



## N-Channel Enhancement-Mode MOSFET Transistors

PRODUCT SUMMARY				
Part Number	$V_{(BR)DSS}$ Min (V)	$r_{DS(on)}$ Max ( $\Omega$ )	$V_{GS(th)}$ (V)	$I_D$ Min (A)
VN10LLS	60	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		5 @ $V_{GS} = 10$ V	0.6 to 2.5	0.23

### FEATURES

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

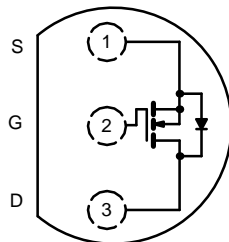
### BENEFITS

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

### APPLICATIONS

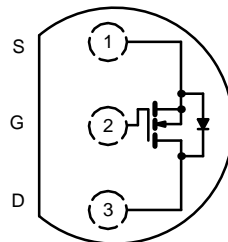
- Direct Logic-Level Interface: TTL/CMOS
- Solid State Relays
- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories, Transistors, etc.
- Battery Operated Systems

TO-226AA  
(TO-92)



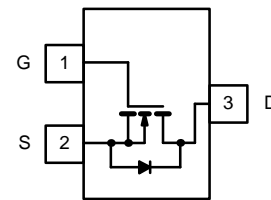
Top View  
VN0610LL  
VN2222LL

TO-92S



Top View  
VN10LLS

TO-236  
(SOT-23)



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

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)						
Parameter	Symbol	VN10LLS	VN0605T	VN0610LL	VN2222LL	Unit
Drain-Source Voltage	$V_{DS}$	60	60	60	60	V
Gate-Source Voltage—Non-Repetitive <sup>b</sup>	$V_{GSM}$	$\pm 30$	$\pm 30$	$\pm 30$	$\pm 30$	
Gate-Source Voltage—Continuous	$V_{GS}$	$\pm 20$	$\pm 20$	$\pm 20$	$\pm 20$	
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ )	$T_A = 25^\circ\text{C}$	$I_D$	0.32	0.18	0.28	A
	$T_A = 100^\circ\text{C}$		0.2	0.11	0.17	
Pulsed Drain Current <sup>a</sup>	$I_{DM}$	1.4	0.72	1.3	1.0	
Power Dissipation	$T_A = 25^\circ\text{C}$	$P_D$	0.9	0.36	0.8	W
	$T_A = 100^\circ\text{C}$		0.4	0.14	0.32	
Maximum Junction-to-Ambient	$R_{thJA}$	139	350	156	156	$^\circ\text{C/W}$
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to 150				$^\circ\text{C}$

Notes

- a. Pulse width limited by maximum junction temperature.  
b.  $t_p \leq 50 \mu\text{s}$ .



SPECIFICATIONS (T <sub>A</sub> = 25 °C UNLESS OTHERWISE NOTED)										
Parameter	Symbol	Test Conditions	Typ <sup>a</sup>	Limits						Unit
				VN10LLS VN0610LL		VN0605T		VN2222LL		
				Min	Max	Min	Max	Min	Max	
<b>Static</b>										
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 100 μA	70	60				60		V
		V <sub>GS</sub> = 0 V, I <sub>D</sub> = 10 μA	70			60				
Gate-Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 1 mA	2.1	0.8	2.5	0.8	3.0	0.6	2.5	
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V T <sub>J</sub> = 125°C					±100		±100	nA
		V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±30 V			±100					
Zero Gate-Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 50 V, V <sub>GS</sub> = 0 V T <sub>J</sub> = 125°C			10		1.0			μA
		V <sub>DS</sub> = 48 V, V <sub>GS</sub> = 0 V T <sub>J</sub> = 125°C			500		500		10	
On-State Drain Current <sup>b</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 10 V	1000	750		500		750		mA
Drain-Source On-Resistance <sup>b</sup>	r <sub>DS(on)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 50 mA	4.5				7.5			Ω
		V <sub>GS</sub> = 5 V, I <sub>D</sub> = 0.2 A	4.5		7.5			7.5		
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 0.5 A	2.4		5		5		7.5	
		T <sub>J</sub> = 125°C	4.4		9		10		13.5	
Forward Transconductance <sup>b</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.5 A	230	100				100		mS
		V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.2 A	180			80				
Common Source Output Conductance <sup>b</sup>	g <sub>os</sub>	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 50 mA	500							μS
<b>Dynamic</b>										
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V f = 1 MHz	22		60		60		60	pF
Output Capacitance	C <sub>oss</sub>		11		25		25		25	
Reverse Transfer Capacitance	C <sub>rss</sub>		2		5		5		5	
<b>Switching<sup>c</sup></b>										
Turn-On Time	t <sub>ON</sub>	V <sub>DD</sub> = 15 V, R <sub>L</sub> = 23 Ω, I <sub>D</sub> ≅ 0.6 A V <sub>GEN</sub> = 10 V, R <sub>G</sub> = 25 Ω	7		10				10	ns
Turn-Off Time	t <sub>OFF</sub>		7		10				10	
Turn-On Time	t <sub>ON</sub>	V <sub>DD</sub> = 30 V, R <sub>L</sub> = 150 Ω, I <sub>D</sub> ≅ 0.2 A V <sub>GEN</sub> = 10 V, R <sub>G</sub> = 25 Ω	7				20			
Turn-Off Time	t <sub>OFF</sub>		11				20			

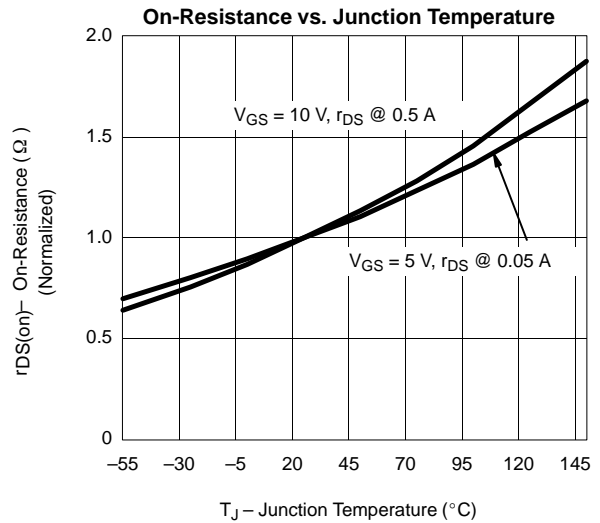
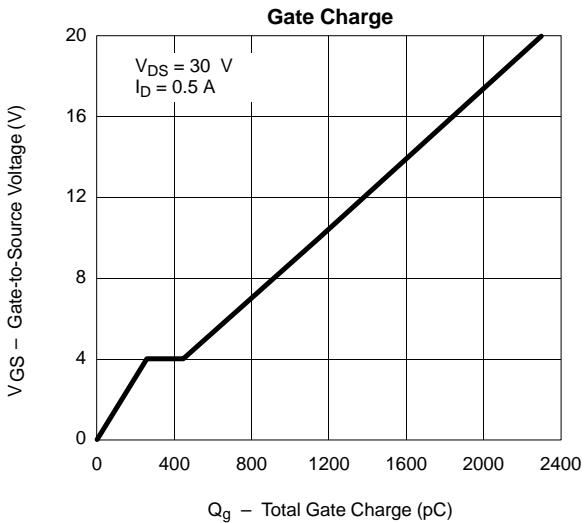
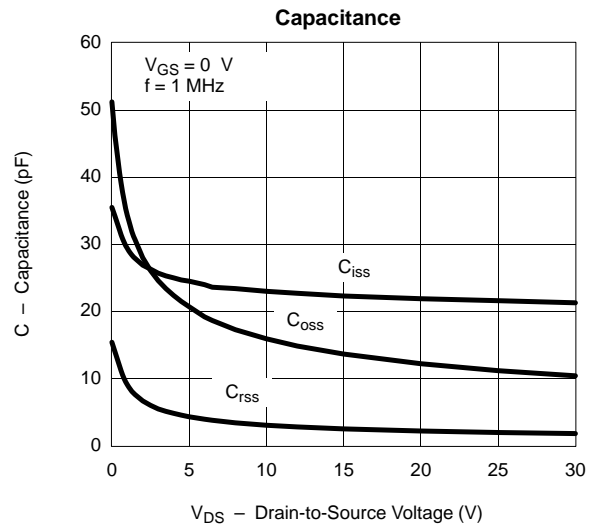
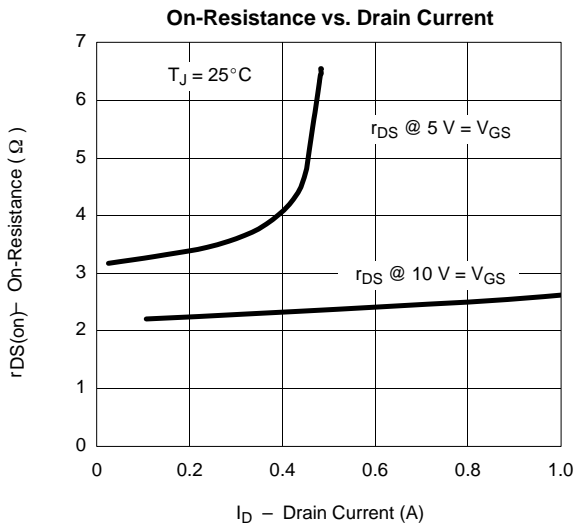
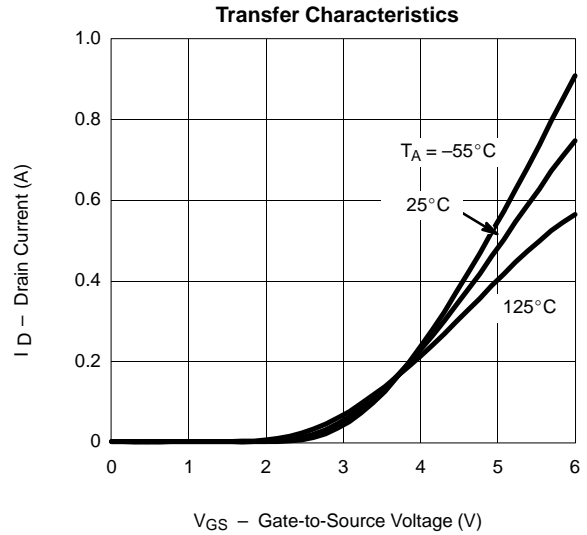
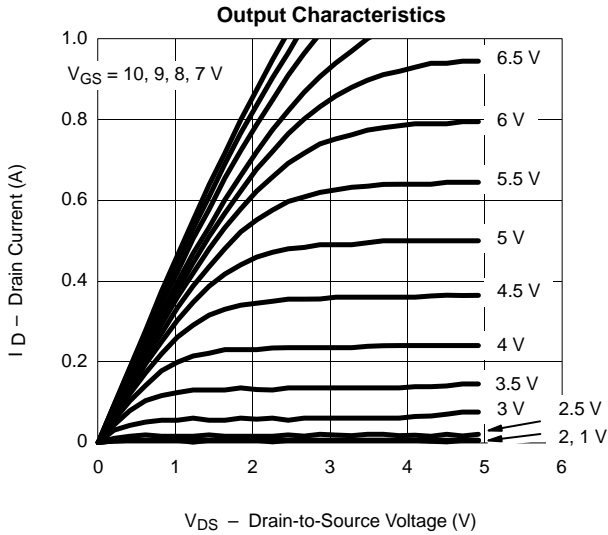
**Notes**

- 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.

VNBF06



**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**





**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

