current | $V_D=V_G=0V$ | --- | --- | 0.3 | A |
| I_{SM} | Pulsed Drain Current | | --- | --- | 1.2 | A |

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2. $R_{\theta JA}$ is measured with the device mounted on a 1inch^2 pad of 2oz copper FR4 PCB
3. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 0.5\%$.

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

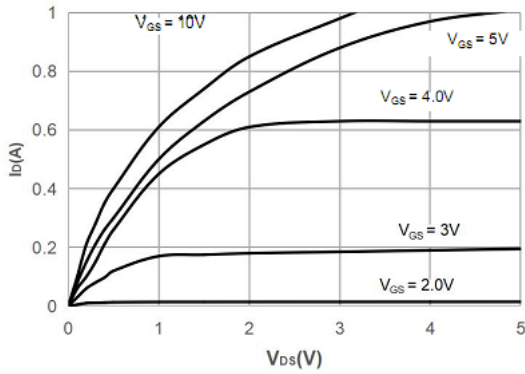


Figure 1: Output Characteristics

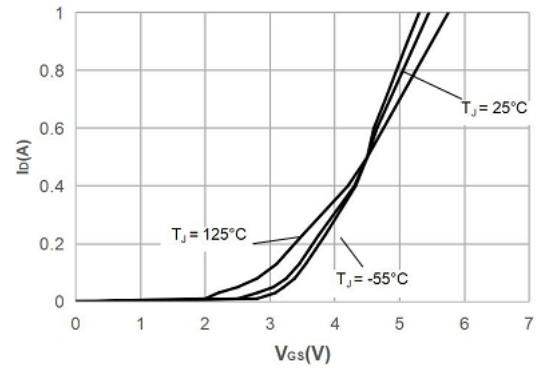


Figure 2: Typical Transfer Characteristics

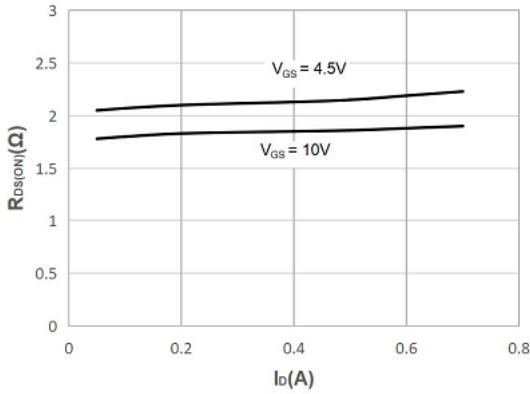


Figure 3: On-resistance vs. Drain Current

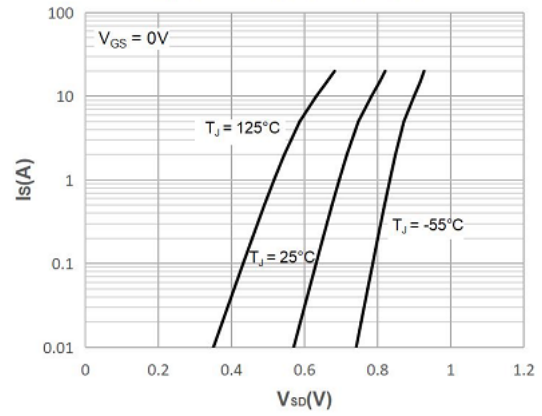


Figure 4: Body Diode Characteristics

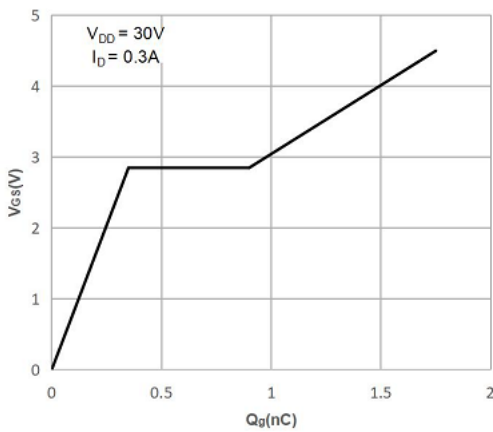


Figure 5: Gate Charge Characteristics

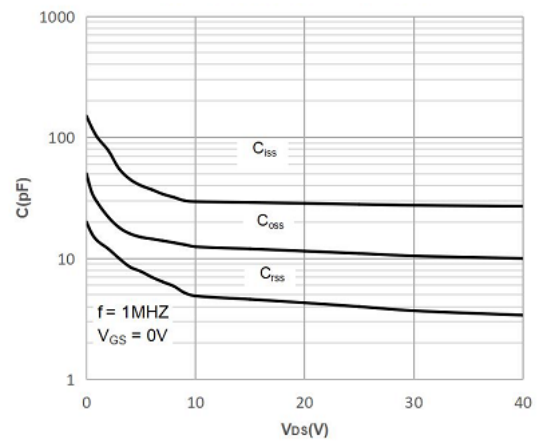


Figure 6: Capacitance Characteristics

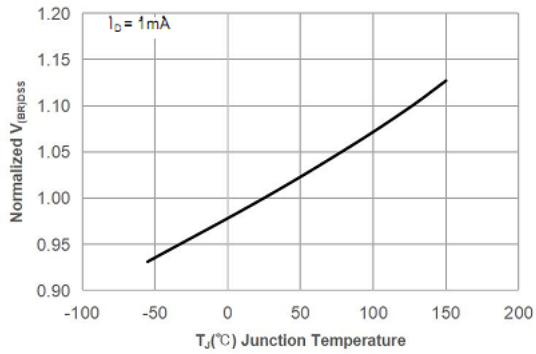


Figure 7: Normalized Breakdown voltage vs. Junction Temperature

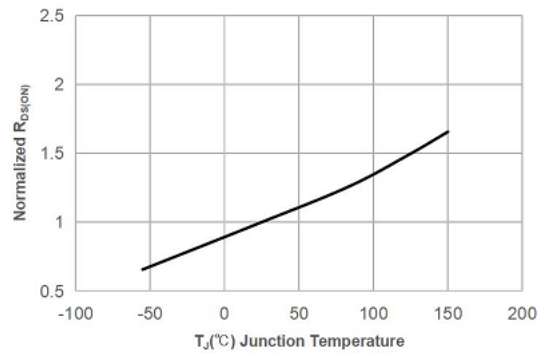


Figure 8: Normalized on Resistance vs. Junction Temperature

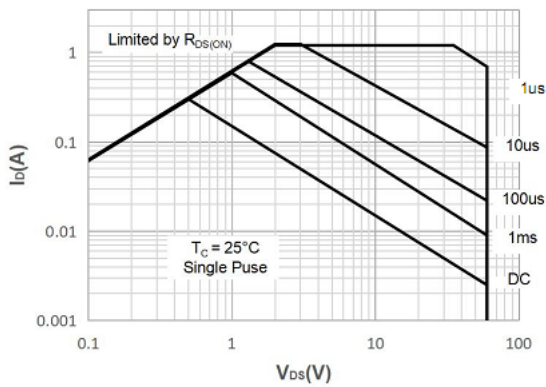


Figure 9: Maximum Safe Operating Area

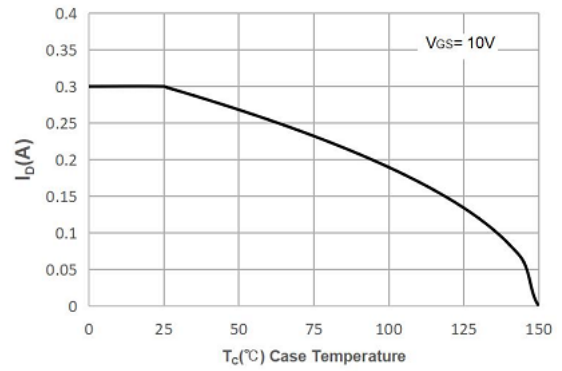


Figure 10: Maximum Continuous Driant Current vs. Case Temperature

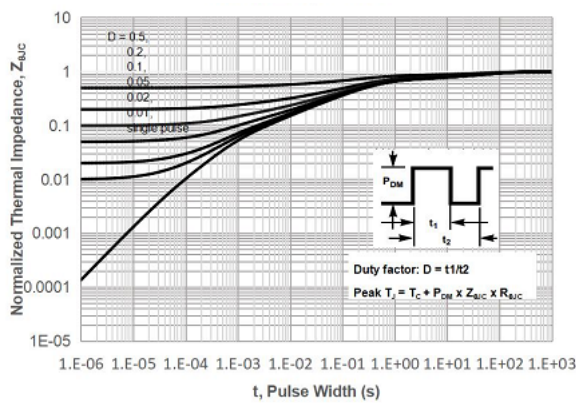


Figure 11: Normalized Maximum Transient Thermal Impedance

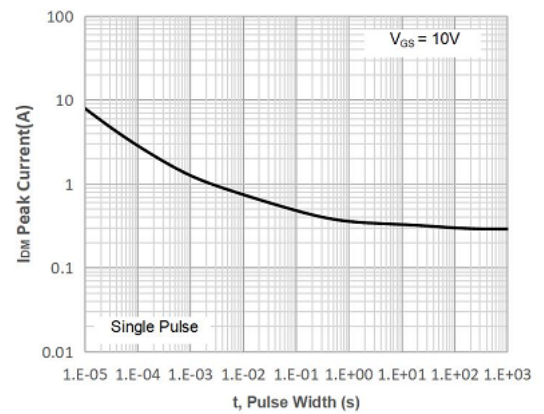
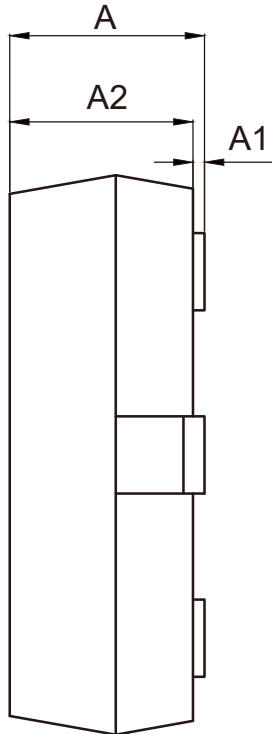
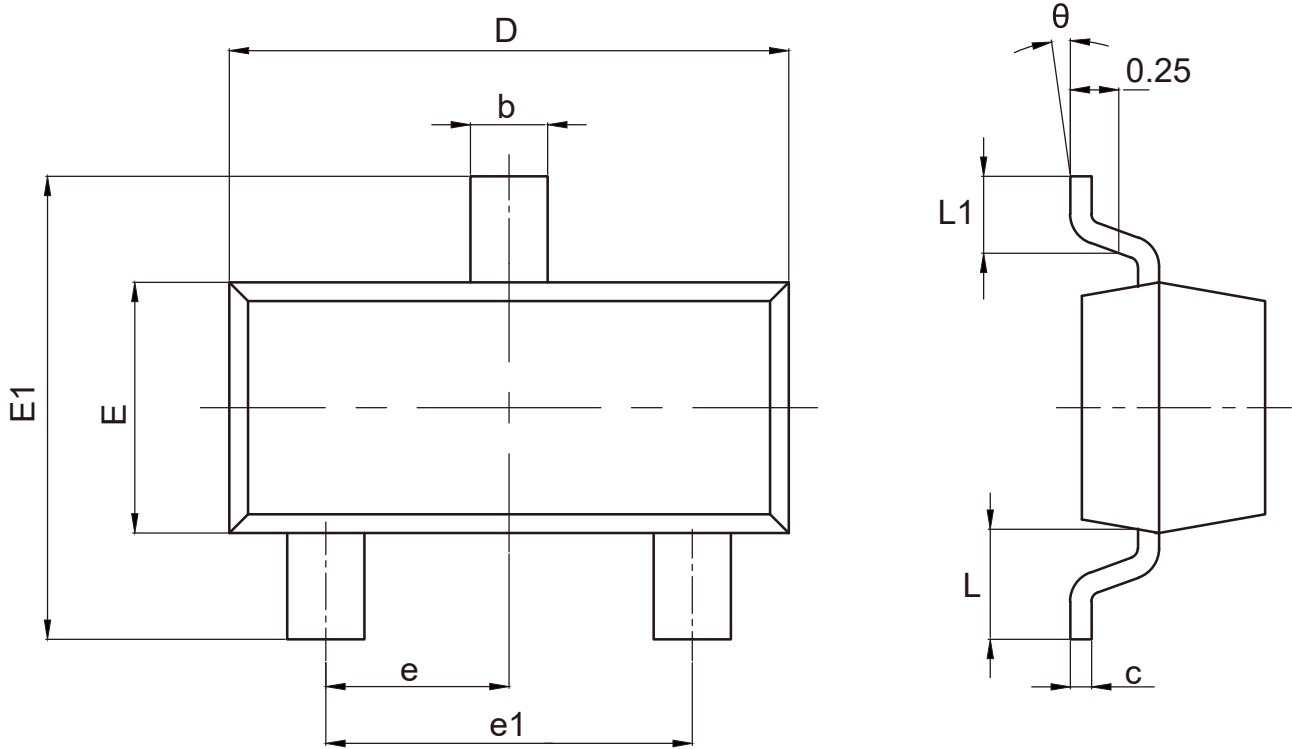


Figure 12: Peak Current Capacity

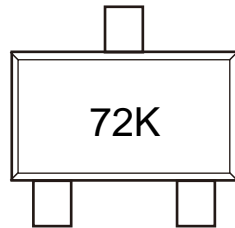
SOT-23 Package Outline Data



| COMMON DIMENSIONS | | | |
|---------------------------|----------|-------|-------|
| CUNITS MEASURE=MILLIMETER | | | |
| SYMBOL | MIN | NOM | MAX |
| A | 0.900 | -- | 1.150 |
| A1 | 0.000 | -- | 0.100 |
| A2 | 0.900 | -- | 1.050 |
| c | 0.100 | -- | 0.200 |
| b | 0.300 | 0.400 | 0.500 |
| D | 2.800 | 2.900 | 3.000 |
| E | 1.200 | -- | 1.400 |
| E1 | 2.250 | -- | 2.550 |
| e | 0.950TYP | | |
| e1 | 1.800 | 1.900 | 2.000 |
| L | 0.550REF | | |
| L1 | 0.300 | 0.400 | 0.500 |
| θ | 0° | -- | 8° |

Unit:mm

Marking Information:



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