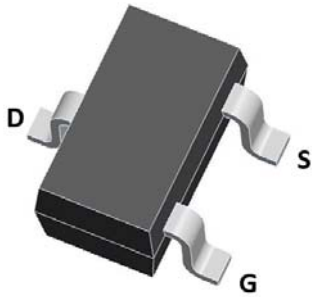
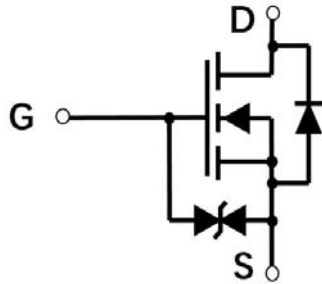
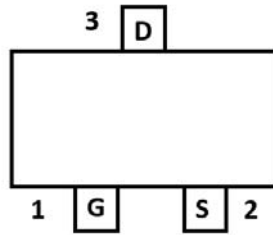


## N-Channel Enhancement Mode Field Effect Transistor



**SOT-323**



### Product Summary

- $V_{DS}$  60V
- $I_D$  300mA
- $R_{DS(ON)}$ ( at  $V_{GS}=10V$ ) <2.5ohm
- $R_{DS(ON)}$ ( at  $V_{GS}=4.5V$ ) <3.0ohm
- Gate-Source ESD Rating Up to 2KV (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

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

Parameter	Symbol	Limit	Unit
Drain-source Voltage	$V_{DS}$	60	V
Gate-source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current	$I_D$	$T_A=25^\circ\text{C}$ @ Steady State	300
		$T_A=70^\circ\text{C}$ @ Steady State	240
Pulsed Drain Current <sup>A</sup>	$I_{DM}$	1.5	A
Total Power Dissipation @ $T_A=25^\circ\text{C}$	$P_D$	300	mW
Thermal Resistance Junction-to-Ambient @ Steady State <sup>B</sup>	$R_{\theta JA}$	416	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55~+150	$^\circ\text{C}$

### ■ Ordering Information (Example)

PREFERRED P/N	PACKING CODE	Marking	MINIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
2N7002KCWQ	F2	72KC.	3000	30000	120000	7" reel



# 2N7002KCWQ

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

Parameter	Symbol	Conditions	Min	Typ	Max	Units
<b>Static Parameter</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> =250μA	60			V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V			1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20V, V <sub>DS</sub> =0V			±10	μA
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA	1	1.5	2.5	V
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> =300mA		1.9	2.5	Ω
		V <sub>GS</sub> = 4.5V, I <sub>D</sub> =200mA		2.0	3.0	
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =300mA, V <sub>GS</sub> =0V			1.2	V
Maximum Body-Diode Continuous Current	I <sub>S</sub>				300	mA
<b>Dynamic Parameters</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, f=1MHZ		27		pF
Output Capacitance	C <sub>oss</sub>			3		
Reverse Transfer Capacitance	C <sub>rss</sub>			2		
<b>Switching Parameters</b>						
Total Gate Charge	Q <sub>g</sub>	V <sub>GS</sub> =10V, V <sub>DS</sub> =30V, I <sub>D</sub> =0.3A		1.65	2.4	nC
Turn-on Delay Time	t <sub>D(on)</sub>	V <sub>GS</sub> =10V, V <sub>DD</sub> =30V, I <sub>D</sub> =300mA, R <sub>GEN</sub> =6Ω		6.5		ns
Turn-off Delay Time	t <sub>D(off)</sub>			9.6		
Reverse recovery Time	t <sub>rr</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =300mA, V <sub>R</sub> =25V, di/dt=-100A/μs		24		ns

A. Pulse Test: Pulse Width ≤ 300us, Duty cycle ≤ 2%.

B. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch.



## ■ Typical Performance Characteristics

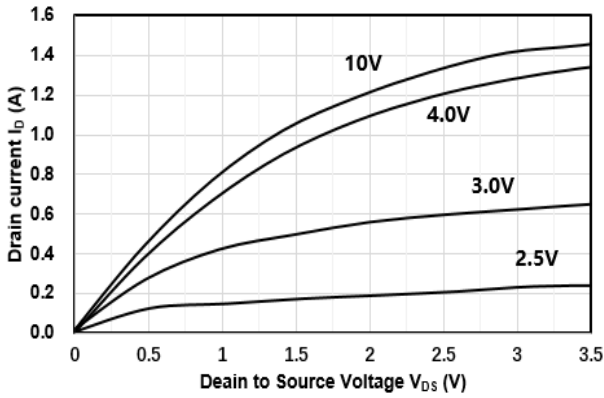


Figure1. Output Characteristics

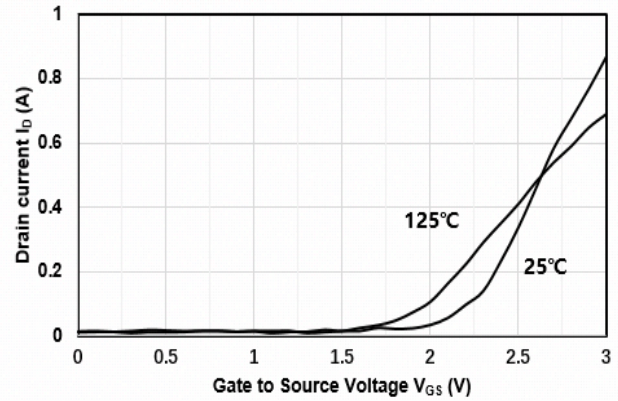


Figure2. Transfer Characteristics

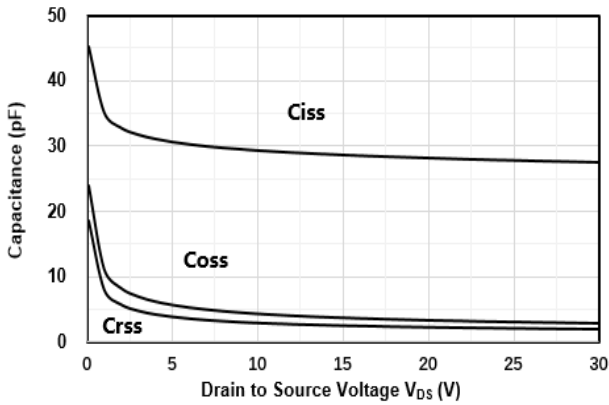


Figure3. Capacitance Characteristics

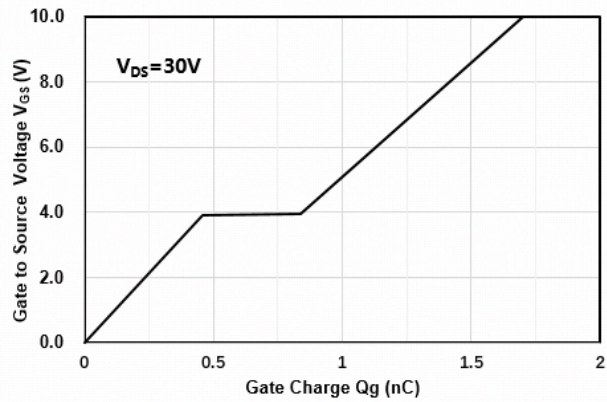


Figure4. Gate Charge

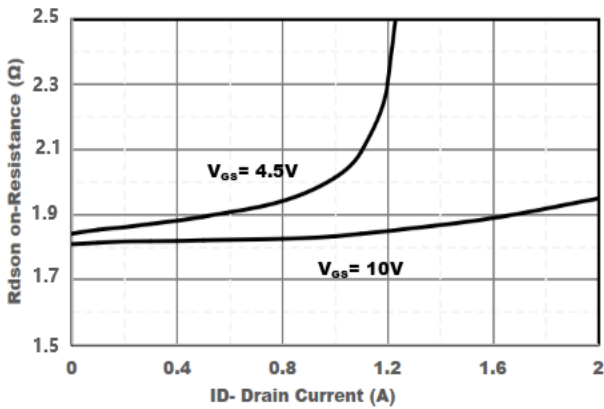


Figure5. Drain-Source on Resistance

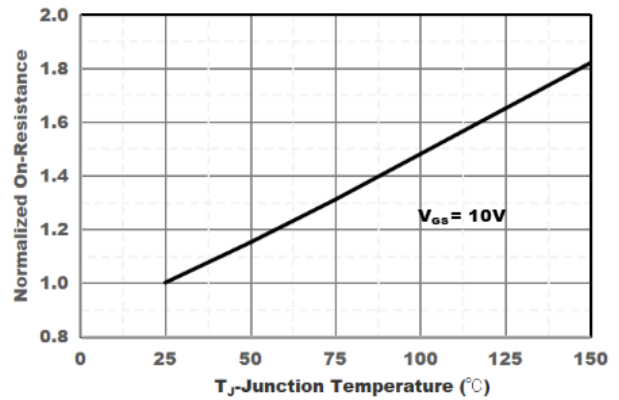


Figure6. Drain-Source on Resistance



# 2N7002KCWQ

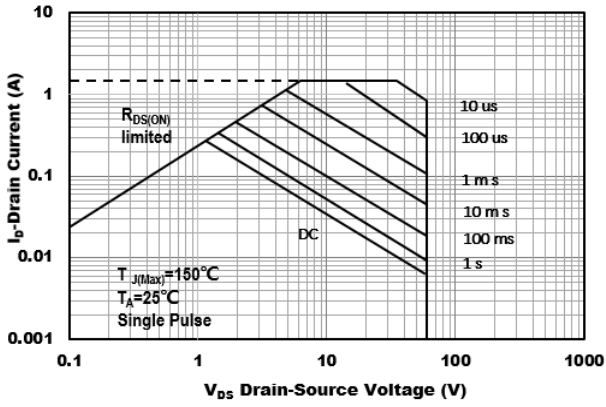


Figure7. Safe Operation Area

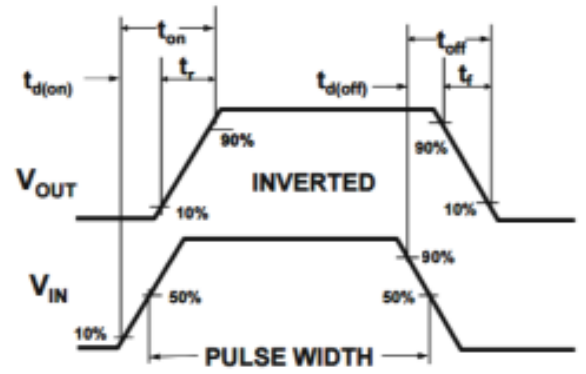
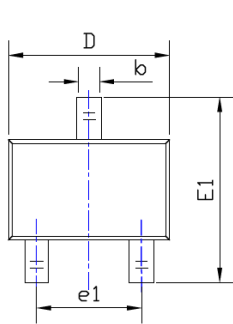


Figure8. Switching wave

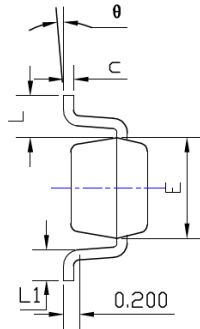


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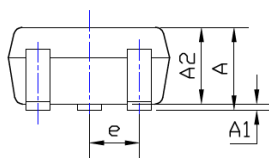
## ■ SOT-323 Package Information



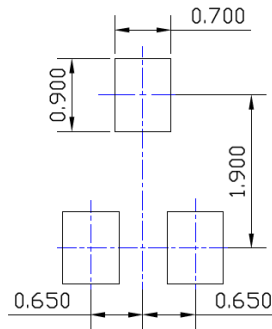
TOP VIEW



SIDE VIEW



SIDE VIEW



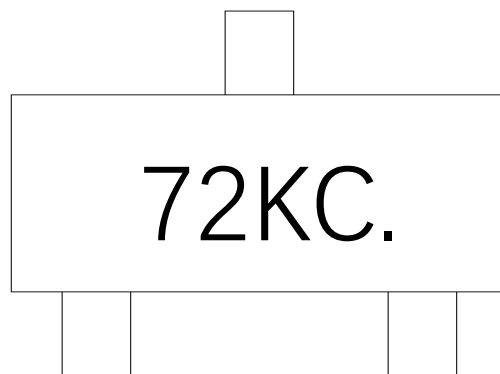
UNIT: mm

SUGGESTED SOLDER PAD LAYOUT

SYMBOL	DIMENSIONS			
	INCHES		Millimeter	
	MIN.	MAX.	MIN.	MAX.
A	0.035	0.043	0.900	1.100
A1	0.000	0.004	0.000	0.100
A2	0.035	0.039	0.900	1.000
b	0.006	0.016	0.150	0.400
c	0.004	0.010	0.100	0.250
D	0.071	0.087	1.800	2.200
E	0.045	0.053	1.150	1.350
E1	0.085	0.096	2.150	2.450
e	0.026TYP		0.650TYP	
e1	0.047	0.055	1.200	1.400
L	0.021REF		0.525REF	
L1	0.010	0.018	0.260	0.460
theta	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. 72KC is Marking Code  
 4. Body color: Black



## 2N7002KCWQ

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### Disclaimer

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