CHENMKO ENTERPRISE CO.,LTD

SURFACE MOUNT

N-Channel Enhancement Mode Field Effect Transistor

VOLTAGE 60 Volts CURRENT 0.250 Ampere

2N7002PT

Lead free devices

APPLICATION

* Servo motor control.
* Power MOSFET gate drivers.
* Other switching applications.

FEATURE

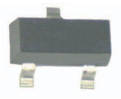
* Small surface mounting type. (SOT-23)
* High density cell design for low $R_{DS(ON)}$.
* Suitable for high packing density.
* Rugged and reliable.
* High saturation current capability.
* Voltage controlled small signal switch.

CONSTRUCTION

* N-Channel Enhancement

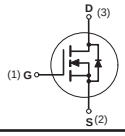
MARKING

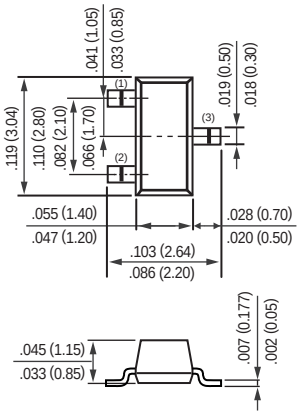
* 7002



SOT-23

CIRCUIT





Dimensions in inches and (millimeters)

SOT-23

Absolute Maximum Ratings

T_A = 25°C unless otherwise noted

Symbol	Parameter		2N7002PT	Units
V_{DSS}	Drain-Source Voltage		60	V
V_{DGR}	Drain-Gate Voltage (R_{GS} ≤ 1 MΩ)		60	V
V_{GSS}	Gate-Source Voltage - Continuous		±20	V
	- Non Repetitive (tp < 50µs)		±40	
I_D	Maximum Drain Current - Continuous	T_A= 25°C	250	mA
	- Pulsed	T_A= 70°C	190	
P_D	Maximum Power Dissipation	T_A= 25°C	350	mW
		T_A= 70°C	220	mW
T_J,T_{STG}	Operating and Storage Temperature Range		-55 to 150	°C
T_L	Maximum Lead Temperature for Soldering Purposes, 1/16" from Case for 10 Seconds		300	°C

Thermal characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	357	°C/W

2002-7

RATING CHARACTERISTIC CURVES (2N7002PT)

Electrical Characteristics T_A = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 10 µA	60	70		V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 60 V, V_{GS} = 0 V			1	µA
		T_C=125°C			0.5	mA
I_{GSSF}	Gate - Body Leakage, Forward	V_{GS} = 15 V, V_{DS} = 0 V			10	nA
I_{GSSR}	Gate - Body Leakage, Reverse	V_{GS} = -15 V, V_{DS} = 0 V			-10	nA
ON CHARACTERISTICS (Note 1)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	1	2.0	2.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 250 mA		1.7	3.0	Ω
		V_{GS} = 4.0 V, I_D = 100 mA		2.5	4.0	
$V_{DS(ON)}$	Drain-Source On-Voltage	V_{GS} = 10 V, I_D = 500mA		0.6	3.75	V
		V_{GS} = 5.0 V, I_D = 50 mA		0.09	1.5	
$I_{D(ON)}$	On-State Drain Current	V_{GS} = 10 V, V_{DS} = 7.5$V_{DS(on)}$	800	1800		mA
		V_{GS} = 4.5V, V_{DS} = 10$V_{DS(on)}$	500	700		
g_{FS}	Forward Transconductance	V_{DS} = 15 $V_{DS(on)}$, I_D = 200 mA		250		mS
DYNAMIC CHARACTERISTICS						
Q_g	Total Gate Charge	V_{DS} = 30 V, V_{GS} = 10 V, I_D= 250 mA		0.6	1.0	nC
Q_{gs}	Gate-Source Charge			0.06	25	
Q_{gd}	Gate-Drain Charge			0.06	5	
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz		25	50	pF
C_{oss}	Output Capacitance			6	25	
C_{rss}	Reverse Transfer Capacitance			1.2	5	
t_{on}	Turn-On Time	V_{DD} = 30 V, R_L = 200 Ω, I_D = 100 mA, V_{GS} = 10 V, R_{GEN} = 10 Ω		7.5	20	nS
t_r				6		
t_{off}	Turn-Off Time	V_{DD} = 30 V, R_L = 200 Ω, I_D = 100 mA, V_{GS} = 10 V, R_{GEN} = 10 Ω		7.5	20	nS
t_f				3		
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
I_S	Maximum Continuous Drain-Source Diode Forward Current				115	mA
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current				0.8	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 200 mA (Note 1)		0.85	1.2	V

Note:
1. Pulse Test: Pulse Width < 300µs, Duty Cycle < 2.0%.

RATING CHARACTERISTIC CURVES (2N7002PT)

Typical Electrical Characteristics

Figure 1. On-Region Characteristics

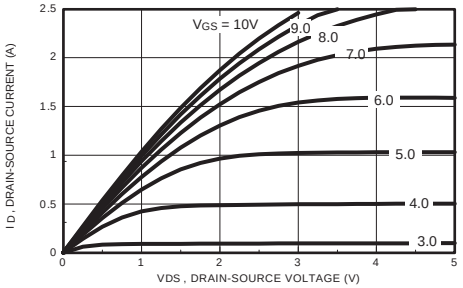


Figure 2. On-Resistance Variation with Gate Voltage and Drain Current

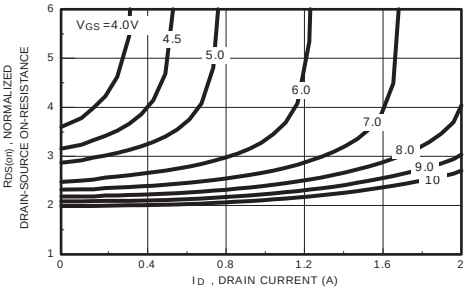


Figure 3. On-Resistance Variation with Temperature

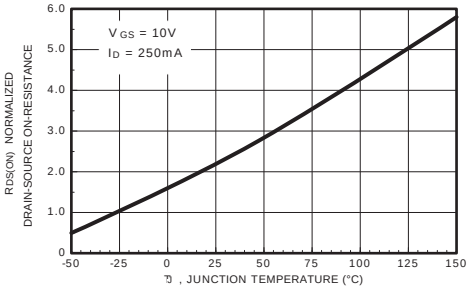


Figure 4. On-Resistance Variation with Drain Current and Temperature

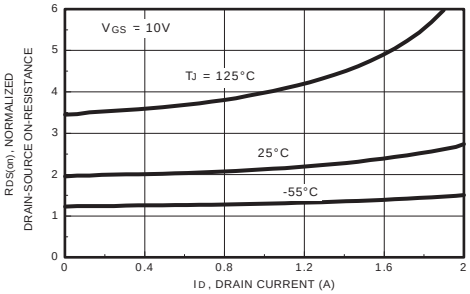


Figure 5. Transfer Characteristics

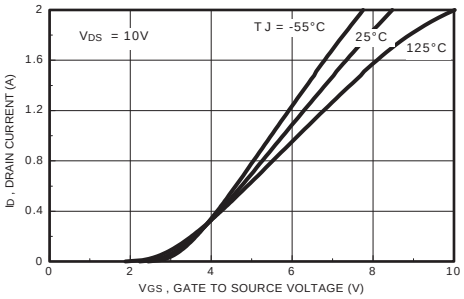
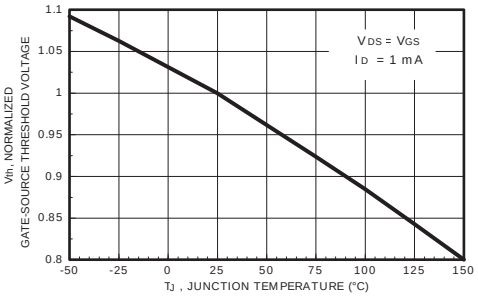


Figure 6. Gate Threshold Variation with Temperature



RATING CHARACTERISTIC CURVES (2N7002PT)

Typical Electrical Characteristics (continued)

Figure 7. Breakdown Voltage Variation with Temperature

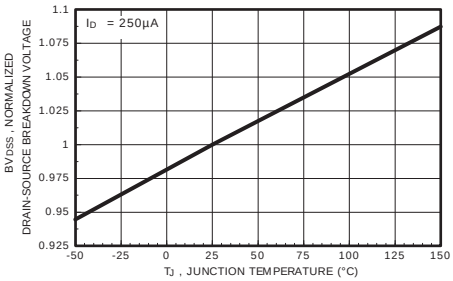


Figure 8. Body Diode Forward Voltage Variation with Drain Current

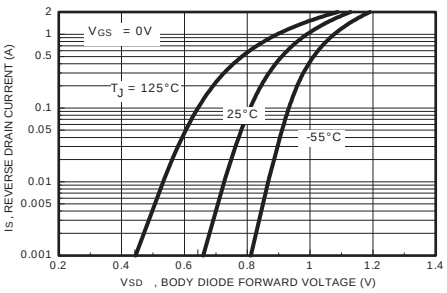


Figure 9. Capacitance Characteristics

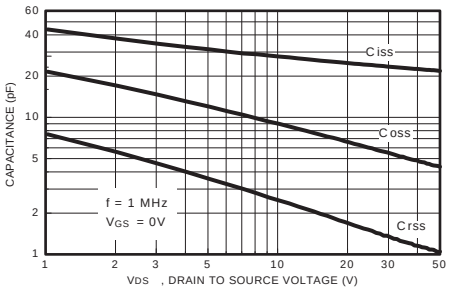


Figure 10. Gate Charge Characteristics

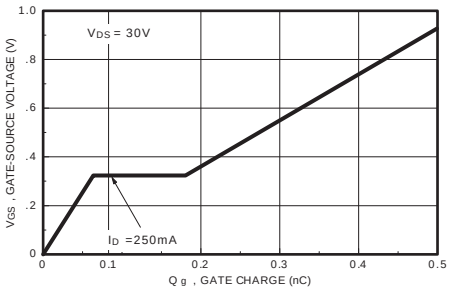


Figure 11.

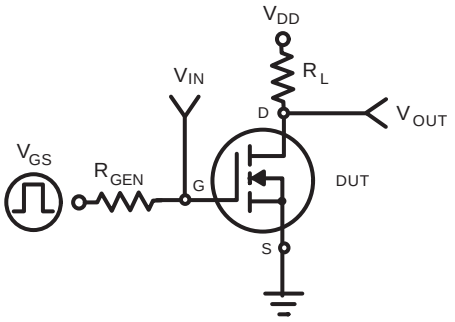
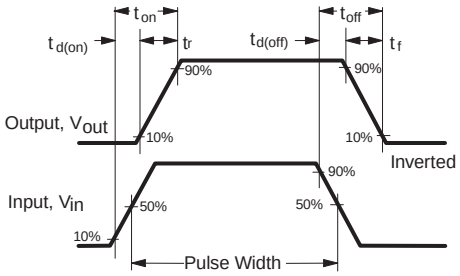


Figure 12. Switching Waveforms



RATING CHARACTERISTIC CURVES (2N7002PT)

Typical Electrical Characteristics (continued)

Figure 13. 2N7002PT Maximum Safe Operating Area

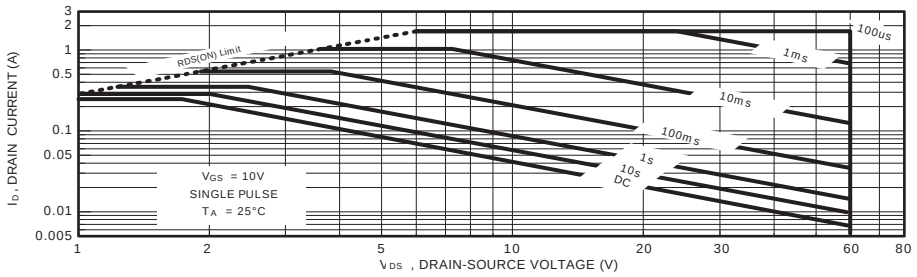


Figure 14. 2N7002PT Transient Thermal Response Curve

