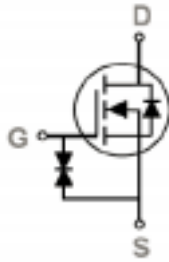
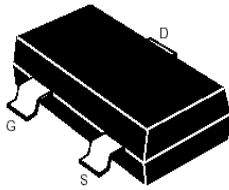


SOT-23

Features

Split gate trench MOSFET technology
 Excellent package for heat dissipation
 High density cell design for low $R_{DS(ON)}$
 5V Logic Level Control
 HMB ESD Protection 2 KV

Mechanical Data

SOT-23 Small Outline Plastic Package
 Epoxy UL: 94V-0

Applications

Battery Protection and Load Switch
 Voltage Regulator Modules
 Point-of-Load(POL) Modules
 Brushed and Brushless Motor Control

$V_{(BR)DSS}$	$R_{DS(ON)}$ Typ	I_D Max
60V	2m Ω @ 10V	380mA

Summary of Packing Options

Product	Package	Packing Quantity	Making
2N7002K	SOT-23	3000 / Reel	72K

Maximum Ratings & Thermal Characteristics

(Ratings at 25°C ambient temperature unless otherwise specified.)

Symbol	Parameter	Rating	Unit
Common Ratings ($T_A=25^\circ\text{C}$ 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	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-50 to 150	$^\circ\text{C}$
Mounted on Large Heat Sink			
I_{DM}	Pulse Drain Current Tested①	$T_A=25^\circ\text{C}$	1.2 A
I_D	Continuous Drain Current($V_{GS}=4.5\text{V}$)	$T_A=25^\circ\text{C}$	380 mA
		$T_A=70^\circ\text{C}$	240
P_D	Maximum Power Dissipation	$T_A=25^\circ\text{C}$	0.35 W
		$T_A=70^\circ\text{C}$	0.2
$R_{\theta JA}$	Thermal Resistance Junction-Ambient	400	$^\circ\text{C/W}$

Electrical Characteristics & Source-Drain Diode Characteristics

(Ratings at 25°C ambient temperature unless otherwise specified).

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°C)	V _{DS} =60V, V _{GS} =0V	--	--	1	μA
	Zero Gate Voltage Drain Current(T _A =125°C)	V _{DS} =48V, V _{GS} =0V	--	--	100	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±20V, V _{DS} =0V	--	--	±10	μA
V _{GS(TH)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1.0	1.3	2.5	V
R _{DS(ON)}	Drain-Source On-State Resistance ^②	V _{GS} =10V, I _D =0.5A	--	1.9	2.85	Ω
R _{DS(ON)}	Drain-Source On-State Resistance ^②	V _{GS} =4.5V, I _D =0.2A	--	2.5	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°C	--	--	0.5	A
V _{SD}	Forward on voltage ^②	T _j =25°C, I _{SD} =0.5A, V _{GS} =0V	--	0.73	1.2	V

Notes:

- ① Pulse width limited by maximum allowable junction temperature
- ② Pulse test ; Pulse width≤300μs, duty cycle≤2%.



Typical Characteristics

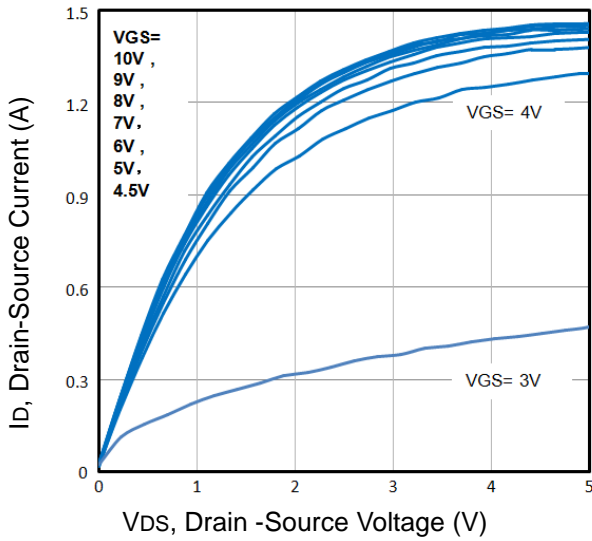


Fig1. Typical Output Characteristics

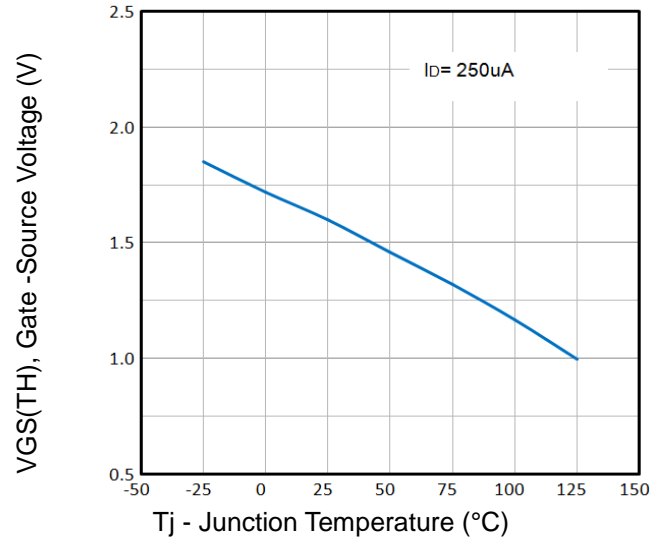


Fig2. Normalized Threshold Voltage Vs. Temperature

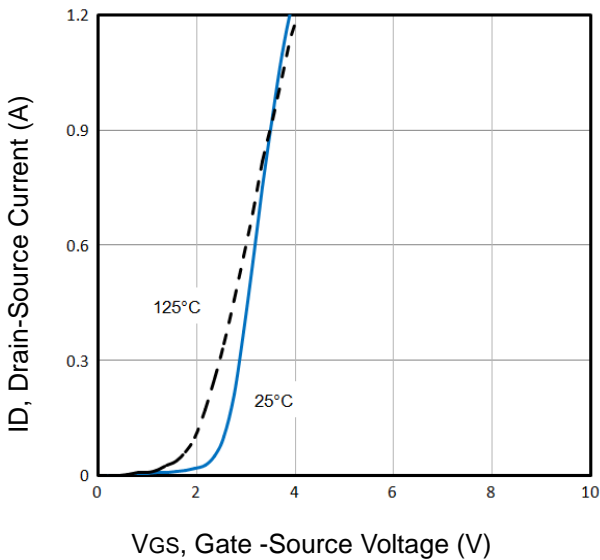


Fig3. Typical Transfer Characteristics

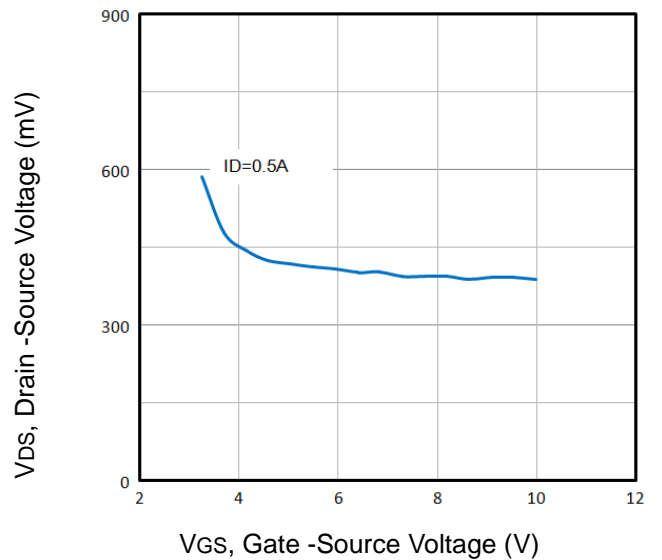


Fig4. Drain-Source Voltage vs Gate-Source Voltage

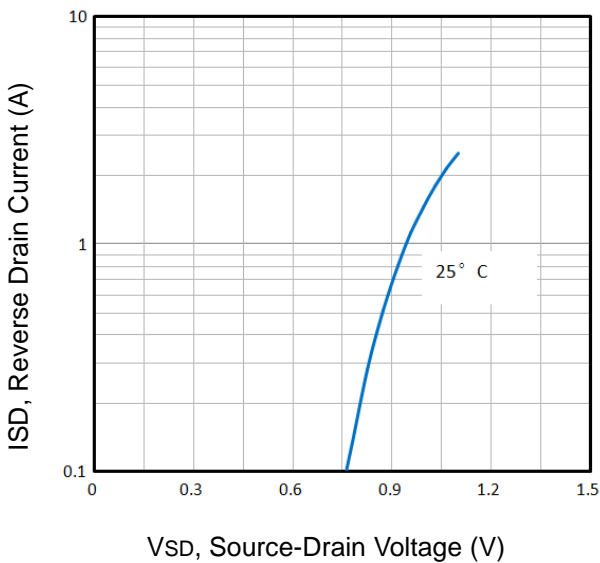


Fig5. Typical Source-Drain Diode Forward Voltage

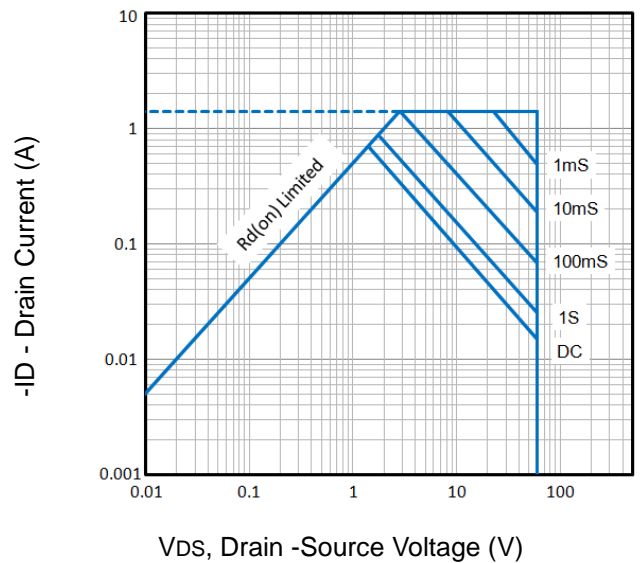


Fig6. Maximum Safe Operating Area

Typical Characteristics

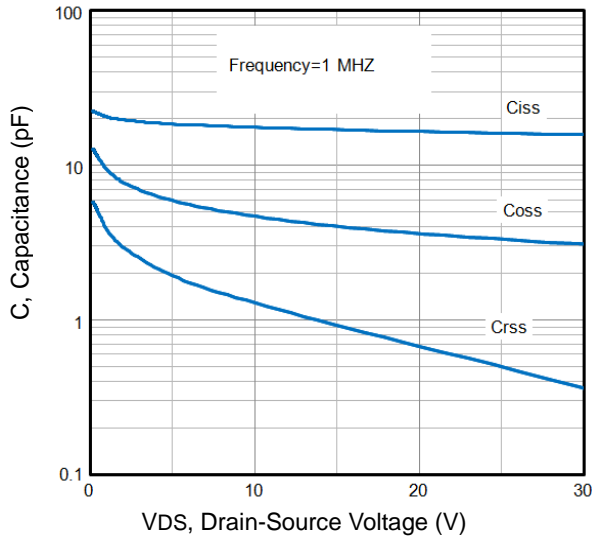


Fig7. Typical Capacitance Vs. Drain-Source Voltage

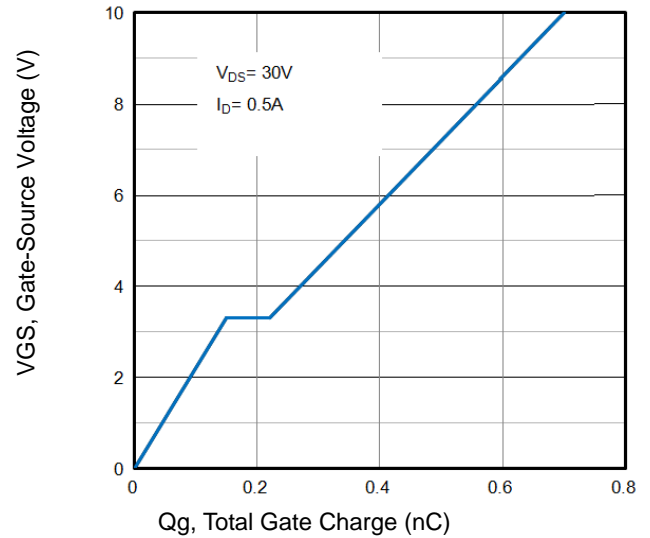
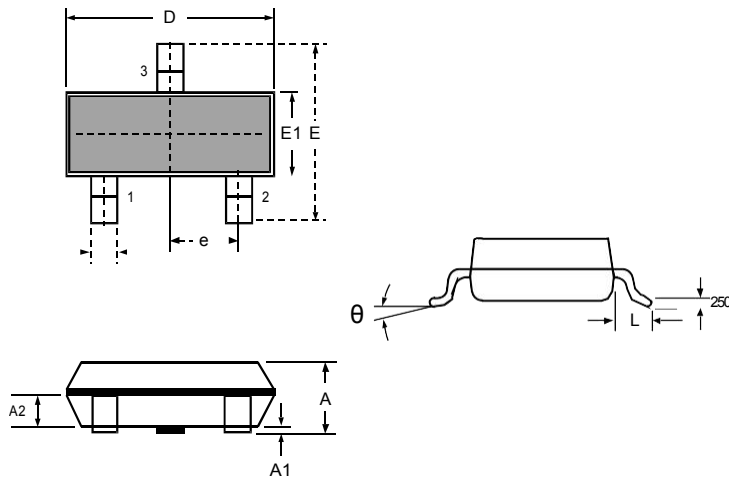


Fig8. Typical Gate Charge Vs. Gate-Source Voltage

Package Outline Dimensions: SOT-23



DIMENSIONS

SYMBOL	MILLIMETER		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
D	2.800	3.000	0.110	0.118
b	0.300	0.500	0.012	0.020
E	2.250	2.550	0.089	0.100
E1	1.200	1.400	0.047	0.055
e	0.950 BSC		0.037 BSC	
L	0.300	0.500	0.012	0.020
θ	0	8°	0	8°

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