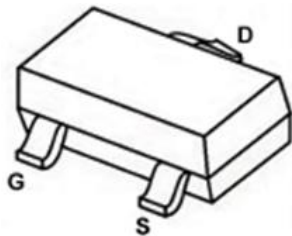
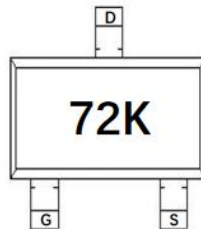
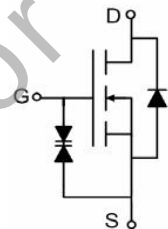


Features

- $V_{DS}=60V$, $I_D=0.2A$
 $R_{DS(ON)} < 2.1\Omega$ @ $V_{GS} = 10V$
 $R_{DS(ON)} < 2.7\Omega$ @ $V_{GS} = 4.5V$
- Advanced Trench Technology
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- Lead free product is acquired
- ESD Protected: 2KV

Application

- Battery Operated Systems
- Direct logic-level Interface: TTL/CMOS
- Solid-State Relays

**SOT-323-3L top view****Marking and pin Assignment****Schematic diagram****Package Marking and Ordering Information**

Device Marking	Device	OUTLINE	Device Package	Reel Size	Reel (PCS)	Per Carton (PCS)
72K	2N7002AKS	TAPING	SOT-323-3L	7inch	3000	120000

Absolute Maximum Ratings ($T_A=25^\circ C$ unless otherwise specified)

Symbol	Parameter		Max.	Units
V_{DSS}	Drain-Source Voltage		60	V
V_{GSS}	Gate-Source Voltage		± 20	V
I_D	Continuous Drain Current	$T_A = 25^\circ C$	0.2	A
		$T_A = 100^\circ C$	0.13	
I_{DM}	Pulsed Drain Current ^{note1}		0.8	A
P_D	Power Dissipation	$T_A = 25^\circ C$	0.3	W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient		415	$^\circ C/W$
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	$^\circ C$

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

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
V _{(BR)DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D = 10μA	60	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =60V, V _{GS} = 0V,	-	-	1	μA
I _{GSS}	Gate to Body Leakage Current	V _{DS} =0V, V _{GS} = ±20V	-	-	±10	uA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	1	-	2.5	V
R _{DS(on)}	Static Drain-Source on-Resistance note2	V _{GS} =10V, I _D =0.3A	-	1.6	2.1	Ω
		V _{GS} =4.5V, I _D =0.2A	-	1.9	2.7	
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz	-	28	-	pF
C _{oss}	Output Capacitance		-	11	-	pF
C _{rss}	Reverse Transfer Capacitance		-	4	-	pF
Q _g	Total Gate Charge	V _{DS} = 10V, I _D = 0.3A, V _{GS} = 4.5V	-	1.7	-	nC
Q _{gs}	Gate-Source Charge		-	0.3	-	nC
Q _{gd}	Gate-Drain(“Miller”) Charge		-	0.6	-	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DD} = 10V, I _D =0.2A, R _{GEN} = 10Ω, V _{GS} =10V,	-	2	-	ns
t _r	Turn-on Rise Time		-	15	-	ns
t _{d(off)}	Turn-off Delay Time		-	7	-	ns
t _f	Turn-off Fall Time		-	20	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I _s	Maximum Continuous Drain to Source Diode Forward Current		-	-	0.2	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	0.8	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0V, I _s =0.2A	-	-	1.2	V

Notes: 1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

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

Typical Performance Characteristics

Figure 1: Output Characteristics

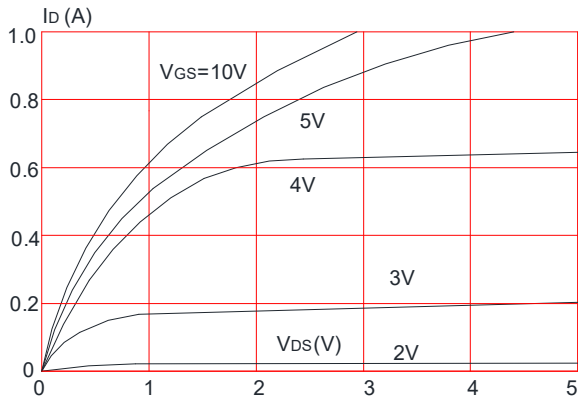


Figure 2: Typical Transfer Characteristics

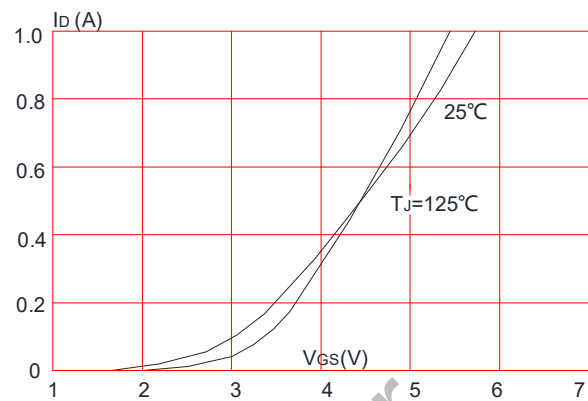


Figure 3: On-resistance vs. Drain Current

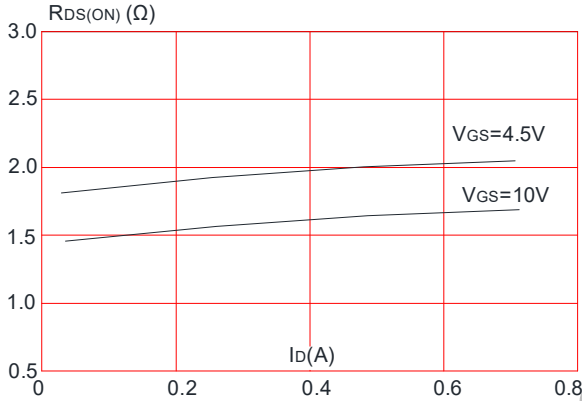


Figure 4: Body Diode Characteristics

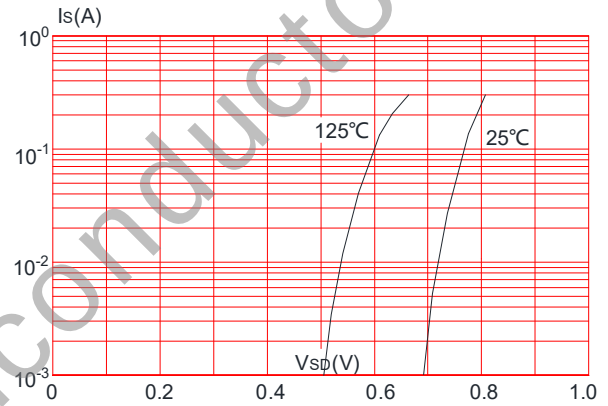


Figure 5: Gate Charge Characteristics

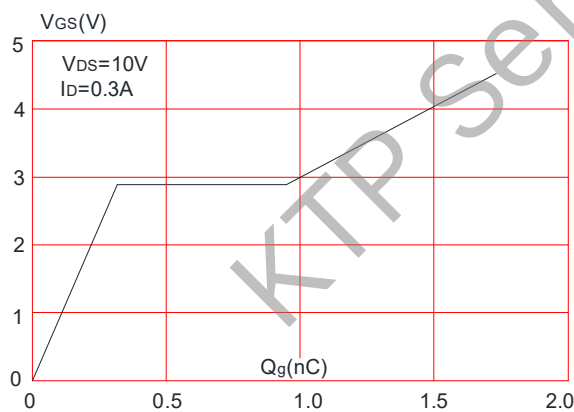


Figure 6: Capacitance Characteristics

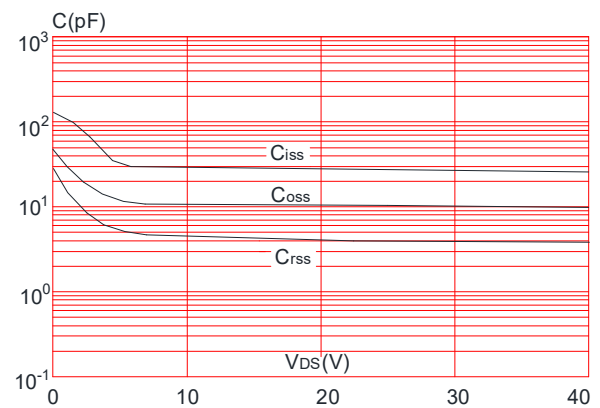


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

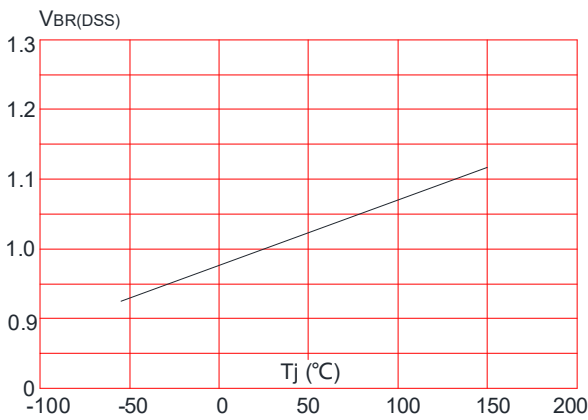


Figure 8: Normalized on Resistance vs. Junction Temperature

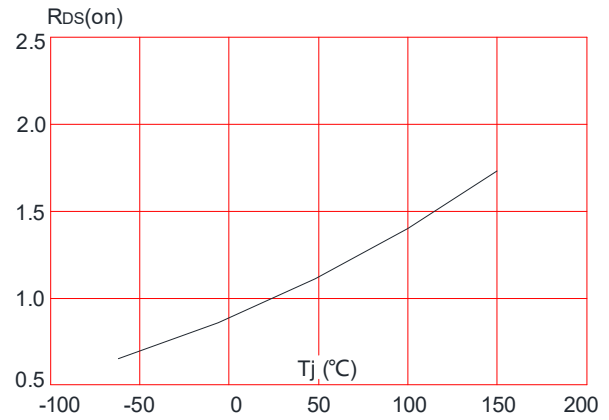


Figure 9: Maximum Safe Operating Area

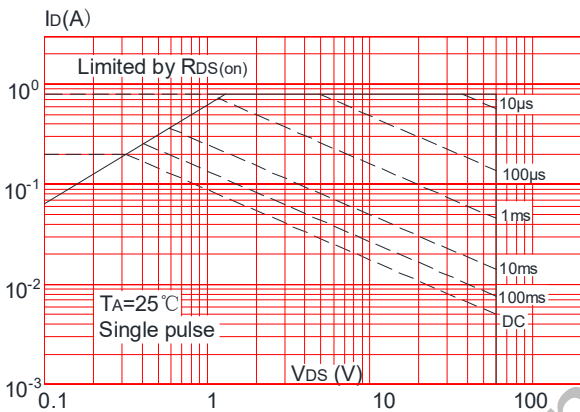


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

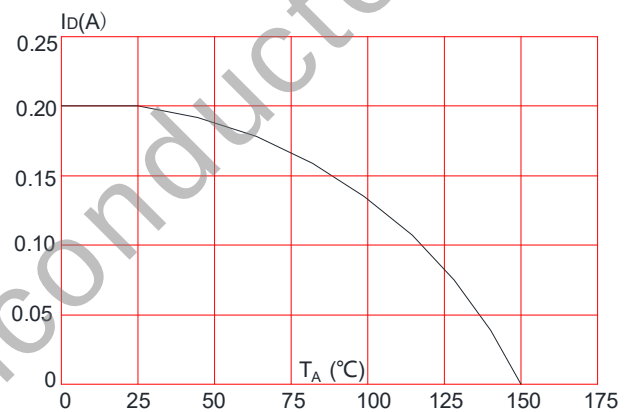
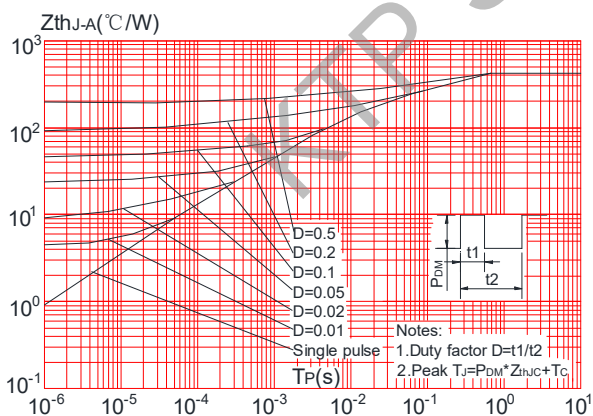


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



Test Circuit

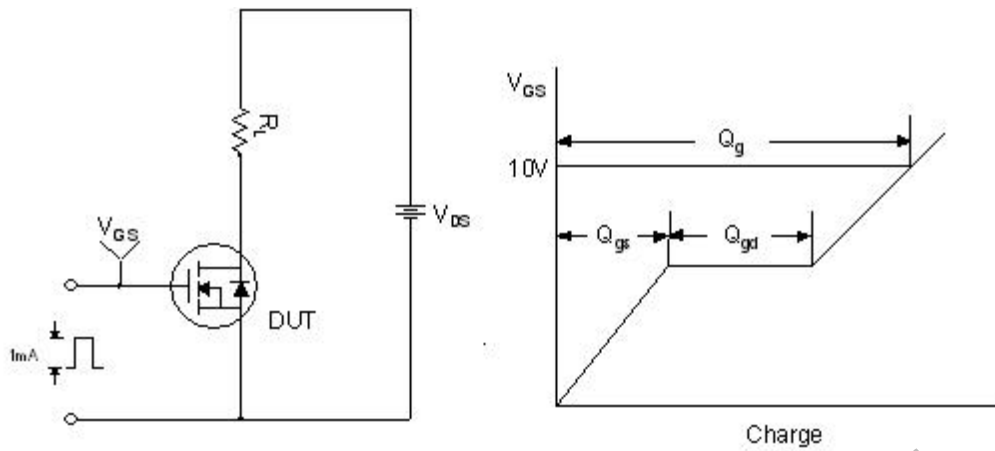


Figure 1. Gate Charge Test Circuit & Waveform

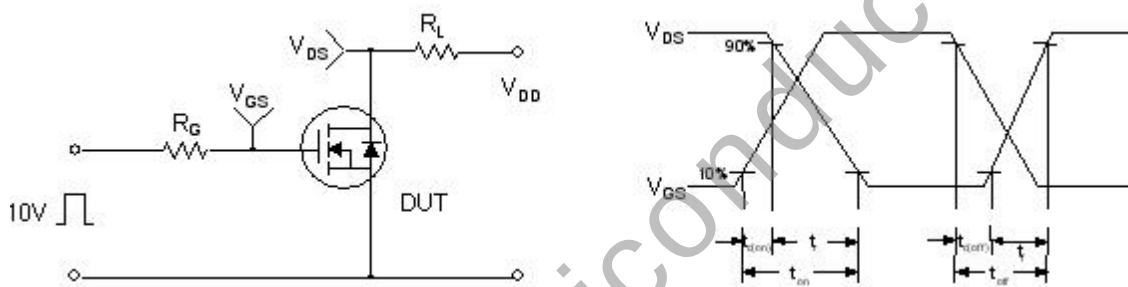


Figure 2. Resistive Switching Test Circuit & Waveforms

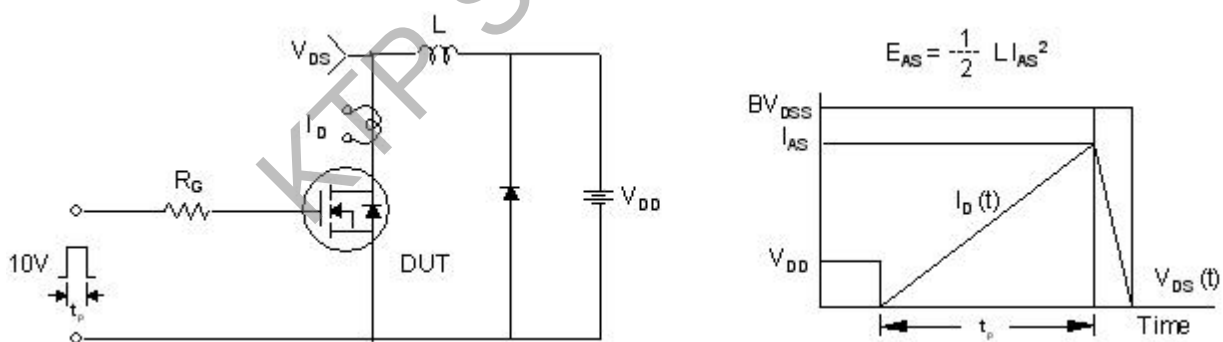
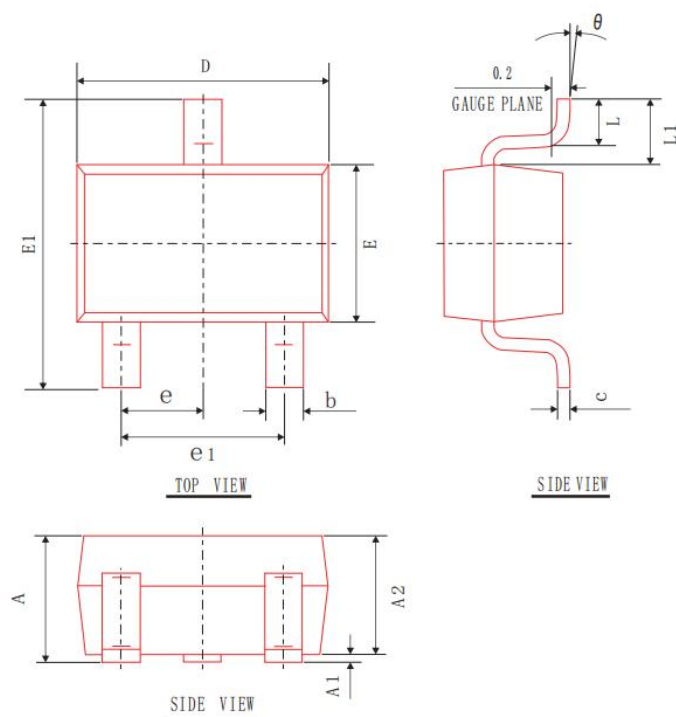


Figure 3. Unclamped Inductive Switching Test Circuit & Waveforms

Package Mechanical Data-SOT-323-3LCOMMON DIMENSIONS
(UNITS OF MEASURE=mm)

SYMBOL	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	0.05	0.10
A2	0.90	0.95	1.00
b	0.20	0.25	0.30
c	0.08	0.10	0.15
e1	1.20	1.30	1.40
D	2.00	2.10	2.20
E	1.15	1.25	1.35
E1	2.15	2.30	2.45
L	0.26	0.36	0.46
θ	0°	4°	8°
L1	0.525 REF		
e	0.65 TYP		