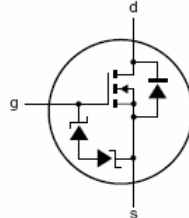


# 2N7002K

## N-Channel MOSFET

### Features

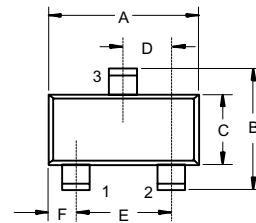
- Epoxy meets UL 94 V-0 flammability rating
- Moisture Sensitivity Level 1
- High density cell design for low  $R_{DS(ON)}$
- Voltage controlled small signal switch
- Rugged and reliable
- ESD Protected up to 2KV (HBM)
- Marking : 72K
- Halogen free available upon request by adding suffix "-HF"



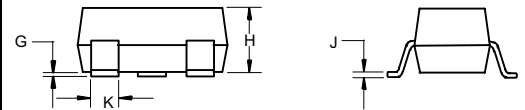
Maximum Ratings @ 25°C Unless Otherwise Specified

Symbol	Rating	Rating	Unit
$V_{DS}$	Drain-source Voltage	60	V
$V_{GS}$	Gate-source Voltage	$\pm 20$	V
$I_D$	Drain Current	340	mA
$P_D$	Total Power Dissipation	350	mW
$T_J$	Operating Junction Temperature	-55 to +150	°C
$T_{STG}$	Storage Temperature	-55 to +150	°C
$R_{thJA}$	Thermal Resistance from Junction to Ambient	357	°C/W

### SOT-23



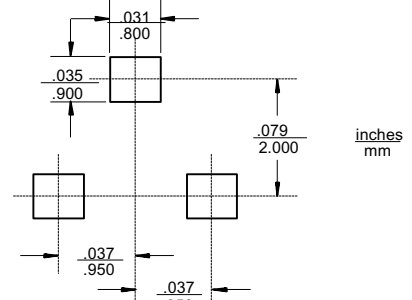
1. GATE
2. SOURCE
3. DRAIN



#### DIMENSIONS

DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	.110	.120	2.80	3.04	
B	.083	.104	2.10	2.64	
C	.047	.055	1.20	1.40	
D	.035	.041	.89	1.03	
E	.070	.081	1.78	2.05	
F	.018	.024	.45	.60	
G	.0005	.0039	.013	.100	
H	.035	.044	.89	1.12	
J	.003	.007	.085	.180	
K	.015	.020	.37	.51	

### Suggested Solder Pad Layout

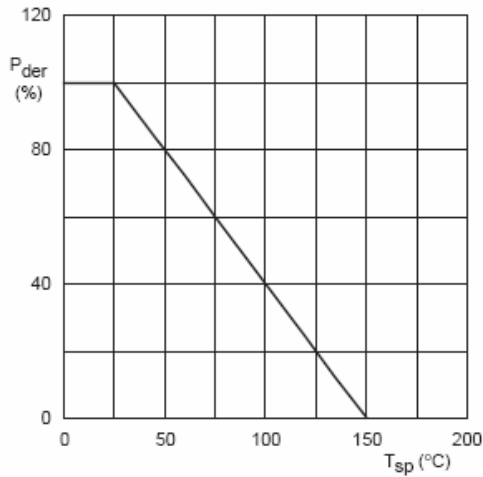


### Electrical Characteristics @ 25°C Unless Otherwise Specified

Symbol	Parameter	Min	Typ	Max	Units
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage ( $V_{GS}=0Vdc, I_D=10\mu A dc$ )	60	---	---	Vdc
$V_{GS(th)}$	Gate-Threshold Voltage ( $V_{DS}=V_{GS}, I_D=1mA dc$ )	1.0	---	---	Vdc
$I_{GSS}$	Gate-body Leakage ( $V_{DS}=0Vdc, V_{GS}=\pm 10Vdc$ ) ( $V_{DS}=0Vdc, V_{GS}=\pm 5Vdc$ )	---	---	$\pm 200$ $\pm 100$	nA dc nA dc
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS}=48Vdc, V_{GS}=0Vdc$ )	---	---	1	$\mu A dc$
$r_{DS(on)}$	Drain-Source On-Resistance ( $V_{GS}=4.5Vdc, I_D=200mA dc$ ) ( $V_{GS}=10Vdc, I_D=500mA dc$ )	---	---	5.3 5.0	$\Omega$
$V_{SD}$	Diode Forward Voltage ( $V_{GS}=0Vdc, I_S=300mA dc$ )	---	---	1.5	Vdc
$Q_r$	Recovered charge ( $V_{GS}=0V, I_S=300mA, V_R=25V,$ ) ( $di_s/dt=-100A/\mu S$ )	---	30	---	nC
$C_{iss}$	Input Capacitance	---	---	40	pF
$C_{oss}$	Output Capacitance	---	---	30	
$C_{rss}$	Reverse Transfer Capacitance	---	---	10	

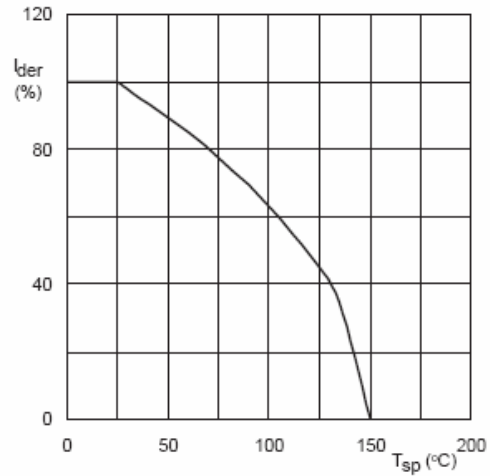
### Switching

$t_{d(on)}$	Turn-on Time	$V_{DD}=50V, R_L=250\Omega,$ $R_{GS}=50\Omega, V_{GS}=10V,$ $R_G=50\Omega$	---	---	10	ns
$t_{d(off)}$	Turn-off Time		---	---	15	
$t_{rr}$	Reverse recovery time	$V_{GS}=0V, I_S=300mA,$ $V_R=25V,$ $di_s/dt=-100A/\mu S$	---	30	---	



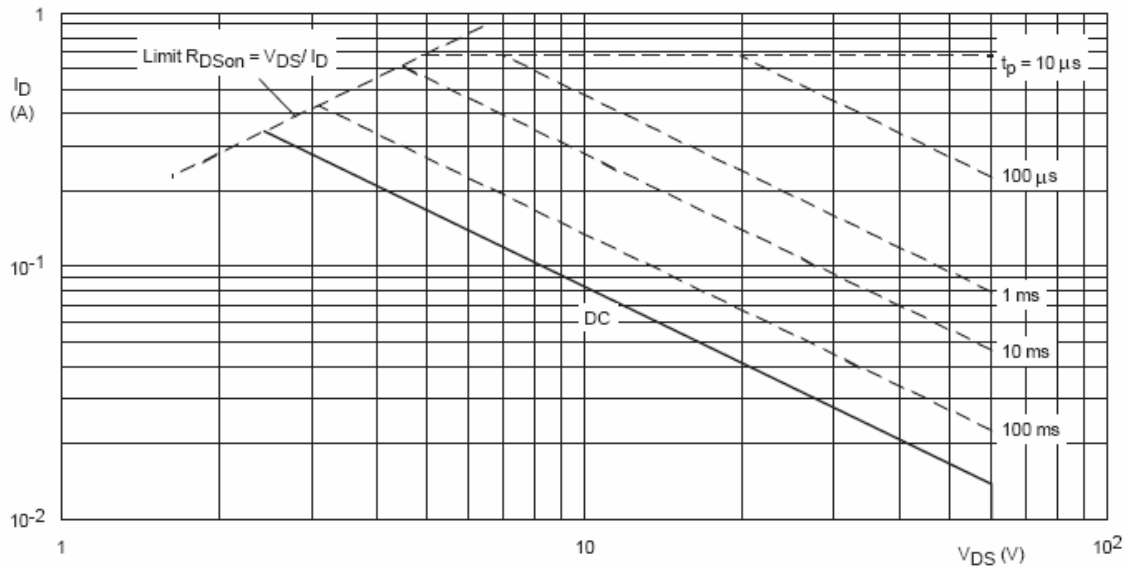
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

Fig 1. Normalized total power dissipation as a function of solder point temperature.



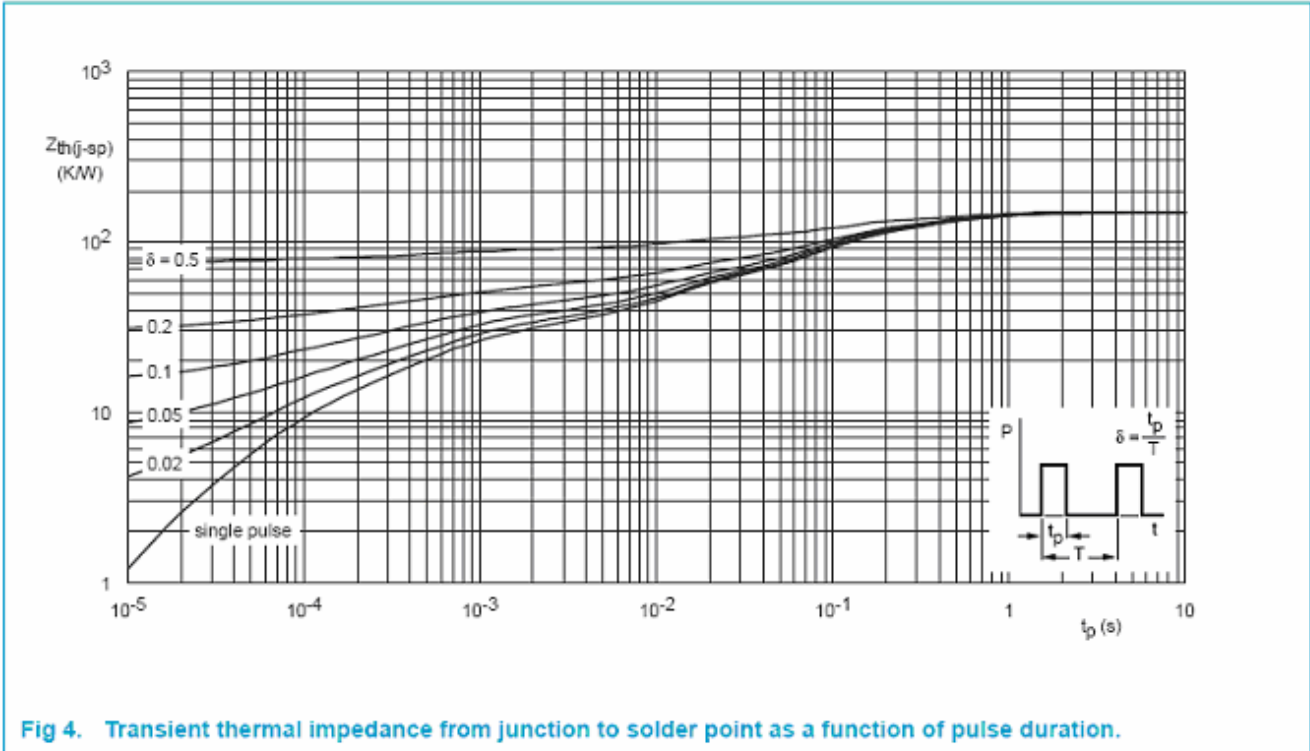
$$I_{der} = \frac{I_D}{I_{D(25^{\circ}C)}} \times 100\%$$

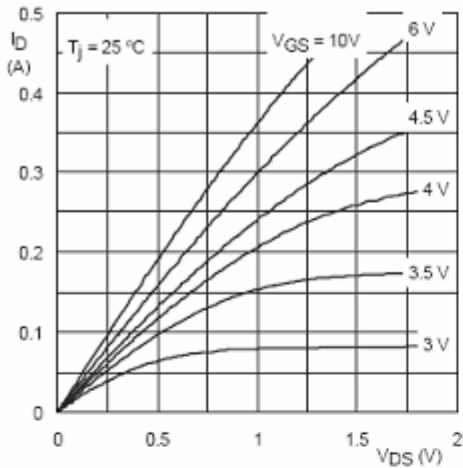
Fig 2. Normalized continuous drain current as a function of solder point temperature.



T<sub>sp</sub> = 25 °C; I<sub>DM</sub> is single pulse; V<sub>GS</sub> = 10 V

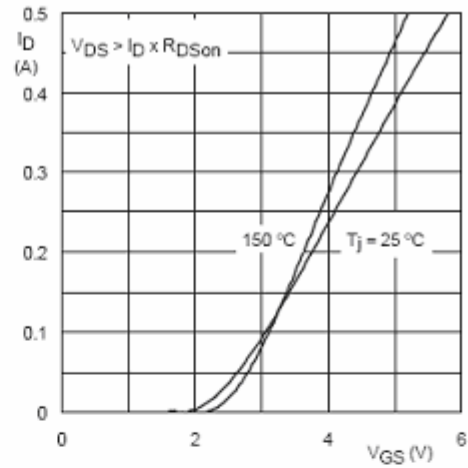
Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage.





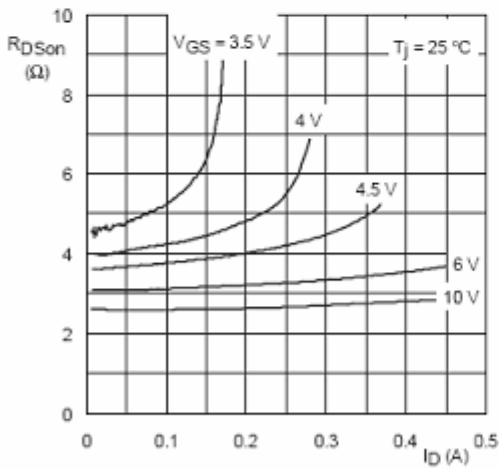
$T_j = 25\text{ }^\circ\text{C}$

Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values.



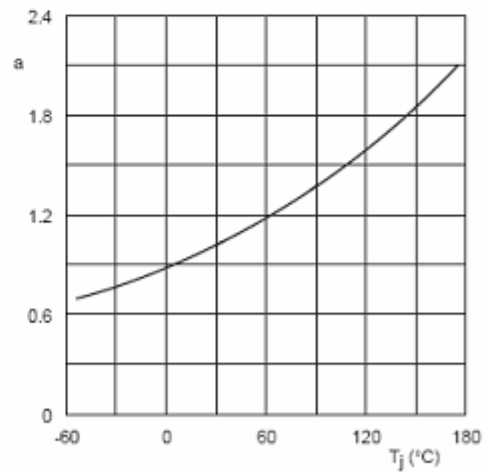
$T_j = 25\text{ }^\circ\text{C}$  and  $150\text{ }^\circ\text{C}$ ;  $V_{DS} > I_D \times R_{DSon}$

Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values.



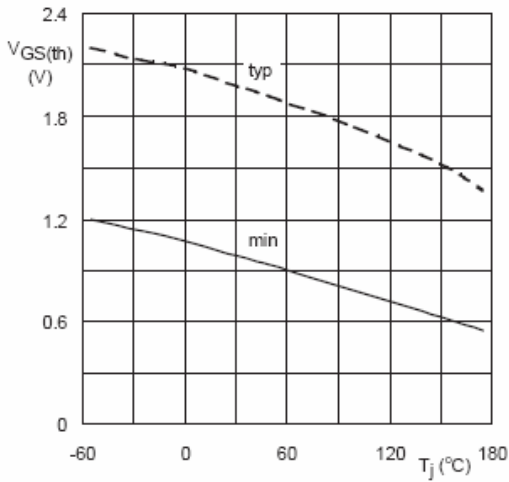
$T_j = 25\text{ }^\circ\text{C}$

Fig 7. Drain-source on-state resistance as a function of drain current; typical values.



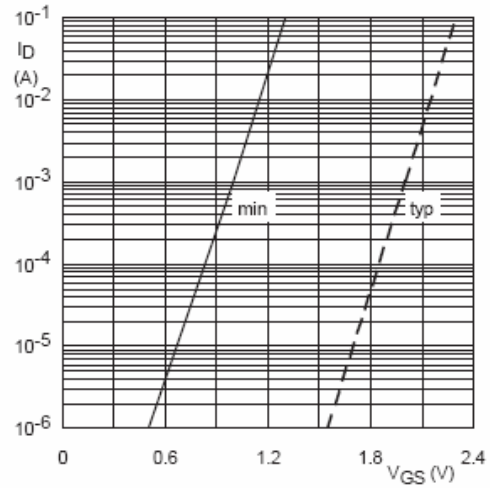
$$a = \frac{R_{DSon}}{R_{DSon(25^\circ\text{C})}}$$

Fig 8. Normalized drain-source on-state resistance factor as a function of junction temperature.



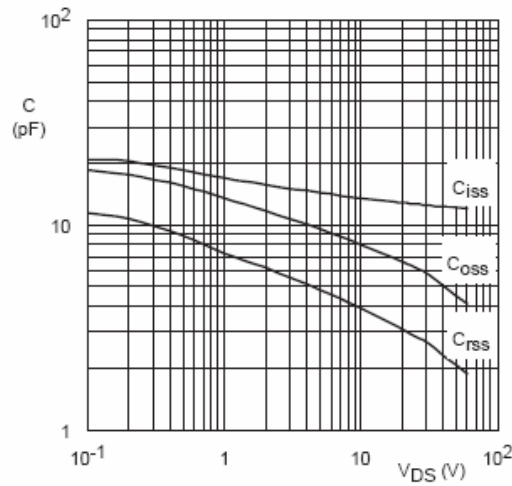
$I_D = 1 \text{ mA}; V_{DS} = V_{GS}$

Fig 9. Gate-source threshold voltage as a function of junction temperature.



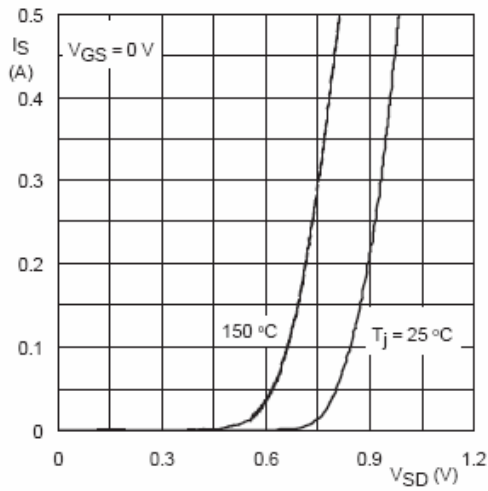
$T_j = 25 \text{ }^\circ\text{C}; V_{DS} = 5 \text{ V}$

Fig 10. Sub-threshold drain current as a function of gate-source voltage.



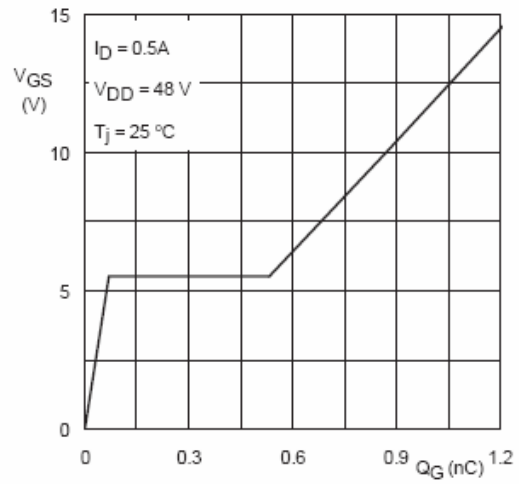
$V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$

Fig 11. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values.



$T_j = 25^\circ\text{C}$  and  $150^\circ\text{C}$ ;  $V_{GS} = 0$  V

Fig 12. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values.



$I_D = 0.5$  A;  $V_{DD} = 48$  V

Fig 13. Gate-source voltage as a function of gate charge; typical values.



Micro Commercial Components

### Ordering Information :

Device	Packing
Part Number-TP	Tape&Reel: 3Kpcs/Reel

Note : Adding "-HF" suffix for halogen free, eg. Part Number-TP-HF

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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А