N-Channel 240-V (D-S) MOSFETs

PRODUCT SUMMARY

Part Number	$V_{(BR)DSS}$ Min (V)	$r_{DS(on)}$ Max (Ω)	$V_{GS(th)}$ (V)	I_D (A)
TN2410L	240	10 @ V_{GS} = 4.5 V	0.5 to 1.8	0.18
VN2406D		6 @ V_{GS} = 10 V	0.8 to 2	1.12
VN2406L		6 @ V_{GS} = 10 V	0.8 to 2	0.18
VN2410L		10 @ V_{GS} = 10 V	0.8 to 2	0.18
VN2410LS		10 @ V_{GS} = 10 V	0.8 to 2	0.19

FEATURES

- Low On-Resistance: 3.5 Ω
- Secondary Breakdown Free: 260 V
- Low Power/Voltage Driven
- Low Input and Output Leakage
- Excellent Thermal Stability

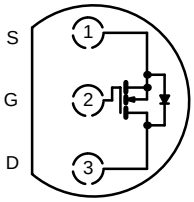
BENEFITS

- Low Offset Voltage
- Full-Voltage Operation
- Easily Driven Without Buffer
- Low Error Voltage
- No High-Temperature “Run-Away”

APPLICATIONS

- High-Voltage Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Transistors, etc.
- Telephone Mute Switches, Ringer Circuits
- Power Supply, Converters
- Motor Control

TO-226AA
(TO-92)



Top View

TN2410L
VN2406L
VN2410L

’Device Marking
Front View

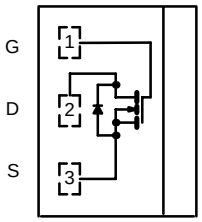
TN2410L
“S” TN
2410L
xxyy

VN2406L
“S” VN
2406L
xxyy

VN2410L
“S” VN
2410L
xxyy

“S” = Siliconix Logo
xxyy = Date Code

TO-220AB
(Tab Drain)



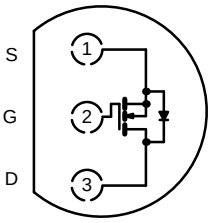
Top View
VN2406D

’Device Marking
Front View

VN2406D
VN2406D
“S” *xxyy*

“S” = Siliconix Logo
xxyy = Date Code

TO-92S
(Copper Lead Frame)



Top View

VN2410LS

’Device Marking
Front View

VN2410LS
“S” VN
2410LS
xxyy

“S” = Siliconix Logo
xxyy = Date Code

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C UNLESS OTHERWISE NOTED)

Parameter		Symbol	TN2410L	VN2406D[b]	VN2406L	VN2410L	VN2410LS	Unit
Drain-Source Voltage		V_{DS}	240	240	240	240	240	V
Gate-Source Voltage		V_{GS}	± 20	± 20	± 20	± 20	± 20	
Continuous Drain Current (T_J = 150°C)	T_A= 25°C	I_D	0.18	1.12	0.18	0.18	0.19	A
	T_A= 100°C		0.11	0.7	0.11	0.11	0.12	
Pulsed Drain Current[a]		I_{DM}	1	3	1.7	1.7	2	
Power Dissipation	T_A= 25°C	P_D	0.8	20	0.8	0.8	0.9	W
	T_A= 100°C		0.32	8	0.32	0.32	0.4	
Thermal Resistance, Junction-to-Ambient		R_{thJA}	156	6.25[c]	156	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.
b. Reference case for all temperature testing.
c. Maximum junction-to-case

SPECIFICATIONS (T_A = 25°C UNLESS OTHERWISE NOTED)

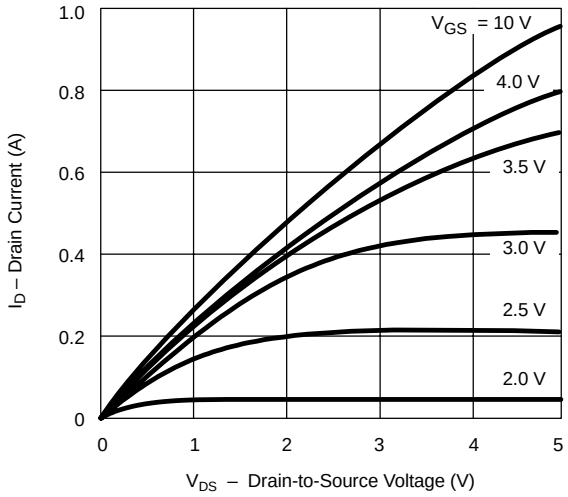
Parameter	Symbol	Test Conditions	Typ[a]	Limits						Unit
				TN2410L		VN2406D/L		VN2410L/LS		
				Min	Max	Min	Max	Min	Max	
Static										
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 100 µA	260	240		240		240		V
Gate-Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 1 mA	1.4	0.5	1.8	0.8	2	0.8	2	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±15 V					±100		±100	nA
		T_J = 125°C					±500		±500	
		V_{DS} = 0 V, V_{GS} = ±20 V			±10					
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 192 V, V_{GS} = 0 V	0.01		1					µA
		T_J = 125°C	1		100					
		V_{DS} = 120 V, V_{GS} = 0 V					10		10	
		T_J = 125°C					500		500	
On-State Drain Current[b]	$I_{D(on)}$	V_{DS} = 10 V, V_{GS} = 4.5 V	0.8	0.25						A
		V_{DS} = 15 V, V_{GS} = 10 V	1.5			1		1		
Drain-Source On-Resistance[b]	$r_{DS(on)}$	V_{GS} = 2.5 V, I_D = 0.1 A	7.5				10		10	Ω
		V_{GS} = 3.5 V, I_D = 0.05 A	4.5		15					
		V_{GS} = 4.5 V, I_D = 0.2 A	4		10					
		T_J = 125°C	7.5		20					
		V_{GS} = 10 V, I_D = 0.5 A	3.5				6		10	
		T_J = 125°C	6.5				14.8		24.7	
Forward Transconductance[b]	g_{fs}	V_{DS} = 10 V, I_D = 0.2 A	500	100						mS
		V_{DS} = 10 V, I_D = 0.5 A	530			300		300		
Input Capacitance	C_{iss}	V_{DS} = 25 V, V_{GS} = 0 V f = 1 MHz	115		135		135		135	pF
Output Capacitance	C_{oss}		30		50		50		50	
Reverse Transfer Capacitance	C_{rss}		5		20		20		20	
Switching[c]										
Turn-On Time	t_{ON}	V_{DD} = 60 V, R_L = 150 Ω I_D ≅ 0.4 A, V_{GEN} = 10 V R_G = 25 Ω	5		35					ns
	$t_{d(on)}$		3				8		8	
	t_r		2				8		8	
Turn-Off Time	t_{OFF}		26		60					
	$t_{d(off)}$		20				23		23	
	t_f		6				34		34	

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.

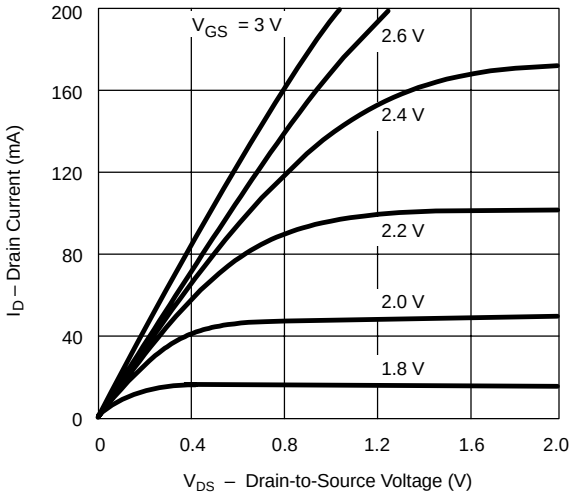
VNDB24

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

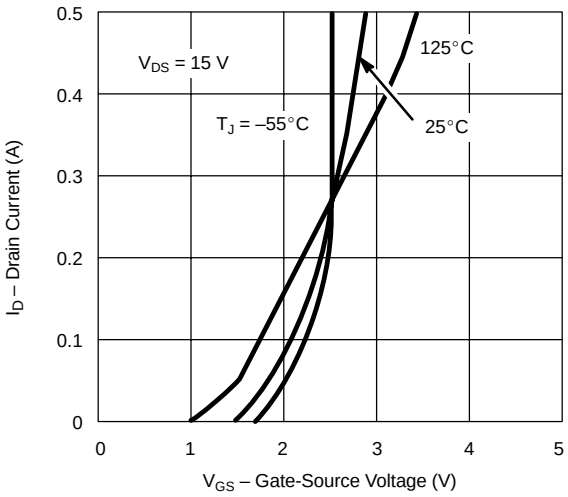
Ohmic Region Characteristics



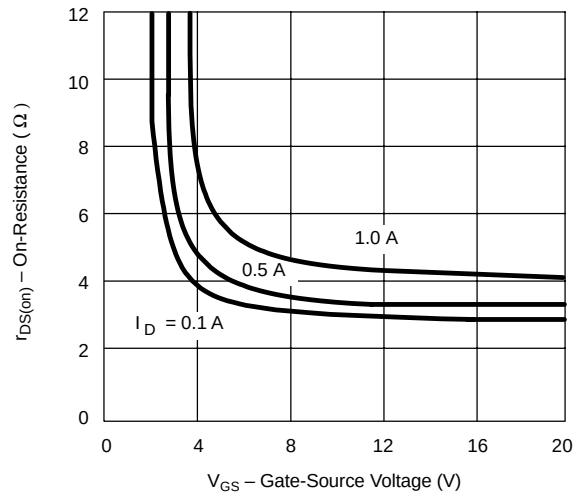
Output Characteristics for Low Gate Drive



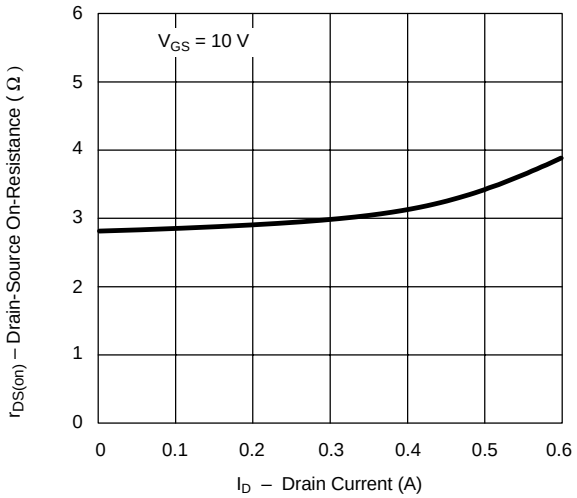
Transfer Characteristics



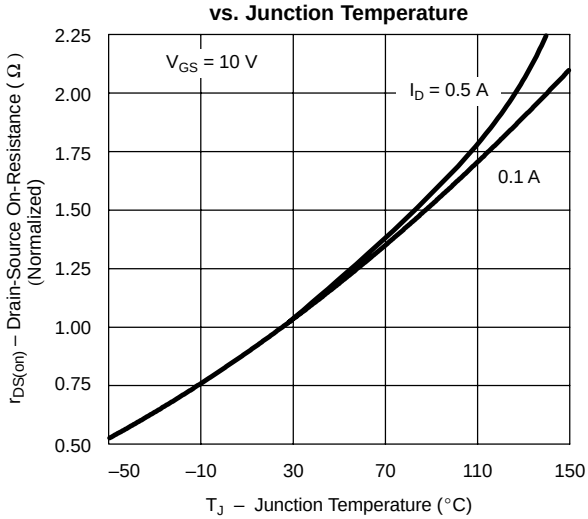
On-Resistance vs. Gate-to-Source Voltage



On-Resistance vs. Drain Current

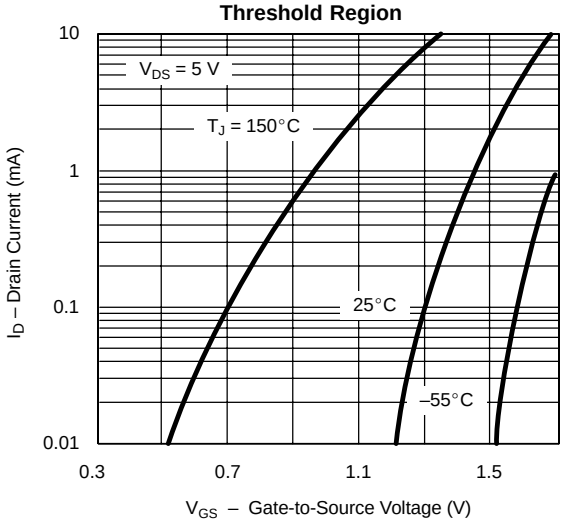


Normalized On-Resistance vs. Junction Temperature

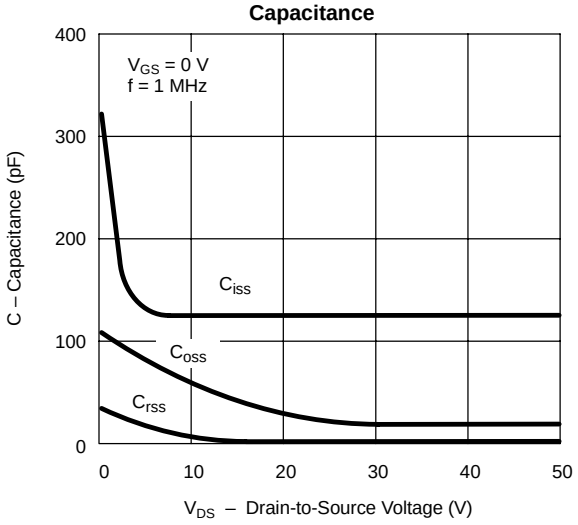


TYPICAL CHARACTERISTICS (T_A = 25°C UNLESS OTHERWISE NOTED)

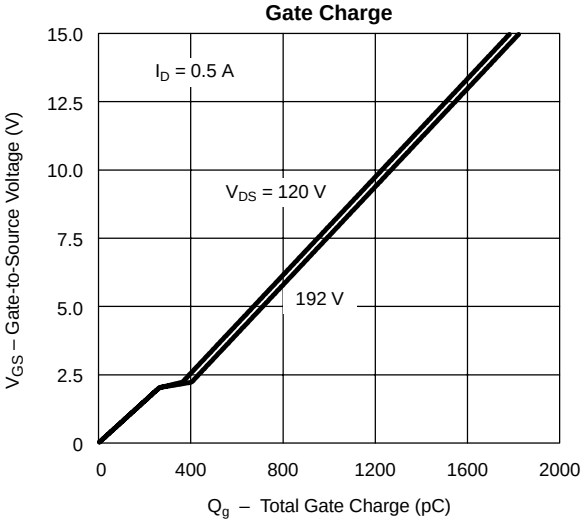
Threshold Region



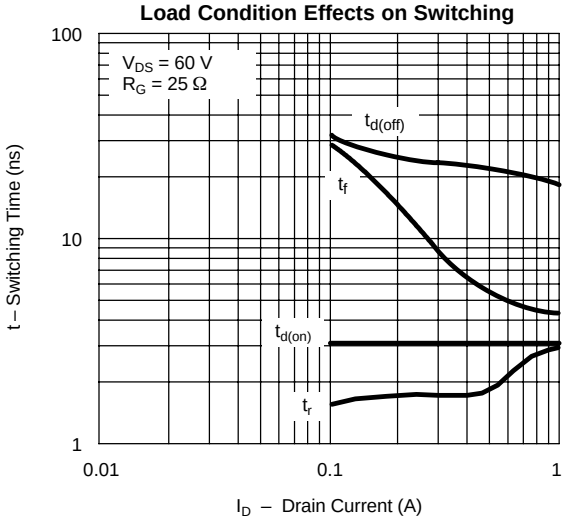
Capacitance



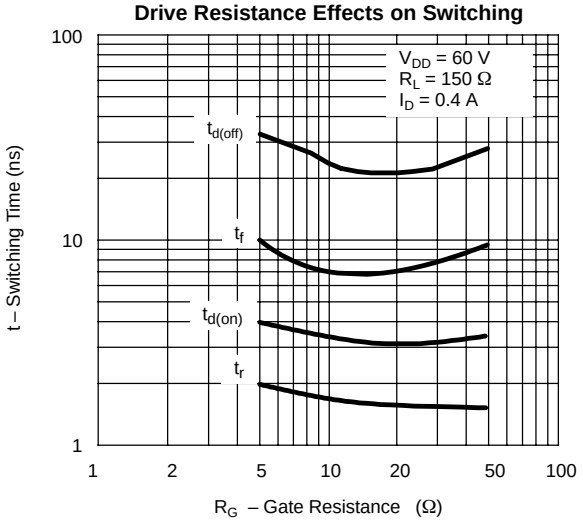
Gate Charge



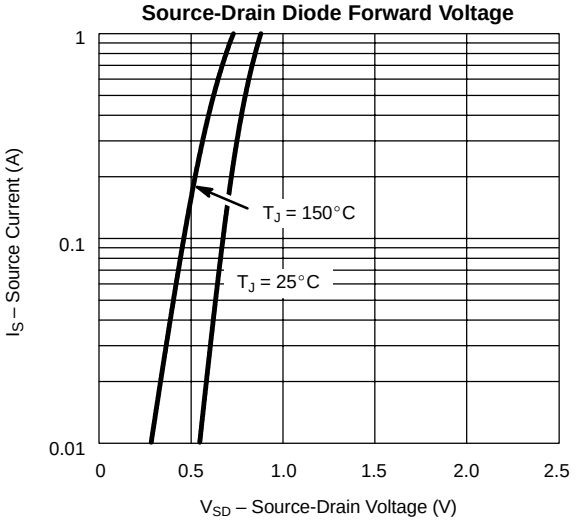
Load Condition Effects on Switching



Drive Resistance Effects on Switching



Source-Drain Diode Forward Voltage



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

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