2N7002KW

60V/0.3A N Channel Advanced Power MOSFET

$V_{(BR)DSS}$	$R_{DS(ON)}$ Typ	I_D Max
60V	1.9Ω @ 10V	0.3A
	2.1Ω @ 4.5V	

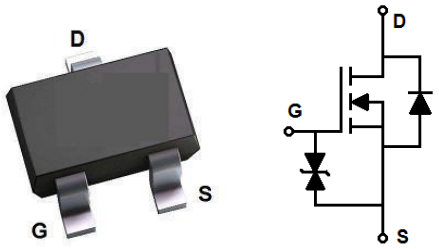
Features

- *Low $R_{DS(on)}$ @V_{GS}=10V*
- *5V Logic Level Control*
- *N Channel SOT323 Package*
- *ESD Protection*
- *Pb−Free, RoHS Compliant*

Applications

- Logic level translators
- High-speed line drivers
- Low-side load switch
- Switching circuits
- Relay driv

SOT323



Absolute Maximum Ratings

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.

Symbol	Parameter		Rating	Unit
Common Ratings (T_A=25°C Unless Otherwise Noted)				
V_{GS}	Gate-Source Voltage		±20	V
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage		60	V
T_J	Maximum Junction Temperature		150	℃
T_{STG}	Storage Temperature Range		-50 to 150	℃
Mounted on Large Heat Sink				
I_{DM}	Pulse Drain Current Tested①	T_A=25°C	1.2	A
I_D	Continuous Drain Current(V_{GS}=4.5V)	T_A=25°C	0.3	A
		T_A=70°C	0.24	
P_D	Maximum Power Dissipation	T_A=25°C	0.3	W
		T_A=70°C	0.2	
$R_{\theta JA}$	Thermal Resistance Junction-Ambient		400	℃ /W

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60V/0.3A N Channel Advanced Power MOSFET

Symbol	Parameter	Condition	Min	Typ	Max	Unit
Static Electrical Characteristics @ T_J = 25°C (unless otherwise stated)						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V I_D=250μA	60	–	–	V
I_{DSS}	Zero Gate Voltage Drain Current(T_A=25℃)	V_{DS}=60V, V_{GS}=0V	–	–	1	μA
	Zero Gate Voltage Drain Current(T_A=125℃)	V_{DS}=48V, V_{GS}=0V	–	–	100	uA
I_{GSS}	Gate-Body Leakage Current	V_{GS}=±20V, V_{DS}=0V	–	–	±10	uA
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250μA	1.0	1.9	2.5	V
$R_{DS(ON)}$	Drain-Source On-State Resistance②	V_{GS}=10V, I_D=0.3A	–	1.9	3	Ω
$R_{DS(ON)}$	Drain-Source On-State Resistance②	V_{GS}=4.5V, I_D=0.3A	–	2.1	4	Ω
Dynamic Electrical Characteristics @ T_J = 25°C (unless otherwise stated)						
C_{iss}	Input Capacitance	V_{DS}=30V,V_{GS}=0V, f=1MHz	–	16	–	pF
C_{oss}	Output Capacitance		–	3.8	–	pF
C_{rss}	Reverse Transfer Capacitance		–	0.6	–	pF
Q_g	Total Gate Charge	V_{DS}=30V I_D=0.5A, V_{GS}=10V	–	0.72	–	nC
Q_{gs}	Gate Source Charge		–	0.15	–	nC
Q_{gd}	Gate Drain Charge		–	0.22	–	nC
Switching Characteristics						
$t_{d(on)}$	Turn on Delay Time	V_{DD}=30V, I_D=0.3A, R_G=3.3Ω, V_{GS}=10V	–	5	–	ns
t_r	Turn on Rise Time		–	3.3	–	ns
$t_{d(off)}$	Turn Off Delay Time		-	18	–	ns
t_f	Turn Off Fall Time		–	5.2	–	ns
Source Drain Diode Characteristics						
I_{SD}	Source drain current(Body Diode)	T_A=25℃	–	–	0.5	A
V_{SD}	Forward on voltage②	T_j=25℃,I_{SD}=0.5A, V_{GS}=0V	–	0.73	1.2	V

Notes:

① Pulse width limited by maximum allowable junction temperature

②Pulse test ; Pulse width≤300μs, duty cycle≤2%.

Typical Characteristics

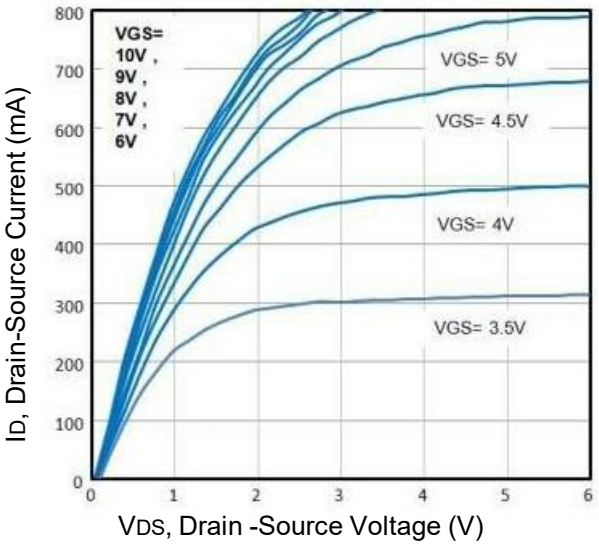

Fig1. Typical Output Characteristics

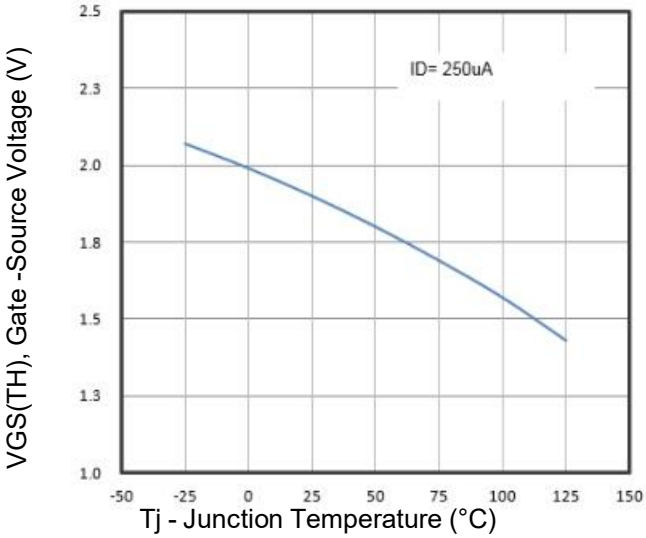

Fig2. Normalized Threshold Voltage Vs. Temperature

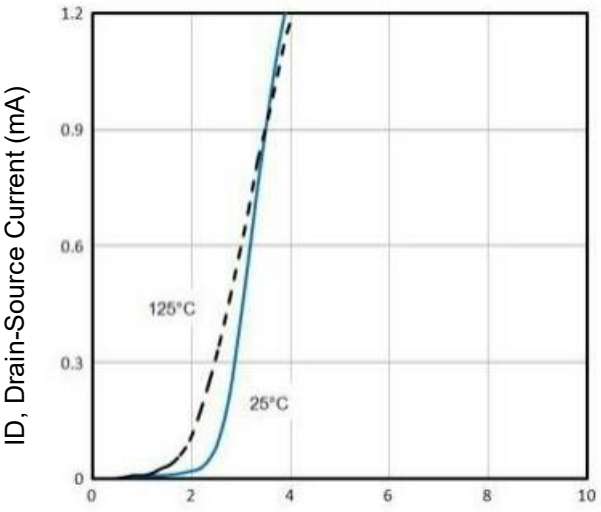

Fig3. Typical Transfer Characteristics

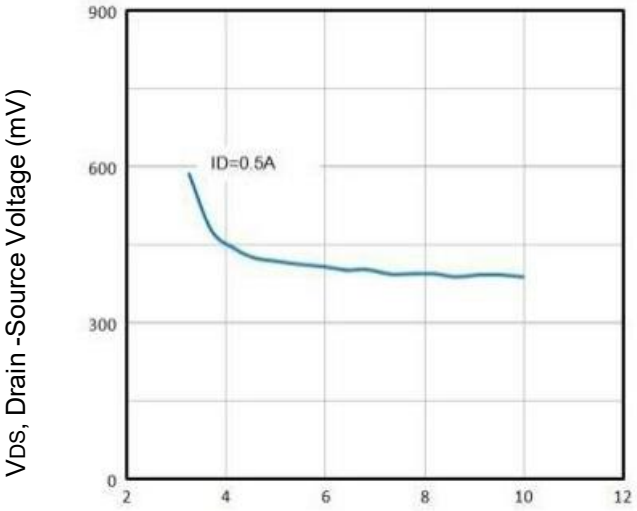

Fig4. Drain -Source Voltage vs Gate -Source Voltage

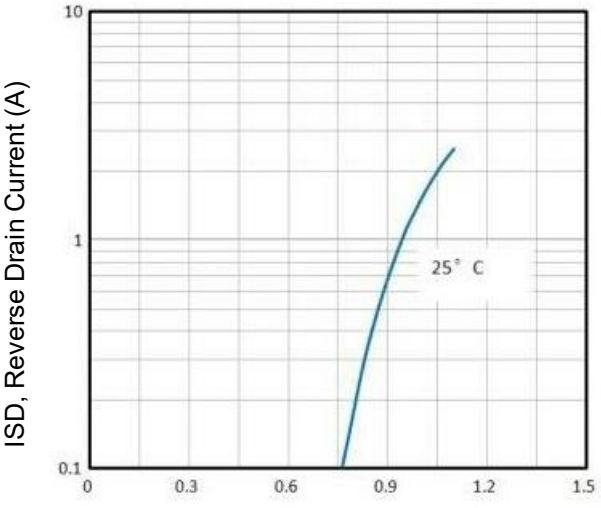

Fig5. Typical Source-Drain Diode Forward Voltage

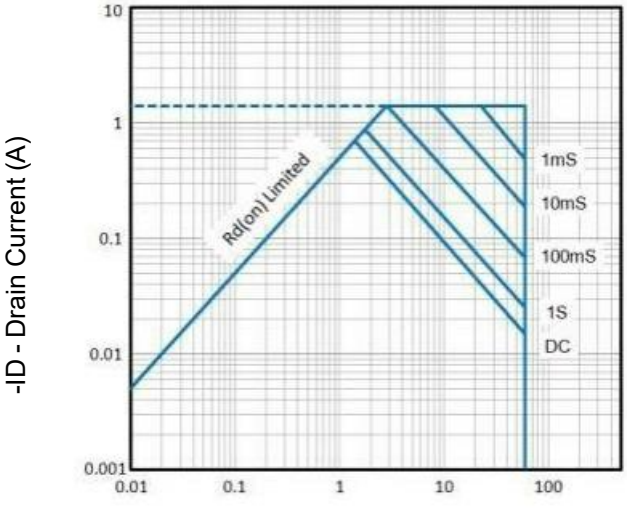

Fig6. Maximum Safe Operating Area

Typical Characteristics

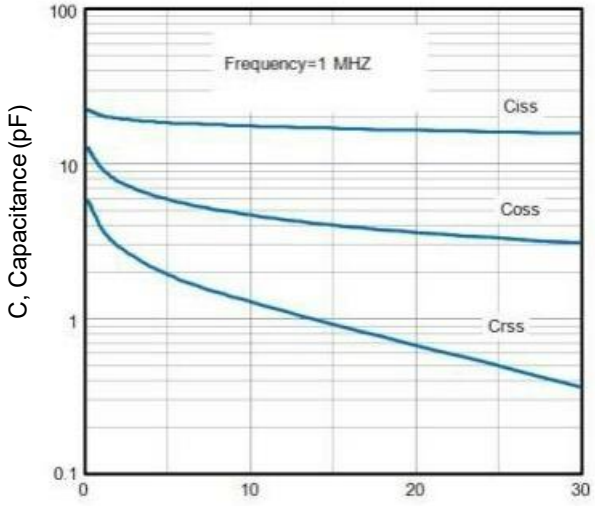

Fig7. Typical Capacitance Vs. Drain-Source Voltage

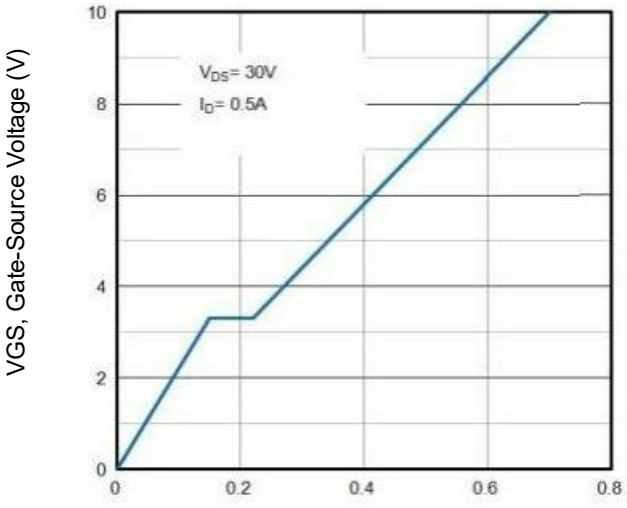

Fig8. Typical Gate Charge Vs. Gate-Source Voltage

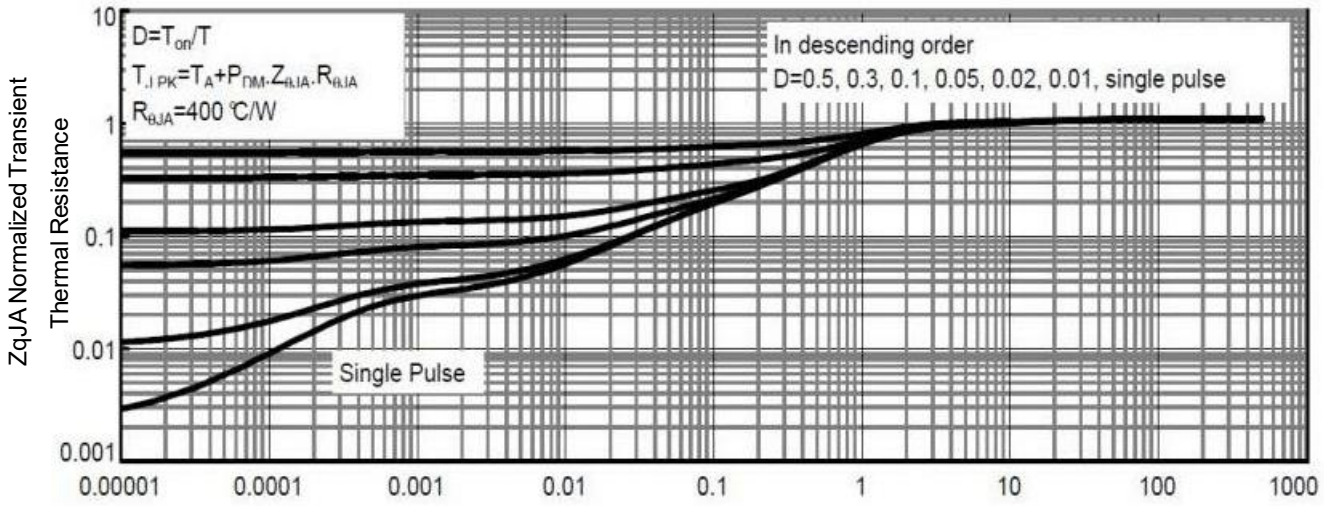

Fig9. Normalized Maximum Transient Thermal Impedance

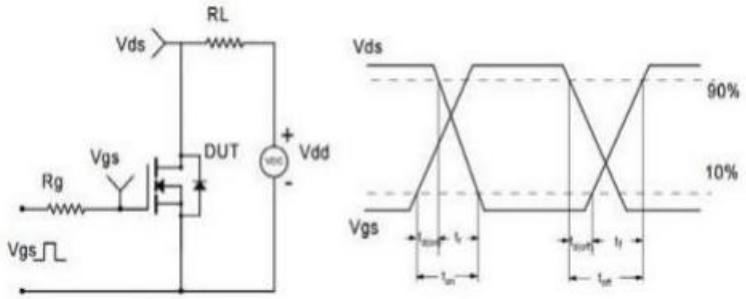

Fig10. Switching Time Test Circuit and waveforms

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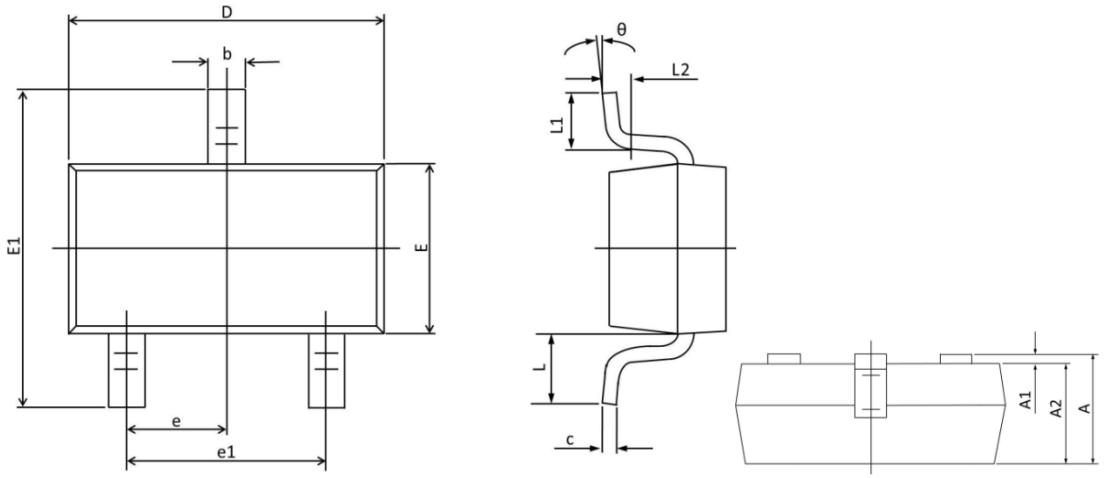
60V/0.3A N Channel Advanced Power MOSFET

SOT-323 Mechanical Data



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MAX	MIN	MAX	MIN
A	1.100	0.800	0.043	0.031
A1	0.100	0.000	0.004	0.000
A2	1.000	0.800	0.039	0.031
b	0.400	0.200	0.016	0.008
c	0.250	0.080	0.010	0.003
D	2.200	1.800	0.087	0.071
E	1.350	1.150	0.053	0.045
E1	2.450	1.800	0.096	0.071
e	0.65BSC		0.026BSC	
e1	1.400	1.200	0.055	0.047
L	0.525REF.		0.021REF.	
L1	0.460	0.150	0.018	0.006
L2	0.200	0.000	0.008	0.000
θ	8°	0°	8°	0°

Ordering Information

Part No.	Marking	Package	Shipping Quantity
2N7002KW	7002	SOT-323	3000PCS/Reel

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