

N-Channel Enhancement Mode Field Effect Transistor

- 0.25Amp 60Volt

Application

- Servomotor control
- Power MOSFET gate drivers
- Other switching applications

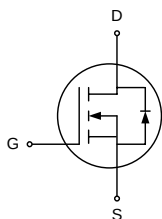
Feature

- Small surface mounting type
- 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

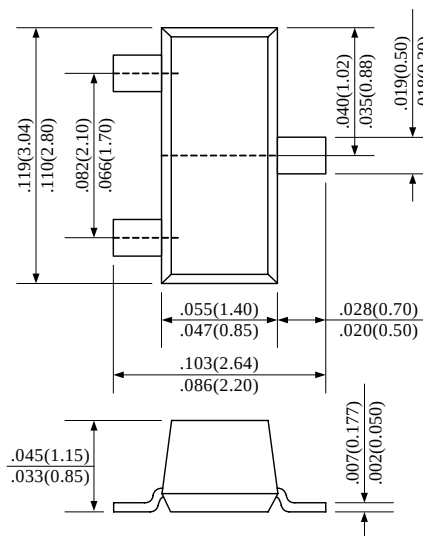
Construction

- N-Channel Enhancement

Circuit



SOT-23



Absolute Maximum Ratings

PARAMETER		SYMBOL	2N7002PT	UNIT
Drain-Source Voltage		V_{DSS}	60	V
Drain-Gate Voltage ($R_{GS} \leq 1M\Omega$)		V_{DGR}	60	V
Gate-Source Voltage - Continuous - Non Repetitive ($t_p < 50\mu s$)		V_{GSS}	± 20	V
			± 40	
Maximum Drain Current - Continuous - Pulsed	$T_A = 25^\circ C$	I_D	250	mA
	$T_A = 70^\circ C$		190	
Maximum Power Dissipation	$T_A = 25^\circ C$	P_D	350	mW
	$T_A = 70^\circ C$		220	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	mW
Maximum Lead Temperature for Soldering Purposes, 1/16" from Case for 10 Seconds		T_L	300	$^\circ C$
Thermal Resistance, Junction-to-Ambient		$R_{\theta JA}$	357	$^\circ C/W$

☐ **Electrical Characteristics**

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BVDSS	VGS = 0V, ID = 10μA	60	70		V
Zero Gate Voltage Drain Current	IDSS	VDS = 60V, VGS = 0V			1	μA
Gate-Body Leakage, Forward	IGSSF	VGS = 15V, VDS = 0V			10	nA
Gate-Body Leakage, Reverse	IGSSR	VGS = -15V, VDS = 0V			-10	nA
ON CHARACTERISTICS (Note 1)						
Gate Threshold Voltage	VGS(th)	VDS = VGS, ID = 250μA	1.0	2.0	2.5	V
Ststic Drain-Source On-Resistance	RDS(ON)	VGS = 10V, ID = 250mA		1.7	3.0	Ω
		VGS = 4V, ID = 100mA		2.5	4.0	
Drain-Source On-Voltage	VDS(ON)	VGS = 10V, ID = 500mA		0.6	3.75	V
		VGS = 5V, ID = 50mA		0.09	1.5	
On-State Drain Current	ID(ON)	VGS = 10V, VDS = 7.5VDS(ON)	800	1800		mA
		VGS = 4.5V, VDS = 10VDS(ON)	500	700		
Forward Transconductance	gFS	VDS = 15VDS(ON), ID = 200mA		250		mS
DYNAMIC CHARACTERISTICS						
Total Gate Charge	Qg	VDS = 30V, VGS = 10V, ID = 200mA		0.6	1.0	nC
Gate-Source Charge	Qgs			0.06	25	
Gate-Srain Charge	Qgd			0.06	5	
Input Capacitance	Ciss	VDS = 25V, VGS = 0V, f = 1.0MHz		25	50	pF
Output Capacitance	Coss			6	25	
Reverse Transfer Capacitance	Crss			1.2	5	
Turn-On Time	ton	VDD = 30V, RL = 200Ω, ID = 100mA, VGS = 10V, RGEN = 10Ω		7.5	20	nS
	tr			6		
Turn-Off Times	toff	VDD = 30V, RL = 200Ω, ID = 100mA, VGS = 10V, RGEN = 10Ω		7.5	20	nS
	tf			3		
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Maximum Continuous Drain-Source Diode Forward Current	IS				115	mA
Maximum Pulsed Drain-Source Diode Forward Current	ISM				0.8	A
Drain-Source Diode Forward Voltage	VSD	VGS = 0V, IS = 200mA		0.85	1.2	V

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

RATING CHARACTERISTIC CURVES (2N7002PT)

Typical Electrical Characteristics

Figure 1. On-Region Characteristics

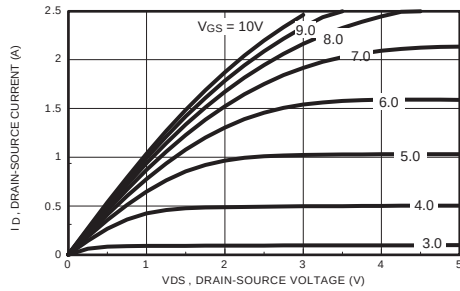


Figure 2. On-Resistance Variation with Gate Voltage and Drain Current

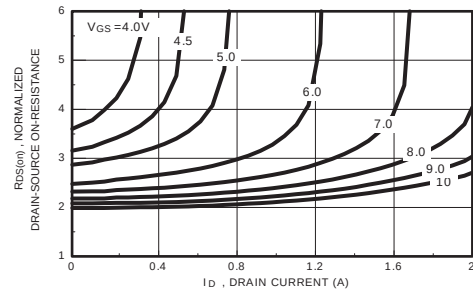


Figure 3. On-Resistance Variation with Temperature

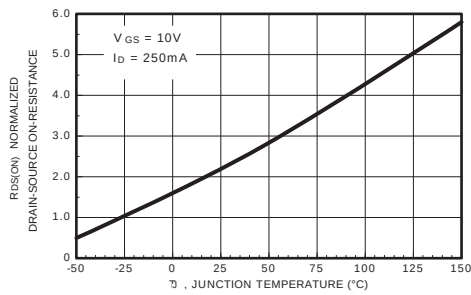


Figure 4. On-Resistance Variation with Drain Current and Temperature

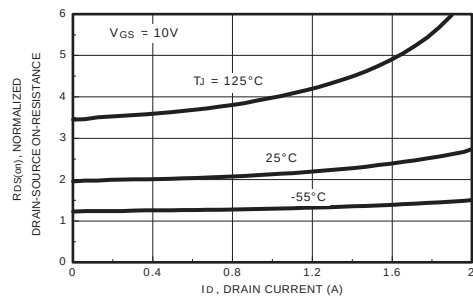


Figure 5. Transfer Characteristics

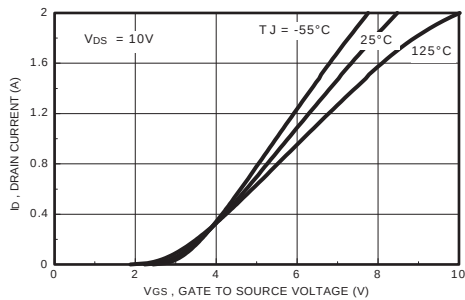
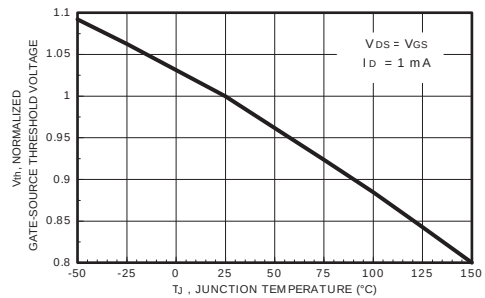


Figure 6. Gate Threshold Variation with Temperature



RATING CHARACTERISTIC CURVES (2N7002PT)

Typical Electrical Characteristics (continued)

Figure 7. Breakdown Voltage Variation with Temperature

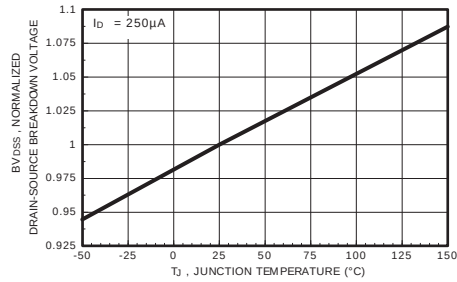


Figure 8. Body Diode Forward Voltage Variation with Drain Current

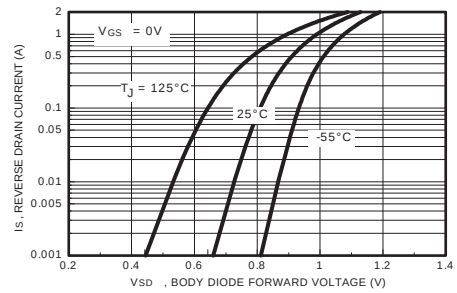


Figure 9. Capacitance Characteristics

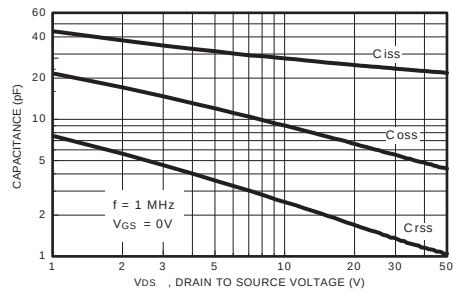


Figure 10. Gate Charge Characteristics

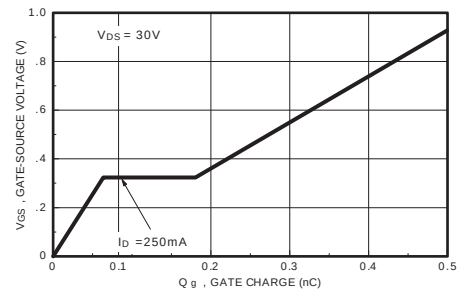


Figure 11.

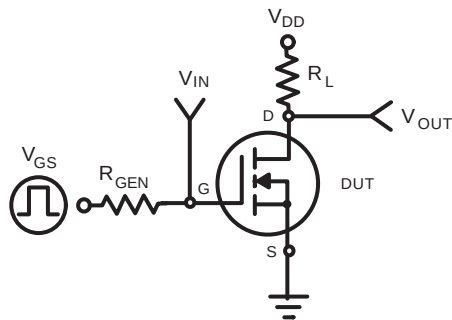
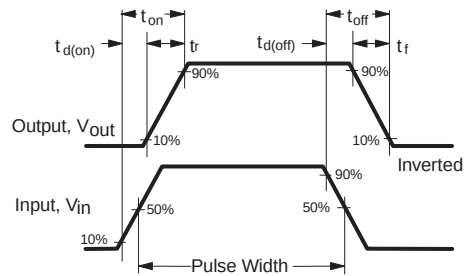


Figure 12. Switching Waveforms



RATING CHARACTERISTIC CURVES (2N7002PT)

Typical Electrical Characteristics (continued)

Figure 13. 2N7002PT Maximum Safe Operating Area

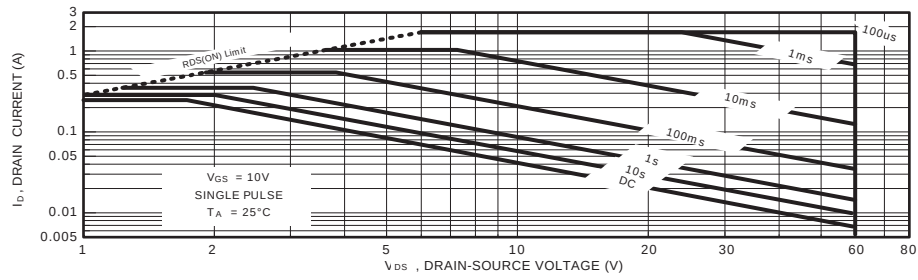


Figure 14. 2N7002PT Transient Thermal Response Curve

