Siliconix incorporated

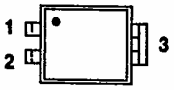
2N7012, 2N7013

N-Channel Enhancement Mode Transistors

T-39-05

4-PIN DIP
(Similar to TO-250)

TOP VIEW



1 GATE
2 SOURCE
3 DRAIN

PRODUCT SUMMARY

PART NUMBER	$V_{(BR)DSS}$ (V)	$r_{DS(ON)}$ (Ω)	I_D (A)
2N7012	60	0.35	1.2
2N7013	40	0.35	1.2

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C Unless Otherwise Noted)

PARAMETERS/TEST CONDITIONS		SYMBOL	LIMITS 2N7012	LIMITS 2N7013	UNITS
Drain-Source Voltage		V_{DS}	60	40	V
Gate-Source Voltage		V_{GS}	±20	±20	
Continuous Drain Current	T_A = 25°C	I_D	1.2	1.2	A
	T_A = 100°C		0.80	0.80	
Pulsed Drain Current[1]		I_{DM}	10	10	
Power Dissipation	T_A = 25°C	P_D	1.0	1.0	W
	T_A = 100°C		0.4	0.4	
Operating Junction & Storage Temperature Range		T_J, T_{stg}	−55 to 150		°C
Lead Temperature ($1/16$" from case for 10 sec.)		T_L	300		

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THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE	SYMBOL	TYPICAL	MAXIMUM	UNITS
Junction-to-Ambient	R_{thJA}		120	K/W

[1]Pulse width limited by maximum junction temperature.

2N7012, 2N7013

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ELECTRICAL CHARACTERISTICS (T_J = 25°C Unless Otherwise Noted)

PARAMETER		SYMBOL	TEST CONDITIONS	TYP	LIMITS MIN	LIMITS MAX	UNIT
STATIC							
Drain-Source Breakdown Voltage	2N7012 2N7013	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 µA		60 40		V
Gate Threshold Voltage		$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 1000 µA		2.0	4.0	
Gate-Body Leakage		I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V			±100	nA
Zero Gate Voltage Drain Current		I_{DSS}	V_{DS} = $V_{(BR)DSS}$, V_{GS} = 0 V			250	µA
			V_{DS} = 0.8 x $V_{(BR)DSS}$, V_{GS} = 0 V, T_J = 125°C			1000	
On-State Drain Current[1]		$I_{D(ON)}$	V_{DS} = 2 V, V_{GS} = 10 V		1.2		A
Drain-Source On-State Resistance[1]		$r_{DS(ON)}$	V_{GS} = 10 V, I_D = 1.0 A	0.3		0.35	Ω
			V_{GS} = 10 V, I_D = 1.0 A, T_J = 125°C	0.55		0.64	
Forward Transconductance[1]		g_{fs}	V_{DS} = 15 V, I_D = 1.0 A	1.5	1.2		S
DYNAMIC							
Input Capacitance		C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	220		300	pF
Output Capacitance		C_{oss}		120		200	
Reverse Transfer Capacitance		C_{rss}		30		100	
Total Gate Charge[2]		Q_g	V_{DS} = 0.8 x $V_{(BR)DSS}$, V_{GS} = 10 V, I_D = 15 A	4.8		6.0	nC
Gate-Source Charge[2]		Q_{gs}		1			
Gate-Drain Charge[2]		Q_{gd}		2			
Turn-On Delay Time[2]		$t_{d(on)}$	V_{DD} = 30 V, R_L = 25 Ω I_D ≅ 1.2 A, V_{GEN} = 10 V, R_G = 25 Ω	7		20	ns
Rise Time[2]		t_r		13		30	
Turn-Off Delay Time[2]		$t_{d(off)}$		18		30	
Fall Time[2]		t_f		13		25	
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (T_A = 25°C)							
Continuous Current		I_S				1.2	A
Pulsed Current[3]		I_{SM}				10	
Forward Voltage[1]		V_{SD}	I_F = I_S, V_{GS} = 0 V			1.6	V
Reverse Recovery Time		t_{rr}	I_F = I_S, dI_F/dt = 100 A/µs	45			ns
Reverse Recovery Charge		Q_{rr}		0.6			µC

[1]Pulse test: Pulse Width ≤ 300 µsec, Duty Cycle ≤ 2%.
[2]Independent of operating temperature.
[3]Pulse width limited by maximum junction temperature.

TYPICAL CHARACTERISTICS (25°C Unless Otherwise Specified)

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Figure 1. Output Characteristics

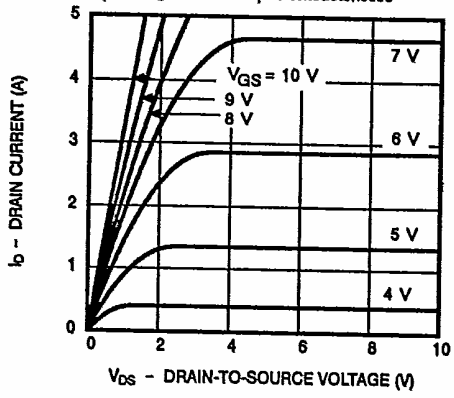


Figure 2. Transfer Characteristics

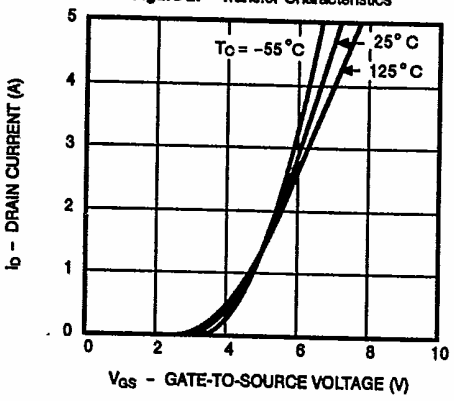


Figure 3. Transconductance

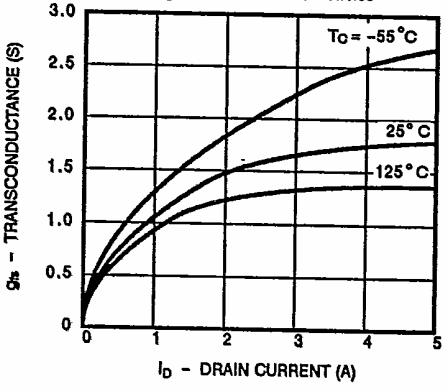


Figure 4. On-Resistance

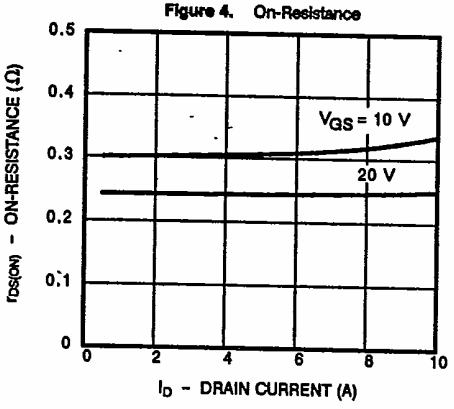


Figure 5. Capacitance

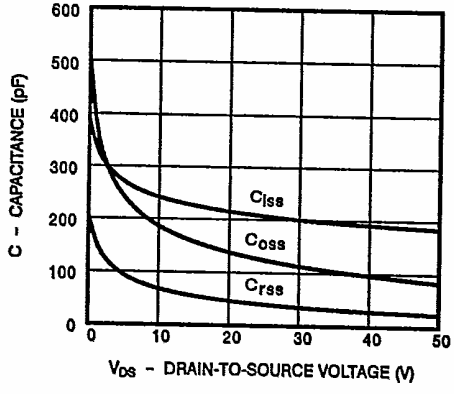
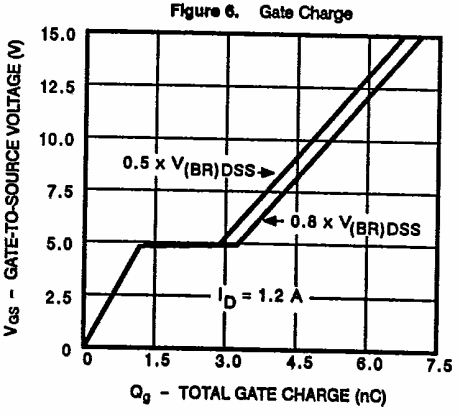


Figure 6. Gate Charge



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TYPICAL CHARACTERISTICS (Cont'd)

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Figure 7. On-Resistance vs. Junction Temperature

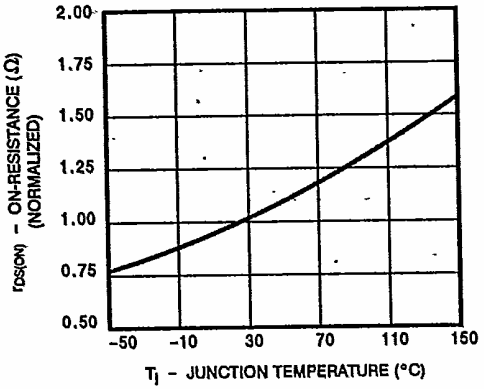
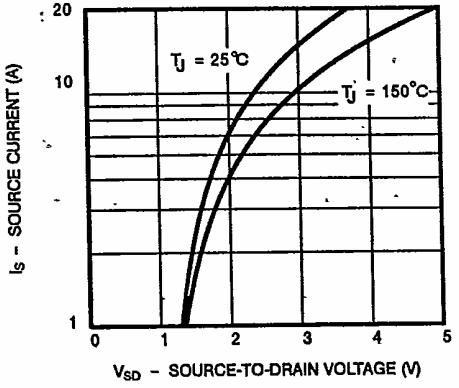


Figure 8. Source-Drain Diode Forward Voltage



THERMAL RATINGS

Figure 9. Maximum Drain Current vs. Ambient Temperature

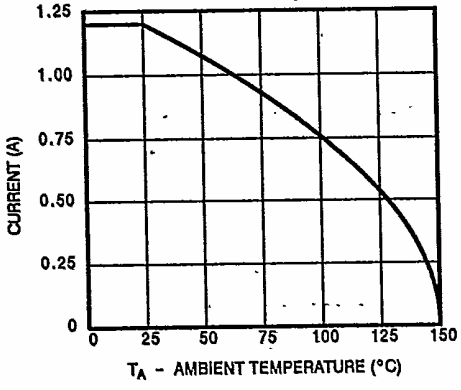
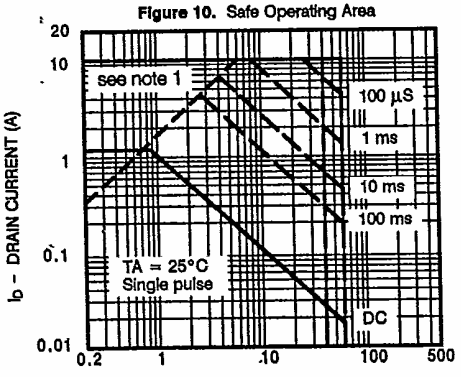


Figure 10. Safe Operating Area



[1]Operation in this area may be limited by $r_{DS(on)}$