

2N7002KW

60V N-Channel Enhancement Mode MOSFET

1. Description

This 60V N-channel MOSFET is based on MDD's unique device design to achieve low $R_{DS(on)}$ and fast switching and good ESD rating performance.

2. Features

- High density cell design for low $R_{DS(ON)}$
- Voltage controlled small signal switch
- Rugged and reliable
- High saturation current capability
- ESD protected

3. Application

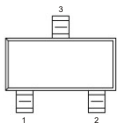
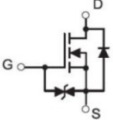
- DC/DC converter
- Battery switch
- Load Switch for Portable Devices

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	I_D	340	mA
Power Dissipation	P_D	200	mW
Thermal Resistance From Junction to Ambient	$R_{\theta JA}$	625	$^{\circ}\text{C/W}$
Storage Temperature	T_{stg}	$-50 \sim +150$	$^{\circ}\text{C}$
Junction Temperature	T_J	150	$^{\circ}\text{C}$

- Stresses exceeding Maximum Ratings may damage the device.
- Maximum Ratings are stress ratings only.
- Functional operation above the Recommended Operating Conditions is not implied.
- Extended exposure to stresses above the recommended Operating Conditions may affect device reliability

5. Pinning information

Pin	Symbol	Description	Simplified outline	Equivalent Circuit	Marking	Package
1	G	Gate			72K	SOT-323
2	S	Source				
3	D	Drain				

6. $T_A=25^{\circ}\text{C}$ unless otherwise specified

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	60	—	—	V
$V_{GS(TH)}$	Gate-Threshold Voltage	$V_{DS}=V_{GS}, I_D=1mA$	1.0	1.3	2.5	V
I_{GSS}	Gate-body Leakage	$V_{DS}=0V, V_{GS}=\pm 20V$	—	—	± 10	μA
I_{DSS}	Zero Gate Voltage Drain current	$V_{DS}=60V, V_{GS}=0V$	—	—	1	μA
$R_{DS(ON)}$	Drain-Source On-Resistance*	$V_{GS}=10V, I_D=500mA$	—	—	2.7	Ω
		$V_{GS}=4.5V, I_D=50mA$	—	—	3.0	Ω
V_{SD}	Diode Forward voltage	$V_{GS}=0V, I_S=300mA$	—	—	1.5	V
I_S	Maximum Body-Diode Continuous Current		—	—	200	mA
Q_{gs}	Gate-Source Charge	$V_{GS}=10V$ $V_{DS}=30V$ $I_D=0.3A$	—	1.22	2.4	nC
Q_{gd}	Output Capacitance		—	0.5	—	nC
Q_g	Reverse Transfer Capacitance		—	0.18	—	nC
C_{iss}	Input capacitance	$V_{GS}=0V$ $V_{DS}=30V$ $f=1MHz$	—	21	—	pF
C_{oss}	Output capacitance		—	9	—	pF
C_{rss}	Reverse transfer capacitance		—	4	—	pF
$t_{d(on)}$	Turn on Delay Time	$V_{GS}=10V$ $V_{DD}=30V$ $I_D=300mA$ $R_{GEN}=5\Omega$	—	7	—	nS
t_r	Turn on Rise Time		—	19	—	nS
$t_{d(off)}$	Turn Off Delay Time		—	20	—	nS
t_f	Turn Off Fall Time		—	84	—	nS

7. Electrical Characteristics Diagrams

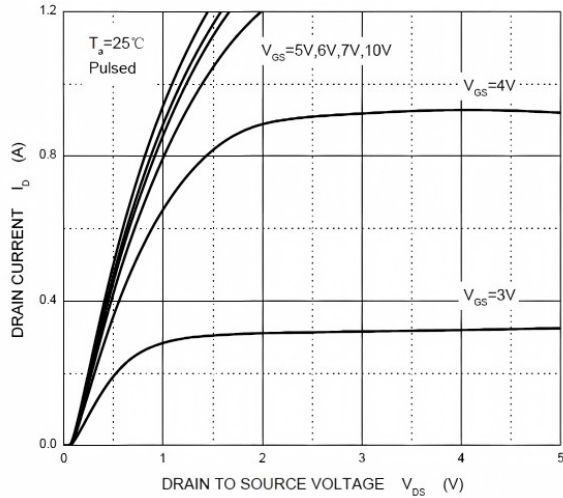


Figure 1. Output Characteristics

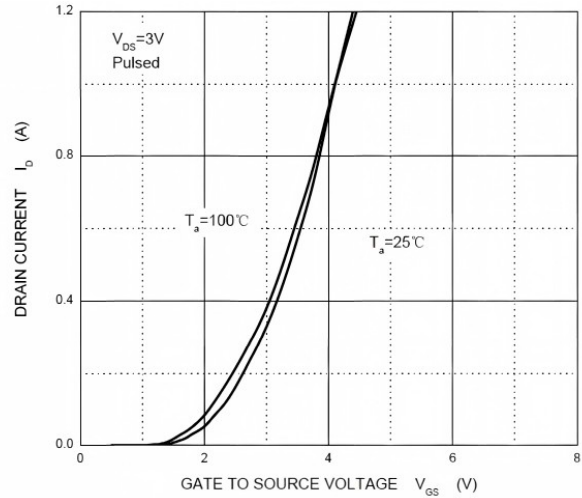


Figure 2. Transfer Characteristics

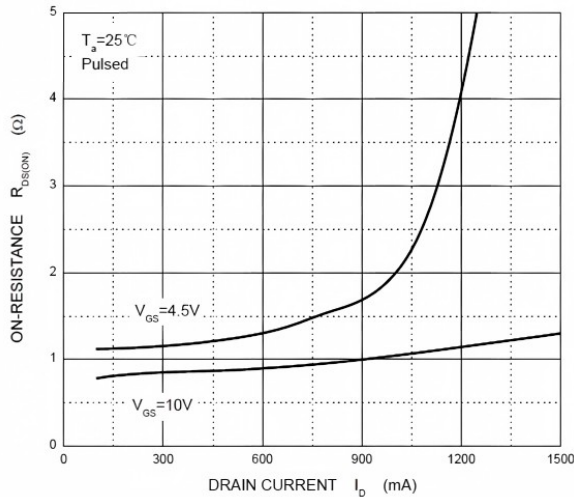


Figure 3. $R_{DS(on)}$ VS Drain Current

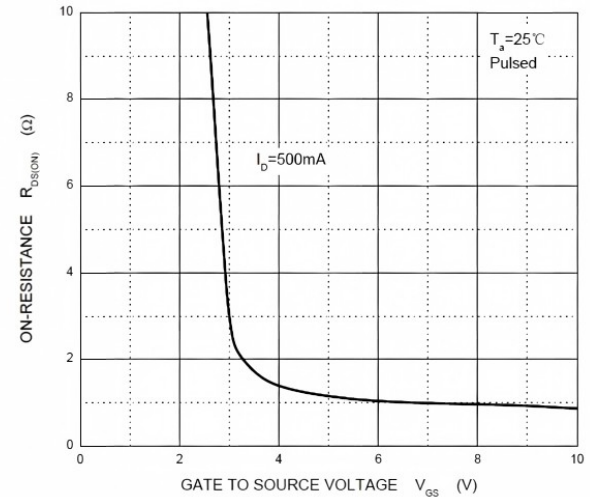


Figure 4. $R_{DS(on)}$ VS V_{GS}

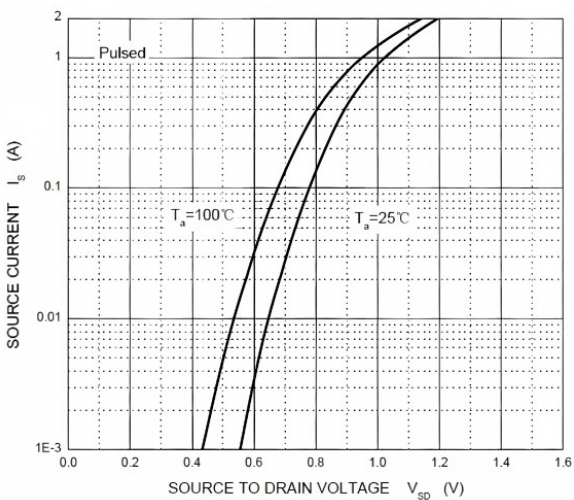


Figure 5. Source-to-Drain Diode Forward Characteristics

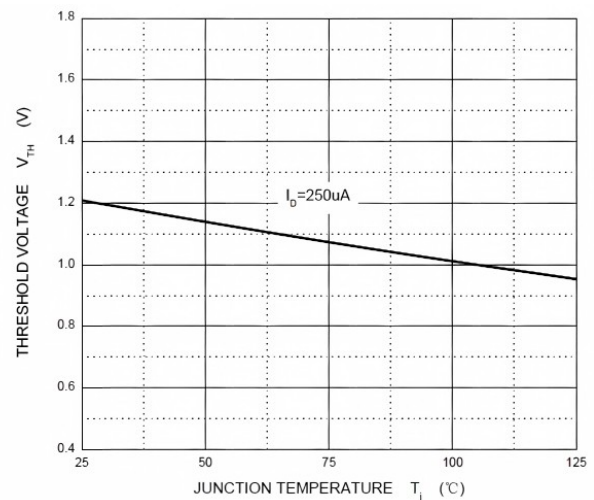
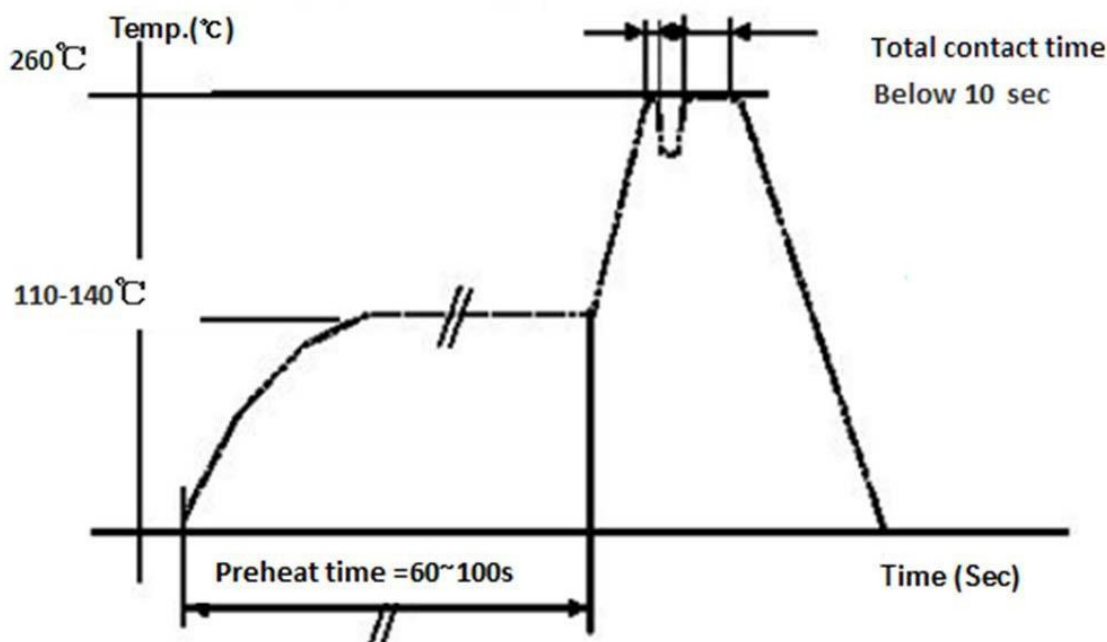


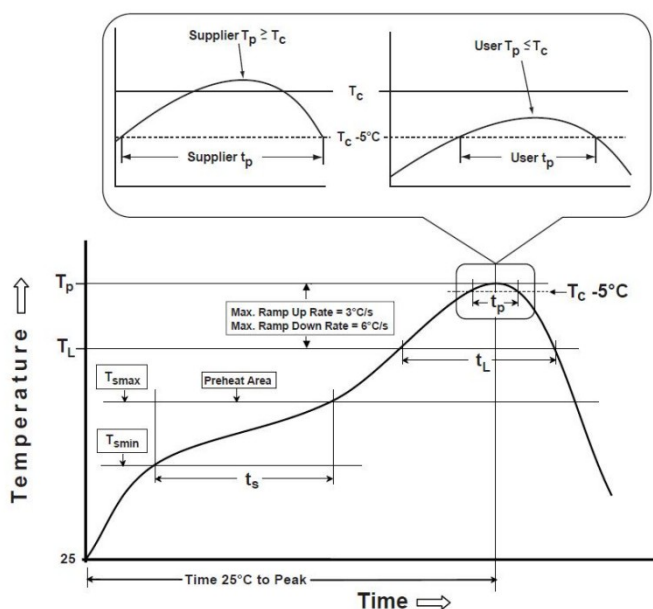
Figure 6. Threshold Voltage vs. Junction Temperature

8. Recommended Soldering Profile for Rectifier Diodes (PbFree)

a)Wave Soldering Profile



b)Reflow Soldering Profile(PbFreeApplication),refer to IPC/JEDEC J-STD-020

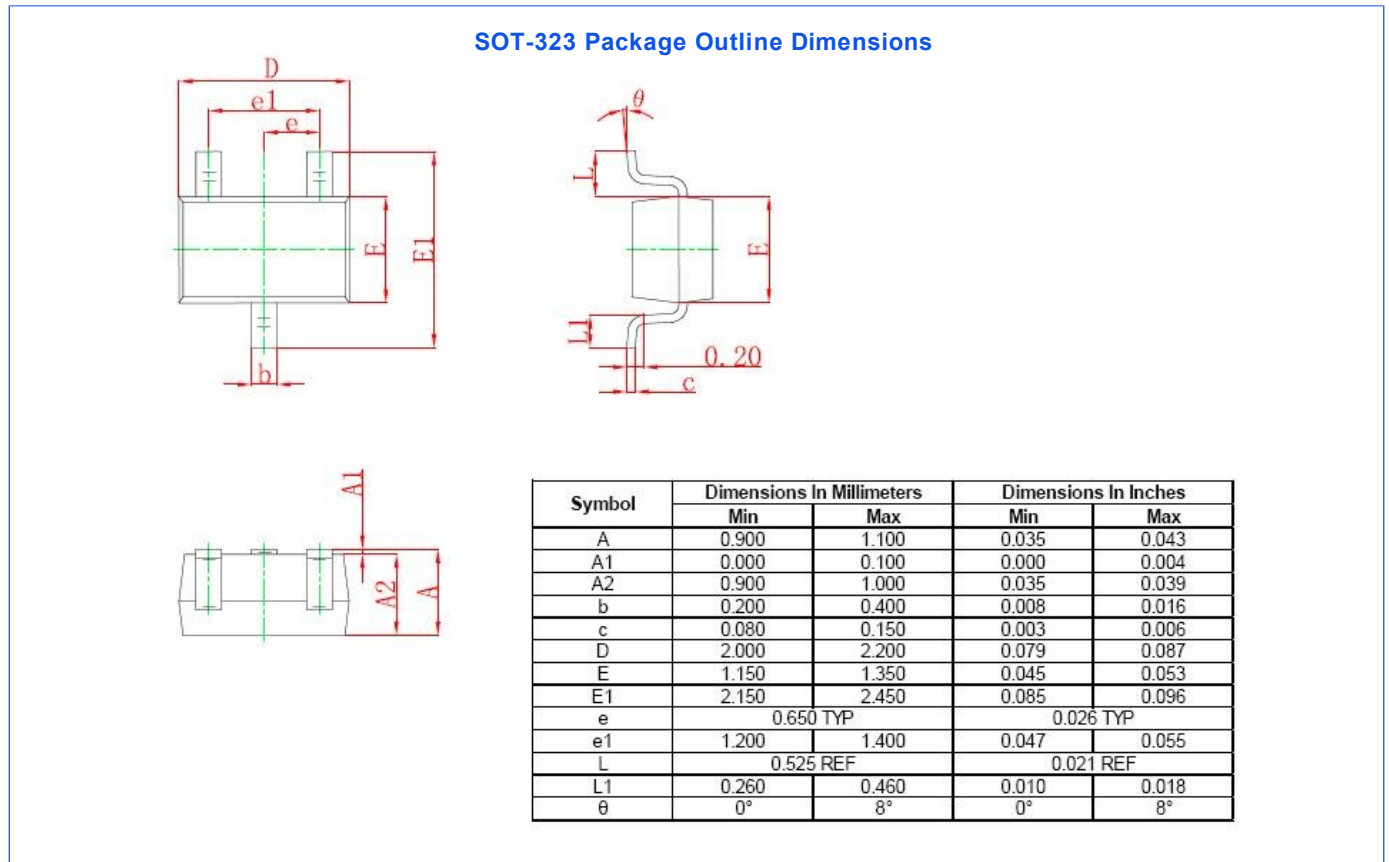


Preheat/Soak Temperature Min (T _{min}) Temperature Max (T _{max}) Time (ts) from (T _{min} to T _{max})	50 °C 200 °C 60-120 seconds
Melting Point of Solder (Sn Ag Cu)	217°C
Ramp-up Rate to 217°C (Melting Point of Solder)	3°C/sec
Time at Temp.>217°C (Melting Point of Solder)	60–150 Sec
Peak Temperature	255±5°C
Time within 5°C below Peak Temp.	20–40 Sec
Cooling Rate	6°C/sec (max)
Time from 25°C to Peak Temp.	8min (max)

c)Manual Soldering

When using an electric soldering iron for manual soldering, it is recommended that the temperature does not exceed 300°C and the soldering time is less than 10 seconds.

9. Outline Drawing



10. Important Notice and Disclaimer

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