N-Channel 60-V (D-S) MOSFETs with Zener Gate

PRODUCT SUMMARY				
Part Number	**$V_{(BR)DSS}$ Min (V)**	**$r_{DS(on)}$ Max (Ω)**	**$V_{GS(th)}$ (V)**	**I_D (A)**
VN0610L	60	5 @ V_{GS} = 10 V	0.8 to 2.5	0.27
VN10KLS		5 @ V_{GS} = 10 V	0.8 to 2.5	0.31
VN2222L		7.5 @ V_{GS} = 10 V	0.6 to 2.5	0.23

FEATURES

- Zener Diode Input Protected
- Low On-Resistance: 3 Ω
- Ultralow Threshold: 1.2 V
- Low Input Capacitance: 38 pF
- Low Input and Output Leakage

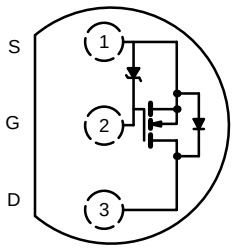
BENEFITS

- Extra ESD Protection
- Low Offset Voltage
- Low-Voltage Operation
- High-Speed, Easily Driven
- Low Error Voltage

APPLICATIONS

- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories, Transistors, etc.
- Battery Operated Systems
- Solid-State Relays
- Inductive Load Drivers

TO-226AA
(TO-92)

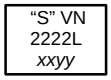


Top View
VN0610L
VN2222L

Device Marking
Front View

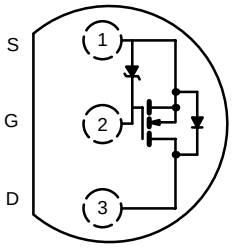
VN0610L

VN2222L



"S" = Siliconix Logo
xxyy = Date Code

TO-92S



Top View
VN10KLS

Device Marking
Front View

VN10KLS

"S" = Siliconix Logo
xxyy = Date Code

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C UNLESS OTHERWISE NOTED)					
Parameter		**Symbol**	**VN2222L VN0610L**	**VN10KLS**	**Unit**
Drain-Source Voltage		V_{DS}	60	60	V
Gate-Source Voltage		V_{GS}	15/–0.3	15/–0.3	
Continuous Drain Current (T_J = 150°C)	T_A= 25°C	I_D	0.27	0.31	A
	T_A= 100°C		0.17	0.20	
Pulsed Drain Current[a]		I_{DM}	1	1.0	
Power Dissipation	T_A= 25°C	P_D	0.8	0.9	W
	T_A= 100°C		0.32	0.4	
Thermal Resistance, Junction-to-Ambient		R_{thJA}	156	139	°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.

SPECIFICATIONS (T_A = 25°C UNLESS OTHERWISE NOTED)

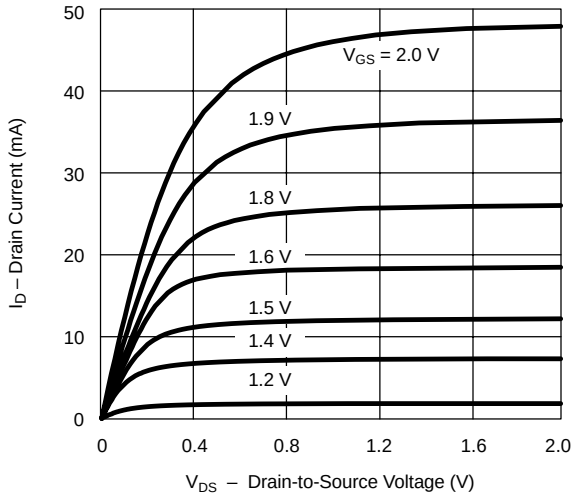
Parameter	Symbol	Test Conditions	Typ[a]	Limits VN0610L VN10KLS Min	Limits VN0610L VN10KLS Max	Limits VN2222L Min	Limits VN2222L Max	Unit
Static								
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 100 μA	120	60		60		V
Gate-Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 1 mA	1.2	0.8	2.5	0.6	2.5	V
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = 15 V	1		100		100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 48 V, V_{GS} = 0 V			10		10	μA
		T_J = 125°C			500		500	μA
On-State Drain Current[b]	$I_{D(on)}$	V_{DS} = 10 V, V_{GS} = 10 V	1	0.75		0.75		A
Drain-Source On-Resistance[b]	$r_{DS(on)}$	V_{GS} = 5 V, I_D = 0.2 A	4		7.5		7.5	Ω
		V_{GS} = 10 V, I_D = 0.5 A	3		5		7.5	Ω
		T_J = 125°C	5.6		9		13.5	Ω
Forward Transconductance[b]	g_{fs}	V_{DS} = 10 V, I_D = 0.5 A	300	100		100		mS
Common Source Output Conductance[b]	g_{os}	V_{DS} = 7.5 V, I_D = 0.05 A	0.2					mS
Dynamic								
Input Capacitance	C_{iss}	V_{DS} = 25 V, V_{GS} = 0 V, f = 1 MHz	38		60		60	pF
Output Capacitance	C_{oss}		16		25		25	pF
Reverse Transfer Capacitance	C_{rss}		2		5		5	pF
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}		9		10		10	ns

Notes
a. For DESIGN AID ONLY, not subject to production testing.
b. Pulse test: PW ≤ 300 μs duty cycle ≤ 2%.
c. Switching time is essentially independent of operating temperature.

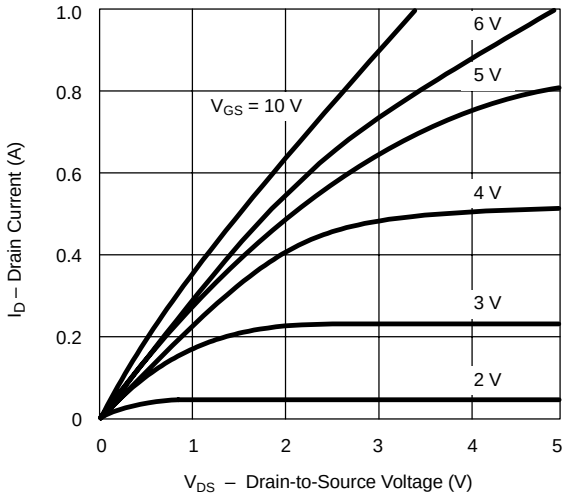
VNDP06

TYPICAL CHARACTERISTICS (T_A = 25°C UNLESS OTHERWISE NOTED)

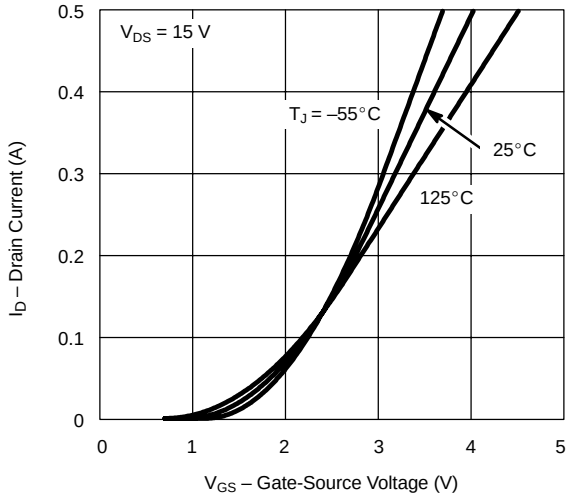
Ohmic Region Characteristics



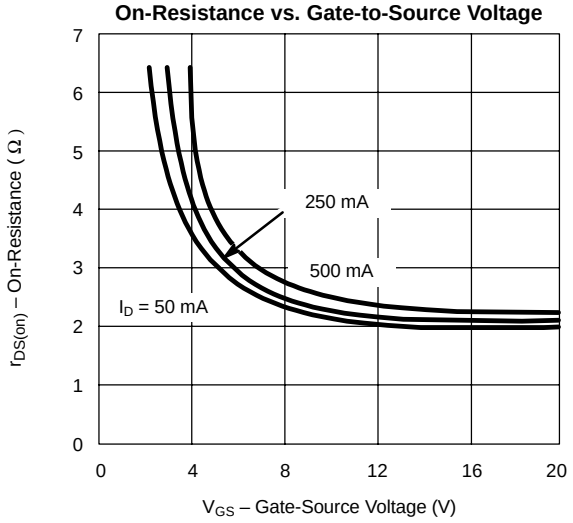
Output Characteristics for Low Gate Drive



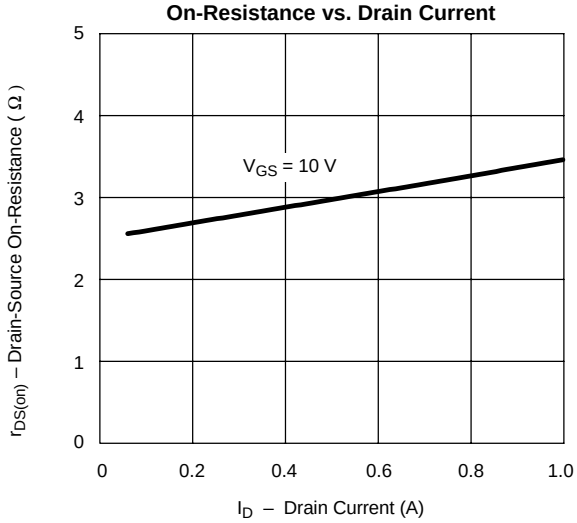
Transfer Characteristics



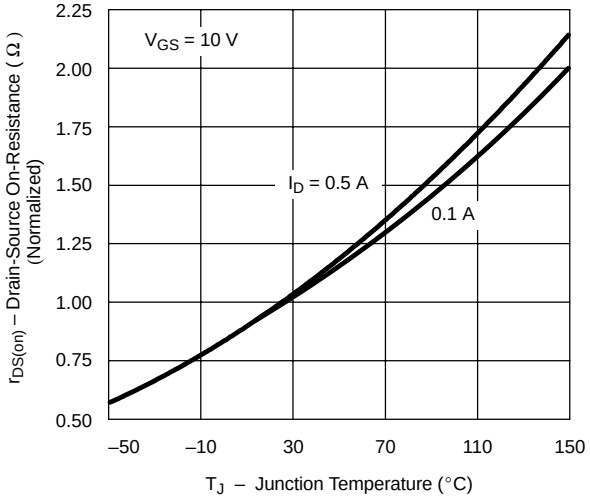
On-Resistance vs. Gate-to-Source Voltage



On-Resistance vs. Drain Current

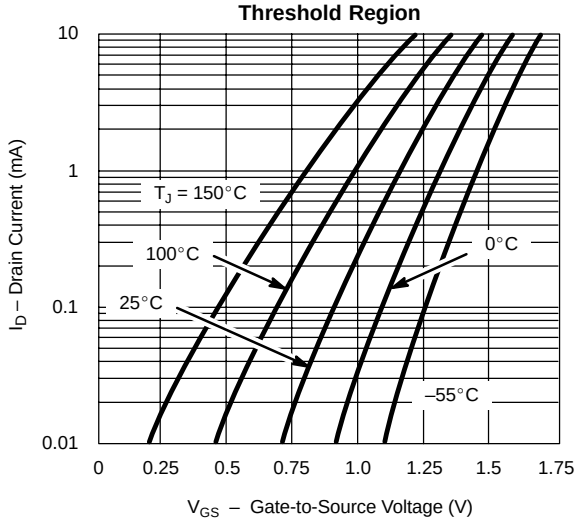


Normalized On-Resistance vs. Junction Temperature

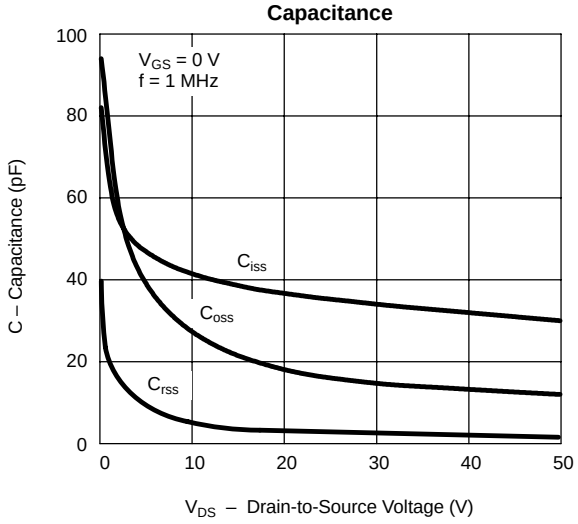


TYPICAL CHARACTERISTICS (T_A = 25°C UNLESS OTHERWISE NOTED)

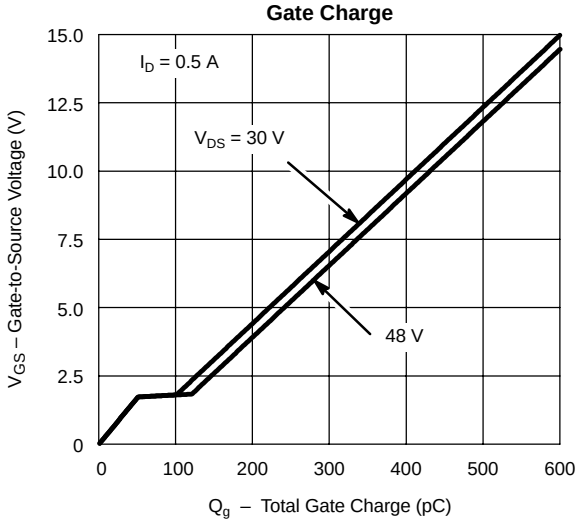
Threshold Region



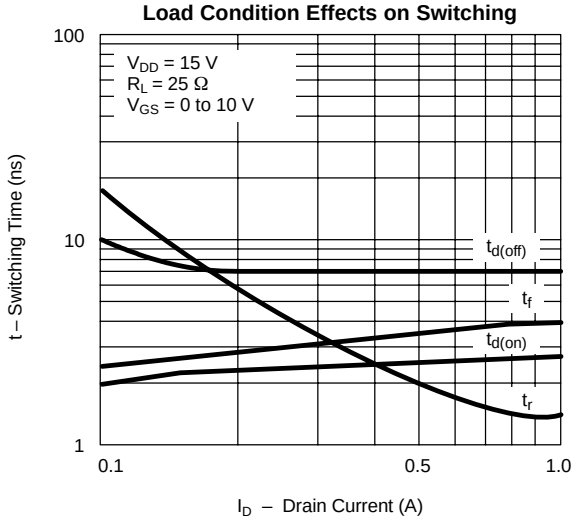
Capacitance



Gate Charge



Load Condition Effects on Switching



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