



### Features

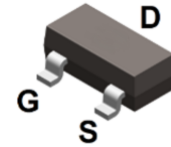
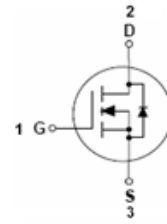
- Advanced trench cell design
- Extremely low threshold voltage

### Typical Applications

- N-channel enhancement mode effect transistor

### Mechanical Data

- Case: SOT-23
- Molding Compound: UL Flammability Classification Rating 94V-0
- Terminals: Matte Tin-Plated Leads, Solderability-per MIL-STD-202, Method 208



SOT-23

### Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
2N7002V	SOT-23	3000 pcs / Tape & Reel	7002V

### Maximum Ratings (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DSS}$	60	V
Gate-to-Source Voltage	$V_{GSS}$	$\pm 30$	V
Continuous Drain Current ( $T_C = 25^\circ\text{C}$ ) <sup>*1</sup>	$I_D$	300	mA
Continuous Drain Current ( $T_A = 25^\circ\text{C}$ ) <sup>*1</sup>	$I_D$	250	mA
Continuous Drain Current ( $T_A = 70^\circ\text{C}$ ) <sup>*1</sup>		200	mA
Pulsed Drain Current ( $t_p = 10\mu\text{s}$ , $T_A = 25^\circ\text{C}$ )	$I_{DM}$	2000	mA
Single Pulse Avalanche Energy <sup>*3</sup>	$E_{AS}$	0.11	mJ
Power Dissipation <sup>*1</sup>	$P_D$	0.35	W
Operating Junction Temperature Range	$T_J$	-55 to +150	$^\circ\text{C}$
Storage Temperature Range	$T_{STG}$	-55 to +150	$^\circ\text{C}$

### Thermal Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance Junction-to-Case <sup>*1</sup>	$R_{\theta JC}$	-	217	230	$^\circ\text{C/W}$
Thermal Resistance Junction-to-Air <sup>*1</sup>	$R_{\theta JA}$	-	319	357	$^\circ\text{C/W}$



### Electrical Characteristics (@ T<sub>A</sub> = 25°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
<b>Static Characteristics</b>						
V <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	60	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V	-	-	1	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> = ±30V, V <sub>DS</sub> = 0V	-	-	±100	nA
<b>On Characteristics</b>						
R <sub>DS(ON)</sub>	Drain-Source On-resistance <sup>*2</sup>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.5A	-	0.9	3	Ω
		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 0.075A	-	1	3.5	
V <sub>GS(TH)</sub>	Static Drain-Source On-resistance	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	1	1.5	2.5	V
R <sub>G</sub>	Gate Resistance	V <sub>GS</sub> = 0V, f = 1MHz	-	51	-	Ω
<b>Dynamic Characteristics</b>						
C <sub>ISS</sub>	Input Capacitance	V <sub>GS</sub> = 0V V <sub>DS</sub> = 25V f = 1.0MHz	-	35	-	pF
C <sub>OSS</sub>	Output Capacitance		-	7	-	
C <sub>RSS</sub>	Reverse Transfer Capacitance		-	3	-	
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time <sup>*4</sup>	V <sub>DD</sub> = 30V V <sub>GS</sub> = 10V R <sub>G</sub> = 25Ω I <sub>D</sub> = 0.2A	-	3.6	-	ns
t <sub>r</sub>	Turn-on Rise Time <sup>*4</sup>		-	3.3	-	
t <sub>d(off)</sub>	Turn-Off Delay Time <sup>*4</sup>		-	20	-	
t <sub>f</sub>	Turn-Off Fall Time <sup>*4</sup>		-	11	-	
Q <sub>G</sub>	Total Gate-Charge	V <sub>DD</sub> = 10V V <sub>GS</sub> = 4.5V I <sub>D</sub> = 0.2A	-	0.41	-	nC
Q <sub>GS</sub>	Gate to Source Charge		-	0.15	-	
Q <sub>GD</sub>	Gate to Drain (Miller) Charge		-	0.2	-	
<b>Source-Drain Diode Characteristics</b>						
V <sub>SD</sub>	Diode Forward Voltage <sup>*2</sup>	I <sub>S</sub> = 0.3A, V <sub>GS</sub> = 0V	-	1.09	1.5	V

Notes:

1. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper
2. The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%
3. The E<sub>AS</sub> data shows Max. rating. The test condition is V<sub>DD</sub> = 30V, V<sub>GS</sub> = 15V, L = 0.1mH
4. Guaranteed by design, not subject to production



### Ratings and Characteristic Curves (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

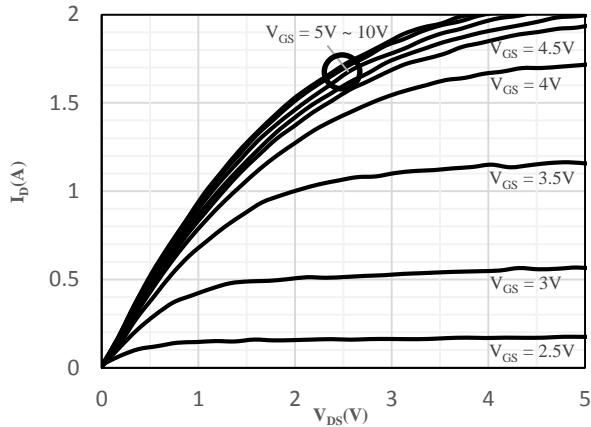


Fig 1 Typical Output Characteristics

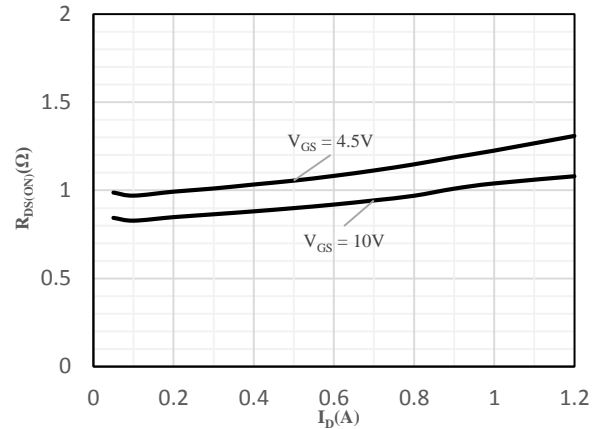


Fig 2 On-Resistance vs. Drain Current and Gate Voltage

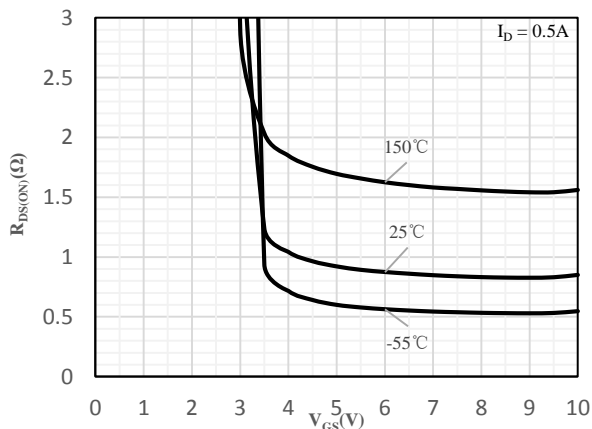


Fig 3 On-Resistance vs. Gate-Source Voltage

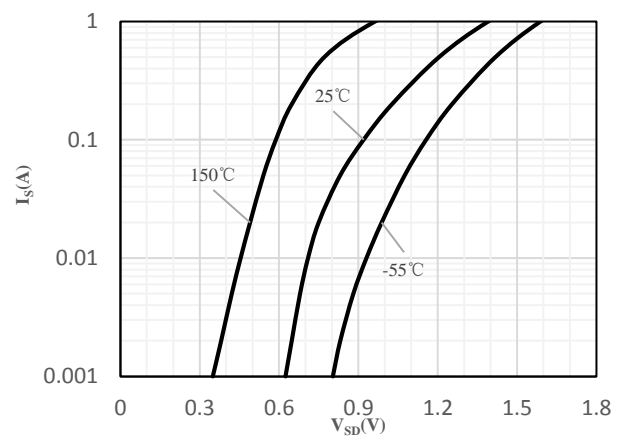


Fig 4 Body-Diode Characteristics

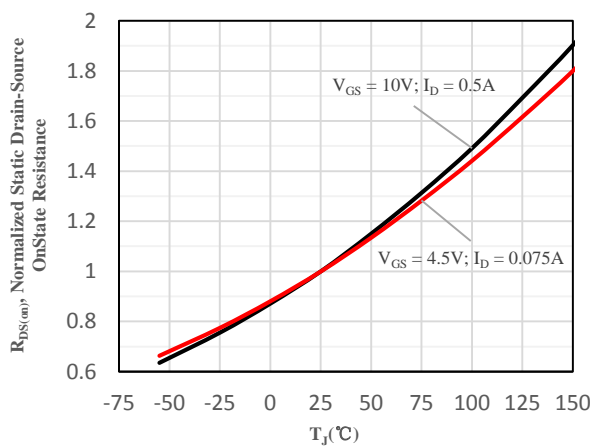


Fig 5 Normalized On-Resistance vs. Junction Temperature

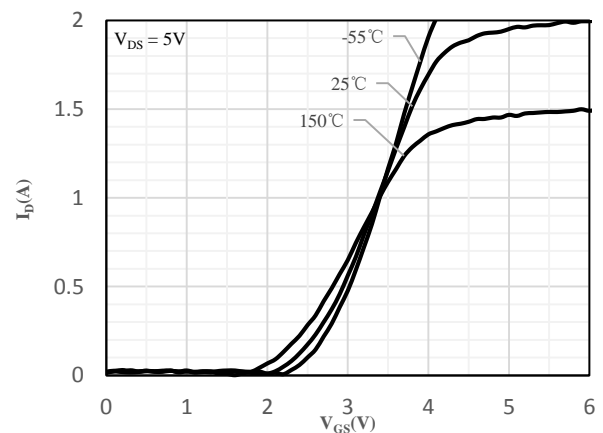


Fig 6 Transfer Characteristics

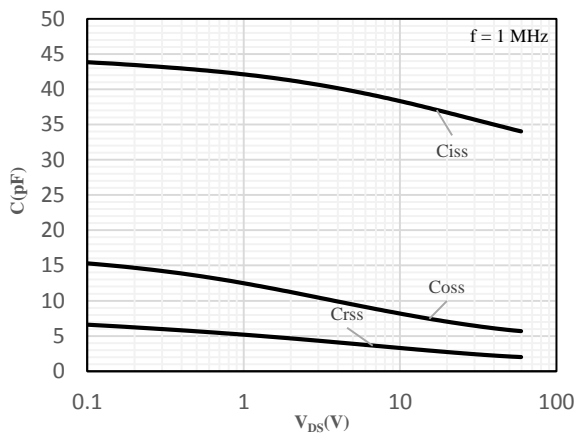


Fig 7 Capacitance Characteristics

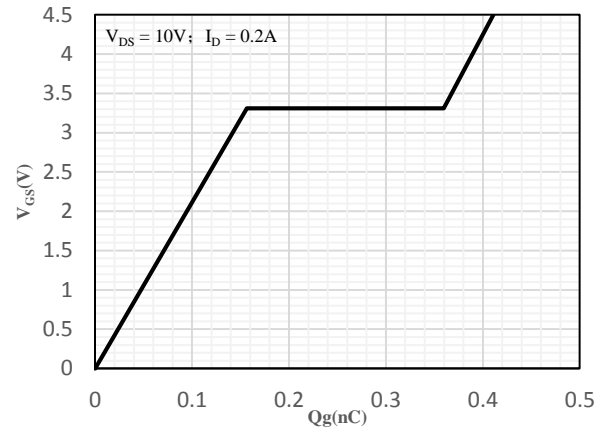


Fig 8 Gate-Charge Characteristics

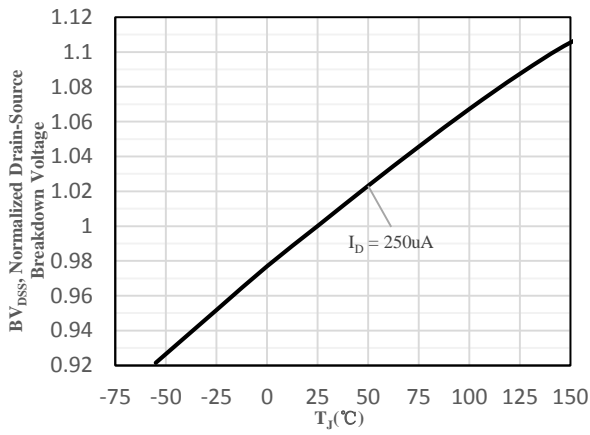


Fig 9 Normalized Breakdown Voltage vs. Junction Temperature

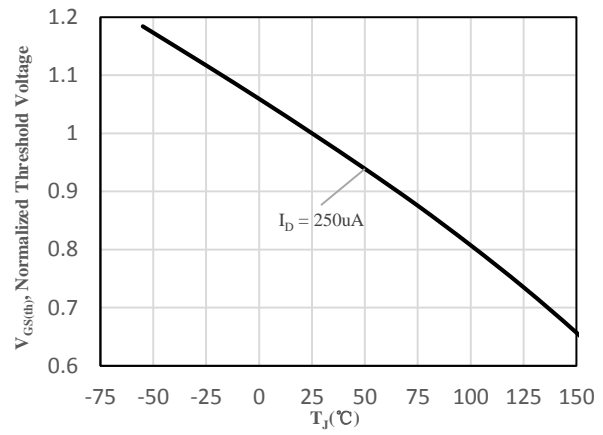


Fig 10 Normalized  $V_{GS(th)}$  vs. Junction Temperature

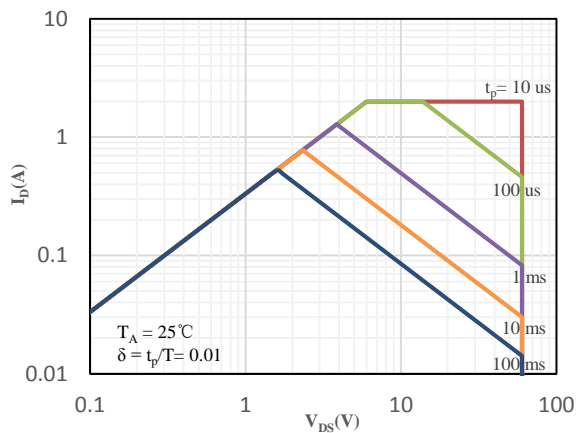


Fig 11 Safe Operation Area

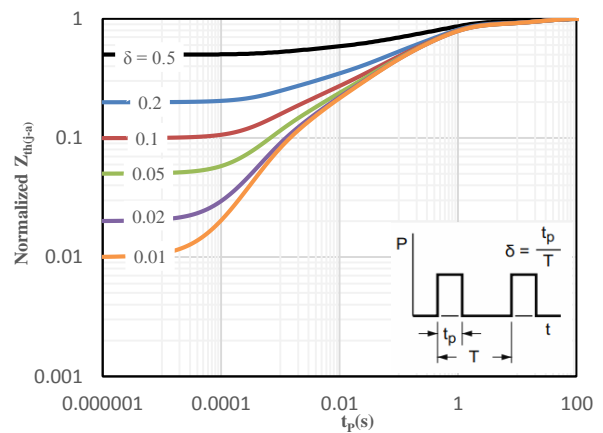
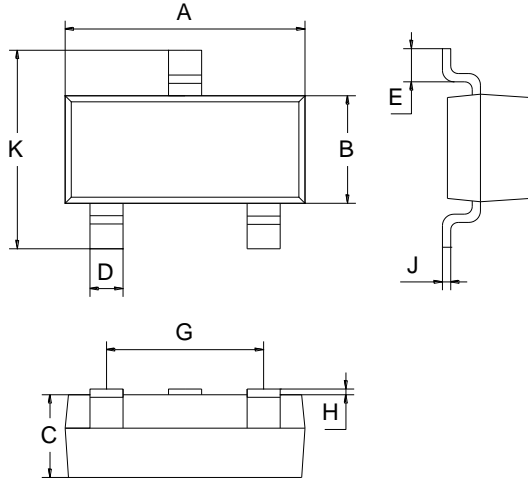


Fig 12 Normalized Maximum transient thermal impedance



### Package Outline Dimensions (Unit: mm)

#### SOT-23



SOT-23		
Dimension	Min.	Max.
A	2.70	3.10
B	1.10	1.50
C	0.90	1.10
D	0.30	0.50
E	0.35	0.48
G	1.80	2.00
H	0.02	0.10
J	0.05	0.15
K	2.20	2.60

### Mounting Pad Layout (Unit: mm)

#### SOT-23

