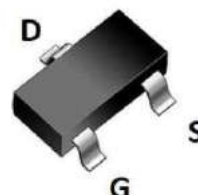


## Features

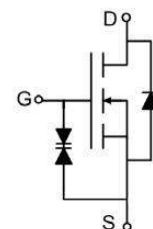
- N-Channel
- Advanced Trench Technology
- Excellent  $R_{DS(ON)}$  and Low Gate Charge
- Lead free product is acquired

$V_{DS}$	60	V
$R_{DS(on),TYP@ V_{GS}=10V}$	1.7	$\Omega$
$R_{DS(on),TYP@ V_{GS}=4.5V}$	2	$\Omega$
$I_D$	0.3	A

SOT-23



Part ID	Package Type	Marking	Packing
2N7002K	SOT-23	7002K	3000pcs/Reel



## Absolute Maximum Ratings $T_A = 25^\circ\text{C}$ , unless otherwise specified

Symbol	Parameter	Rating	Unit	
<b>Common Ratings (<math>T_c=25^\circ\text{C}</math> Unless Otherwise Noted)</b>				
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	60	V	
$T_J$	Maximum Junction Temperature	150	$^\circ\text{C}$	
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$	
$I_{DM}$	Drain Current-Continuous@ Current-Pulsed (Note 1)	$T_c = 25^\circ\text{C}$ 1.2	A	
<b>Mounted on Large Heat Sink</b>				
$I_D$	Drain Current-Continuous	$T_c = 25^\circ\text{C}$	0.3	A
		$T_c = 100^\circ\text{C}$	0.2	A
$P_D$	Maximum Power Dissipation	0.35	W	
$R_{\theta JA}$	Thermal Resistance Junction-Ambient	357	$^\circ\text{C/W}$	

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

Symbol	Parameter	Condition	Min	Typ	Max	Unit
<b>Static Electrical Characteristics @ T<sub>J</sub>=25°C (unless otherwise stated)</b>						
V(BR)DSS	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> =±20V, V <sub>DS</sub> =0V	--	--	±10	μA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.0	1.5	2.5	V
R <sub>DS(on)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =0.3A	--	1.7	2.2	Ω
R <sub>DS(on)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =4.5V, I <sub>D</sub> =0.2A	--	2	2.9	Ω
<b>Dynamic Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz	--	28	--	pF
C <sub>oss</sub>	Output Capacitance		--	11	--	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	4	--	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =10V, I <sub>D</sub> =0.3A, V <sub>GS</sub> =4.5V	--	1.7	--	nC
Q <sub>gs</sub>	Gate-Source Charge		--	0.3	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	0.6	--	nC
<b>Switching Characteristics</b>						
T <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> =10V, I <sub>D</sub> =0.2A, R <sub>G</sub> =10Ω, V <sub>GS</sub> =10V	--	2	--	ns
T <sub>r</sub>	Turn-on Rise Time		--	15	--	ns
T <sub>d(off)</sub>	Turn-Off Delay Time		--	7	--	ns
T <sub>f</sub>	Turn-Off Fall Time		--	20	--	ns
<b>Source- Drain Diode Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>						
I <sub>SD</sub>	Source-Drain Current (Body Diode)		--	--	0.3	A
V <sub>SD</sub>	Forward on voltage	I <sub>S</sub> =0.3A, V <sub>GS</sub> =0V	--	--	1.2	V

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%

## Typical Performance Characteristics

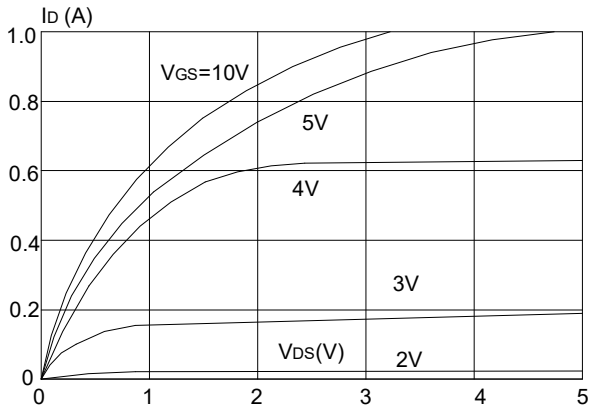


Figure 1: Output Characteristics

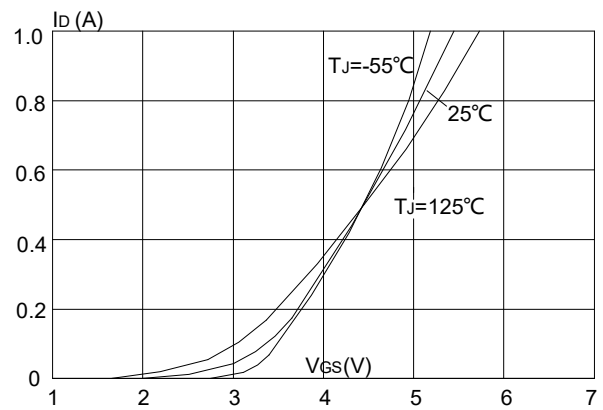


Figure 4: Typical Transfer Characteristics

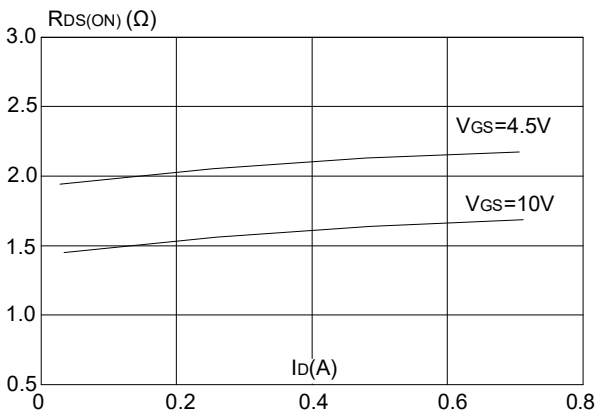


Figure 2: On-resistance vs. Drain Current

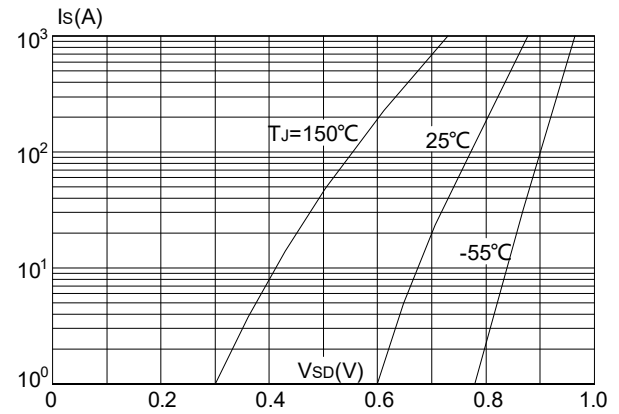


Figure 5: Body Diode Characteristics

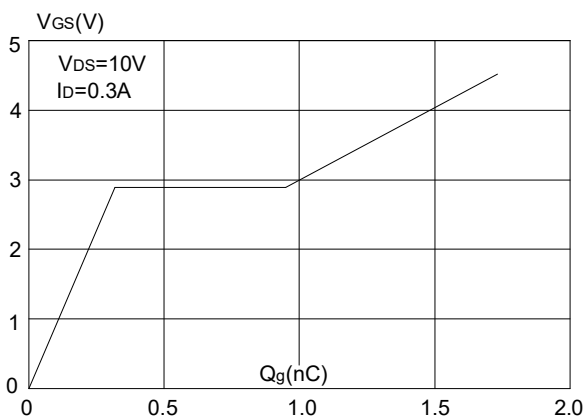


Figure 3: Gate Charge Characteristics

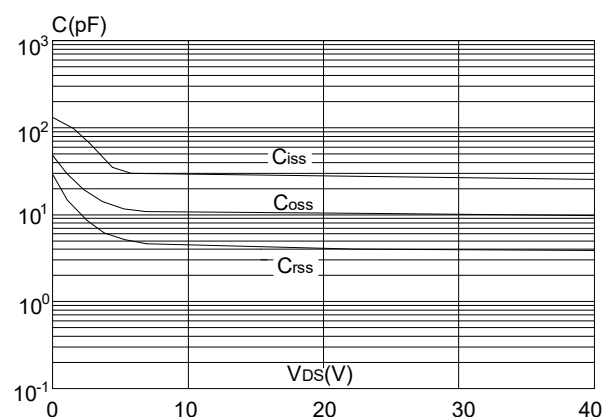
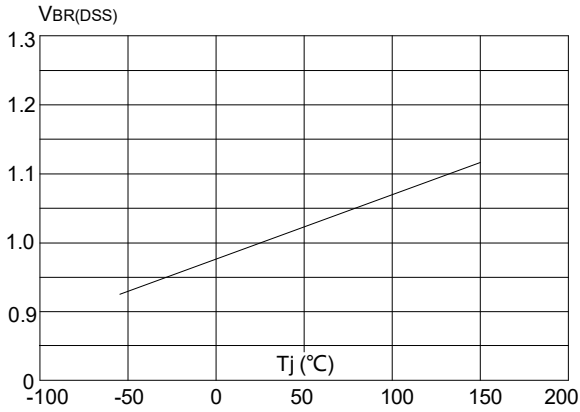
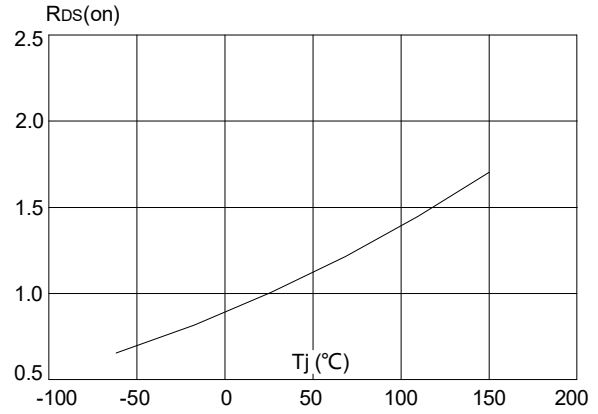


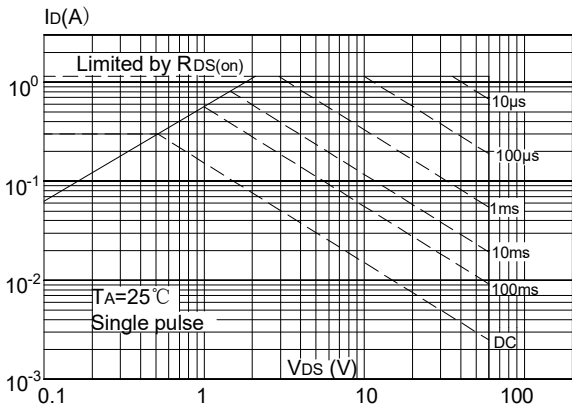
Figure 6: Capacitance Characteristics



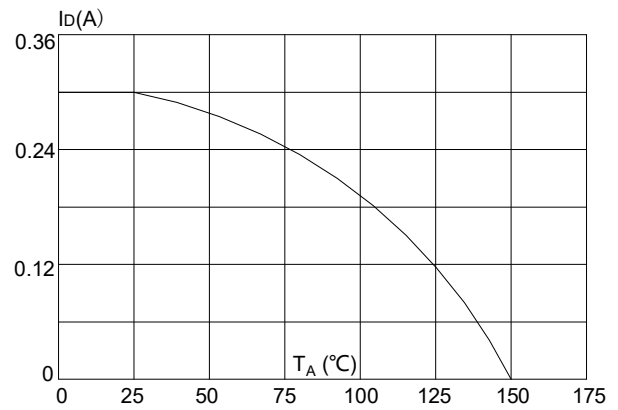
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



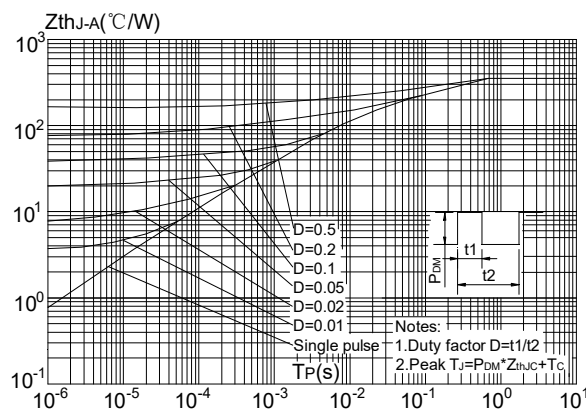
**Figure 9:** Normalized on Resistance vs. Junction Temperature



**Figure 8:** Maximum Safe Operating Area



**Figure 10:** Maximum Continuous Drain Current vs. Ambient Temperature



**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

## Test Circuit

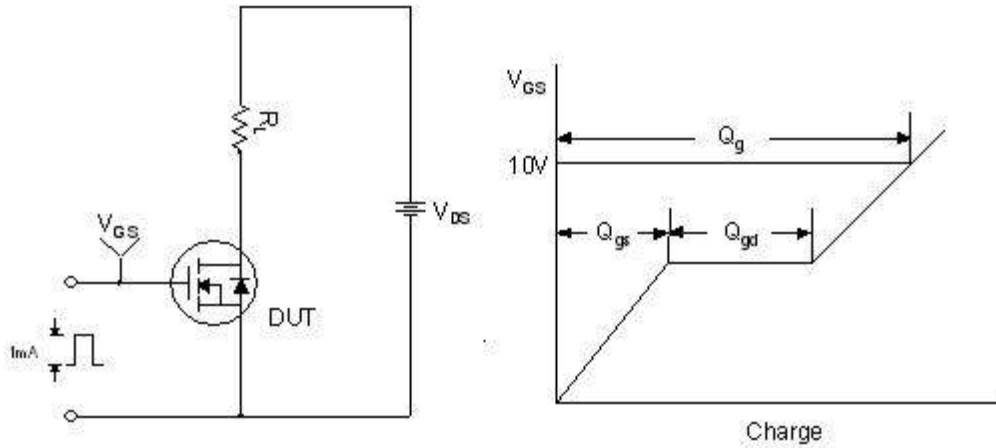


Figure 1. Gate Charge Test Circuit & Waveform

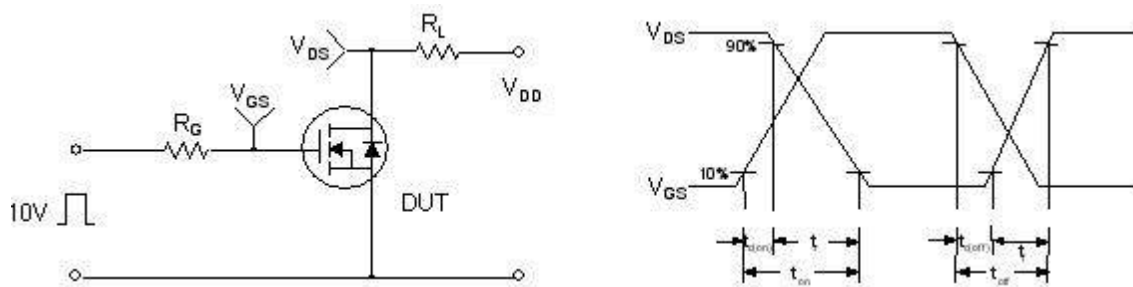


Figure 2. Resistive Switching Test Circuit & Waveforms

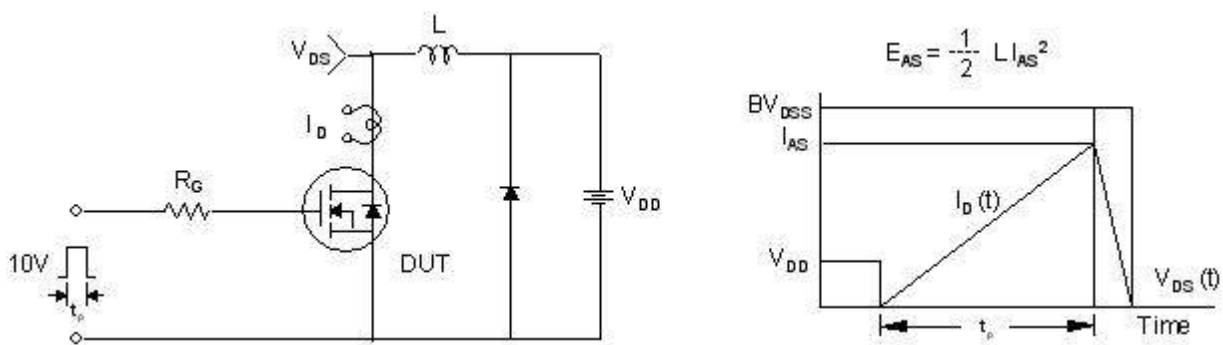
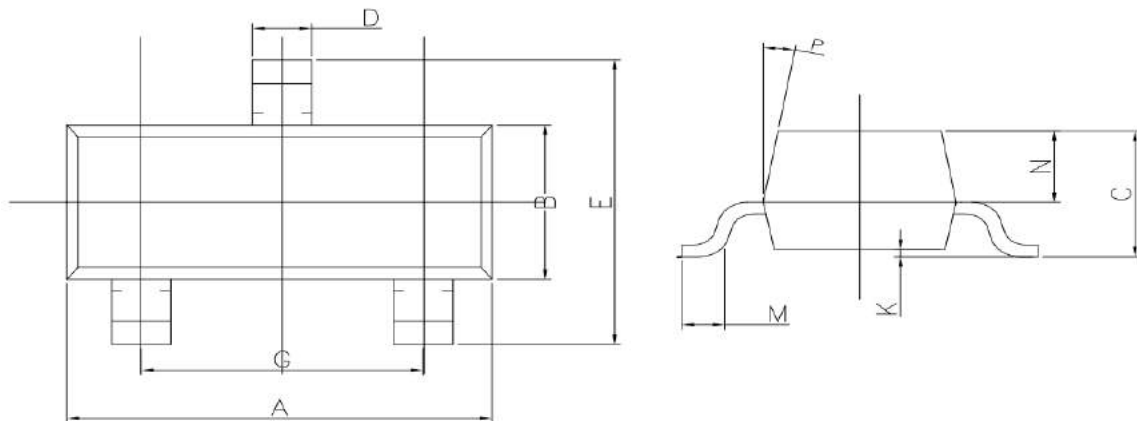


Figure 3. Unclamped Inductive Switching Test Circuit & Waveforms

## SOT-23 Package Information



DIM	MILLIMETERS
A	2.90 ± 0.1
B	1.30 ± 0.10
C	0.90 ~ 1.15
D	0.40 ± 0.1
E	2.40 ± 0.15
G	1.90 ± 0.10
K	0.00~0.10
M	0.30MIN
N	0.60 ± 0.10
P	10°TYP

## Customer Service

### Sales and Service:

[zj@ztasemi.com](mailto:zj@ztasemi.com)