

SuperMOS – SOT23-3L 60V BV_{DSS}, 1.75Ω R_{DS(on)}, N-channel MOSFET

1. Description

The 2N7002K-T1-GE3-ES 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 2N7002K-T1-GE3-ES is Pb-free.

2. Features

- 60V, R_{DS(ON)}=1.75Ω(TYP.) @V_{GS}=10V
R_{DS(ON)}=2.06Ω(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
2N7002K-T1-GE3-ES	SOT23-3L	72KA	Halogen free	Tape & Reel	3,000 PCS	UL 94V-0	7 inches

Table-1 Ordering information

5. Pin Configuration and Functions

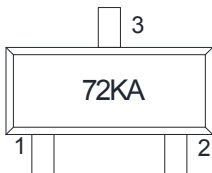
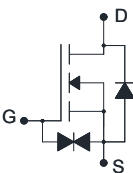
Pin	Function	Outline	Circuit Diagram
1	Gate		
2	Source		
3	Drain		

Table-2 Pin configuration

6. Specification

Absolute Maximum Rating & Thermal Characteristics

Ratings at 25 °C 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	$T_A=25^{\circ}\text{C}$	I_D	0.38	A
	$T_A=100^{\circ}\text{C}$		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, $t_p=10\mu\text{s}$, Duty Cycle=1%

Electrical Characteristics

At TA = 25°C 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	0.8	1.5	2.5	V
Drain-to-source On-resistance	R _{DS(on)}	V _{GS} =10V, I _D =0.3A		1.75	3	Ω
		V _{GS} =4.5V, I _D =0.2A		2.06	4	
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			1.5	V

7. Typical Characteristic

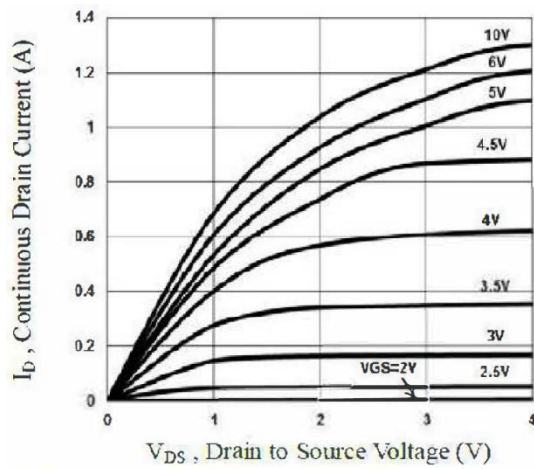


Fig.1 Output Characteristics

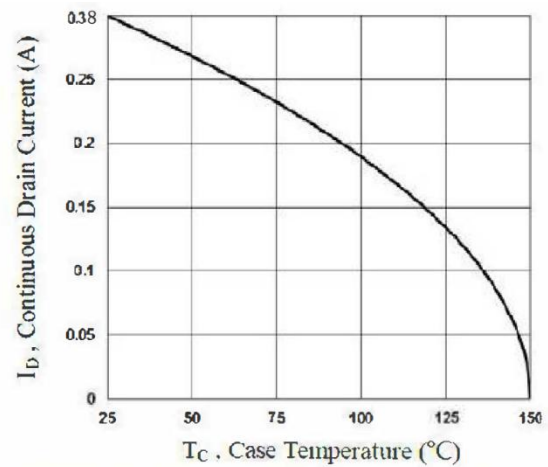


Fig.2 Continuous Drain Current vs. T_C

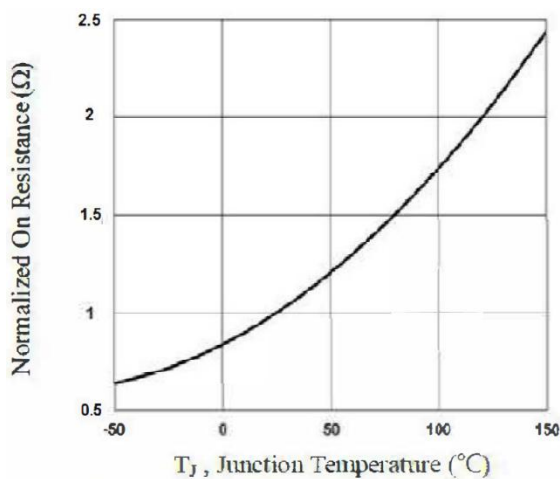


Fig.3 Normalized $R_{DS(on)}$ vs. T_J

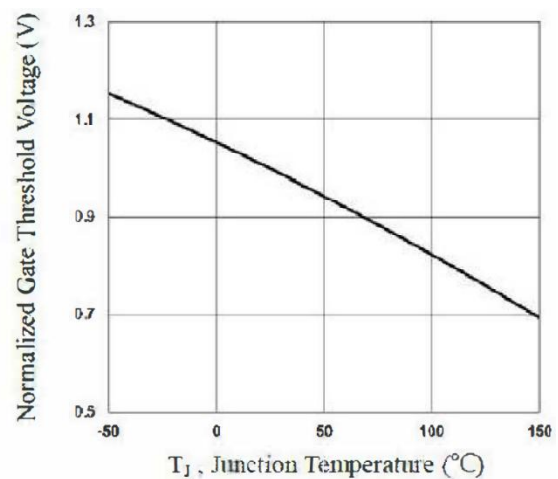


Fig.4 Normalized V_{th} vs. T_J

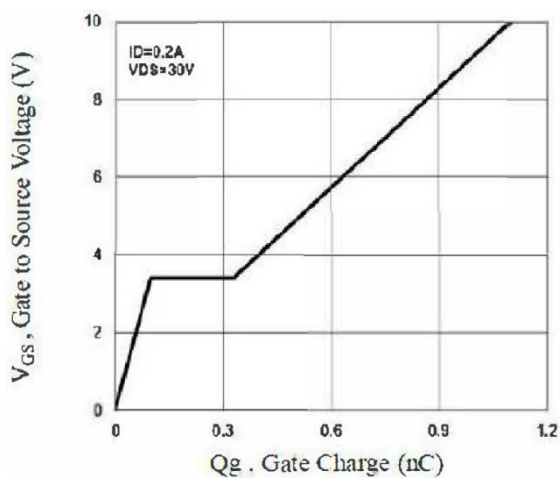


Fig.5 Gate Charge Waveform

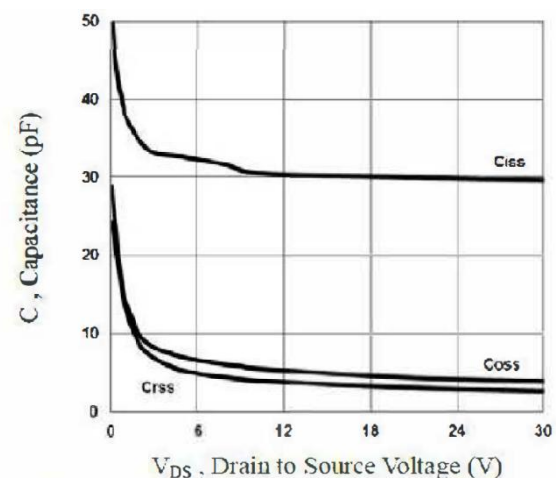


Fig.6 Capacitance Characteristics

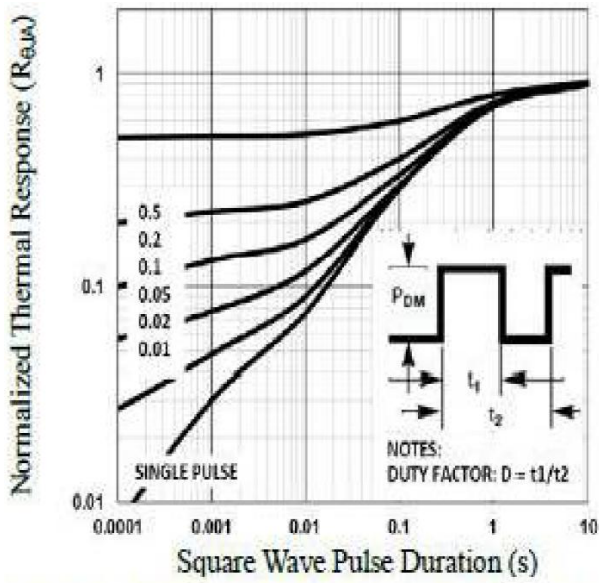


Fig.7 Normalized Transient Impedance

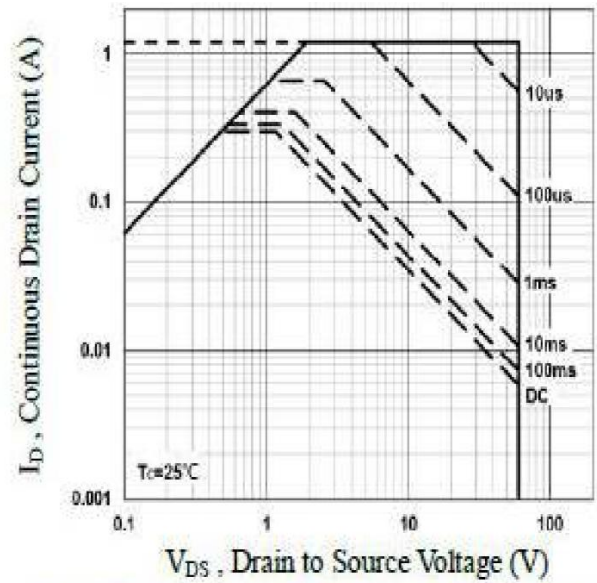
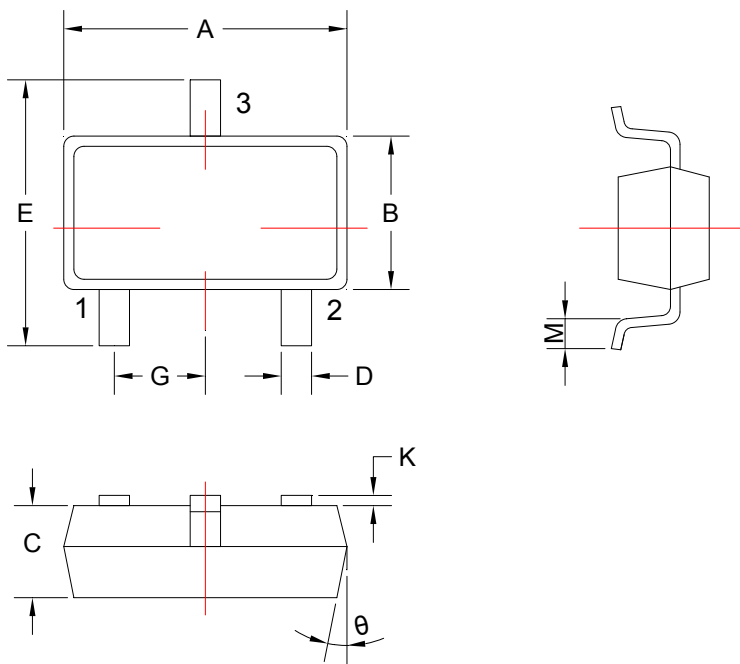


Fig.8 Maximum Safe Operation Area

8. Dimension (SOT23-3L)



COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER					
SYMBOL	MIN	MAX	SYMBOL	MIN	MAX
A	2.82	3.02	G	0.95 TYP	
B	1.50	1.70	K	0	0.10
C	1.05	1.15	M	0.20	-
D	0.30	0.50	θ	7°	11°
E	2.65	2.95			

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