

60V N-Channel Enhancement Mode MOSFET

General Description

- Epoxy meets UL 94 V-0 flammability rating
 - High density cell design for low $R_{DS(ON)}$
 - Voltage controlled small signal switch
 - Rugged and reliable
 - ESD Protected
 - The AEC-suffix is needed for automotive and other applications
- Unique site and control change requirements;
AEC -Q101 Qualified with PPAP capability.

General Features

$V_{DS} = 60V$ $I_D = 340mA$
 $R_{DS(ON)} < 5 \Omega @ V_{GS} = 10V$

Applications

- DC-DC Converter
- Portable Equipment
- Power Management

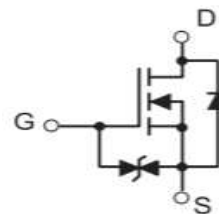
Package Marking and Ordering Information

Marking	Part Number	Package
72K	2N7002KQ-V	SOT-23

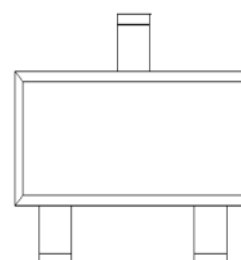
Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_{DS}	Drain-source Voltage	60	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current	340	mA
P_d	Total Power Dissipation	300	mW
T_J	Junction Temperature	-55 to 150	$^{\circ}C$
T_{JL}	Storage Temperature	-55 to 150	$^{\circ}C$
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	357	$^{\circ}C/W$

Inner Equivalent Principium Chart



Pin Assignment



Electrical Characteristic ($T_C = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{(BR)DSS}$	Drain-source Voltage Breakdown Voltage	$V_{GS}=0V, I_D=10\mu A$	60			V
$V_{GS(th)}$	Gate-Threshold Voltage (note 1)	$V_{DS}=V_{GS}, I_D=1mA$	1.0		2.5	V
I_{GSS}	Gate -body Leakage	$V_{DS}=0V, V_{GS}=\pm 10V$ $V_{DS}=0V, V_{GS}=\pm 5V$ $V_{DS}=0V, V_{GS}=\pm 20V$			± 200 ± 100 10	nA nA μA
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=48V, V_{GS}=0V$			1	μA
$R_{DS(on)}$	Drain-source On-resistance (note 1)	$V_{GS}=4.5V, I_D=200mA$ $V_{GS}=10V, I_D=500mA$			5.3 5.0	Ω
V_{sd}	Diode Forward Voltage (note 1)	$V_{GS}=0V, I_S=300mA$			1.5	V
Q_r	Recovered charge	$V_{GS}=0V, I_S=300mA, V_R=25V$ $dI_S/dt=-100A/\mu s$		30		nC

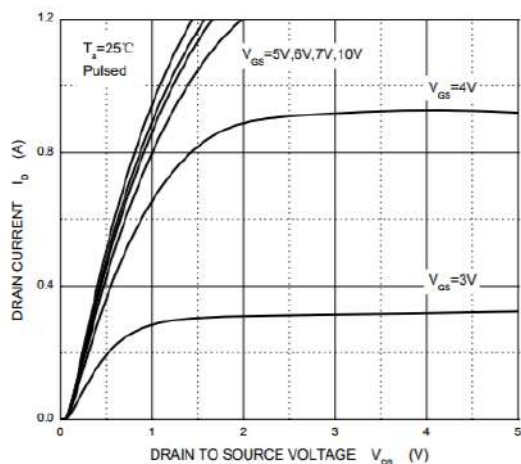
C_{iss}	Input Capacitance	$V_{DS}=10V$			40	pF
C_{oss}	Output Capacitance	$V_{GS}=0V$			30	
C_{rss}	Reverse Transfer Capacitance	$f=1MHz$			10	

$t_{d(on)}$	Turn on time	$V_{DD}=50V, R_L=250\Omega$			10	ns
$t_{d(off)}$	Turn off time	$R_G=50\Omega, V_{GS}=10V, R_G=50\Omega$			15	
t_{rr}	Reverse recovery time	$V_{GS}=0V, I_S=300mA$ $V_R=25V, dI_S/dt=-100A/\mu s$		30		

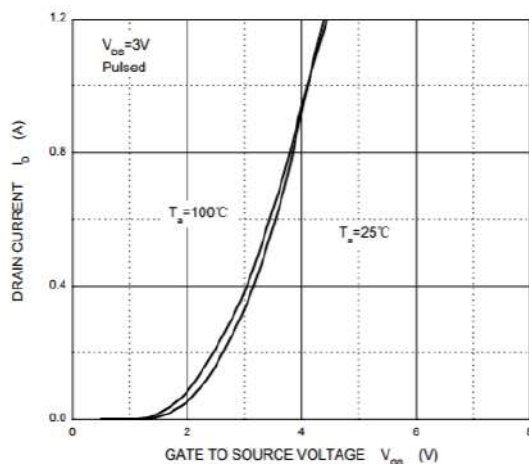
Note:

1. Pulse Test : Pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

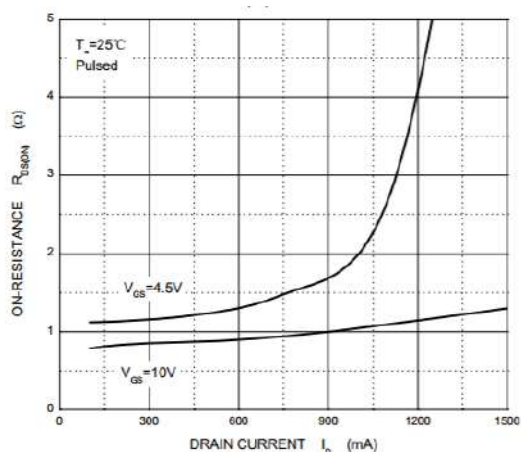
Characteristics Curve



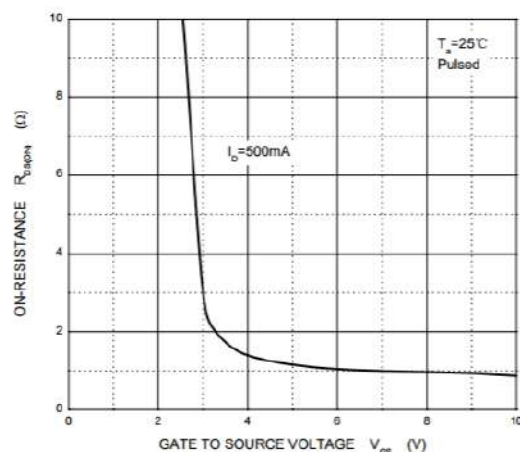
Output Characteristics



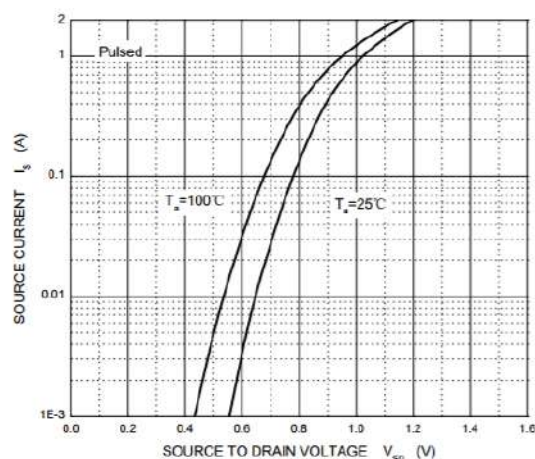
Transfer Characteristics



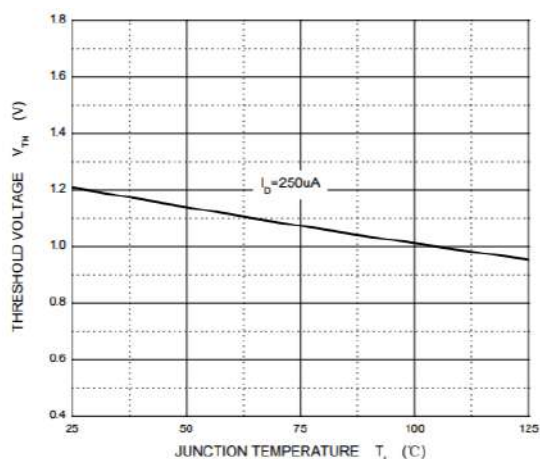
$R_{DS(on)}-I_D$



$R_{DS(on)}-V_{GS}$



I_S-V_{SD}



Threshold Voltage

Test Circuit & Waveform

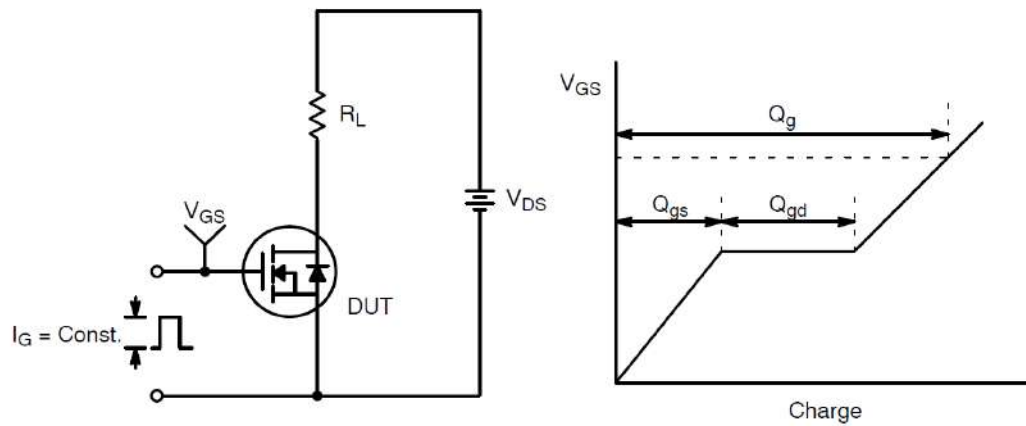


Figure 14: Gate Charge Test Circuit & Waveform

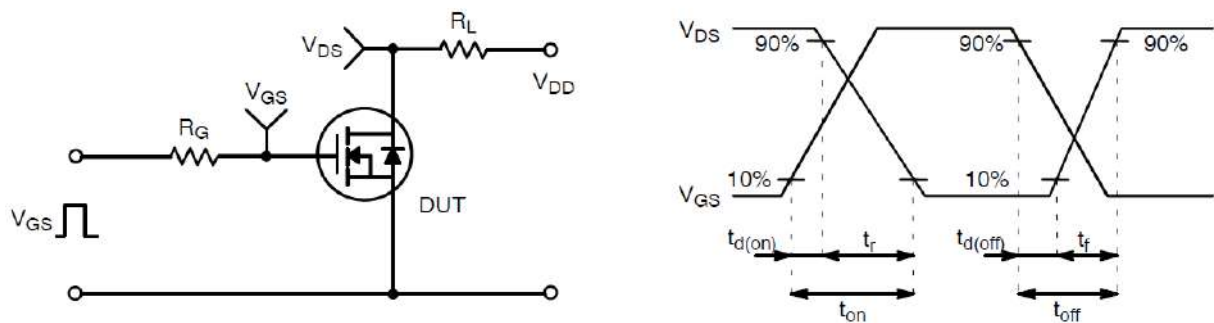


Figure 15: Resistive Switching Test Circuit & Waveforms

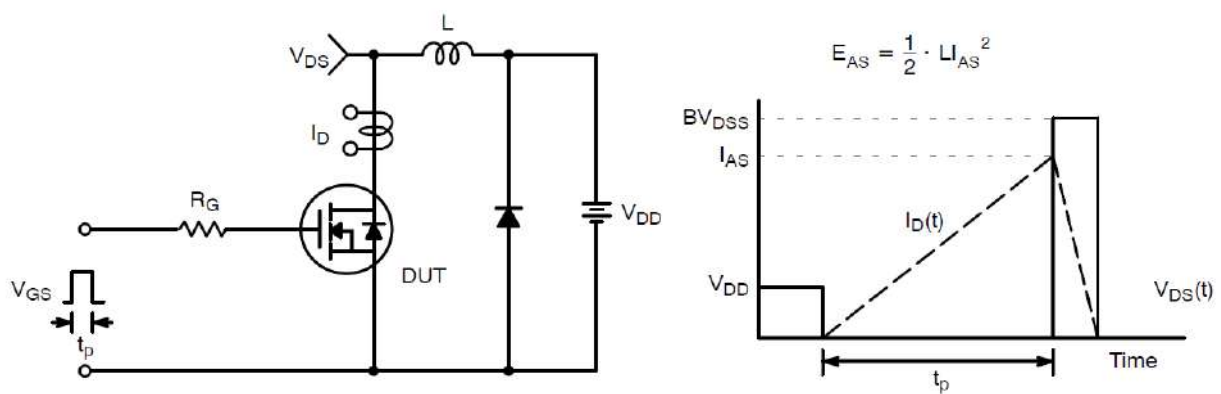
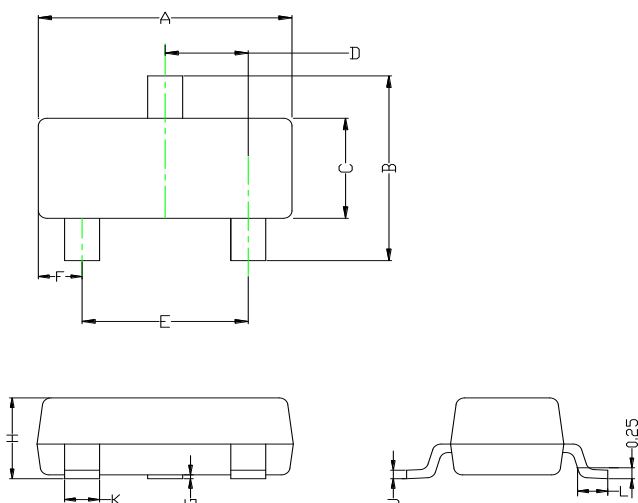


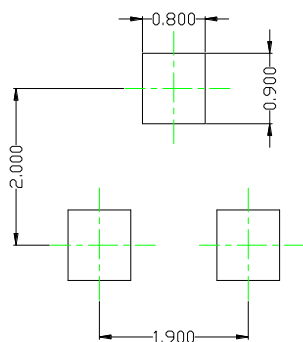
Figure 16: Unclamped Inductive Switching Test Circuit & Waveforms

Package Outline



Symbol	Dimensions in mm	
	Min.	Max.
A	2.800	3.040
B	2.100	2.640
C	1.200	1.400
D	0.890	1.030
E	1.780	2.050
F	0.450	0.600
G	0.013	0.100
H	0.900	1.110
J	0.085	0.180
K	0.370	0.510
L	0.300	0.500

Land Pattern Recommendation



Notice:

1. Lead plating: Pb free solder
2. Lead thickness includes solder plating
3. Lead frame: CAC-5
4. Other Tolerance: ± 0.05