

20V N-Channel Enhancement Mode MOSFET

Description

The AP2N02AK uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

General Features

$V_{DS} = 20V$ $I_D = 2.2A$

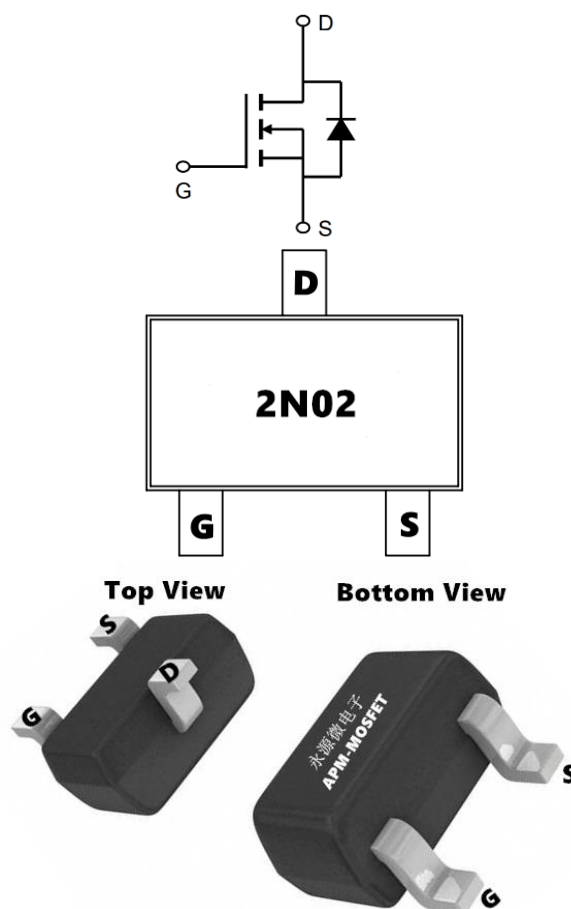
$R_{DS(ON)} < 55m\Omega$ @ $V_{GS}=4.5V$ (Type: 42m Ω)

Application

Battery protection

Load switch

Uninterruptible power supply



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP2N02AK	SOT523-3L	2N02AK	3000

Absolute Maximum Ratings ($T_C=25^{\circ}C$ unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	20	V
V_{GS}	Gate-Source Voltage	± 12	V
$I_D@T_A=25^{\circ}C$	Continuous Drain Current, V_{GS} @ 4.5V ¹	2.2	A
$I_D@T_A=70^{\circ}C$	Continuous Drain Current, V_{GS} @ 4.5V ¹	1.1	A
I_{DM}	Pulsed Drain Current ²	6.6	A
$P_D@T_A=25^{\circ}C$	Total Power Dissipation ³	1	W
T_{STG}	Storage Temperature Range	-55 to 150	$^{\circ}C$
T_J	Operating Junction Temperature Range	-55 to 150	$^{\circ}C$
$R_{\theta JA}$	Thermal Resistance Junction-ambient ¹	125	$^{\circ}C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	80	$^{\circ}C/W$

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Electrical Characteristics ($T_J=25^{\circ}\text{C}$, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BVDSS	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	20	22	---	V
RDS(ON)	Static Drain-Source On-Resistance ²	$V_{GS}=4.5V, I_D=3A$	---	42	55	m Ω
		$V_{GS}=2.5V, I_D=2A$	---	55	65	
VGS(th)	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	0.4	0.6	1.2	V
IDSS	Drain-Source Leakage Current	$V_{DS}=16V, V_{GS}=0V, T_J=25^{\circ}\text{C}$	---	---	1	uA
		$V_{DS}=16V, V_{GS}=0V, T_J=55^{\circ}\text{C}$	---	---	5	
IGSS	Gate-Source Leakage Current	$V_{GS}=\pm 12V, V_{DS}=0V$	---	---	± 100	nA
gfs	Forward Transconductance	$V_{DS}=5V, I_D=3A$	---	10.5	---	S
Qg	Total Gate Charge (4.5V)	$V_{DS}=15V, V_{GS}=4.5V, I_D=3A$	---	4.6	---	nC
Qgs	Gate-Source Charge		---	0.7	---	
Qgd	Gate-Drain Charge		---	1.5	---	
Td(on)	Turn-On Delay Time	$V_{DD}=10V, V_{GS}=4.5V, R_G=3.3\Omega, I_D=3A$	---	1.6	---	ns
Tr	Rise Time		---	42	---	
Td(off)	Turn-Off Delay Time		---	14	---	
Tf	Fall Time		---	7	---	
Ciss	Input Capacitance	$V_{DS}=15V, V_{GS}=0V, f=1\text{MHz}$	---	310	---	pF
Coss	Output Capacitance		---	49	---	
Crss	Reverse Transfer Capacitance		---	35	---	
IS	Continuous Source Current ^{1,4}	$V_G=V_D=0V$, Force Current	---	---	3.6	A
VSD	Diode Forward Voltage ²	$V_{GS}=0V, I_S=1A, T_J=25^{\circ}\text{C}$	---	---	1.2	V

Note :

- 1、The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2、The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- 3、The power dissipation is limited by 150 $^{\circ}\text{C}$ junction temperature
- 4、The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

Typical Characteristics

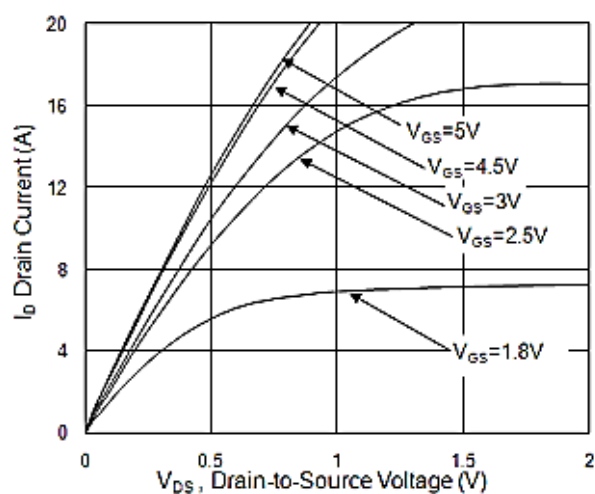


Fig.1 Typical Output Characteristics

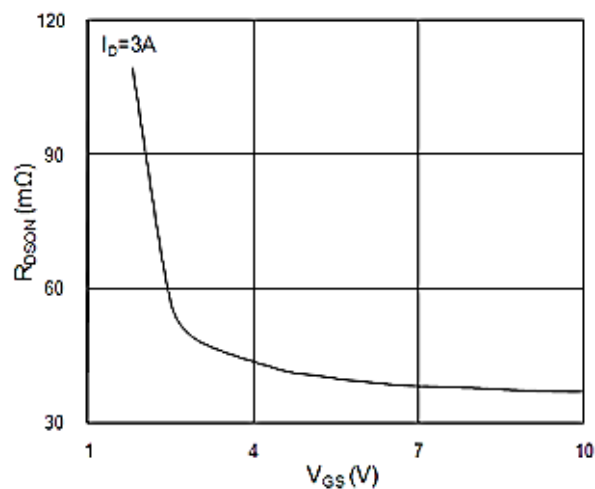


Fig.2 On-Resistance vs. G-S Voltage

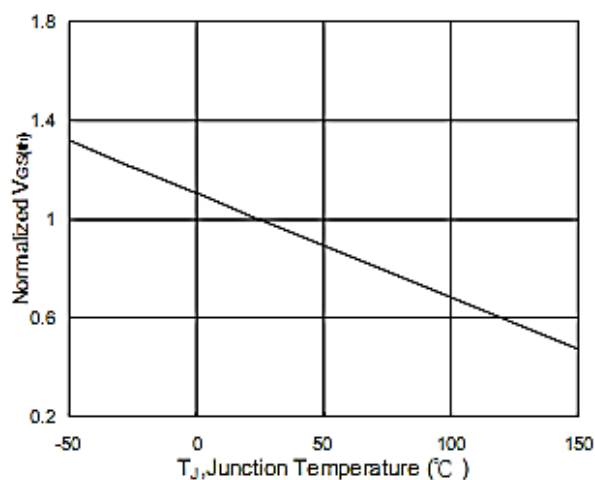
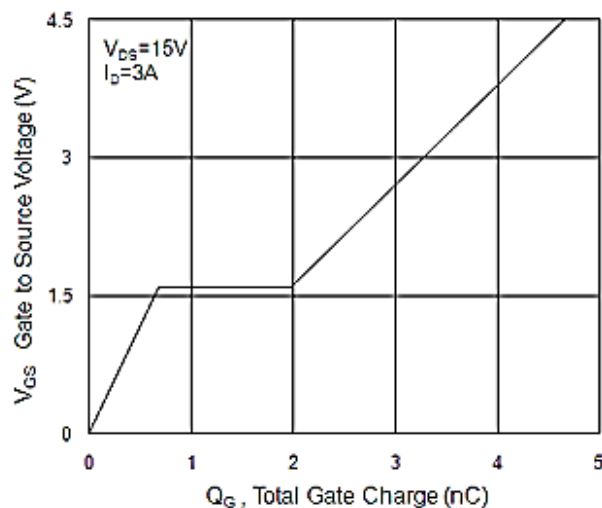
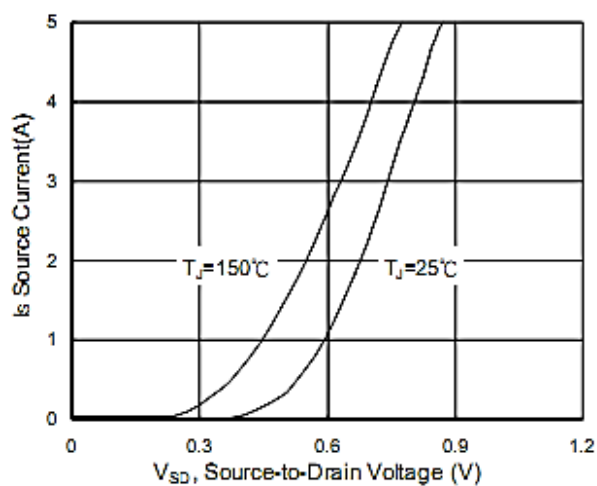


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

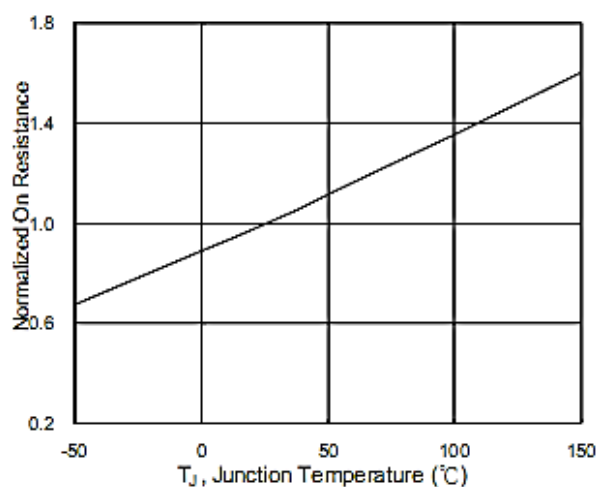


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

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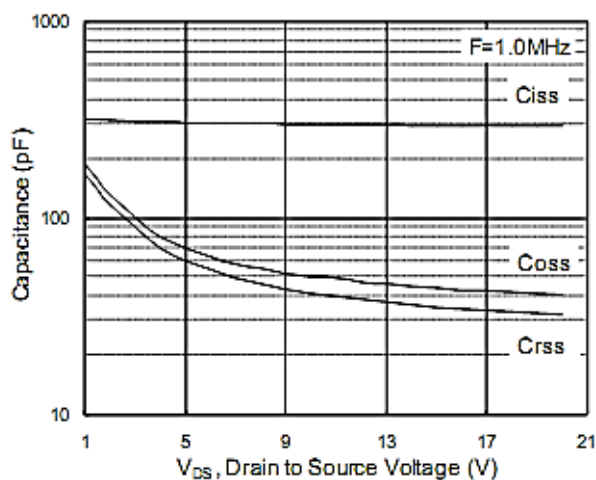


Fig.7 Capacitance

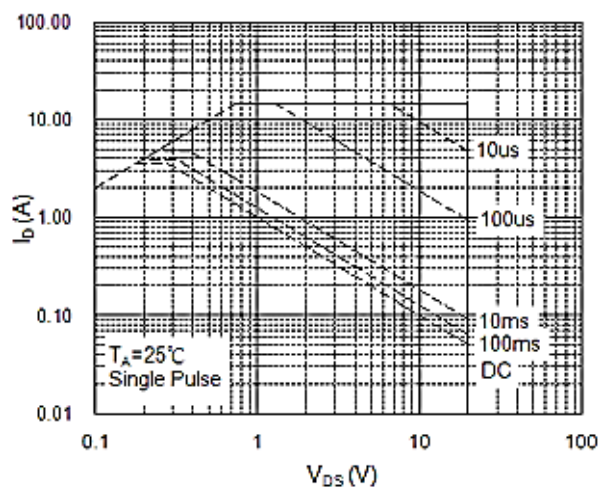


Fig.8 Safe Operating Area

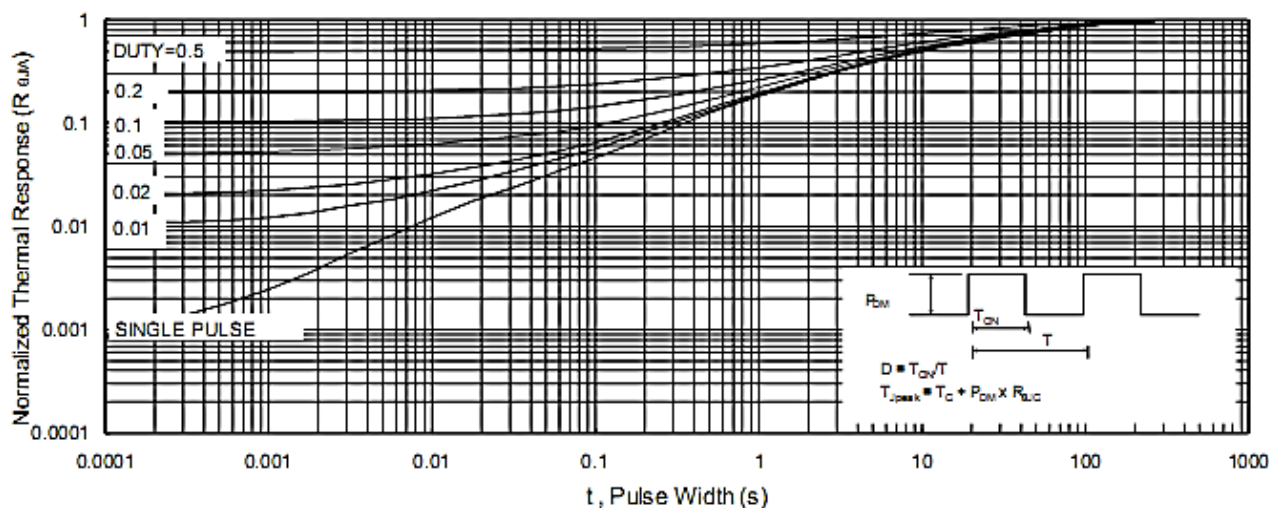


Fig.9 Normalized Maximum Transient Thermal Impedance

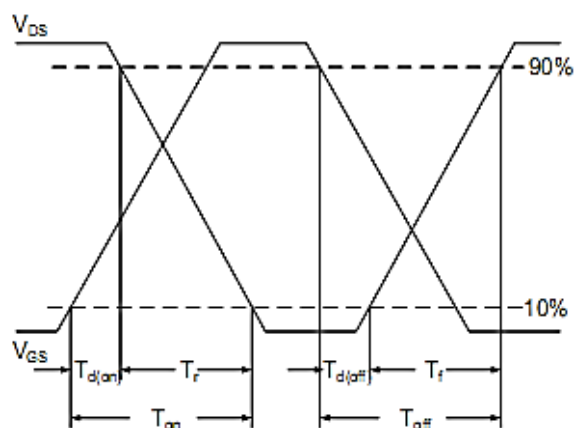


Fig.10 Switching Time Waveform

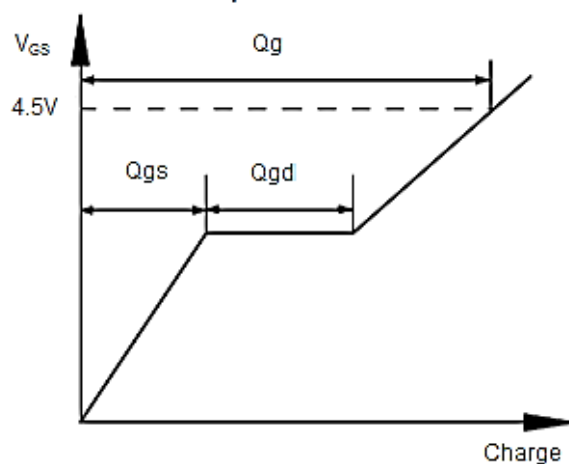
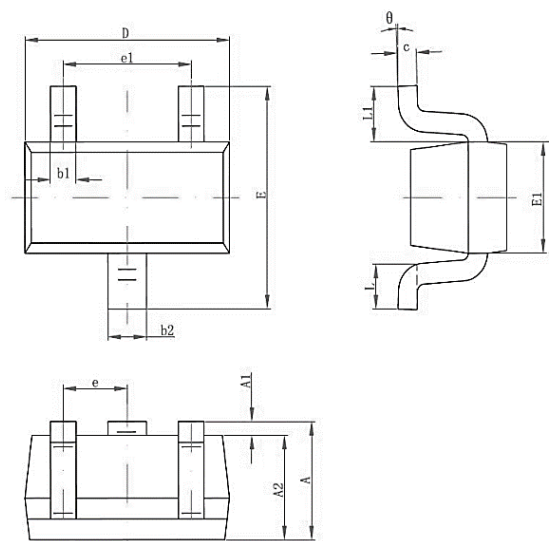


Fig.11 Gate Charge Waveform

Package Mechanical Data-SOT523-3-Single



Symbol	Dimensions In Millimeters	
	Min.	Max.
A	0.70	0.90
A1	0.00	0.10
A2	0.70	0.80
b1	0.15	0.29
b2	0.25	0.39
C	0.10	0.20
D	1.50	1.70
E	1.45	1.75
E1	0.70	0.90
e	0.500 (Typ)	
e1	0.90	1.10
L	0.26	0.46
θ	0°	8°

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Edition	Date	Change
REV1.0	2024/1/1	Initial release

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