

N-Channel Enhancement Mode Field Effect Transistor

- 0.25Amp 60Volt

Application

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

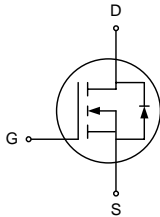
Feature

- Small surface mounting type
- High density cell design for low RDS(ON)
- Suitable for high packing density
- Rugged and reliable
- High saturation current capability
- Voltage controlled small signal switch

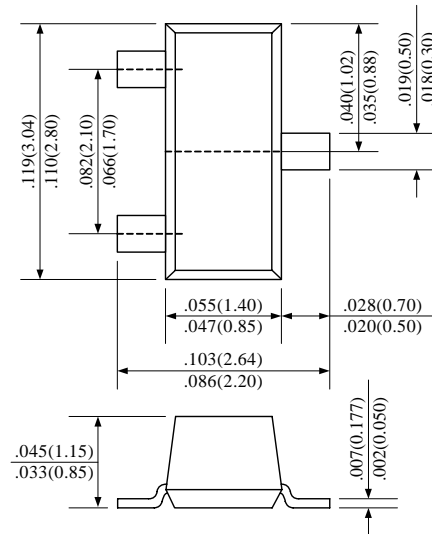
Construction

- 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} ≤ 1MΩ)	V _{DGR}	60	V
Gate-Source Voltage - Continuous	V _{GSS}	± 20	V
- Non Repetitive (tp < 50μs)		± 40	
Maximum Drain Current - Continuous	I _D	250	mA
- Pulsed		190	
Maximum Power Dissipation	P _D	350	mW
		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	°C
Thermal Resistance, Junction-to-Ambient	RθJA	357	°C/W

□ Electrical Characteristics

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
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OFF CHARACTERISTICS

Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} = 0V, I _D = 10μA	60	70		V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 60V, V _{GS} = 0V			1	μA
Gate-Body Leakage, Forward	I _{GSSF}	V _{GS} = 15V, V _{DS} = 0V			10	nA
Gate-Body Leakage, Reverse	I _{GSSR}	V _{GS} = -15V, V _{DS} = 0V			-10	nA

ON CHARACTERISTICS (Note 1)

Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250μA	1.0	2.0	2.5	V
Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} = 10V, I _D = 250mA		1.7	3.0	Ω
		V _{GS} = 4V, I _D = 100mA		2.5	4.0	
Drain-Source On-Voltage	V _{DS(ON)}	V _{GS} = 10V, I _D = 500mA		0.6	3.75	V
		V _{GS} = 5V, I _D = 50mA		0.09	1.5	
On-State Drain Current	I _{D(ON)}	V _{GS} = 10V, V _{DS} = 7.5V _{DS(ON)}	800	1800		mA
		V _{GS} = 4.5V, V _{DS} = 10V _{DS(ON)}	500	700		
Forward Transconductance	g _{FS}	V _{DS} = 15V _{DS(ON)} , I _D = 200mA		250		mS

DYNAMIC CHARACTERISTICS

Total Gate Charge	Q _g	V _{DS} = 30V, V _{GS} = 10V, I _D = 200mA		0.6	1.0	nC
Gate-Source Charge	Q _{gs}			0.06	25	
Gate-Drain Charge	Q _{gd}			0.06	5	
Input Capacitance	C _{iss}	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz		25	50	pF
Output Capacitance	C _{oss}			6	25	
Reverse Transfer Capacitance	C _{rss}			1.2	5	
Turn-On Time	t _{on}	V _{DD} = 30V, R _L = 200Ω, I _D = 100mA, V _{GS} = 10V, R _{GEN} = 10Ω		7.5	20	nS
	t _r			6		
Turn-Off Times	t _{off}	V _{DD} = 30V, R _L = 200Ω, I _D = 100mA, V _{GS} = 10V, R _{GEN} = 10Ω		7.5	20	nS
	t _f			3		

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS

Maximum Continuous Drain-Source Diode Forward Current	I _S				115	mA
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				0.8	A
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} = 0V, I _S = 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

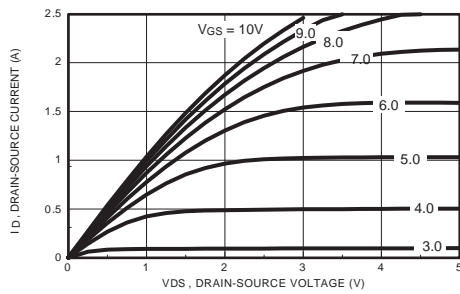


Figure 2. On-Resistance Variation with Gate Voltage and Drain Current

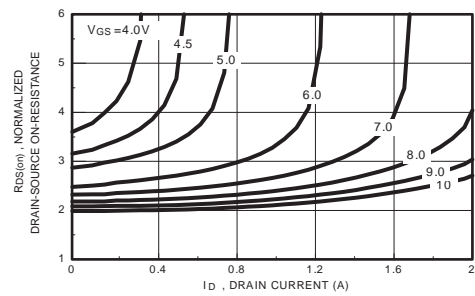


Figure 3. On-Resistance Variation with Temperature

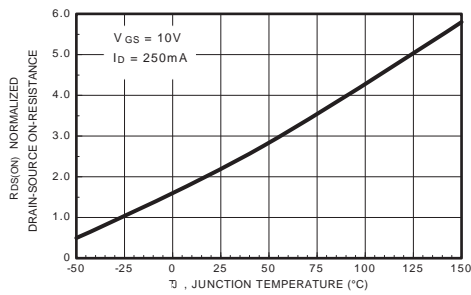


Figure 4. On-Resistance Variation with Drain Current and Temperature

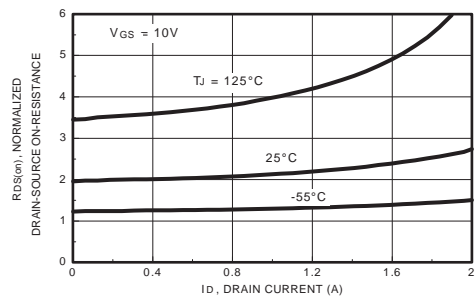


Figure 5. Transfer Characteristics

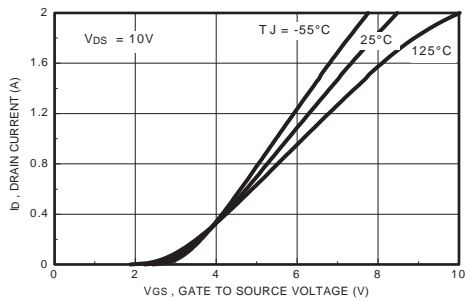
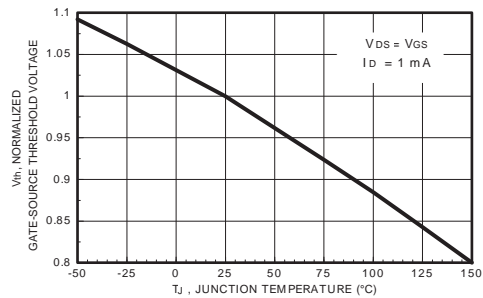


Figure 6. Gate Threshold Variation with Temperature



RATING CHARACTERISTIC CURVES (2N7002PT)

Typical Electrical Characteristics (continued)

Figure 7. Breakdown Voltage Variation with Temperature

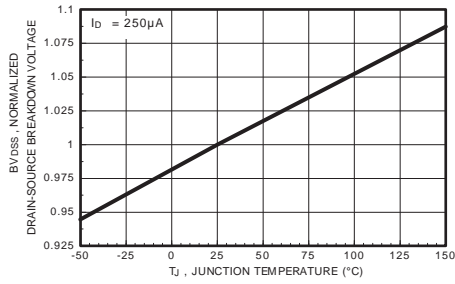


Figure 8. Body Diode Forward Voltage Variation with Drain Current

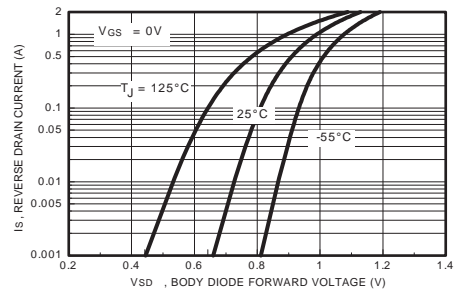


Figure 9. Capacitance Characteristics

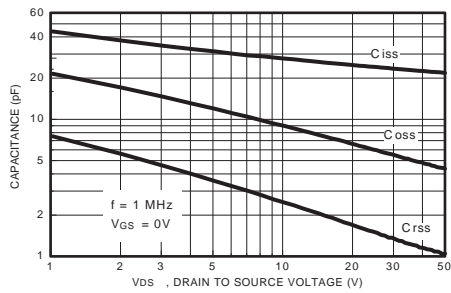


Figure 10. Gate Charge Characteristics

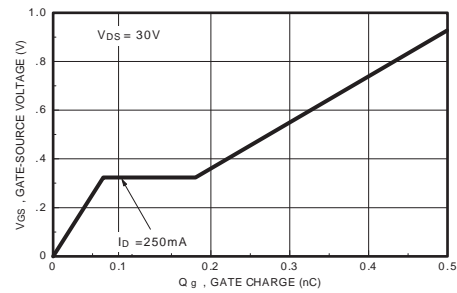


Figure 11.

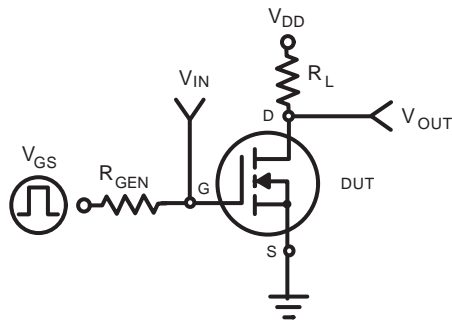
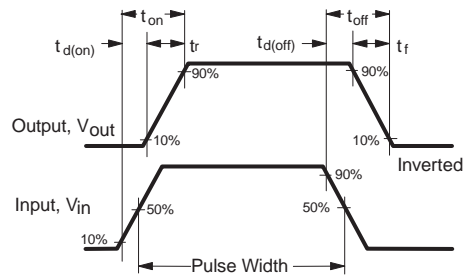


Figure 12. Switching Waveforms



RATING CHARACTERISTIC CURVES (2N7002PT)

Typical Electrical Characteristics (continued)

Figure 13. 2N7002PT Maximum Safe Operating Area

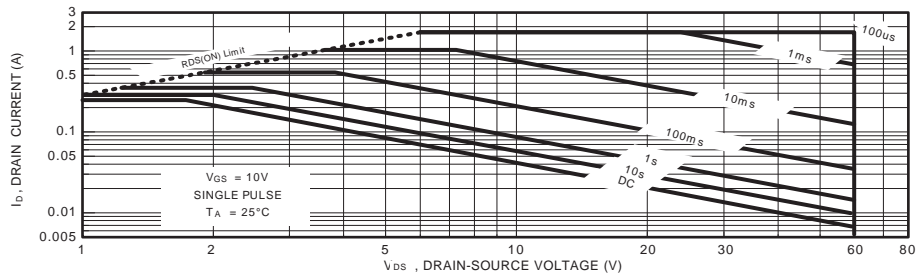


Figure 14. 2N7002PT Transient Thermal Response Curve

