SuperMOS – SOT363 60V BV_{DSS} 1.5Ω $R_{DS(on)}$ 0.38A I_D, N-channel MOSFET

1. Description

The 2N7002KD is N-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. Device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product 2N7002KD is Pb-free.

2. Features

- 60V, $R_{DS(ON)}$=1.5Ω(Typ), V_{GS}=10V
  $R_{DS(ON)}$=2.4Ω(Typ), V_{GS}=4.5V
- Use trench MOSFET technology
- High density cell design for low $R_{DS(on)}$
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

3. Applications

- PWM applications
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

4. Ordering Information

Part Number	Package	Marking	Material	Packing	Quantity per reel	Flammability Rating	Reel Size
2N7002KD	SOT363	72KZ	Halogen free	Tape & Reel	3,000 PCS	UL 94V-0	7 inches

Table-1 Ordering information

5. Pin Configuration and Functions

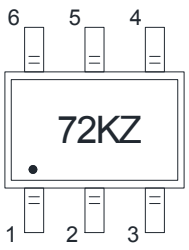
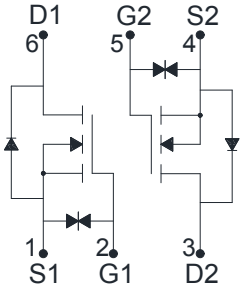
Pin	Function	Outline	Circuit Diagram
1	Source1		
2	Gate1		
6	Drain1		
4	Source2		
5	Gate2		
3	Drain2		

Table-2 Pin configuration

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6. Specification

Absolute Maximum Rating & Thermal Characteristics

Ratings at 25 ℃ ambient temperature unless otherwise specified.

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		BV_{DSS}	60	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_A=25℃	I_D	0.38	A
	T_A=100℃		0.25	
Maximum Power Dissipation		P_D	350	mW
Pulsed Drain Current [a]		I_{DM}	1.5	A
Operating Junction Temperature		T_J	150	°C
Lead Temperature		T_L	260	°C
Storage Temperature Range		T_{stg}	-55 to 150	°C

Thermal resistance ratings

Single Operation			
Parameter	Symbol	Typical	Unit
Junction-to-Ambient Thermal Resistance	$R_{\theta JA}$	300	°C/W

Note:

a: Repetitive rating, pulse width limited by junction temperature, tp=10μs, Duty Cycle=1%

Electrical Characteristics

At TA = 25℃ unless otherwise specified

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=10mA	60			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=60V, V_{GS}=0V			1.0	uA
Gate-to-source Leakage Current	I_{GSS}	V_{DS}=0V, V_{GS}=±20V			±10	uA
Forward Trans conductance	g_{fs}	V_{DS}=10V, I_D=0.1A		0.24		S
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS}=V_{DS}, I_D=250uA	1.1	1.5	2.4	V
Drain-to-source On-resistance	$R_{DS(on)}$	V_{GS}=10V, I_D=0.3A		1.5	3	Ω
		V_{GS}=4.5V, I_D=0.2A		2.4	3.7	
CHARGES, CAPACITANCES AND GATE RESISTANCE						
Input Capacitance	C_{ISS}	V_{GS}=0V, f=1MHz, V_{DS} =10V		30.5	45	pF
Output Capacitance	C_{OSS}			5.5	10	
Reverse Transfer Capacitance	C_{RSS}			4.1	8	
Total Gate Charge	$Q_{G(TOT)}$	V_{GS}=10V, V_{DS}=30V, I_D=0.2A		1.12	2	nC
Gate-to-Source Charge	Q_{GS}			0.1	0.2	
Gate-to-Drain Charge	Q_{GD}			0.23	0.5	
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{d(ON)}$	V_{GS}=10V, V_{DS}=30V, I_D=0.2A, R_G=6Ω		3	6	ns
Rise Time	t_r			5	10	
Turn-Off Delay Time	$t_{d(OFF)}$			14	27	
Fall Time	t_f			9	17	
BODY DIODE CHARACTERISTICS						
Forward Voltage	V_{SD}	V_{GS}=0V, I_S=1A			1	V

7. Typical Characteristic

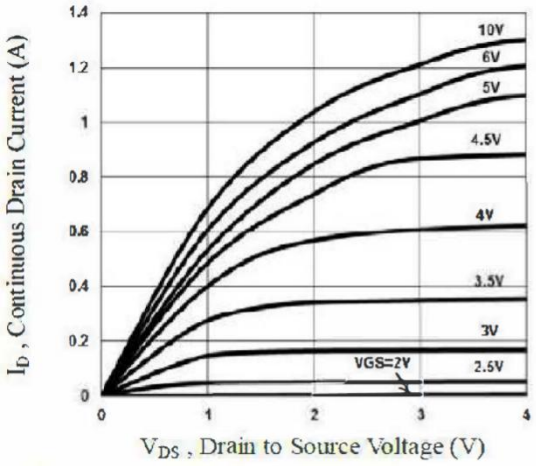


Fig.1 Output Characteristics

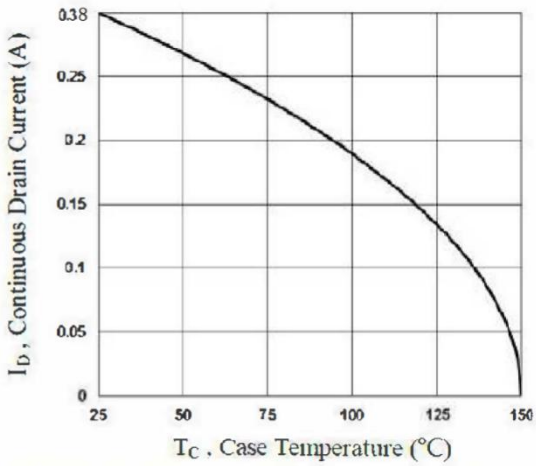


Fig.2 Continuous Drain Current vs. T_c

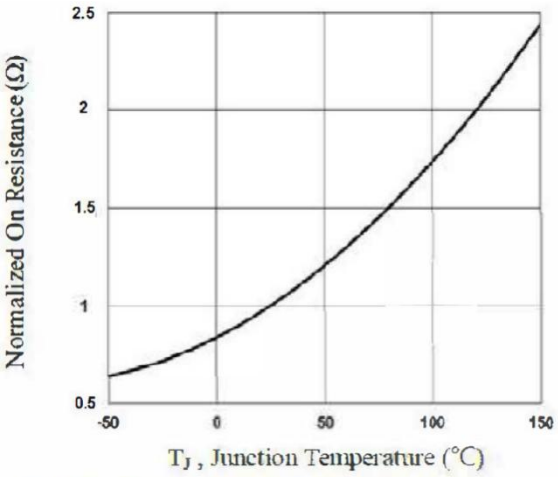


Fig.3 Normalized RDSON vs. T_J

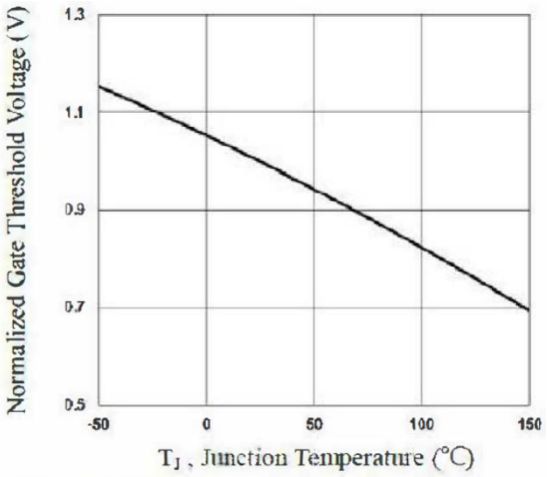


Fig.4 Normalized V_{th} vs. T_J

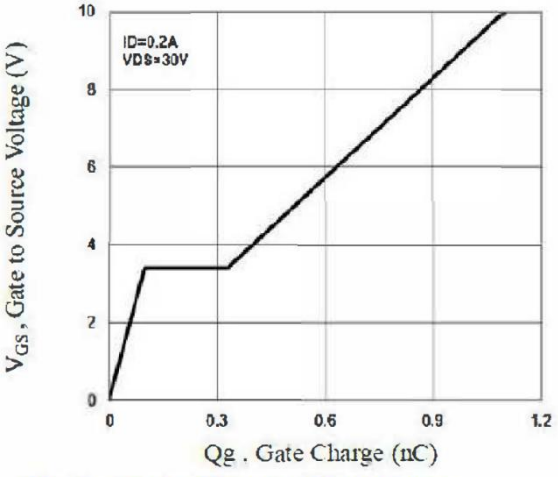


Fig.5 Gate Charge Waveform

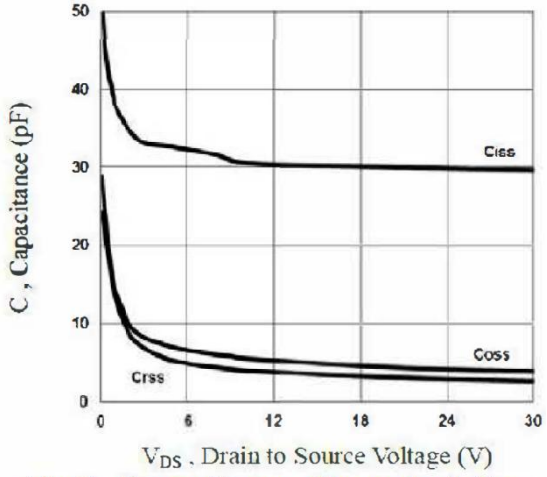


Fig.6 Capacitance Characteristics

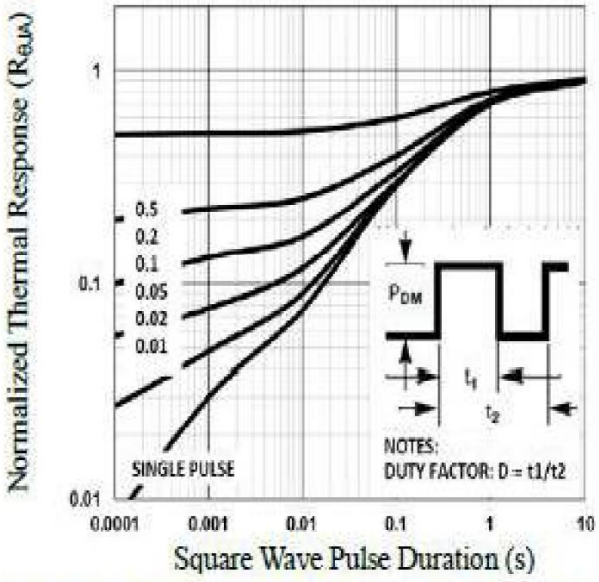


Fig.7 Normalized Transient Impedance

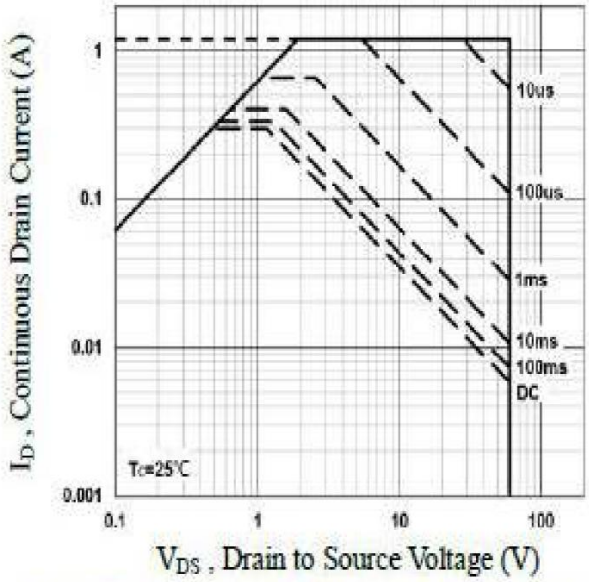
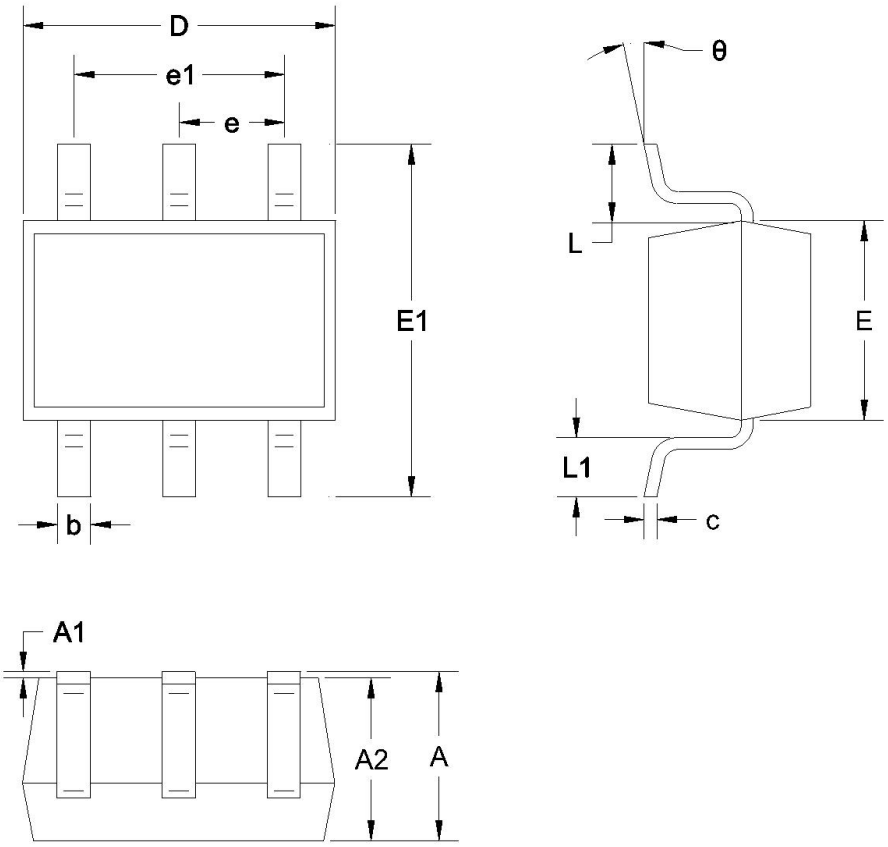


Fig.8 Maximum Safe Operation Area

8. Dimension and Patterns (SOT363)



Unit: mm

Symbol		A	A1	A2	b	c	D	θ
Spec	Min	0.900	0.000	0.900	0.150	0.080	2.000	0°
	Max	1.100	0.100	1.000	0.350	0.150	2.200	8°
Symbol		E	E1	e	e1	L	L1	-
Spec	Min	1.150	2.150	0.650 REF	1.200	0.525 REF	0.2600	-
	Max	1.350	2.450		1.400		0.4600	-

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