N-Channel Enhancement-Mode MOSFET Transistors

PRODUCT SUMMARY				
Part Number	$V_{(BR)DSS}$ Min (V)	$r_{DS(on)}$ Max (Ω)	$V_{GS(th)}$ (V)	I_D Min (A)
VN10LE	60	5 @ V_{GS} = 10 V	0.8 to 2.5	0.38
VN10LLS		5 @ V_{GS} = 10 V	0.8 to 2.5	0.32
VN0605T		5 @ V_{GS} = 10 V	0.8 to 3.0	0.18
VN0610LL		5 @ V_{GS} = 10 V	0.8 to 2.5	0.28
VN2222LL	60	5 @ V_{GS} = 10 V	0.6 to 2.5	0.23

FEATURES

- Low On-Resistance: 2.5 Ω
- Low Threshold: <2.1 V
- Low Input Capacitance: 22 pF
- Fast Switching Speed: 7 ns
- Low Input and Output Leakage

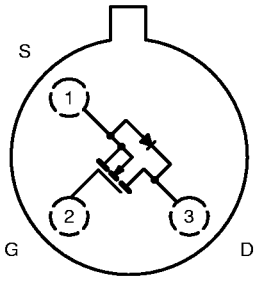
BENEFITS

- Low Offset Voltage
- Low-Voltage Operation
- Easily Driven Without Buffering
- High-Speed Circuits
- Low Error Voltage

APPLICATIONS

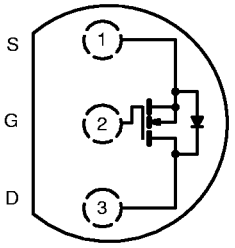
- Direct Logic-Level Interface: TTL/CMOS
- Solid State Relays
- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories, Transistors, etc.
- Battery Operated Systems

TO-206AC (TO-52)



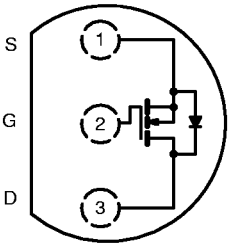
Top View
VN10LE

TO-226AA (TO-92)



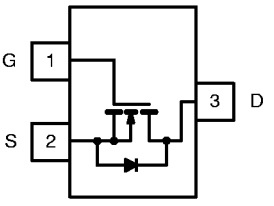
Top View
VN0610LL
VN2222LL

TO-92S



Top View
VN10LLS

TO-236 (SOT-23)



Top View
VN0605T (V2)*
*Marking Code for TO-236

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C UNLESS OTHERWISE NOTED)								
Parameter		Symbol	VN10LE[b]	VN10LLS	VN0605T	VN0610LL	VN2222LL	Unit
Drain-Source Voltage		V_{DS}	60	60	60	60	60	V
Gate-Source Voltage—Non-Repetitive[c]		V_{GSM}		±30	±30	±30	±30	
Gate-Source Voltage—Continuous		V_{GS}	±20	±20	±20	±20	±20	
Continuous Drain Current (T_J = 150°C)	T_A= 25°C	I_D	0.38	0.32	0.18	0.28	0.23	A
	T_A= 100°C		0.24	0.2	0.11	0.17	0.14	
Pulsed Drain Current[a]		I_{DM}	1.0	1.4	0.72	1.3	1.0	
Power Dissipation	T_A= 25°C	P_D	1.5	0.9	0.36	0.8	0.8	W
	T_A= 100°C		0.6	0.4	0.14	0.32	0.32	
Maximum Junction-to-Ambient		R_{thJA}	400	139	350	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.
b. Reference case for all temperature testing.
c. $t_p \leq 50$ µs.

SPECIFICATIONS (T_A = 25°C UNLESS OTHERWISE NOTED)

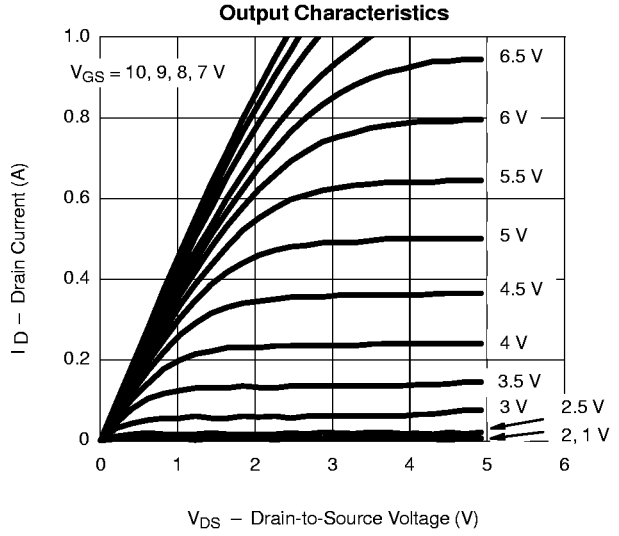
Parameter	Symbol	Test Conditions	Typ[a]	Limits VN10LE VN10LLS VN0610LL Min	Max	VN0605T Min	Max	VN2222LL Min	Max	Unit
Static										
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 100 µA	70	60				60		V
		V_{GS} = 0 V, I_D = 10 µA	70			60				
Gate-Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 1 mA	2.1	0.8	2.5	0.8	3.0	0.6	2.5	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V			±100[d]		±100		±100	nA
		T_J=125°C					±500			
		V_{DS} = 0 V, V_{GS} = ±30 V			±100					
Zero Gate-Voltage Drain Current	I_{DSS}	V_{DS} = 50 V, V_{GS} = 0 V			10		1.0			µA
		T_J= 125°C			500		500			
		V_{DS} = 48 V, V_{GS} = 0 V							10	
		T_J= 125°C							500	
On-State Drain Current[b]	$I_{D(on)}$	V_{DS} = 10 V, V_{GS} = 10 V	1000	750		500		750		mA
Drain-Source On-Resistance[b]	$r_{DS(on)}$	V_{GS} = 4.5 V, I_D = 50 mA	4.5				7.5			Ω
		V_{GS} = 5 V, I_D = 0.2 A	4.5		7.5				7.5	
		V_{GS} = 10 V, I_D = 0.5 A	2.4		5		5		7.5	
		T_J= 125°C	4.4		9		10		13.5	
Forward Transconductance[b]	g_{fs}	V_{DS} = 10 V, I_D = 0.5 A	230	100				100		mS
		V_{DS} = 10 V, I_D = 0.2 A	180			80				
Common Source Output Conductance[b]	g_{os}	V_{DS} = 5 V, I_D = 50 mA	500							µs
Dynamic										
Input Capacitance	C_{iss}	V_{DS} =25 V, V_{GS} = 0 V f = 1 MHz	22		60		60		60	pF
Output Capacitance	C_{oss}		11		25		25		25	
Reverse Transfer Capacitance	C_{rss}		2		5		5		5	
Switching[c]										
Turn-On Time	t_{ON}	V_{DD} = 15 V, R_L = 23 Ω, I_D ≅ 0.6 A V_{GEN} = 10 V, R_G = 25 Ω	7		10				10	ns
Turn-Off Time	t_{OFF}		7		10				10	
Turn-On Time	t_{ON}	V_{DD} = 30 V, R_L = 150 Ω, I_D ≅ 0.2 A V_{GEN} = 10 V, R_G = 25 Ω	7				20			
Turn-Off Time	t_{OFF}		11				20			

Notes
a. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
b. Pulse test: PW ≤300 µs duty cycle ≤3%.
c. Switching time is essentially independent of operating temperature.
d. VN10LE only.

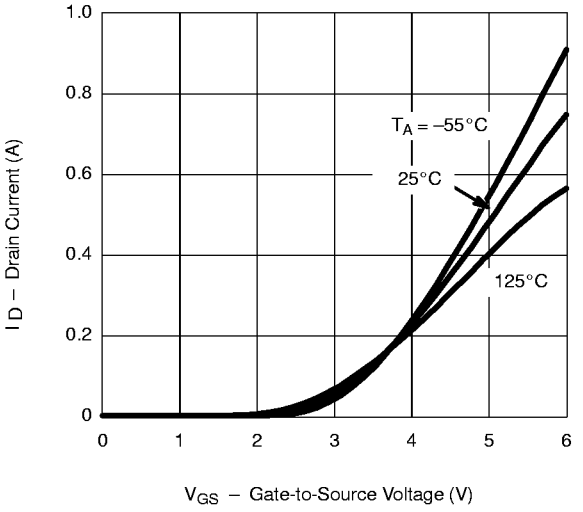
VNBF06

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

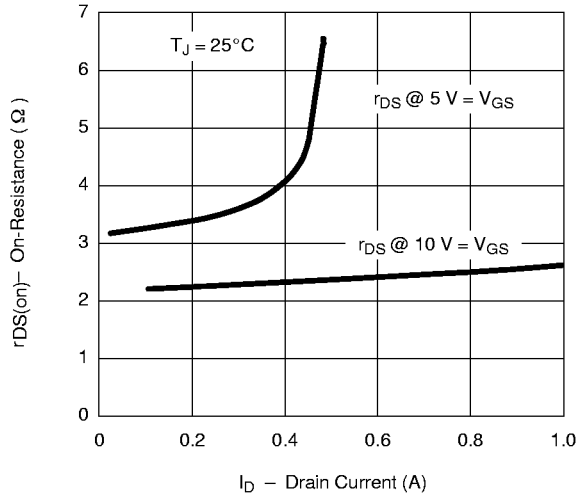
Output Characteristics



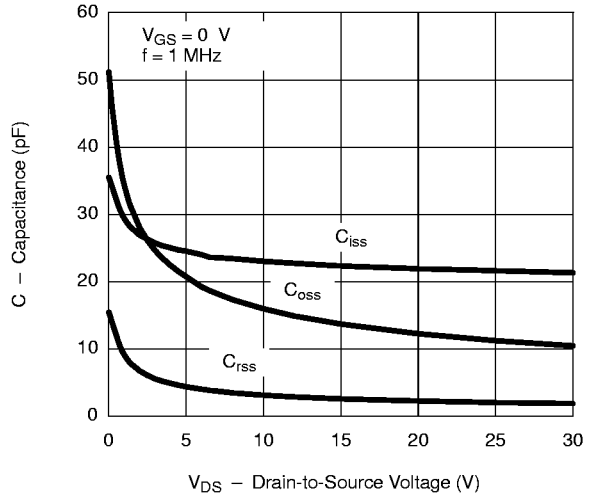
Transfer Characteristics



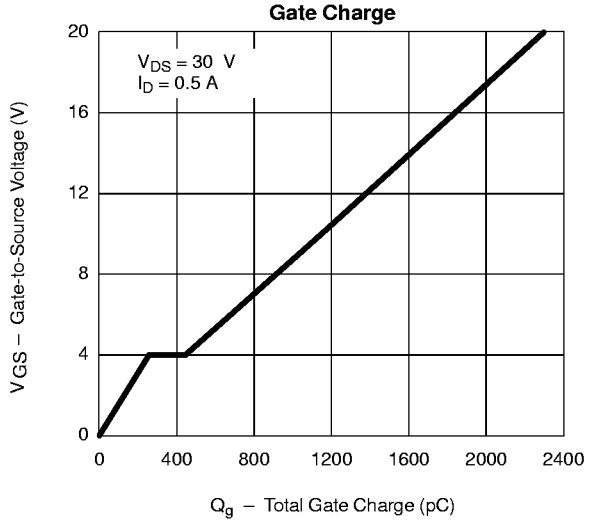
On-Resistance vs. Drain Current



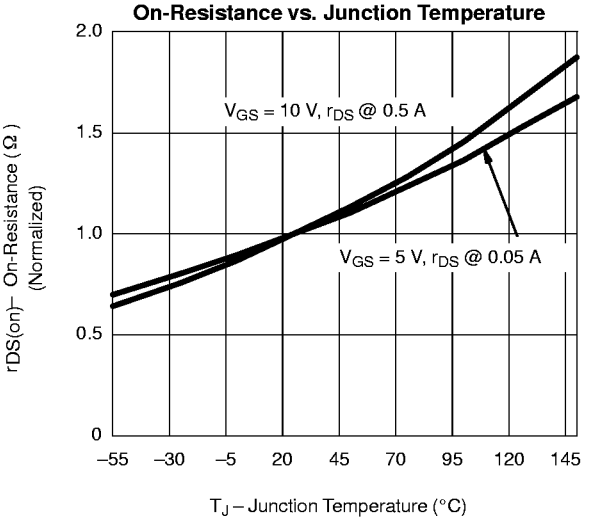
Capacitance



Gate Charge

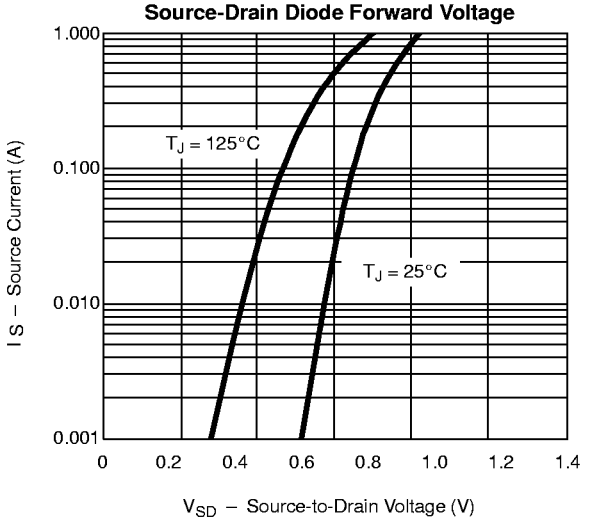


On-Resistance vs. Junction Temperature

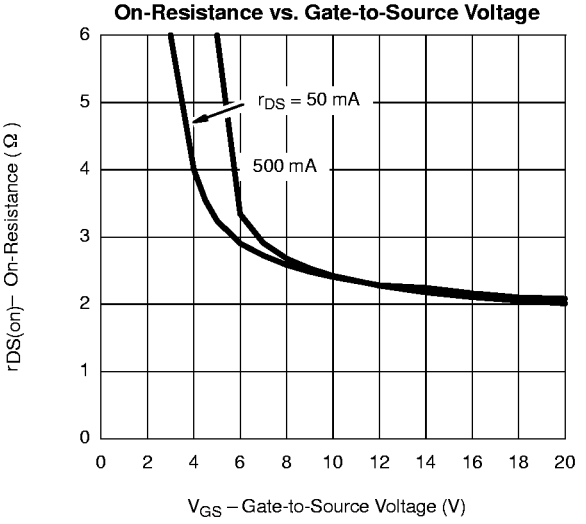


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

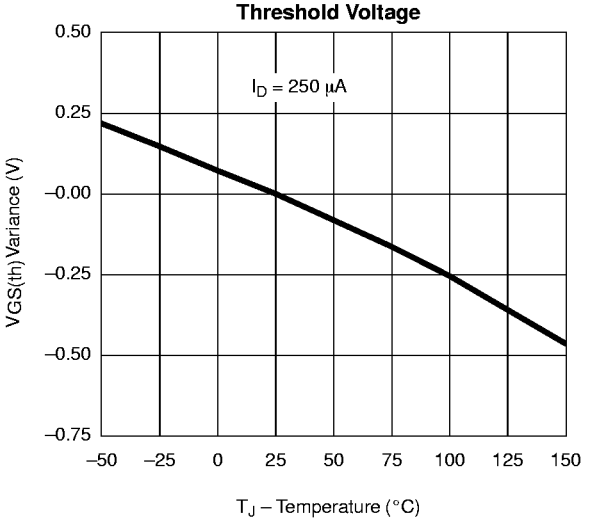
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



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