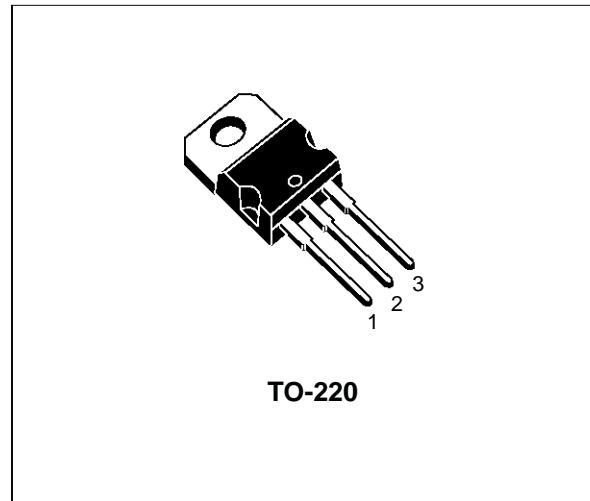


OMNIFET : FULLY AUTOPROTECTED POWER MOSFET

TYPE	V_{clamp}	$R_{\text{DS(on)}}$	I_{lim}
VNP49N04	42 V	0.02 Ω	49 A

- LINEAR CURRENT LIMITATION
- THERMAL SHUT DOWN
- SHORT CIRCUIT PROTECTION
- INTEGRATED CLAMP
- LOW CURRENT DRAWN FROM INPUT PIN
- DIAGNOSTIC FEEDBACK THROUGH INPUT PIN
- ESD PROTECTION
- DIRECT ACCESS TO THE GATE OF THE POWER MOSFET (ANALOG DRIVING)
- COMPATIBLE WITH STANDARD POWER MOSFET
- STANDARD TO-220 PACKAGE



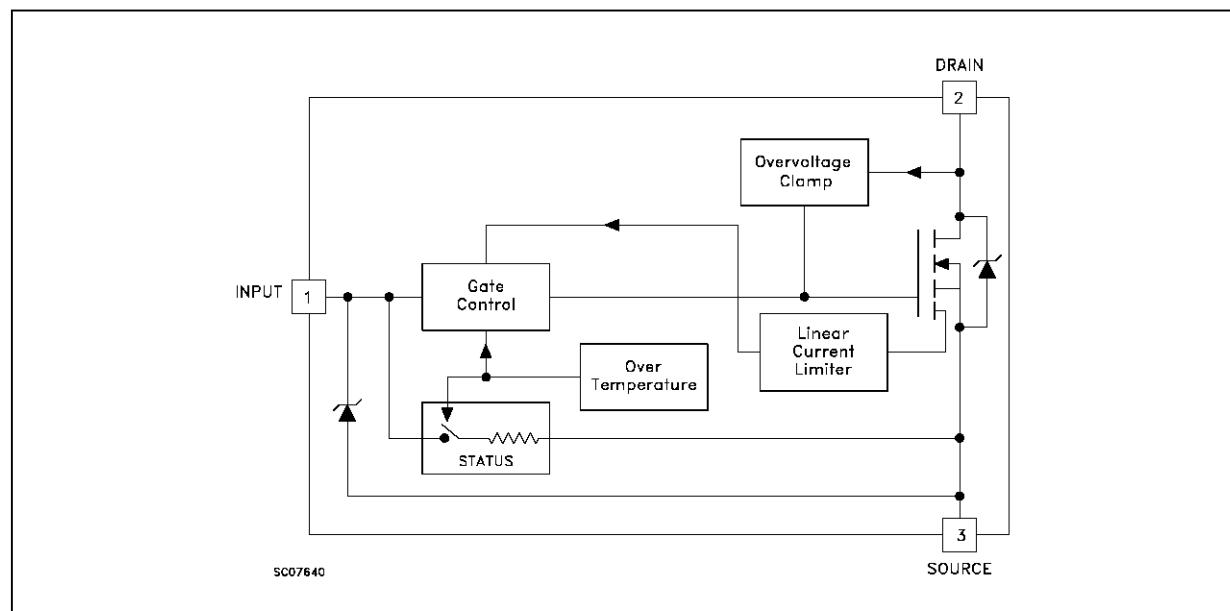
DESCRIPTION

The VNP49N04 is a monolithic device made using STMicroelectronics VIPower Technology, intended for replacement of standard power MOSFETs in DC to 50 KHz applications. Built-in thermal shut-down, linear current limita-

tion and overvoltage clamp protect the chip in harsh environments.

Fault feedback can be detected by monitoring the voltage at the input pin.

BLOCK DIAGRAM



VNP49N04

ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage ($V_{in} = 0$)	Internally Clamped	V
V_{in}	Input Voltage	18	V
I_D	Drain Current	Internally Limited	A
I_R	Reverse DC Output Current	-50	A
V_{esd}	Electrostatic Discharge ($C = 100 \text{ pF}, R=1.5 \text{ k}\Omega$)	2000	V
P_{tot}	Total Dissipation at $T_c = 25^\circ\text{C}$	125	W
T_j	Operating Junction Temperature	Internally Limited	$^\circ\text{C}$
T_c	Case Operating Temperature	Internally Limited	$^\circ\text{C}$
T_{stg}	Storage Temperature	-55 to 150	$^\circ\text{C}$

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	$^\circ\text{C}/\text{W}$

ELECTRICAL CHARACTERISTICS ($T_{case} = 25^\circ\text{C}$ unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{CLAMP}	Drain-source Clamp Voltage	$I_D = 200 \text{ mA} \quad V_{in} = 0$	36	42	48	V
V_{CLTH}	Drain-source Clamp Threshold Voltage	$I_D = 2 \text{ mA} \quad V_{in} = 0$	35			V
V_{INCL}	Input-Source Reverse Clamp Voltage	$I_{in} = -1 \text{ mA}$	-1		-0.3	V
I_{DSS}	Zero Input Voltage Drain Current ($V_{in} = 0$)	$V_{DS} = 13 \text{ V} \quad V_{in} = 0$ $V_{DS} = 25 \text{ V} \quad V_{in} = 0$			50 200	μA μA
I_{ISS}	Supply Current from Input Pin	$V_{DS} = 0 \text{ V} \quad V_{in} = 10 \text{ V}$		250	500	μA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{IN(th)}$	Input Threshold Voltage	$V_{DS} = V_{in} \quad I_D + I_{in} = 1 \text{ mA}$	0.8		3	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{in} = 10 \text{ V} \quad I_D = 25 \text{ A}$ $V_{in} = 5 \text{ V} \quad I_D = 25 \text{ A}$			0.02 0.025	Ω Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} \text{ (*)}$	Forward Transconductance	$V_{DS} = 13 \text{ V} \quad I_D = 25 \text{ A}$	25	30		S
C_{oss}	Output Capacitance	$V_{DS} = 13 \text{ V} \quad f = 1 \text{ MHz} \quad V_{in} = 0$		1100	1500	pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING (**)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 15 \text{ V}$ $I_d = 25 \text{ A}$		200	300	ns
t_r	Rise Time	$V_{gen} = 10 \text{ V}$ $R_{gen} = 10 \Omega$		1300	1800	ns
$t_{d(off)}$	Turn-off Delay Time	(see figure 3)		800	1200	ns
t_f	Fall Time			300	450	ns
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 15 \text{ V}$ $I_d = 25 \text{ A}$		1.3	1.9	μs
t_r	Rise Time	$V_{gen} = 10 \text{ V}$ $R_{gen} = 1000 \Omega$		3.8	5.2	μs
$t_{d(off)}$	Turn-off Delay Time	(see figure 3)		12	14	μs
t_f	Fall Time			6.1	8.5	μs
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 15 \text{ V}$ $I_D = 25 \text{ A}$		25		$\text{A}/\mu\text{s}$
V_{in}	Total Input Charge	$V_{DD} = 15 \text{ V}$ $I_D = 25 \text{ A}$ $V_{in} = 10 \text{ V}$		100		nC

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 25 \text{ A}$ $V_{in} = 0$			1.6	V
$t_{rr} (**)$	Reverse Recovery Time	$I_{SD} = 25 \text{ A}$ $di/dt = 100 \text{ A}/\mu\text{s}$		250		ns
$Q_{rr} (**)$	Reverse Recovery Charge	$V_{DD} = 30 \text{ V}$ $T_j = 25 \text{ }^\circ\text{C}$		910		nC
$I_{RRM} (**)$	Reverse Recovery Current	(see test circuit, figure 5)		7.5		A

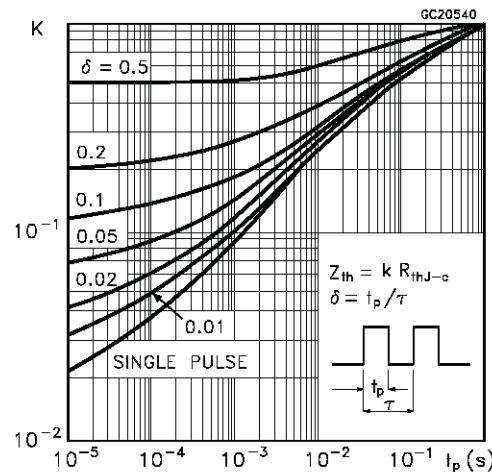
PROTECTION

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{lim}	Drain Current Limit	$V_{in} = 10 \text{ V}$ $V_{DS} = 13 \text{ V}$ $V_{in} = 5 \text{ V}$ $V_{DS} = 13 \text{ V}$	30	49	68	A
$t_{dlim} (**)$	Step Response Current Limit	$V_{in} = 10 \text{ V}$ $V_{in} = 5 \text{ V}$		35 90	50 150	μs μs
$T_{jsh} (**)$	Overtemperature Shutdown		150			$^\circ\text{C}$
$T_{jrs} (**)$	Overtemperature Reset		135			$^\circ\text{C}$
$I_{gf} (**)$	Fault Sink Current	$V_{in} = 10 \text{ V}$ $V_{DS} = 13 \text{ V}$ $V_{in} = 5 \text{ V}$ $V_{DS} = 13 \text{ V}$		50 20		mA mA
$E_{as} (**)$	Single Pulse Avalanche Energy	starting $T_j = 25 \text{ }^\circ\text{C}$ $V_{DD} = 20 \text{ V}$ $V_{in} = 10 \text{ V}$ $R_{gen} = 1 \text{ K}\Omega$ $L = 6 \text{ mH}$	4			J

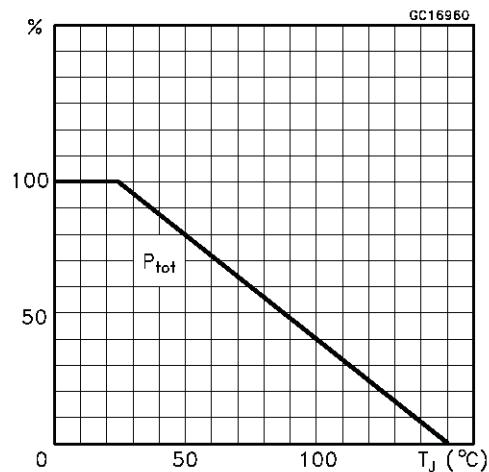
(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

(**) Parameters guaranteed by design/characterization

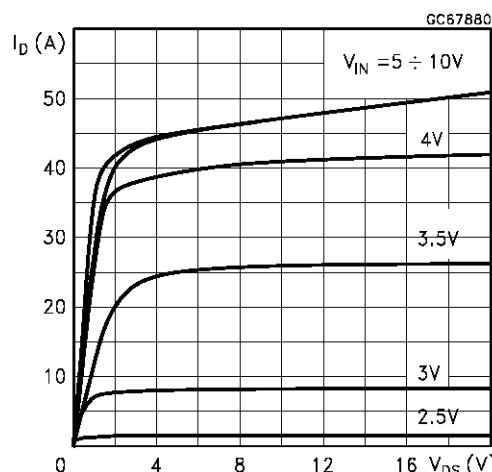
Thermal Impedance



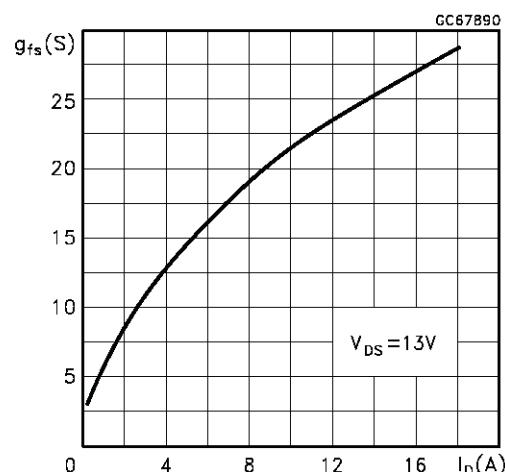
Derating Curve



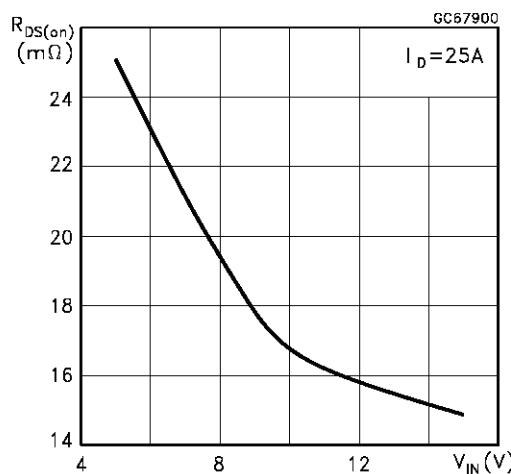
Output Characteristics



Transconductance



Static Drain-Source On Resistance vs Input Voltage



Static Drain-Source On Resistance

