

N-Channel 60V(D-S) MOSFET

Product summary		
V_{DS}	60	V
$R_{DS(ON)}$ (at $V_{GS}=10V$) Typ.	1.6	Ω
$R_{DS(ON)}$ (at $V_{GS}=4.5V$) Typ.	1.7	Ω
I_D ($T_A=25^\circ C$)	0.31	A

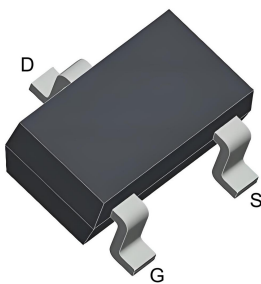
Features

- Low input Capacitance
- Trench Power MV MOSFET technology
- ESD Protection

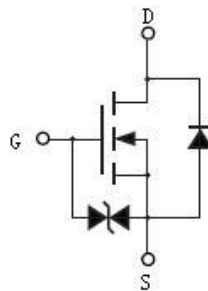
Applications

- Small signal application
- Load switch

Pin Configuration



SOT-23



Packing Information

Device	Package	Reel Size	Quantity(Min. Package)
2N7002K	SOT-23	7"	3000pcs

Absolute Maximum Ratings (at $T_A=25^\circ C$ Unless Otherwise Noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	60	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Continuous Drain Current ^A	$T_A=25^\circ C$	0.31
		$T_A=70^\circ C$	0.25
I_{DM}	Pulse Drain Current Tested ^B	0.77	A
P_D	Power Dissipation ^A	$T_A=25^\circ C$	0.36
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to +150	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Typical	Units
$R_{\theta JA}$	Thermal Resistance-Junction to ambient ^A	347	$^\circ C/W$

Electrical Characteristics (at $T_J = 25^\circ\text{C}$ Unless Otherwise Noted)

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
Static Parameters						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	60	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=48V, V_{GS}=0V$	--	--	1	μA
I_{GSS}	Gate-Body Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$	--	--	± 10	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.6	2.0	V
$R_{DS(on)}$	Drain-Source On-State Resistance ^B	$V_{GS}=10V, I_D=0.3A$	--	1.6	1.9	Ω
		$V_{GS}=4.5V, I_D=0.2A$	--	1.7	2.2	Ω
V_{SD}	Diode Forward Voltage	$I_{SD}=0.3A, V_{GS}=0V$	--	--	1.2	V
Dynamic Parameters ^C						
C_{iss}	Input Capacitance	$V_{GS}=0V, V_{DS}=30V$ $f=1\text{MHz}$	--	26.2	--	pF
C_{oss}	Output Capacitance		--	2.7	--	pF
C_{rss}	Reverse Transfer Capacitance		--	1.7	--	pF
Q_g	Total Gate Charge	$V_{DS}=30V, I_D=0.3A$ $V_{GS}=4.5V$	--	0.9	--	nC
Q_g	Total Gate Charge	$V_{DS}=30V, I_D=0.3A$ $V_{GS}=10V$	--	1.7	--	nC
Q_{gs}	Gate-Source Charge		--	0.4	--	nC
Q_{gd}	Gate-Drain Charge		--	0.3	--	nC
$t_{D(on)}$	Turn-on Delay Time	$V_{DD}=30V$ $I_D=0.3A, R_{GEN}=10\Omega$ $V_{GS}=10V$	--	1.0	--	ns
t_r	Turn-on Rise Time		--	19.4	--	ns
$t_{D(off)}$	Turn-off Delay Time		--	23.2	--	ns
t_f	Turn-off Fall Time		--	21	--	ns

A. The data tested by surface mounted on a 1 inch x 1 inch FR-4 board with 2OZ copper.

B. Pulse Test: Pulse Width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

C. Guaranteed by design, not subject to production testing.

Typical Characteristics

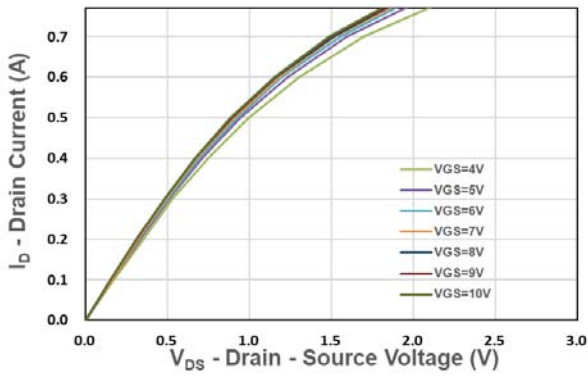


Figure 1. Output Characteristics

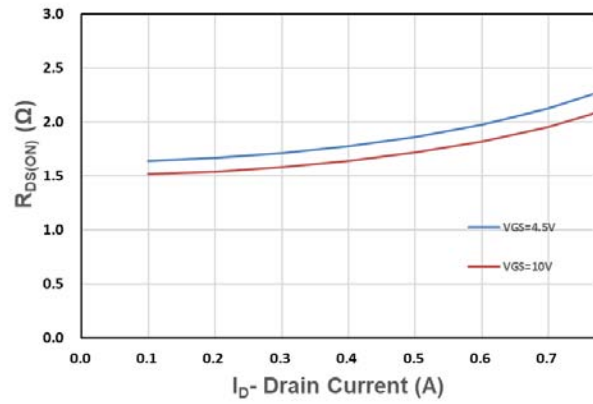


Figure 2. On-Resistance vs. I_D

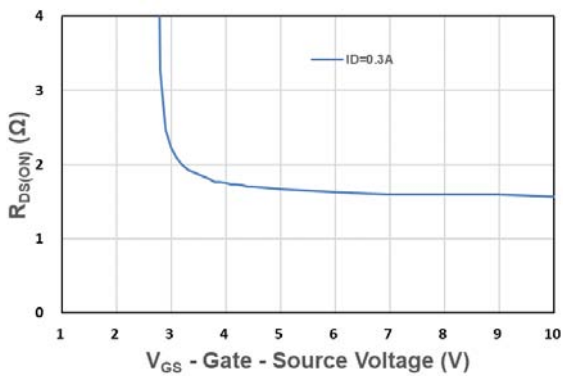


Figure 3. On-Resistance vs. V_{GS}

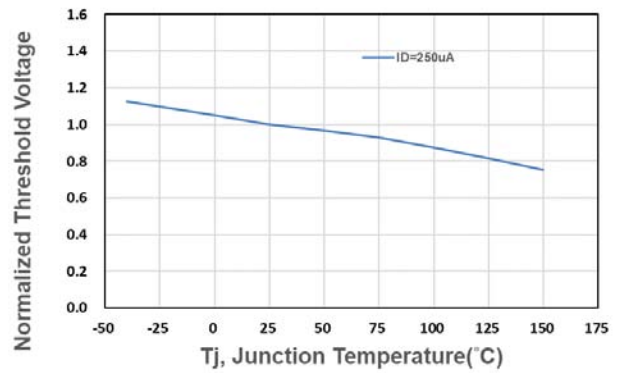


Figure 4. Gate Threshold Voltage

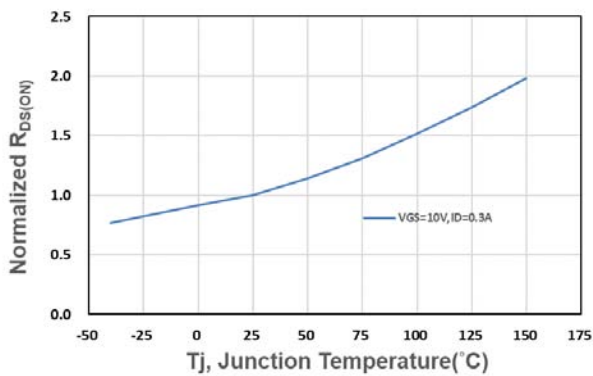


Figure 5. Drain-Source On Resistance

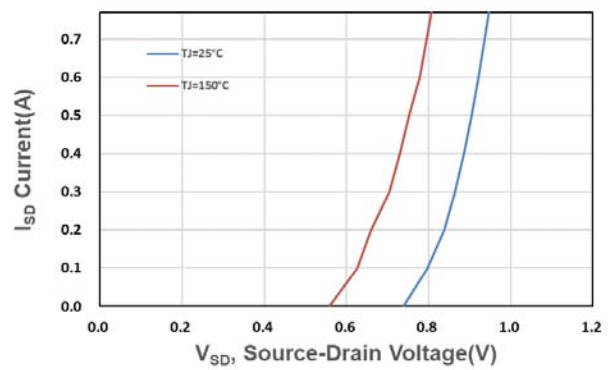


Figure 6. Source-Drain Diode Forward

Typical Characteristics

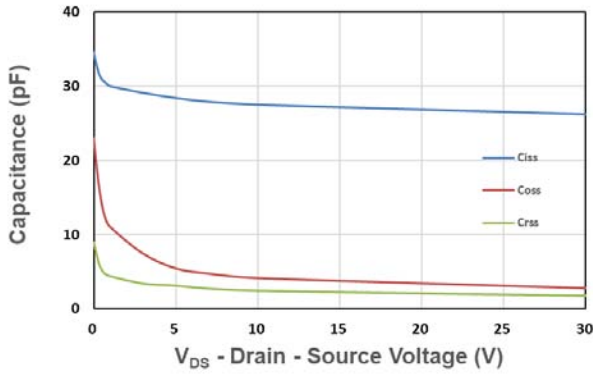


Figure 7. Capacitance

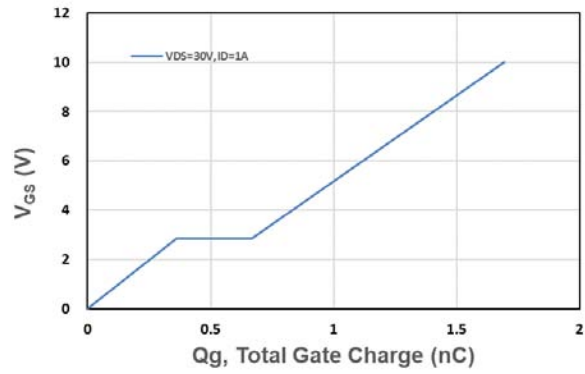


Figure 8. Gate Charge Characteristics

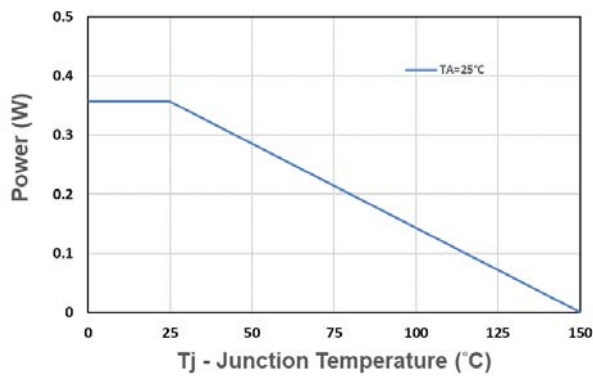


Figure 9. Power Dissipation

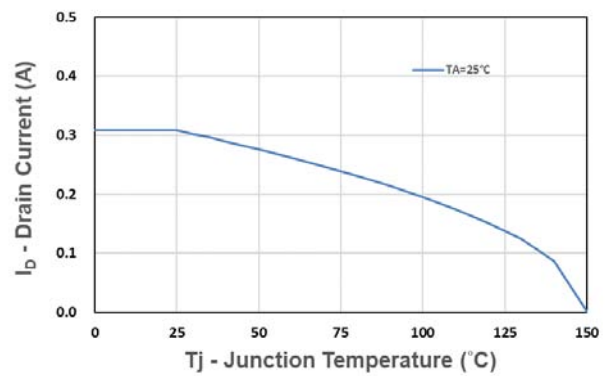


Figure 10. Drain Current

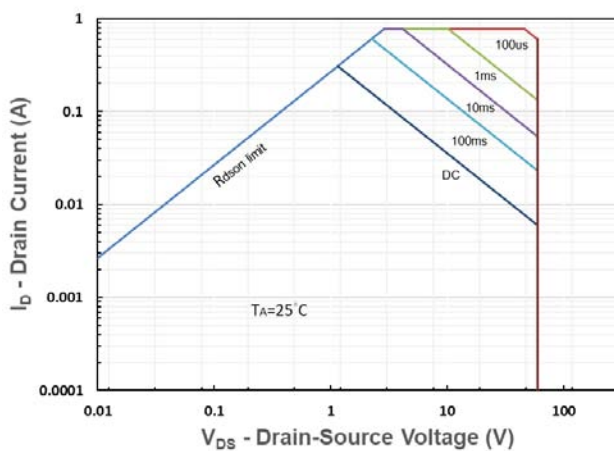


Figure 11. Safe Operating Area

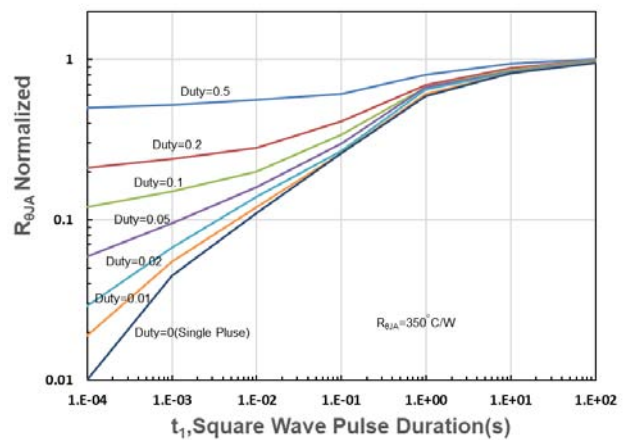
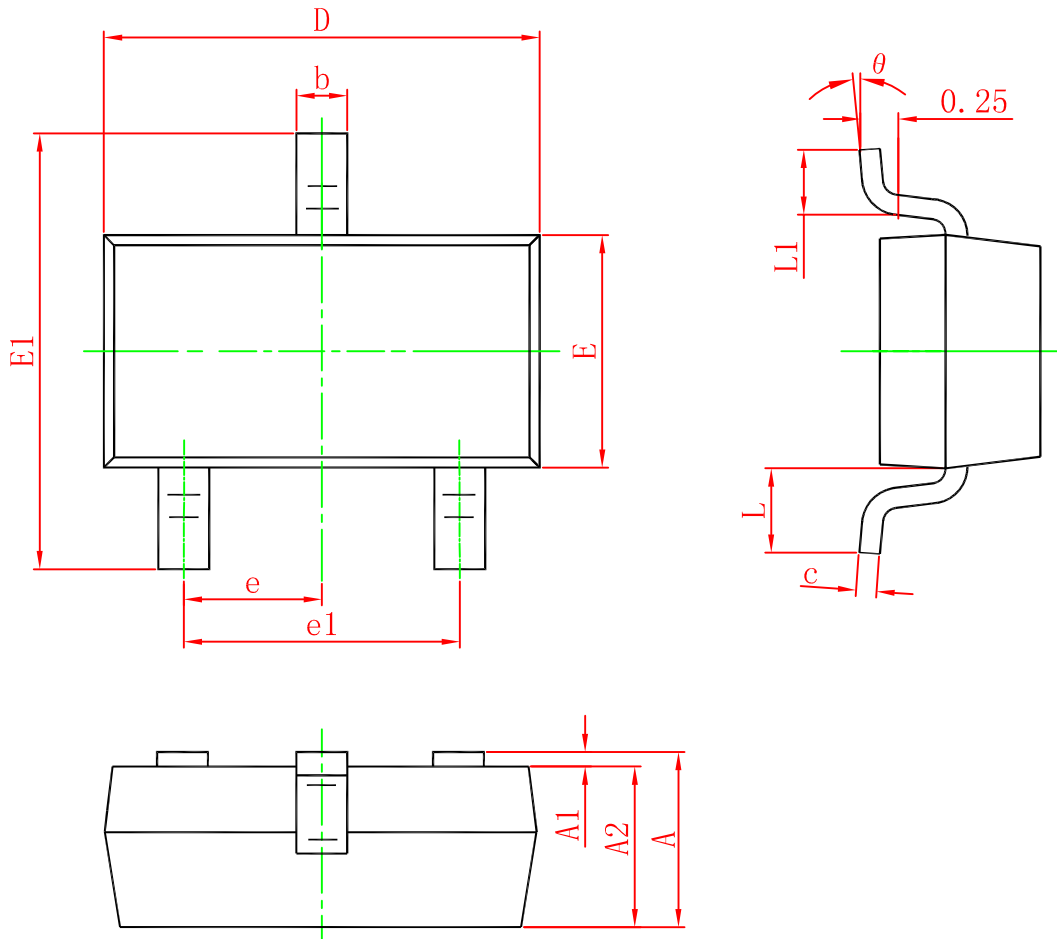


Figure 12. $R_{\theta JA}$ Transient Thermal Impedance

SOT-23 Package Information



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°