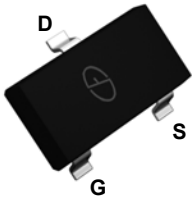
GOOD-ARK
SEMICONDUCTOR

2N7002K

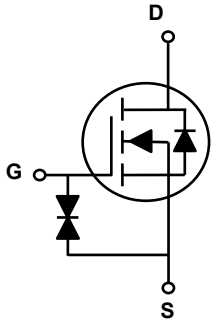
60V N-Channel MOSFET

Main Product Characteristics

V_{DS}	60V
$R_{DS(ON)}$	3.0Ω
I_D	300mA



SOT-23



Schematic Diagram

Features and Benefits

- Advanced MOSFET process technology
- Ideal for high efficiency switched mode power supplies
- Low on-resistance with low gate charge
- Fast switching and reverse body recovery

RoHS Compliant

Description

The 2N7002K utilizes the latest techniques to achieve high cell density and low on-resistance. These features make this device extremely efficient and reliable for use in high efficiency switch mode power supplies and a wide variety of other applications.

Absolute Maximum Ratings (T_A=25°C unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous @ Current-Pulsed[1]	I_D	0.3	A
	I_D (70°C)	0.26	
	I_{DM}	0.8	A
Maximum Power Dissipation	P_D	0.43	W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 175	°C
Thermal Resistance,Junction-to-Ambient[2]	$R_{\theta JA}$	350	°C/W

Electrical Characteristics (T_A=25°C unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
On / Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=250uA	60	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=60V, V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±5V, V_{DS}=0V	-	-	100	nA
		V_{GS}=±10V, V_{DS}=0V	-	-	150	nA
		V_{GS}=±20V, V_{DS}=0V	-	-	10	μA
Gate-Source Breakdown Voltage	BV_{GSO}	I_G=±250uA, V_{DS}=0V	±20	-	-	V
Static Drain-Source On-Resistance[3]	$R_{DS(ON)}$	V_{GS}=10V, I_D=0.5A	-	-	3	Ω
		V_{GS}=5V, I_D=0.05A	-	-	3.5	Ω
Forward Transconductance[3]	gfs	V_{DS}=10V, I_D=0.2A	0.08	-	-	S
Gate Threshold Voltage[3]	$V_{GS(th)}$	V_{GS}=V_{DS}, I_D=250uA	1	-	2.5	V
Dynamic and Switching Characteristics						
Turn-on Delay Time[4]	$t_{d(on)}$	V_{DD}=30V,V_{GS}=10V, R_{GEN}=6Ω, I_D=0.3A	-	4	-	nS
Rise Time[4]	t_r		-	2.7	-	
Turn-Off Delay Time[4]	$t_{d(off)}$		-	9.4	-	
Fall Time[4]	t_f		-	33	-	
Total Gate Charge[4]	Q_g	V_{DS}=10V,I_D=0.3A, V_{GS}=10V	-	1.6	-	nC
Gate to Source Charge[4]	Q_{gs}		-	0.3	-	
Gate to Drain Charge[4]	Q_{gd}		-	0.45	-	
Input Capacitance[4]	C_{iss}	V_{DS}=25V, V_{GS}=0V, F=1MHz	-	30	-	pF
Output Capacitance[4]	C_{oss}		-	6	-	
Reverse Transfer Capacitance[4]	C_{rss}		-	3	-	
Drain-Source Diode Characteristics and Maximum Ratings						
Diode Forward Voltage[3]	V_{SD}	V_{GS}=0V, I_S=0.2A	-	-	1.3	V
Reverse Recovery Time	t_{rr}	I_F=0.5A, V_R=10V d_I/d_t=100A/us	-	8.2	-	nS
Reverse Recovery Charge	Q_{rr}		-	3.2	-	nC

Notes:

1. Repetitive rating: Pulsed width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse test: pulse width ⩽ 300us, duty cycle ⩽ 2%.
4. Guaranteed by design, not subject to production testing.

Typical Electrical and Thermal Characteristics

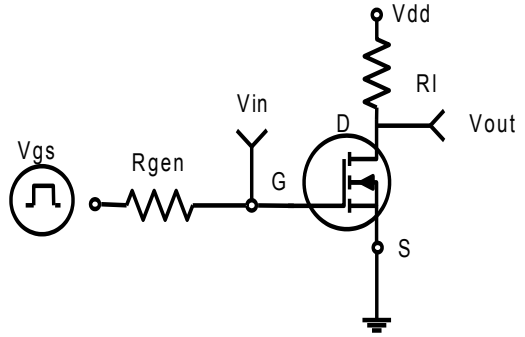


Figure 1. Switching Test Circuit

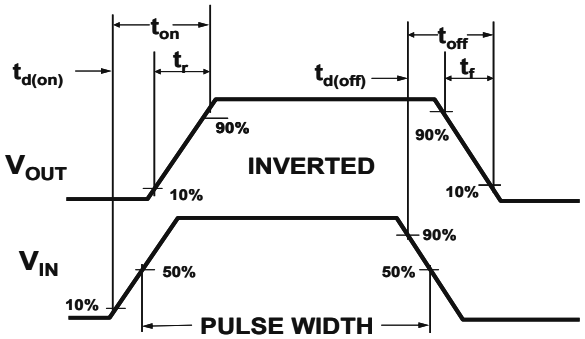


Figure 2. Switching Waveforms

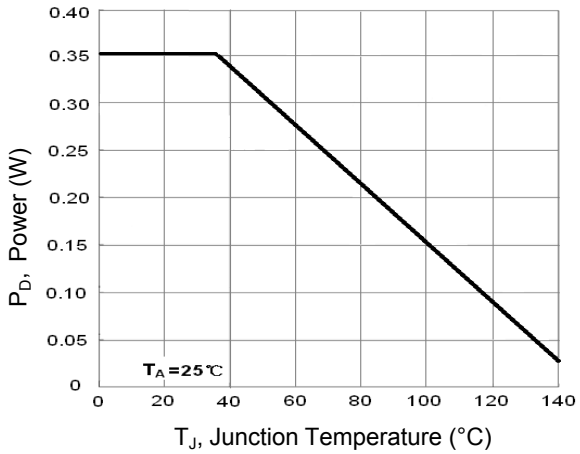


Figure 3. Power Dissipation

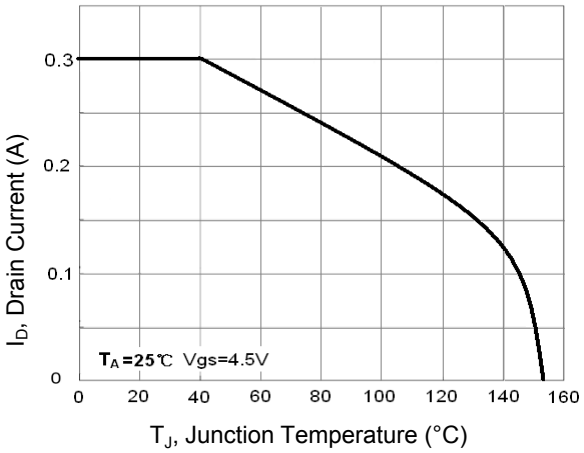


Figure 4. Drain Current

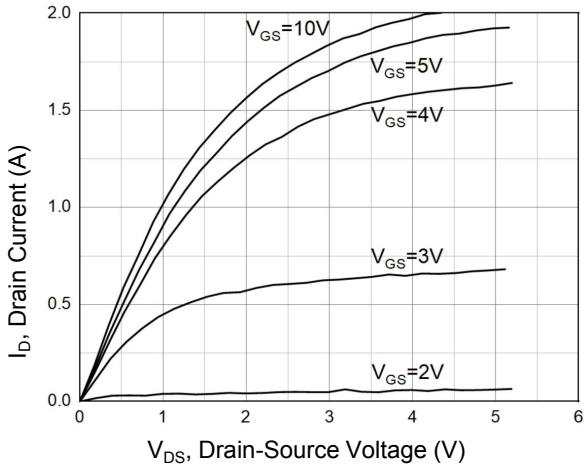


Figure 5. Output Characteristics

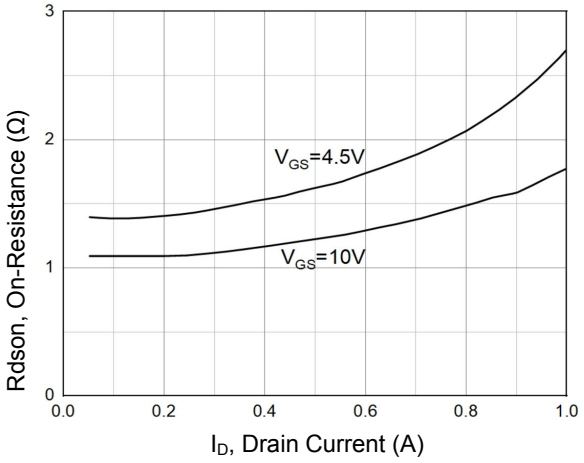


Figure 6. Drain-Source On-Resistance

Typical Electrical and Thermal Characteristics

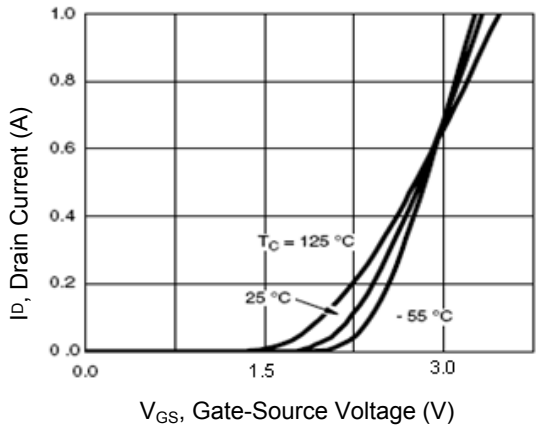


Figure 7. Transfer Characteristics

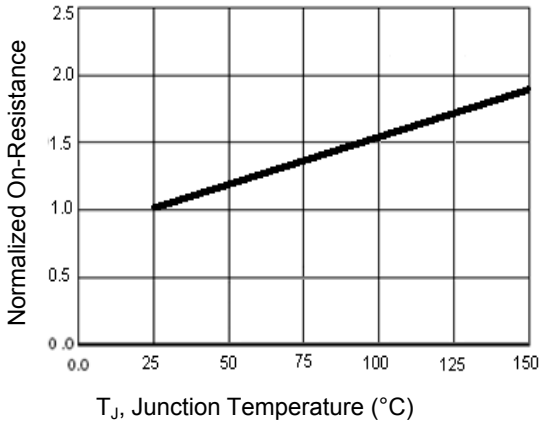


Figure 8. Drain-Source On-Resistance

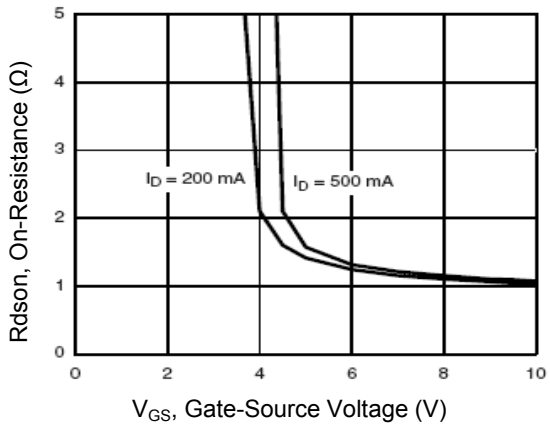


Figure 9. Rdson vs. V_{GS}

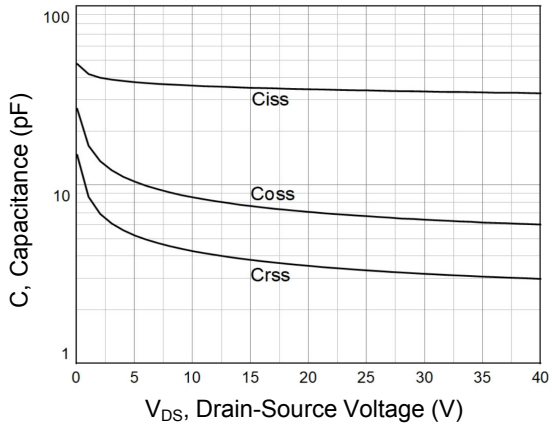


Figure 10. Capacitance vs. V_{DS}

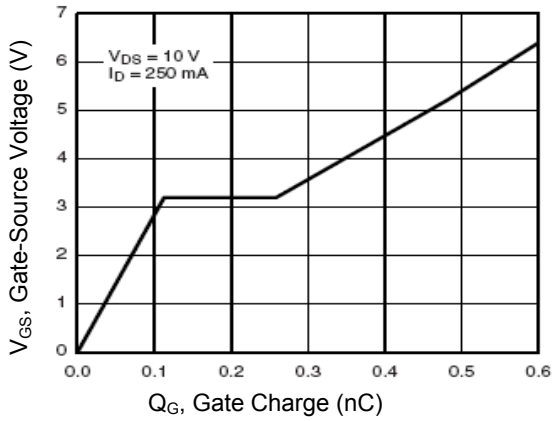


Figure 11. Gate Charge

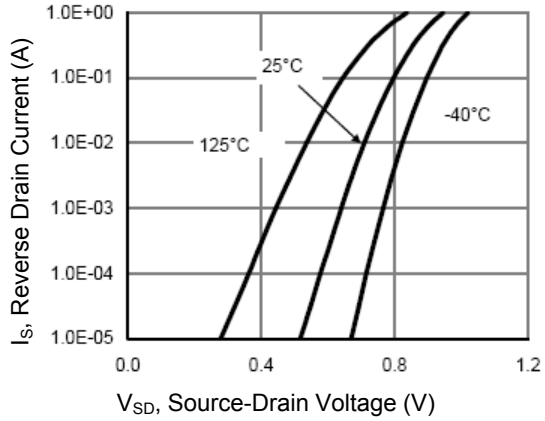


Figure 12. Source-Drain Diode Forward

Typical Electrical and Thermal Characteristics

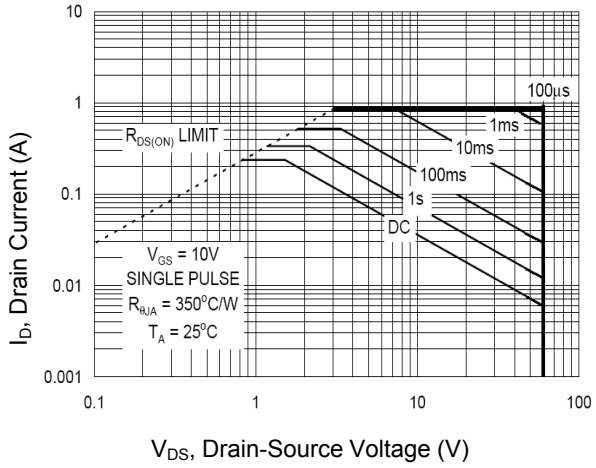


Figure 13. Safe Operation Area

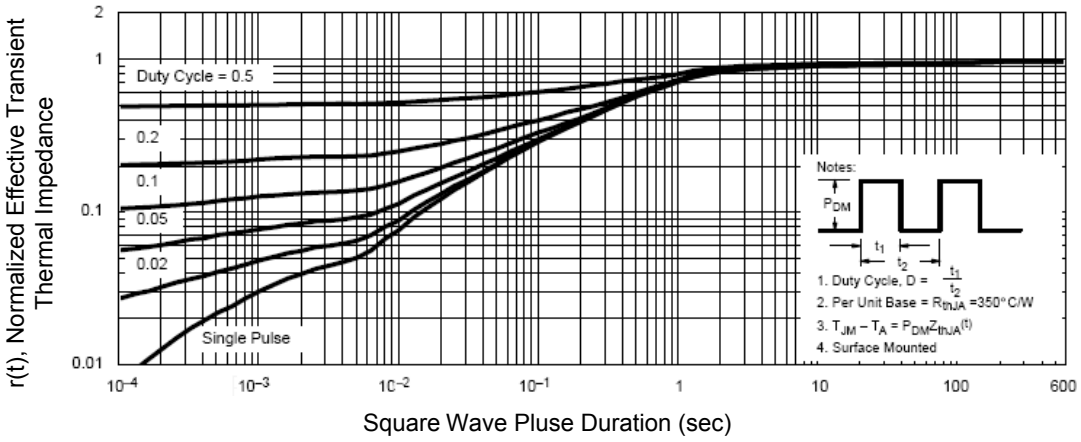
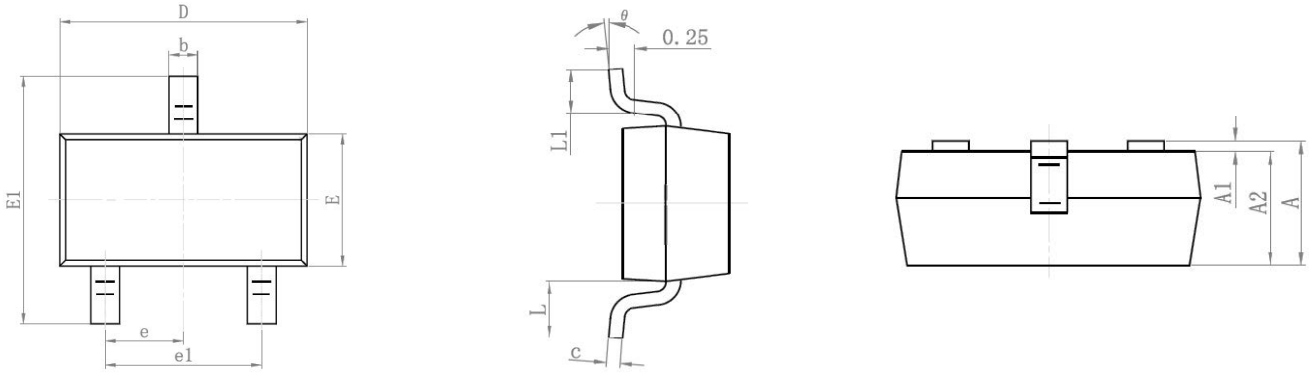


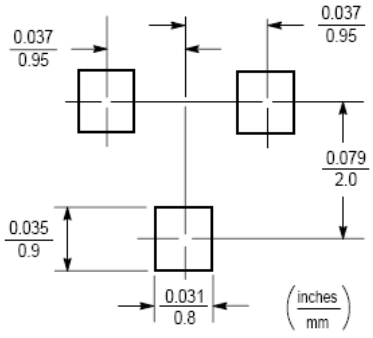
Figure 14. Normalized Maximum Transient Thermal Impedance

Package Outline Dimensions (SOT-23)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
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	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

Recommended Pad Layout



Notes:

1. Tolerance ±0.10mm (4 mil) unless otherwise specified.
2. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
3. Dimension L is measured in gauge plane.

Order Information

Device	Package	Marking	Carrier	Quantity
2N7002K	SOT-23	S72	Tape & Reel	3,000pcs / Reel