

VN2222LL

Preferred Device

Small Signal MOSFET 150 mAmps, 60 Volts

N-Channel TO-92

Features

- Pb-Free Packages are Available*

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	60	Vdc
Drain-Gate Voltage ($R_{GS} = 1.0 \text{ M}\Omega$)	V_{DGR}	60	Vdc
Gate-Source Voltage - Continuous - Non-repetitive ($t_p \leq 50 \mu\text{s}$)	V_{GS} V_{GSM}	± 20 ± 40	Vdc Vpk
Drain Current - Continuous - Pulsed	I_D I_{DM}	150 1000	mA dc
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	400 3.2	mW mW/ $^\circ\text{C}$
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to $+150$	$^\circ\text{C}$

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	312.5	$^\circ\text{C}/\text{W}$
Maximum Lead Temperature for Soldering Purposes, 1/16" from case for 10 seconds	T_L	300	$^\circ\text{C}$

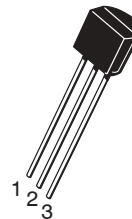
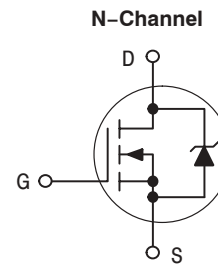
*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



ON Semiconductor®

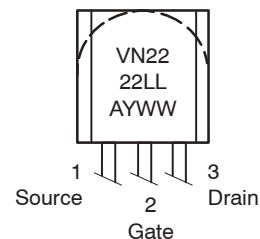
<http://onsemi.com>

150 mA, 60 V
 $R_{DS(on)} = 7.5 \Omega$



TO-92
CASE 29
STYLE 22

MARKING DIAGRAM & PIN ASSIGNMENT



A = Assembly Location
Y = Year
WW = Work Week

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 1096 of this data sheet.

Preferred devices are recommended choices for future use and best overall value.

VN2222LL

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
----------------	--------	-----	-----	------

OFF CHARACTERISTICS

Drain-Source Breakdown Voltage (V _{GS} = 0, I _D = 100 µAdc)	V _{(BR)DSS}	60	–	Vdc
Zero Gate Voltage Drain Current (V _{DS} = 48 Vdc, V _{GS} = 0) (V _{DS} = 48 Vdc, V _{GS} = 0, T _J = 125°C)	I _{DSS}	– –	10 500	µAdc
Gate-Body Leakage Current, Forward (V _{GSF} = 30 Vdc, V _{DS} = 0)	I _{GSSF}	–	–100	nAdc

ON CHARACTERISTICS (Note 1)

Gate Threshold Voltage (V _{DS} = V _{GS} , I _D = 1.0 mAdc)	V _{GS(th)}	0.6	2.5	Vdc
Static Drain-Source On-Resistance (V _{GS} = 10 Vdc, I _D = 0.5 Adc) (V _{GS} = 10 Vdc, I _D = 0.5 Vdc, T _C = 125°C)	r _{DS(on)}	– –	7.5 13.5	Ω
Drain-Source On-Voltage (V _{GS} = 5.0 Vdc, I _D = 200 mAdc) (V _{GS} = 10 Vdc, I _D = 500 mAdc)	V _{DS(on)}	– –	1.5 3.75	Vdc
On-State Drain Current (V _{GS} = 10 Vdc, V _{DS} ≥ 2.0 V _{DS(on)})	I _{D(on)}	750	–	mA
Forward Transconductance (V _{DS} = 10 Vdc, I _D = 500 mAdc)	g _{fs}	100	–	µmhos

DYNAMIC CHARACTERISTICS

Input Capacitance	(V _{DS} = 25 Vdc, V _{GS} = 0, f = 1.0 MHz)	C _{iss}	–	60	pF
Output Capacitance		C _{oss}	–	25	
Reverse Transfer Capacitance		C _{rss}	–	5.0	

SWITCHING CHARACTERISTICS (Note 1)

Turn-On Delay Time	(V _{DD} = 15 Vdc, I _D = 600 mA, R _{gen} = 25 Ω, R _L = 23 Ω)	t _{on}	–	10	ns
Turn-Off Delay Time		t _{off}	–	10	

1. Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%.

ORDERING INFORMATION

Device	Package	Shipping [†]
VN2222LL	TO-92	1000 Unit / Box
VN2222LLG	TO-92 (Pb-Free)	1000 Unit / Box
VN2222LLRL	TO-92	1000 Unit / Box
VN2222LLRLRA	TO-92	2000 Tape & Reel
VN2222LLRLRAG	TO-92 (Pb-Free)	2000 Tape & Reel
VN2222LLRLRM	TO-92	2000 Unit / Ammo Box

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

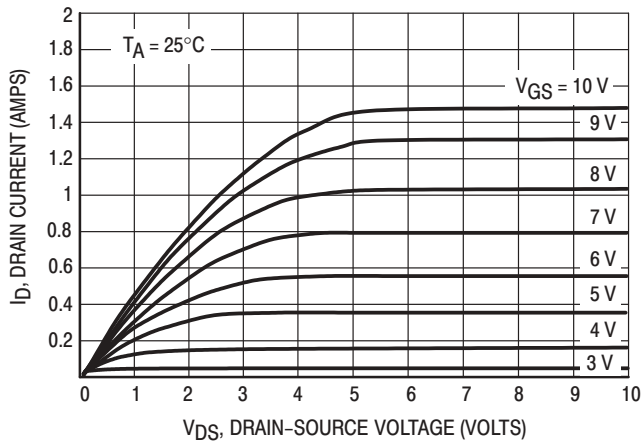


Figure 1. Ohmic Region

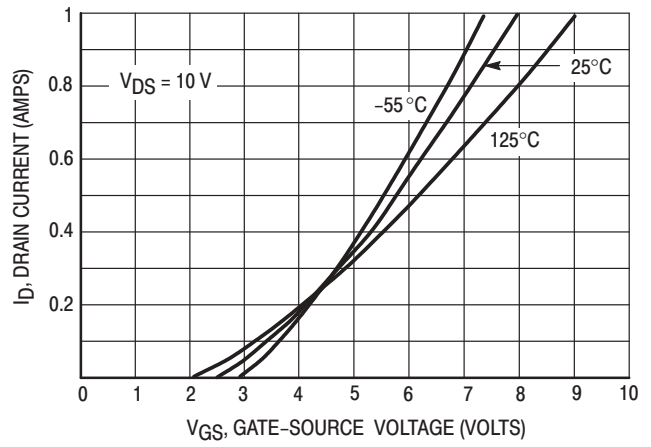


Figure 2. Transfer Characteristics

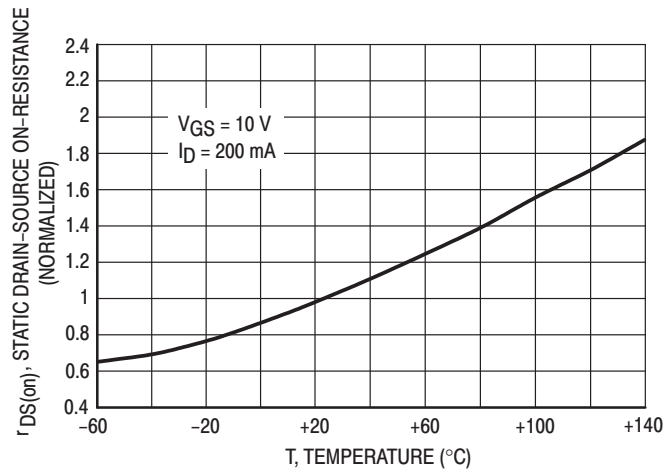


Figure 3. Temperature versus Static Drain-Source On-Resistance

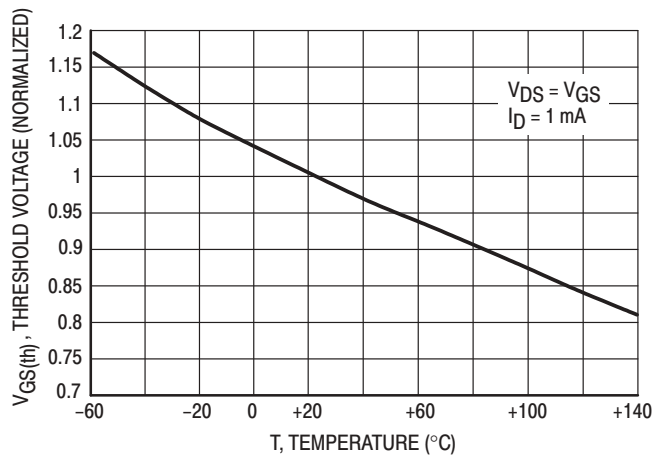


Figure 4. Temperature versus Gate Threshold Voltage

VN2406L

Preferred Device

Small Signal MOSFET 200 mAmps, 240 Volts N-Channel TO-92

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain – Source Voltage	V_{DSS}	240	Vdc
Drain – Gate Voltage	V_{DGR}	240	Vdc
Gate – Source Voltage – Continuous – Non-repetitive ($t_p \leq 50 \mu s$)	V_{GS} V_{GSM}	± 20 ± 40	Vdc Vpk
Continuous Drain Current	I_D	200	mA _{dc}
Pulsed Drain Current	I_{DM}	500	mA _{dc}
Power Dissipation @ $T_C = 25^\circ C$ Derate above $25^\circ C$	P_D	350 2.8	mW mW/ $^\circ C$
Operating and Storage Temperature	T_J, T_{stg}	–	$^\circ C$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	312.5	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes, 1/16" from case for 10 seconds	T_L	300	$^\circ C$

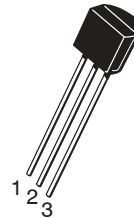
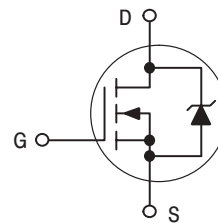


ON Semiconductor™

<http://onsemi.com>

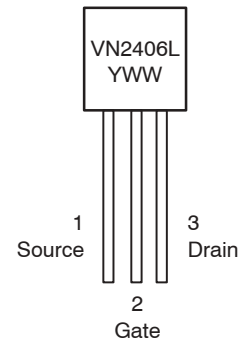
200 mAmps
240 VOLTS
 $R_{DS(on)} = 6 \Omega$

N-Channel



TO-92
CASE 29
Style 22

MARKING DIAGRAM & PIN ASSIGNMENT



Y = Year
WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
VN2406L	TO-92	1000 Units/Box
VN2406LZL1	TO-92	2000 Ammo Pack

Preferred devices are recommended choices for future use and best overall value.

VN2406L

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
----------------	--------	-----	-----	------

STATIC CHARACTERISTICS

Drain–Source Breakdown Voltage (V _{GS} = 0, I _D = 100 μA)	V _{(BR)DSS}	240	–	Vdc
Zero Gate Voltage Drain Current (V _{DS} = 120 Vdc, V _{GS} = 0) (V _{DS} = 120 Vdc, V _{GS} = 0, T _A = 125°C)	I _{DSS}	– –	10 500	μAdc
Gate–Body Leakage (V _{DS} = 0, V _{GS} = ±15 V)	I _{GSS}	–	±100	nAdc
Gate Threshold Voltage (V _{DS} = V _{GS} , I _D = 1.0 mA)	V _{GS(th)}	0.8	2.0	Vdc
On–State Drain Current (Note 1) (V _{GS} = 10 V, V _{DS} ≥ 2.0 V _{DS(on)})	I _{D(on)}	1.0	–	Adc
Drain–Source On Resistance (Note 1) (V _{GS} = 2.5 V, I _D = 0.1 A) (V _{GS} = 10 V, I _D = 0.5 A)	r _{DS(on)}	– –	10 6.0	Ω
Forward Transconductance (Note 1) (V _{DS} = 10 V, I _D = 0.5 A)	g _{fs}	300	–	mS

DYNAMIC CHARACTERISTICS

Input Capacitance	(V _{DS} = 25 Vdc, V _{GS} = 0, f = 1.0 MHz)	C _{iss}	–	125	pF
Output Capacitance		C _{oss}	–	50	pF
Reverse Transfer Capacitance		C _{rss}	–	20	pF

SWITCHING CHARACTERISTICS

Turn–On Time	(V _{DD} = 60 Vdc, I _D = 0.4 A, R _L = 150 Ω, R _G = 25 Ω)	t _(on)	–	8.0	ns
		t _(r)	–	8.0	ns
Turn–Off Time		t _(off)	–	23	ns
		t _(f)	–	34	ns

1. Pulse Test; Pulse Width < 300 μs, Duty Cycle ≤ 2.0%.