

TO-92 Plastic-Encapsulate MOSFETS

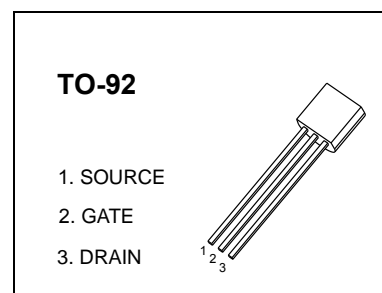
N-channel MOSFET

Application:

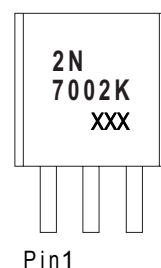
- Load Switch for Portable Devices
- DC/DC Converter

Features:

- High density cell design for Low $R_{DS(on)}$
- Voltage controlled small signal switch
- Rugged and reliable
- High saturation current capability
- ESD protected



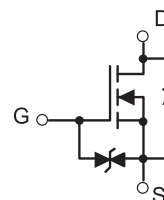
MARKING



2N7002K= Device code

$V_{(BR)DSS}$	$R_{DS(on)MAX}$	I_D
60V	2.5Ω@10V	340mA
	3Ω@4.5V	

Equivalent circuit



ORDERING INFORMATION

Part Number	Package	Packing Method	Pack Quantity
2N7002K	TO-92	Bulk	1000pcs/Bag
2N7002K-TA	TO-92	Tape	2000pcs/Box

MOSFET MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source voltage	60	V
V_{GS}	Gate-Source voltage	±20	V
I_D	Drain Current	340	mA
P_D	Power Dissipation	0.625	W
T_J, T_{stg}	Operation Junction and Storage Temperature Range	-55~+150	°C
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	200	°C/W

MOSFET ELECTRICAL CHARACTERISTICS

T_a=25 °C unless otherwise specified

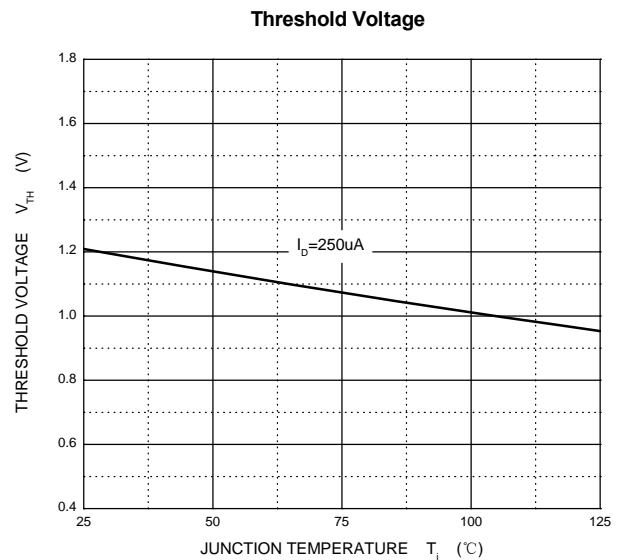
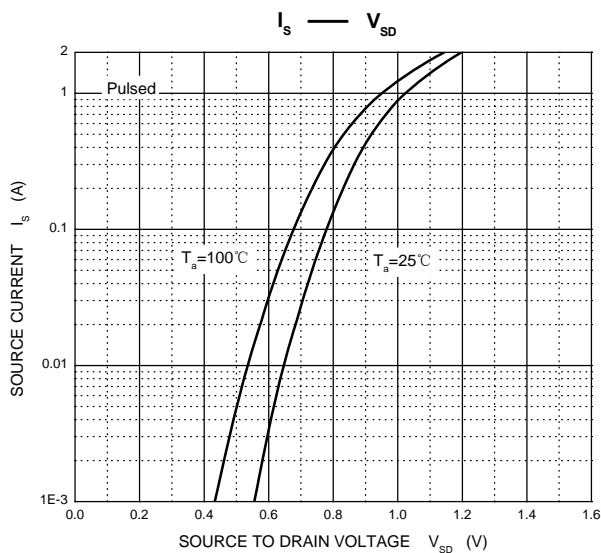
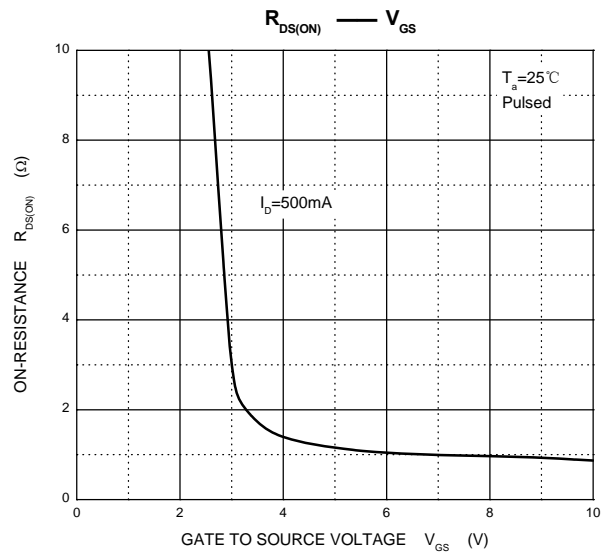
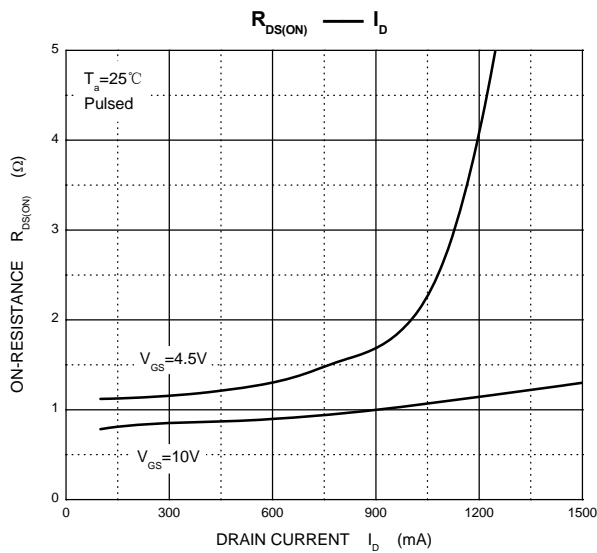
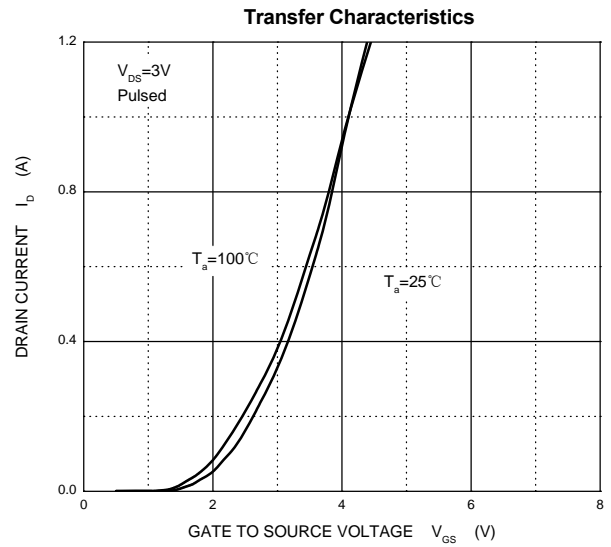
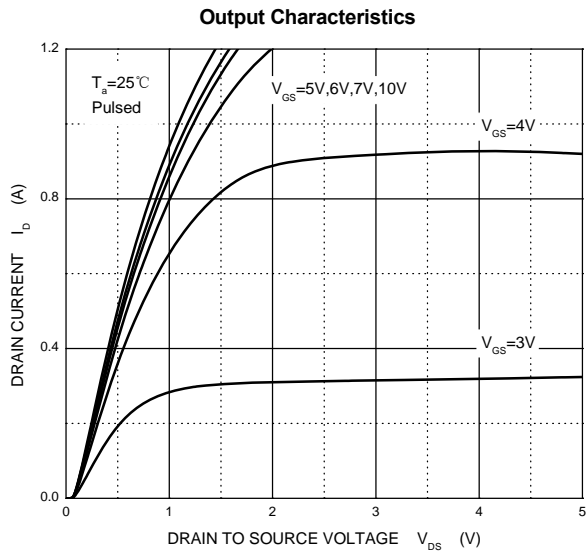
Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Static Characteristics						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0V, I _D = 250μA	60			V
Gate Threshold Voltage*	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 1mA	1	1.3	2.5	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 48V, V _{GS} = 0V			1	μA
Gate –Source leakage current	I _{GSS1}	V _{GS} = ±20V, V _{DS} = 0V			±10	μA
	I _{GSS2}	V _{GS} = ±10V, V _{DS} = 0V			±200	nA
	I _{GSS3}	V _{GS} = ±5V, V _{DS} = 0V			±100	nA
Drain-Source On-Resistance*	R _{DS(on)}	V _{GS} = 4.5V, I _D = 200mA		1.1	3	Ω
		V _{GS} = 10V, I _D = 500mA		0.9	2.5	Ω
Diode Forward Voltage	V _{SD}	V _{GS} = 0V, I _S = 300mA			1.5	V
Recovered charge	Q _r	V _{GS} = 0V, I _S = 300mA, V _R = 25V, dI _S /dt = -100A/μS		30		nC
Dynamic Characteristics**						
Input Capacitance	C _{iss}	V _{DS} = 10V, V _{GS} = 0V, f = 1MHz			40	pF
Output Capacitance	C _{oss}				30	pF
Reverse Transfer Capacitance	C _{rss}				10	pF
Switching Characteristics**						
Turn-On Delay Time	t _{d(on)}	V _{GS} = 10V, V _{DD} = 50V, R _G = 50Ω, R _S = 50Ω, R _L = 250Ω			10	ns
Turn-Off Delay Time	t _{d(off)}				15	ns
Reverse recovery Time	t _{rr}	V _{GS} = 0V, I _S = 300mA, V _R = 25V, dI _S /dt = -100A/μS		30		ns
GATE-SOURCE ZENER DIODE						
Gate-Source Breakdown Voltage	BV _{GSO}	I _{GS} = ±1mA (Open Drain)	±21.5		±30	V

Notes :

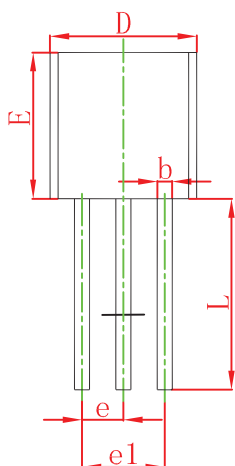
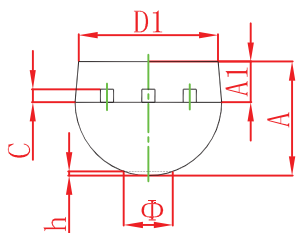
*Pulse Test : Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.

**These parameters have no way to verify.

Typical Characteristics

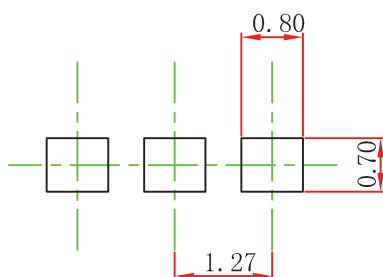


TO-92 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.300	4.700	0.169	0.185
D1	3.430		0.135	
E	4.300	4.700	0.169	0.185
e	1.270 TYP		0.050 TYP	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571
Φ		1.600		0.063
h	0.000	0.380	0.000	0.015

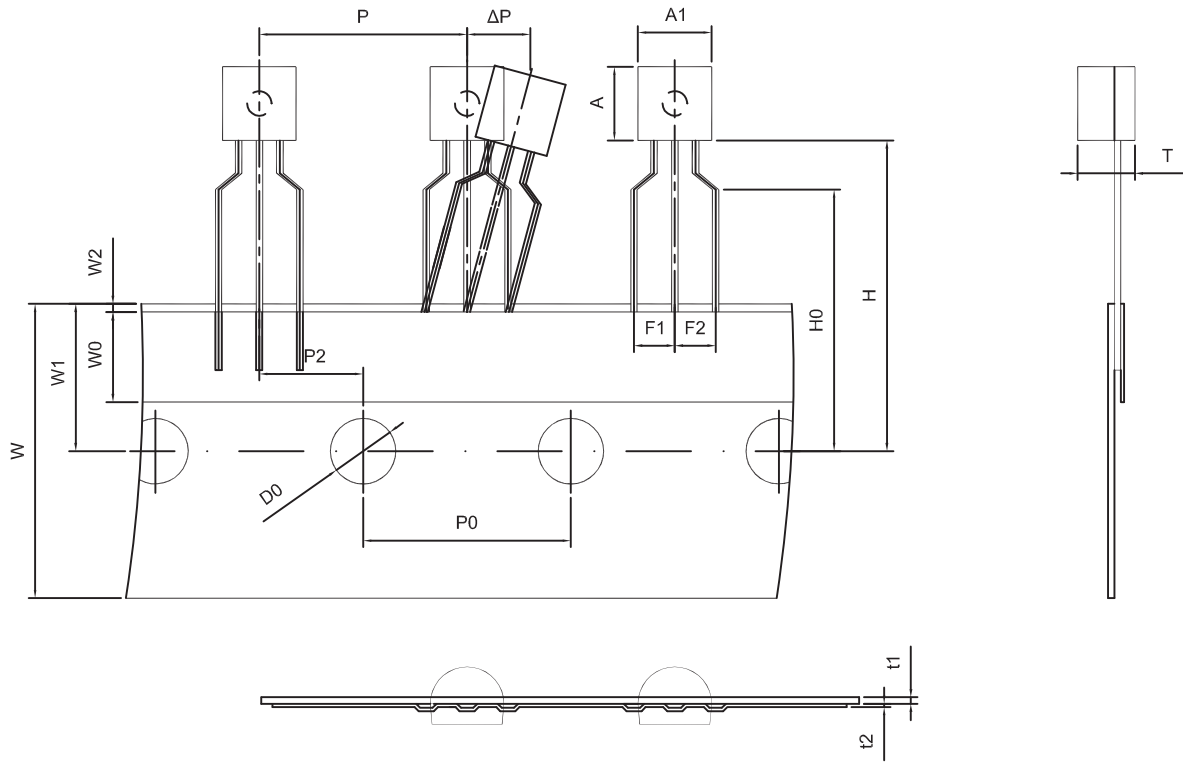
TO-92 Suggested Pad Layout



Note:

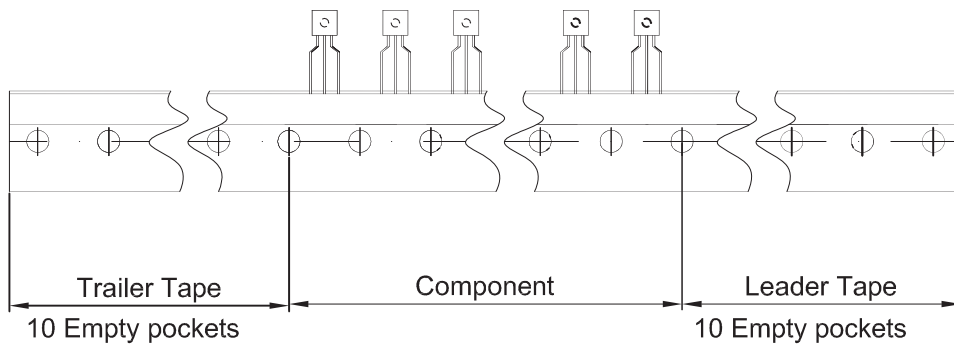
1. Controlling dimension: in millimeters.
2. General tolerance: $\pm 0.05\text{mm}$.
3. The pad layout is for reference purposes only.

TO-92 Tape and Reel



Dimensions are in millimeter

A1	A	T	P	P0	P2	F1	F2	W
4.5	4.5	3.5	12.7	12.7	6.35	2.5	2.5	18.0
W0	W1	W2	H	H0	D0	t1	t2	ΔP
6.0	9.0	1.0 MAX.	19.0	16.0	4.0	0.4	0.2	0



Package	Box	Box Size(mm)	Carton	Carton Size(mm)
TO-92	2000 pcs	333×162×43	20,000 pcs	350×340×250