ND2012L/2020L

N-Channel Depletion-Mode MOS Transistors

Product Summary

Part Number	$V_{(BR)DSV}$ Min (V)	$r_{DS(on)}$ Max (Ω)	$V_{GS(off)}$ (V)	I_D (A)
ND2012L	200	12	−1.5 to −4	0.16
ND2020L		20	−0.5 to −2.5	0.132

For applications information see AN901.

Features

- High Breakdown Voltage: 220 V
- Normally "On" Low r_{DS} Switch: 9 Ω
- Low Input and Output Leakage
- Low-Power Drive Requirement
- Low Input Capacitance

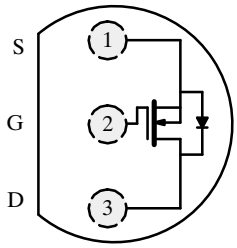
Benefits

- Full-Voltage Operation
- Low Offset Voltage
- Low Error Voltage
- Easily Driven Without Buffer
- High-Speed Switching

Applications

- Normally "On" Switching Circuits
- Current Sources/Limiters
- Power Supply, Converter Circuits
- Solid-State Relays
- Telecom Switches

TO-226AA
(TO-92)



Top View

Absolute Maximum Ratings (T_A = 25°C Unless Otherwise Noted)

Parameter		Symbol	ND2012L	ND2020L	Unit
Drain-Source Voltage		V_{DS}	200	200	V
Gate-Source Voltage		V_{GS}	±30	±30	
Continuous Drain Current (T_J = 150°C)	T_A = 25°C	I_D	0.16	0.132	A
	T_A = 100°C		0.1	0.083	
Pulsed Drain Current[a]		I_{DM}	0.8	0.8	
Power Dissipation	T_A = 25°C	P_D	0.8	0.8	W
	T_A = 100°C		0.32	0.32	
Maximum Junction-to-Ambient		R_{thJA}	156	156	°C/W
Operating Junction and Storage Temperature Range		T_J, T_{stg}	−55 to 150		°C

Notes
a. Pulse width limited by maximum junction temperature.

ND2012L/2020L

Specifications[a]

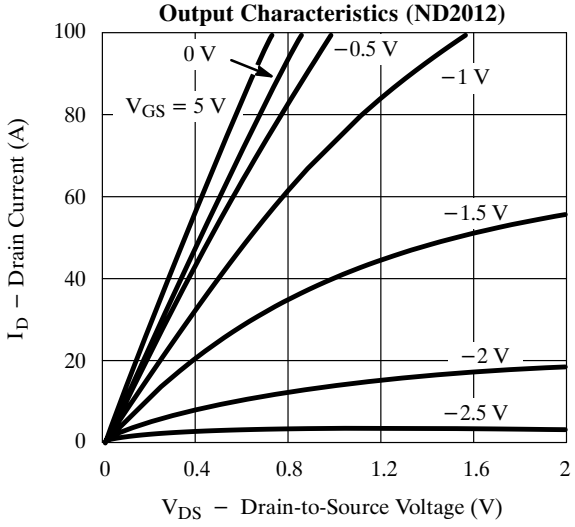
Parameter	Symbol	Test Conditions	Typ[b]	Limits ND2012L Min	Limits ND2012L Max	Limits ND2020L Min	Limits ND2020L Max	Unit
Static								
Drain-Source Breakdown Voltage	$V_{(BR)DSV}$	V_{GS} = −8 V, I_D = 10 μA	220	200				V
		V_{GS} = −5 V, I_D = 10 μA	220			200		
Gate-Source Cutoff Voltage	$V_{GS(th)}$	V_{DS} = 5 V, I_D = 10 μA		−1.5	−4	−0.5	−2.5	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V			±10		±10	nA
		T_J = 125°C			±50		±50	
Drain Cutoff Current	$I_{D(off)}$	V_{DS} = 160 V, V_{GS} = −8 V			1			μA
		T_J = 125°C			200			
		V_{DS} = 160 V, V_{GS} = −5 V					1	
		T_J = 125°C					200	
Drain-Saturation Current[c]	I_{DSS}	V_{DS} = 10 V, V_{GS} = 0 V	300	30		30		mA
Drain-Source On-Resistance[c]	$r_{DS(on)}$	V_{GS} = 2 V, I_D = 20 mA	7					Ω
		V_{GS} = 0 V, I_D = 20 mA	8		12		20	
		T_J = 125°C	12.6		30		50	
Forward Transconductance[c]	g_{fs}	V_{DS} = 7.5 V, I_D = 20 mA	55					mS
Common Source Output Conductance[c]	g_{os}		75					μS
Dynamic								
Input Capacitance	C_{iss}	V_{DS} = 25 V, V_{GS} = −5 V, f = 1 MHz	35		100		100	pF
Output Capacitance	C_{oss}		10		20		20	
Reverse Transfer Capacitance	C_{rss}		2		5		5	
Switching[d]								
Turn-On Time	$t_{d(on)}$	V_{DD} = 25 V, R_L = 1250 Ω I_D ≅ 20 mA, V_{GEN} = −5 V R_G = 25 Ω	20					ns
	t_r		20					
Turn-Off Time	$t_{d(off)}$		10					
	t_f		10					

Notes
a. T_A = 25°C unless otherwise noted.
b. For DESIGN AID ONLY, not subject to production testing.
c. Pulse test: PW ≤ 300 μs duty cycle ≤ 2%.
d. Switching time is essentially independent of operating temperature.

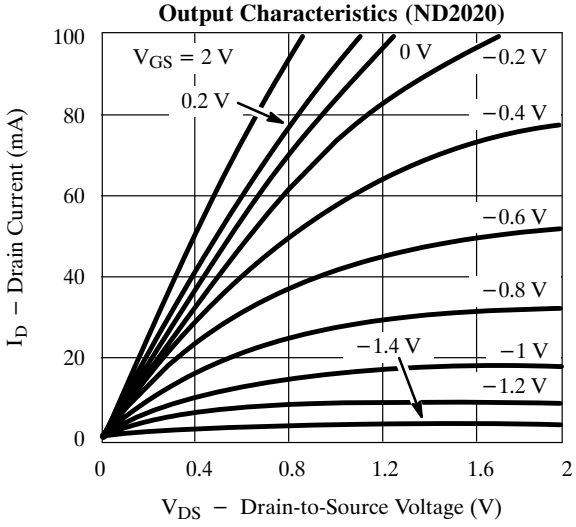
VDDQ20

Typical Characteristics (25°C Unless Otherwise Noted)

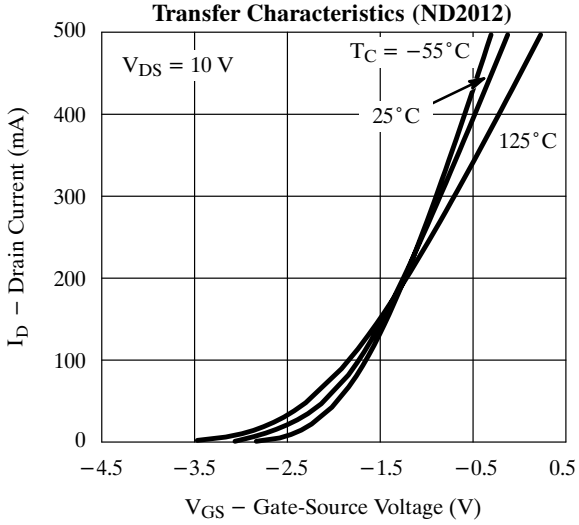
Output Characteristics (ND2012)



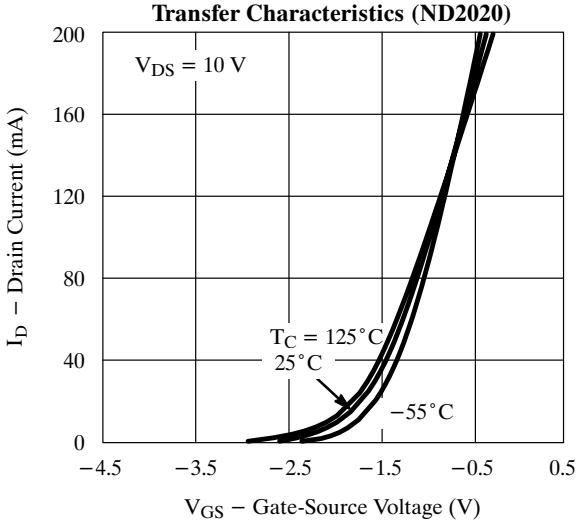
Output Characteristics (ND2020)



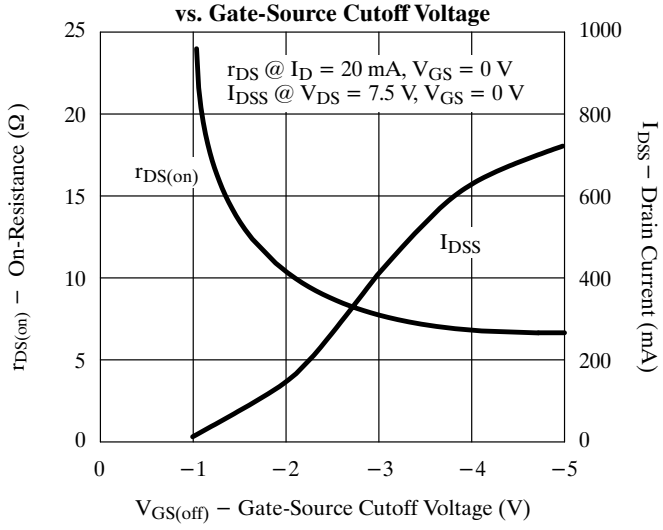
Transfer Characteristics (ND2012)



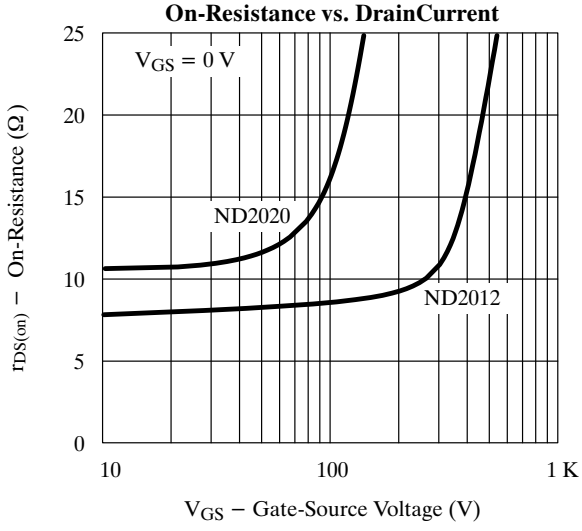
Transfer Characteristics (ND2020)



On-Resistance and Drain Current vs. Gate-Source Cutoff Voltage

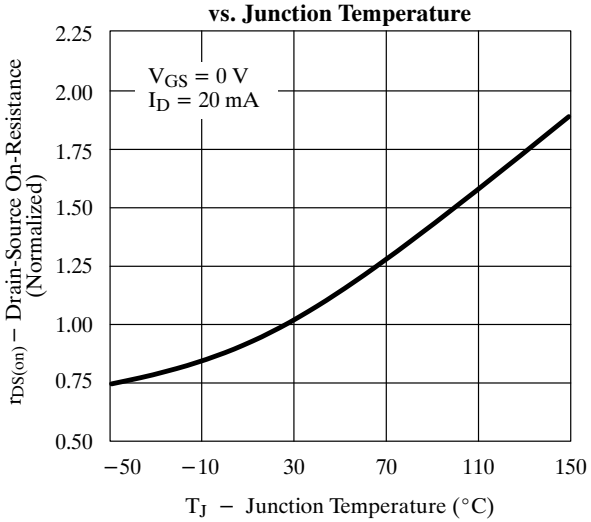


On-Resistance vs. DrainCurrent

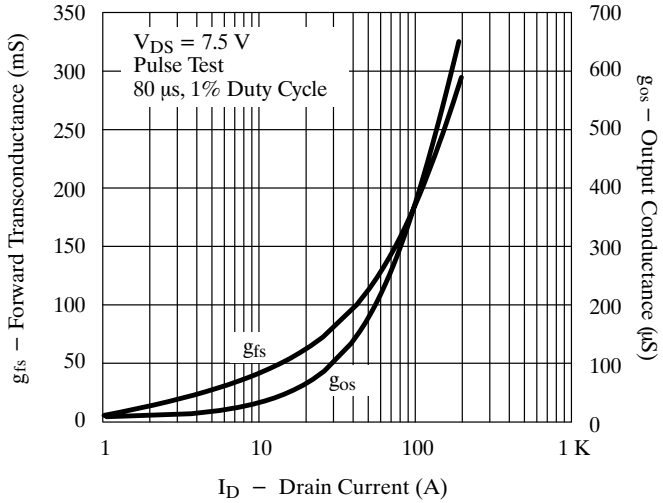


Typical Characteristics (25°C Unless Otherwise Noted) (Cont'd)

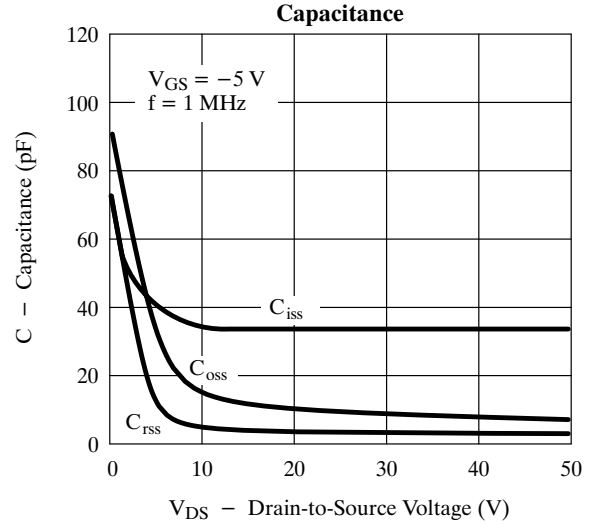
Normalized On-Resistance vs. Junction Temperature



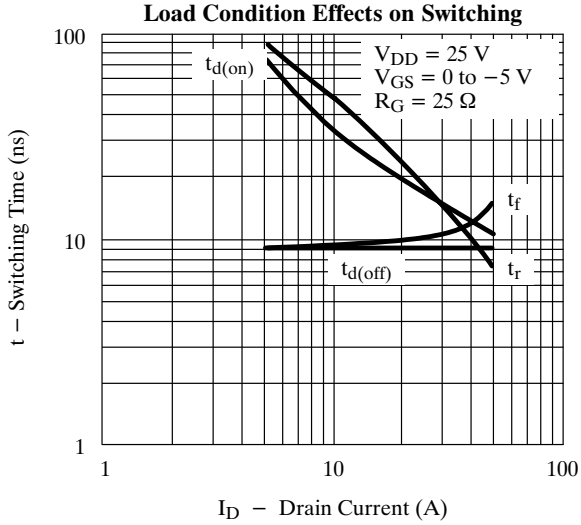
Forward Transconductance and Output Conductance vs. Drain Current



Capacitance



Load Condition Effects on Switching



Normalized Effective Transient Thermal Impedance, Junction-to-Ambient (TO-226AA)