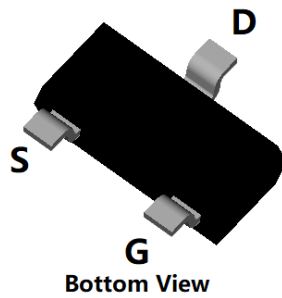
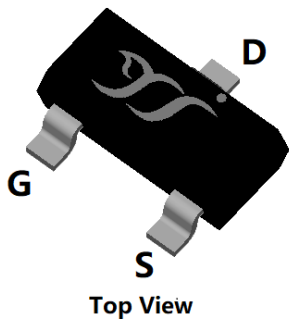
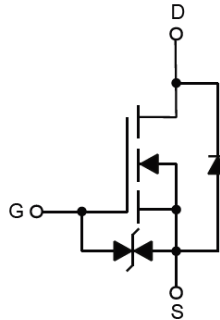


N-Channel Enhancement Mode Field Effect Transistor



SOT-23



Product Summary

- V_{DS} 60V
- I_D 300mA
- $R_{DS(ON)}$ (at $V_{GS}=10V$) <2.0ohm
- $R_{DS(ON)}$ (at $V_{GS}=4.5V$) <2.5ohm
- ESD protected up to 2.0KV (HBM)

General Description

- Trench Power MV MOSFET technology
- Voltage controlled small signal switch
- Low input Capacitance
- Fast Switching Speed
- Low Input / Output Leakage
- Part no. with suffix "Q" means AEC-Q101 qualified

Applications

- Battery operated systems
- Solid-state relays
- Direct logic-level interface: TTL/CMOS
- 12V, 24V Automotive systems

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

Parameter	Symbol	Limit	Unit
Drain-source Voltage	V_{DS}	60	V
Gate-source Voltage	V_{GS}	± 20	V
Drain Current @ $T_A=25^\circ C$	I_D	300	mA
Pulsed Drain Current ^A	I_{DM}	1.5	A
Total Power Dissipation @ $T_A=25^\circ C$	P_D	520	mW
Thermal Resistance Junction-to-Ambient @ Steady State ^B	$R_{\theta JA}$	285	$^\circ C/W$
Junction and Storage Temperature Range	T_J, T_{STG}	-55~+175	$^\circ C$

■ Ordering Information (Example)

PREFERRED P/N	PACKING CODE	Marking	MINIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
2N7002KDHQ	F2	72KD.	3000	30000	120000	7" reel



2N7002KDHQ

■ Electrical Characteristics (T_J=25°C unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Static Parameter						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	60			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =60V, V _{GS} =0V			1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} = ±20V, V _{DS} =0V			±10	μA
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D =250μA	1.1	1.5	2.4	V
Static Drain-Source On-Resistance	R _{DS(on)}	V _{GS} = 10V, I _D =300mA		1.1	2.0	Ω
		V _{GS} = 4.5V, I _D =200mA		1.3	2.5	
Diode Forward Voltage	V _{SD}	I _S =115mA, V _{GS} =0V		0.9	1.2	V
Gate resistance	R _G	f=1MHz		150		Ω
Dynamic Parameters						
Input Capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, f=1MHz		25		pF
Output Capacitance	C _{oss}			8		
Reverse Transfer Capacitance	C _{rss}			4		
Switching Parameters						
Total Gate Charge	Q _g	V _{GS} =10V, V _{DS} =30V, I _D =1A		1.75		nC
Gate Source Charge	Q _{gs}			1.00		
Gate Drain Charge	Q _{gd}			0.25		
Reverse Recovery Charge	Q _{rr}	I _{SD} =1A, di/dt=100A/us		3.9		nC
Reverse Recovery Time	t _{rr}			15		ns
Turn-on Delay Time	t _{D(on)}	V _{GS} =10V, V _{DS} =30V, I _D =1A, R _g =3Ω		4.6		ns
Turn-on Rise Time	t _r			20.0		
Turn-off Delay Time	t _{D(off)}			10.5		
Turn-off Fall Time	t _f			25.5		

A. Repetitive rating; pulse width limited by max. junction temperature.

B. The value of R_{θJA} is measured with the device mounted on the minimum recommend pad size, in the still air environment with T_A=25°C. The maximum allowed junction temperature of 175°C. The value in any given application depends on the user's specific board design.



2N7002KDHQ

■ Typical Performance Characteristics

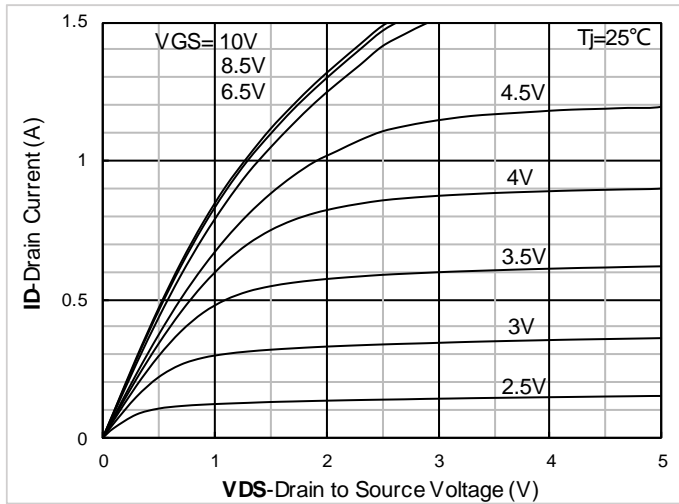


Figure1. Output Characteristics

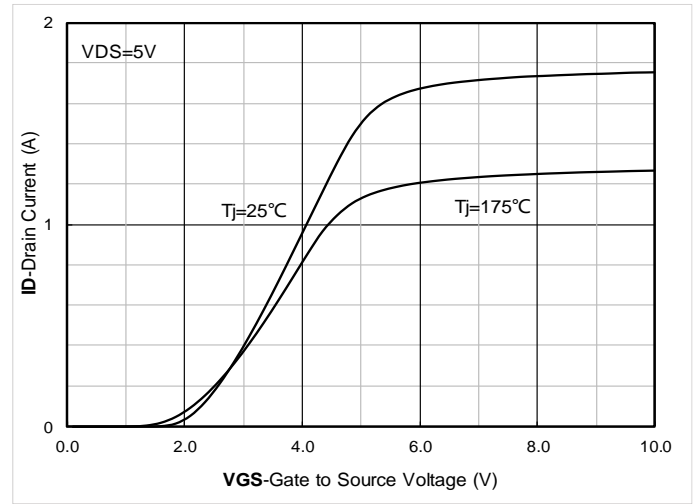


Figure2. Transfer Characteristics

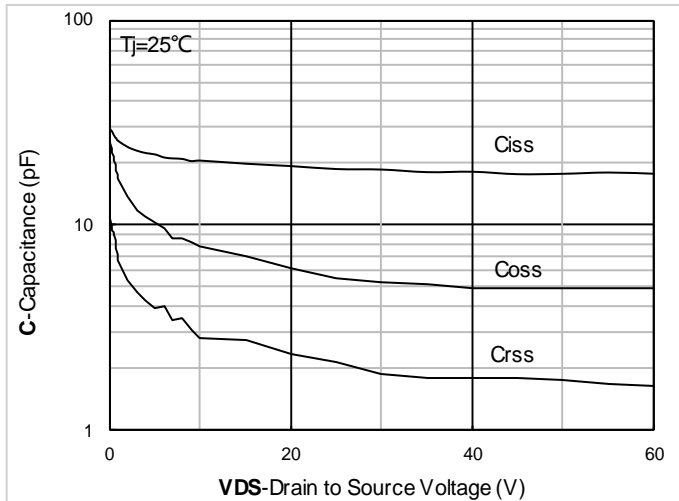


Figure3. Capacitance Characteristics

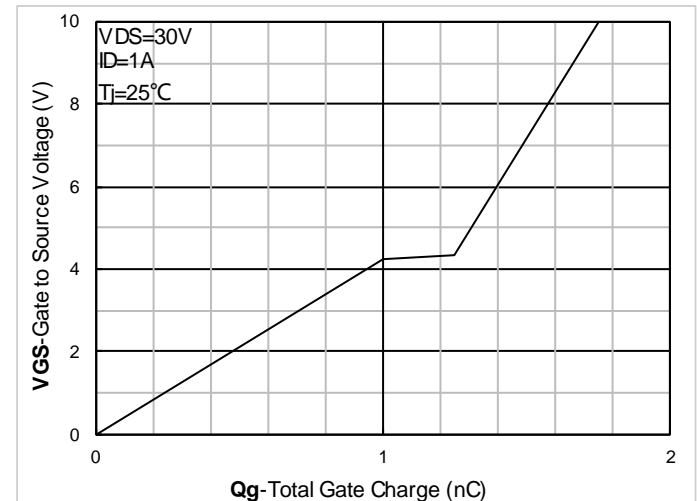


Figure4. Gate Charge

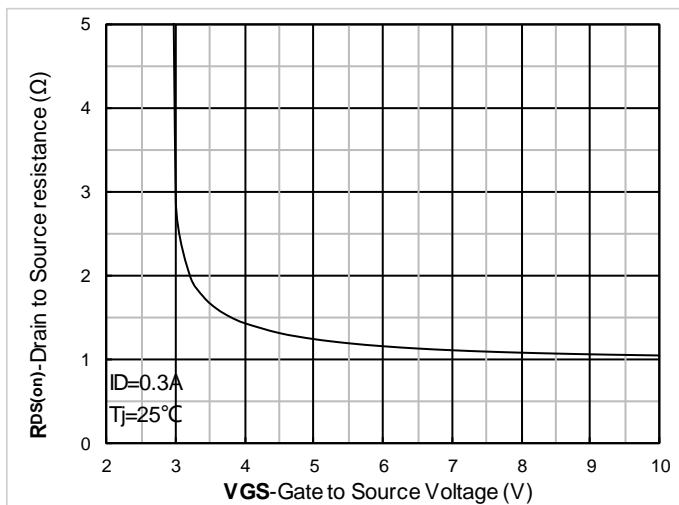


Figure5. On-Resistance vs Gate to Source Voltage

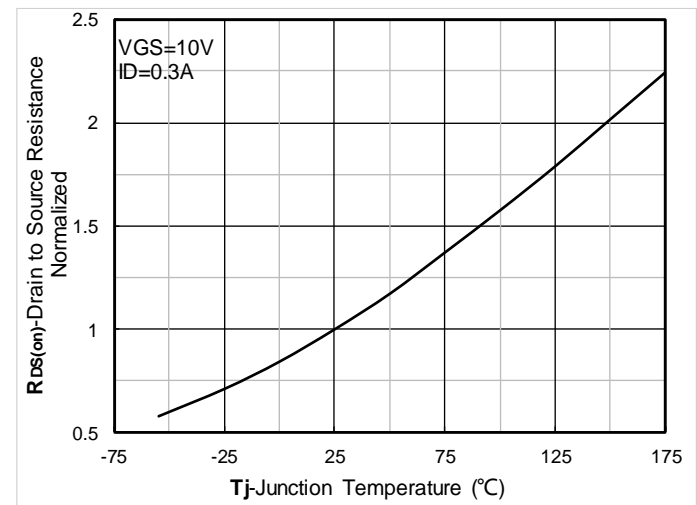


Figure6. Normalized On-Resistance



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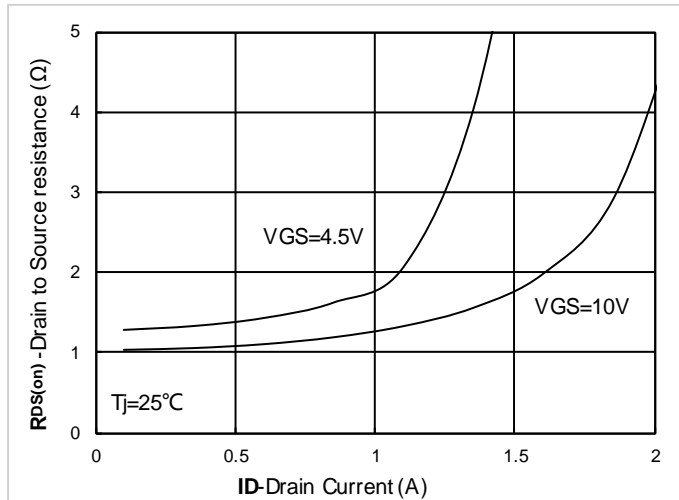


Figure 7. $R_{DS(on)}$ VS Drain Current

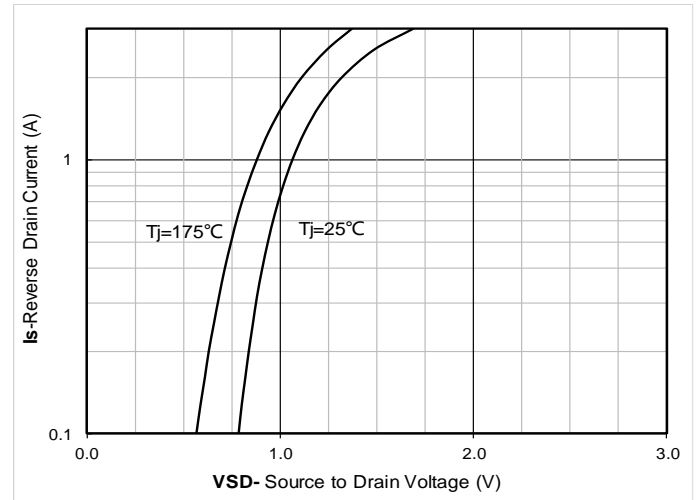


Figure 8. Forward characteristics of reverse diode

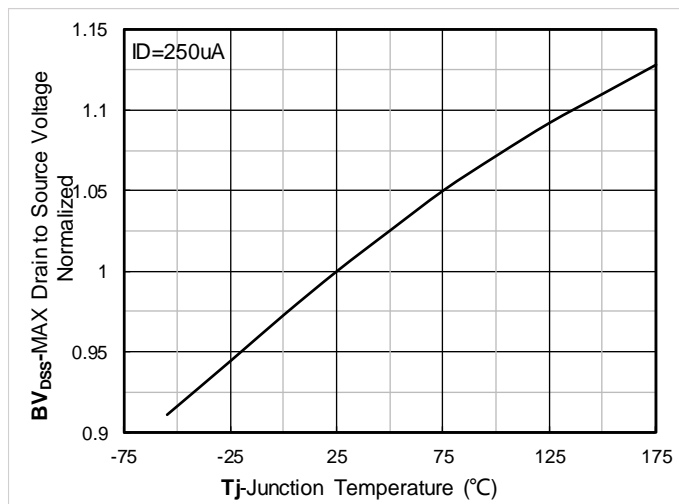


Figure 9. Normalized breakdown voltage

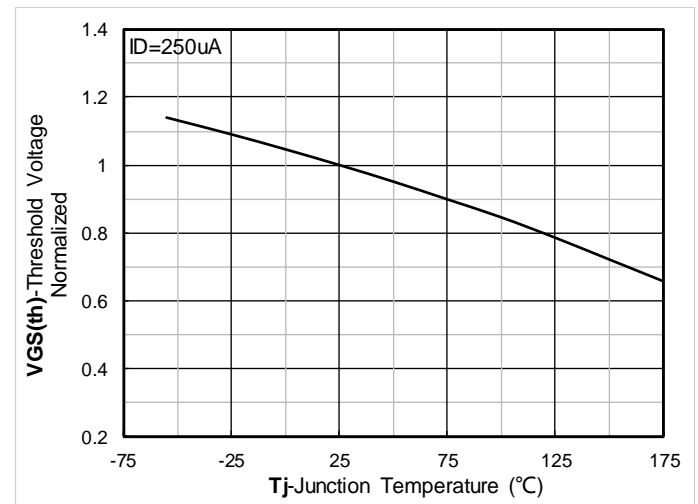


Figure 10. Normalized Threshold voltage

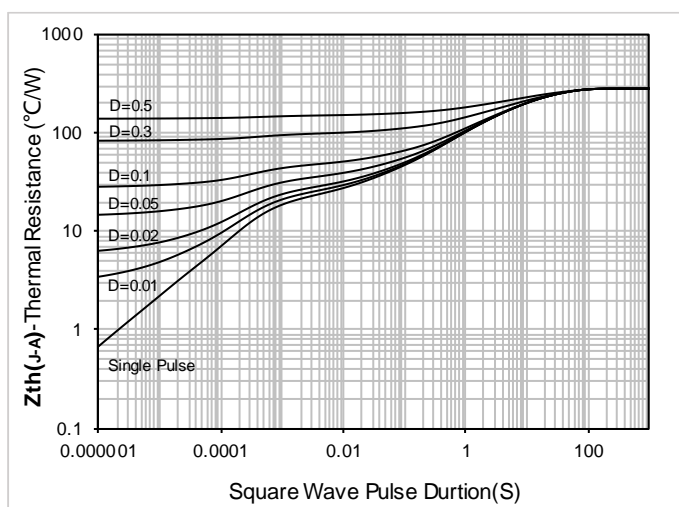


Figure 11. Maximum Transient Thermal Impedance

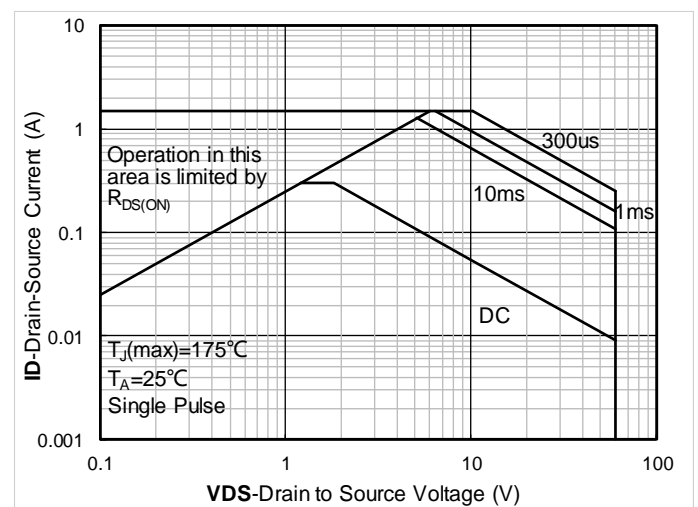


Figure 12. Safe Operation Area

■ Test Circuits & Waveforms

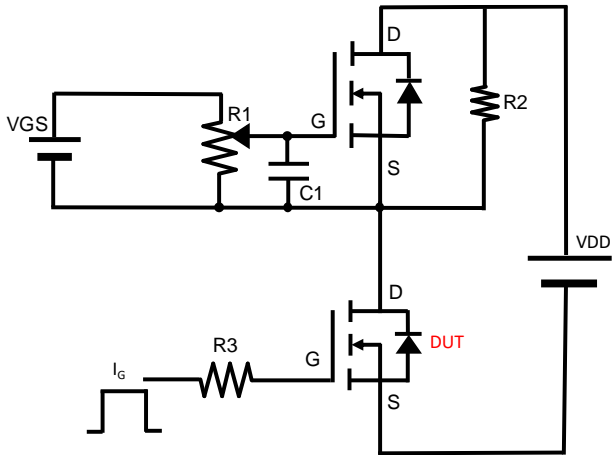


Figure A. Gate Charge Test Circuit & Waveform

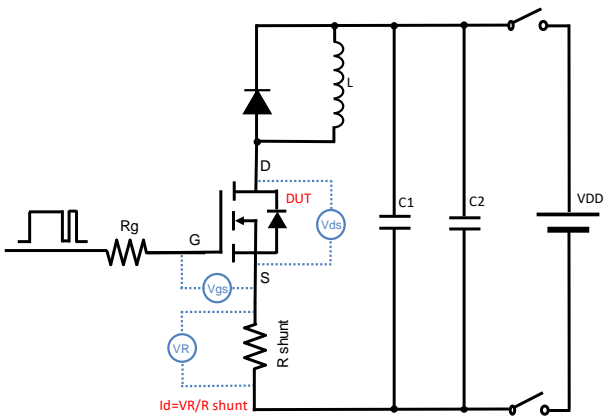


Figure B. Resistive Switching Test Circuit & Waveform

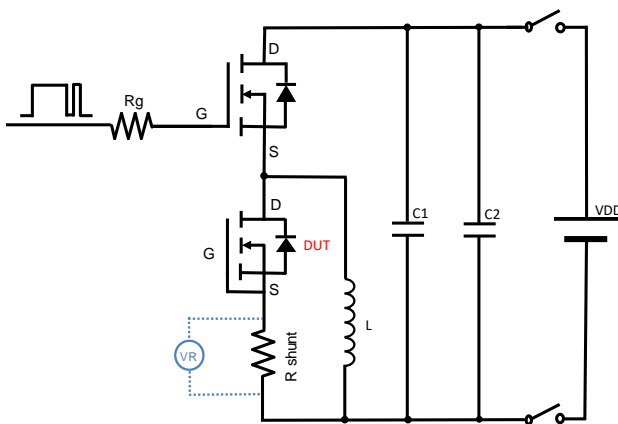
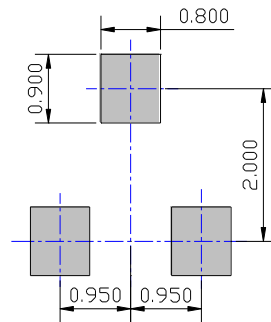
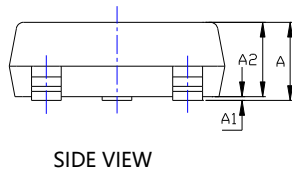
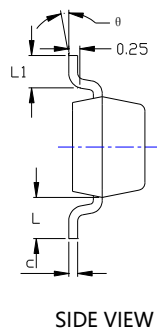
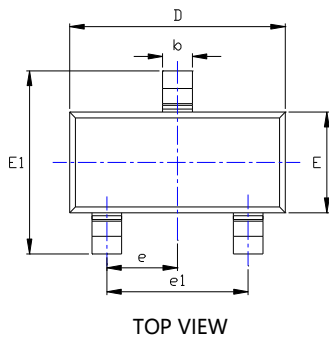


Figure C. Diode Recovery Test Circuit & Waveform



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■ SOT-23 Package Outline Dimensions

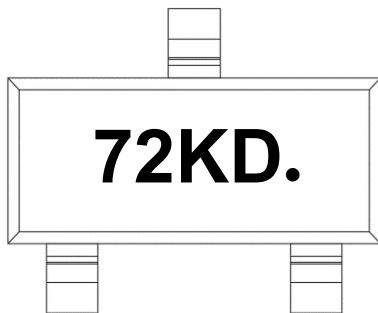


UNIT: mm

SYMBOL	DIMENSIONS			
	INCHES		Millimeter	
	MIN.	MAX.	MIN.	MAX.
A	0.035	0.045	0.900	1.150
A1	0.000	0.004	0.000	0.100
A2	0.035	0.041	0.900	1.050
b	0.012	0.020	0.300	0.500
c	0.004	0.008	0.100	0.200
D	0.110	0.118	2.800	3.000
E	0.047	0.055	1.200	1.400
E1	0.089	0.100	2.250	2.550
e	0.037TYP		0.950TYP	
e1	0.071	0.079	1.800	2.000
L	0.022REF		0.550REF	
L1	0.012	0.020	0.300	0.500
θ	0°	8°	0°	8°

NOTE:
 1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
 2. TOLERANCE 0.1mm UNLESS OTHERWISE SPECIFIED.
 3. THE PAD LAYOUT IS FOR REFERENCE PURPOSES ONLY.

■ Marking Information



Note:

1. All marking is at middle of the product body
2. All marking is in laser marking
3. 72KD is Marking Code
4. Body color: Black



2N7002KDHQ

Disclaimer

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