

N-Channel Enhancement Mode Field Effect Transistor

Product Summary

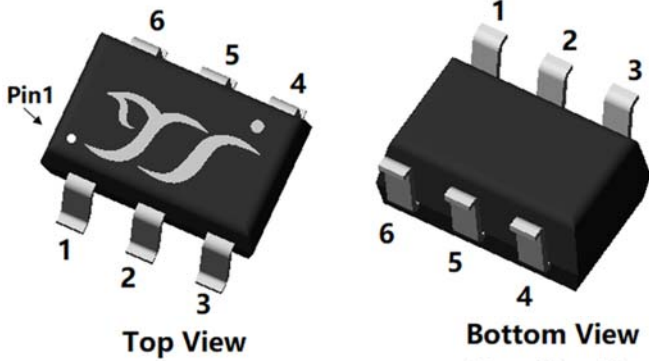
- V_{DS} 60V
- I_D 220mA
- $R_{DS(ON)}$ (at $V_{GS}=10V$) <2.5ohm
- $R_{DS(ON)}$ (at $V_{GS}=4.5V$) <3.0ohm
- ESD protected up to 2.0KV (HBM)

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

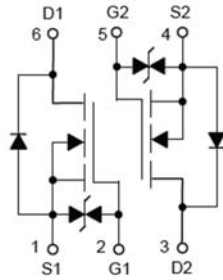
- Battery operated systems
- Solid-state relays
- Direct logic-level interface: TTL/CMOS
- 12V, 24V Automotive systems



Top View

Bottom View

SOT-363



■ 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}	± 20	V
Drain Current	I_D	220	mA
Pulsed Drain Current ^A	I_{DM}	1.3	A
Total Power Dissipation @ $T_A=25^\circ\text{C}$	P_D	250	mW
Thermal Resistance Junction-to-Ambient @ Steady State ^B	$R_{\theta JA}$	500	$^\circ\text{C}/\text{W}$
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
2N7002KDDWQ	F2	72KD	3000	30000	120000	7" reel



2N7002KDDWQ

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

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Static Parameter						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	60			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=60V, V_{GS}=0V, T_J=25^\circ\text{C}$			1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$			± 10	μA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.8	1.5	2.4	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=220mA$		1.1	2.5	Ω
		$V_{GS}=4.5V, I_D=200mA$		1.3	3	
Diode Forward Voltage	V_{SD}	$I_S=300mA, V_{GS}=0V$		0.9	1.2	V
Dynamic Parameters						
Input Capacitance	C_{iss}	$V_{DS}=25V, V_{GS}=0V, f=1MHz$		25		μF
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}	$I_{SD}=1A, di/dt=100A/\mu s$		3.9		nC
Reverse Recovery Time	t_{rr}			15		ns
Turn-on Delay Time	$t_{D(on)}$	$V_{GS}=10V, V_{DS}=30V, I_D=1A, R_g=3\Omega$		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 $R_{\theta JA}$ is measured with the device mounted on the minimum recommend pad size, in the still air environment with $T_A=25^\circ\text{C}$. The maximum allowed junction temperature of 150°C . The value in any given application depends on the user's specific board design.



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■ Typical Performance Characteristics

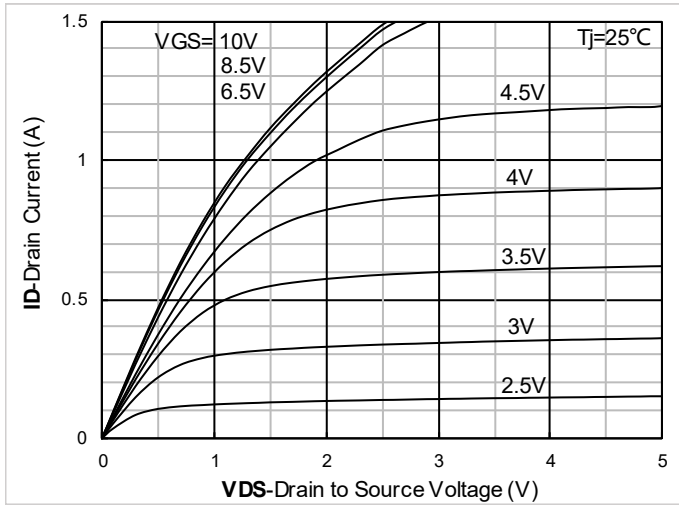


Figure1. Output Characteristics

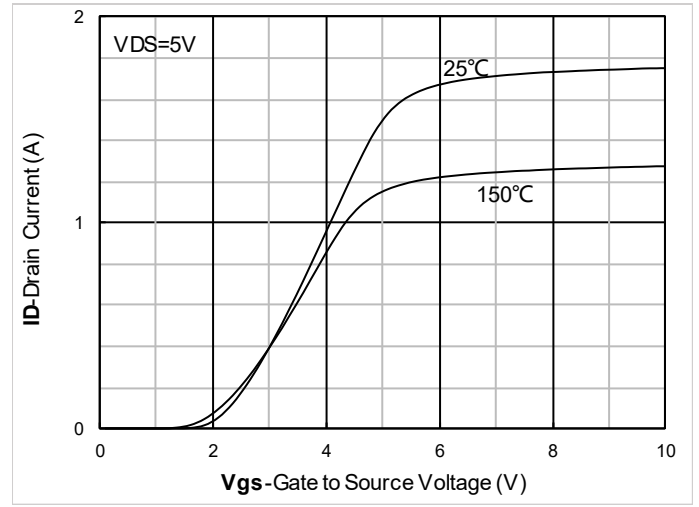


Figure2. Transfer Characteristics

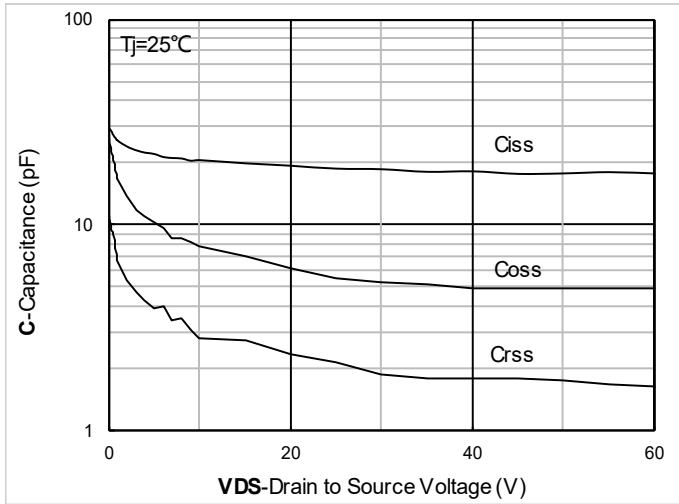


Figure3. Capacitance Characteristics

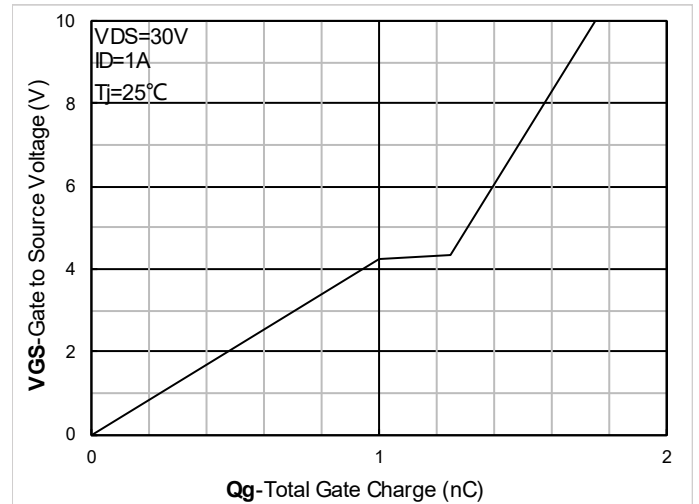


Figure4. Gate Charge

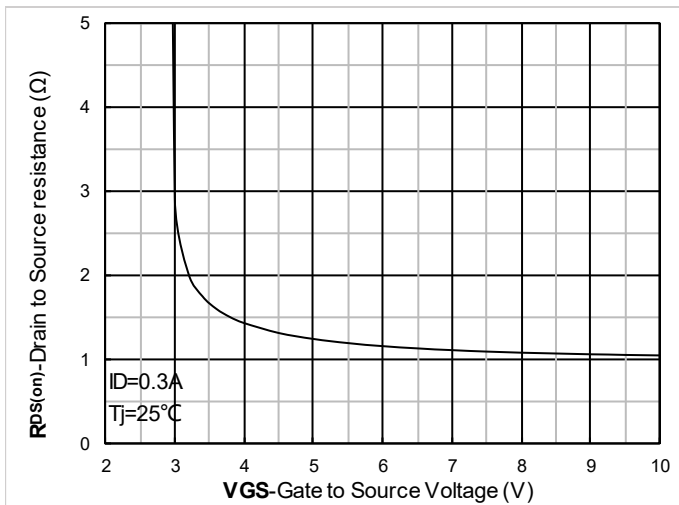


Figure5. On-Resistance vs Gate to Source Voltage

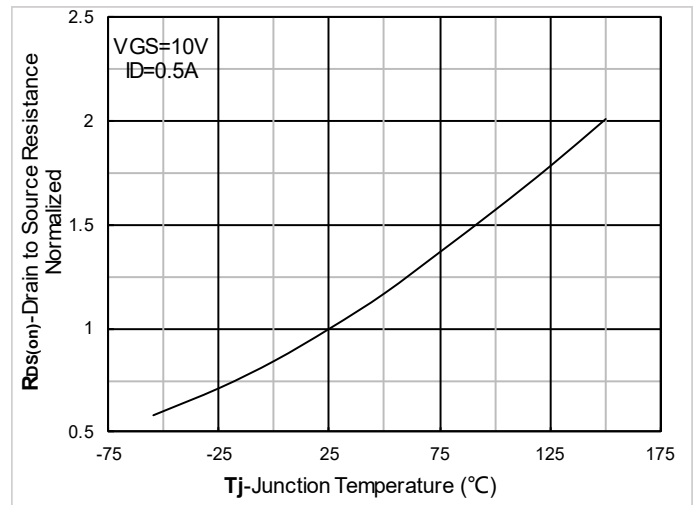


Figure6. Normalized On-Resistance



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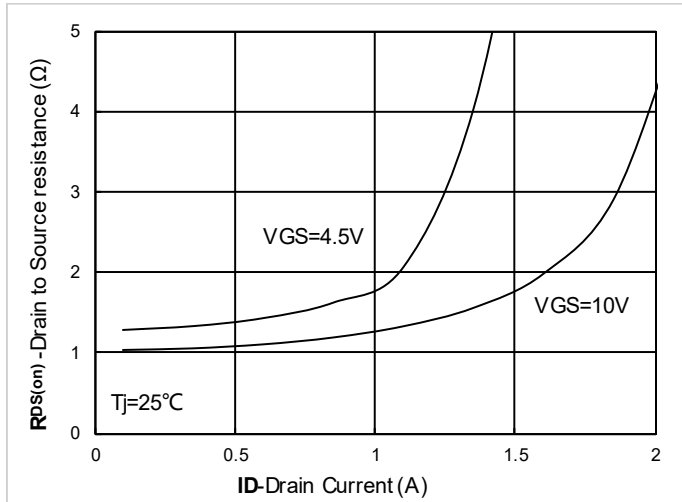


Figure 7. $R_{DS(on)}$ VS Drain Current

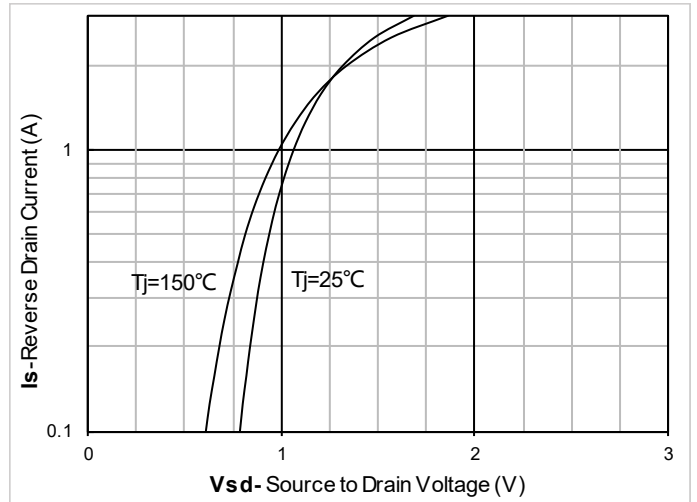


Figure 8. Forward characteristics of reverse diode

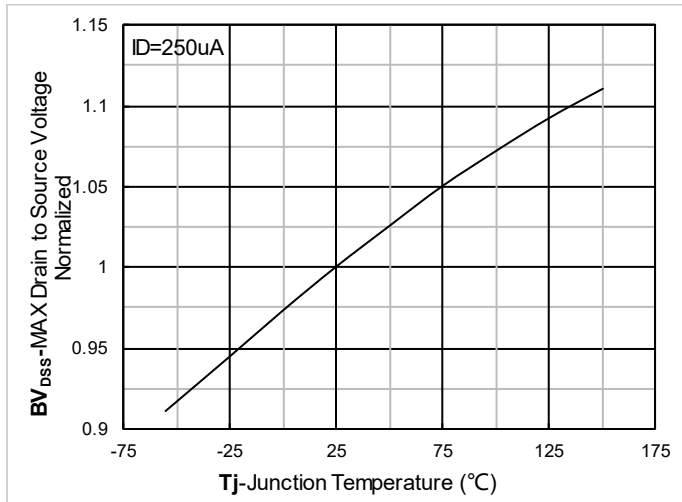


Figure 9. Normalized breakdown voltage

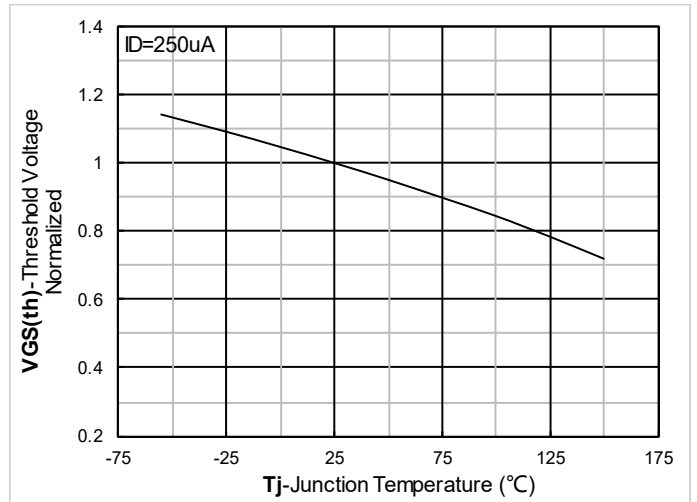


Figure 10. Normalized Threshold voltage

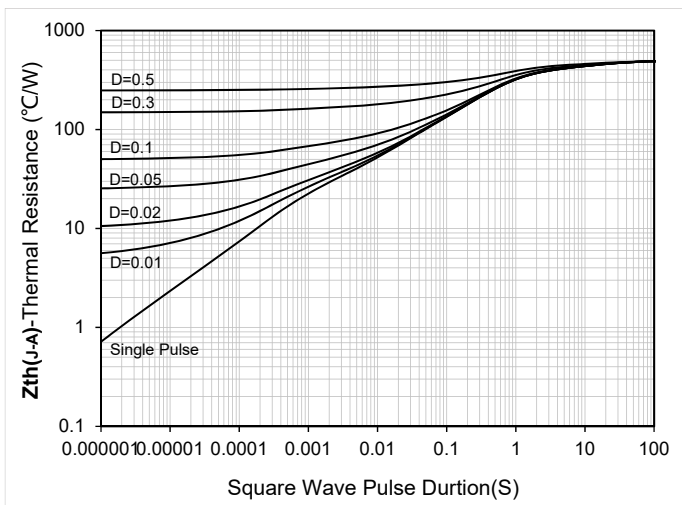


Figure 11. Maximum Transient Thermal Impedance

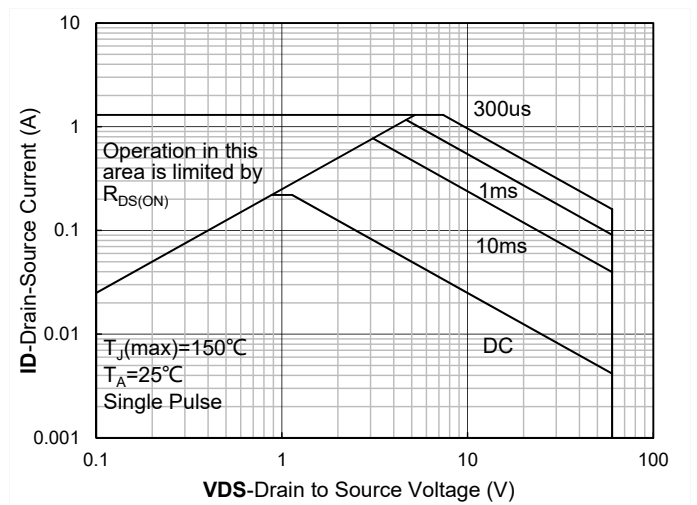


Figure 12. Safe Operation Area

■ Test Circuits & Waveforms

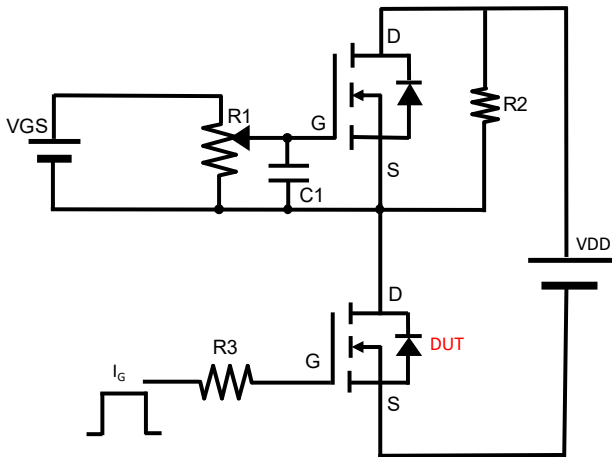


Figure A. Gate Charge Test Circuit & Waveform

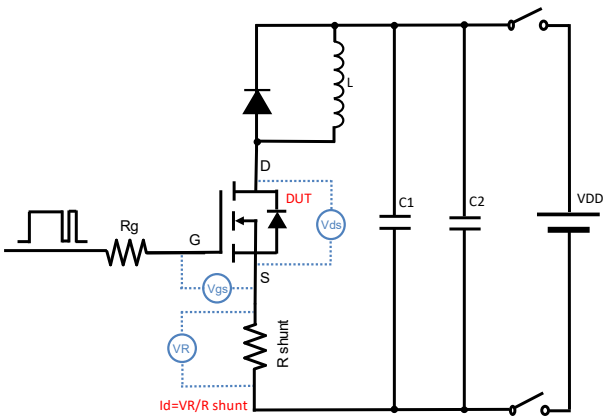


Figure B. Resistive Switching Test Circuit & Waveform

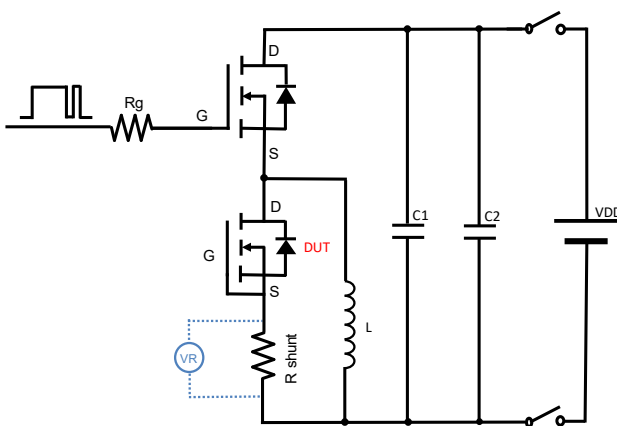
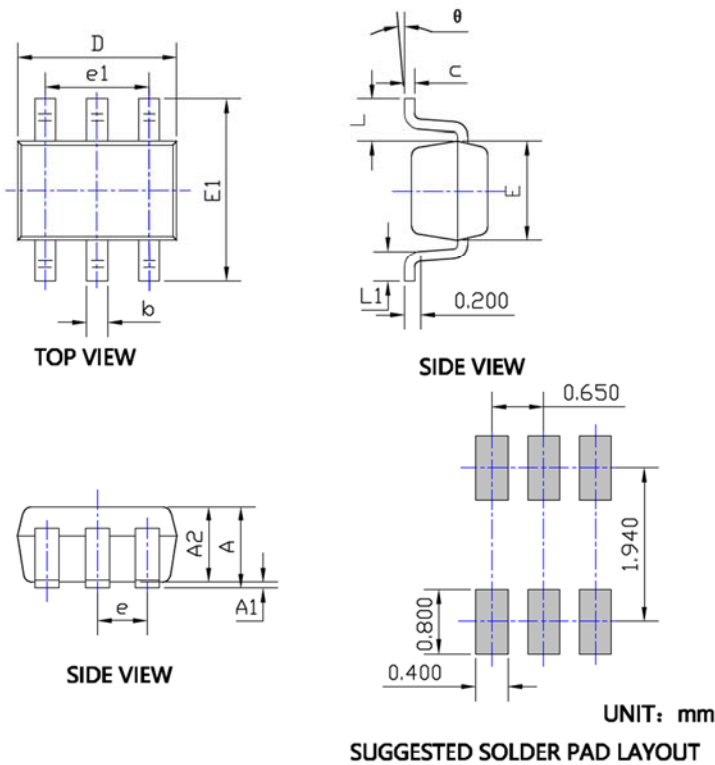


Figure C. Diode Recovery Test Circuit & Waveform



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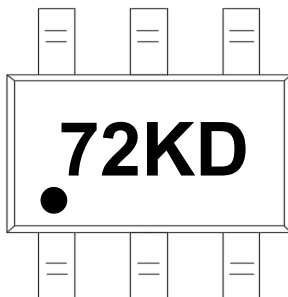
■ SOT-363 Package Outline Dimensions



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	0.014	0.150	0.350
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
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



2N7002KDDWQ

Disclaimer

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