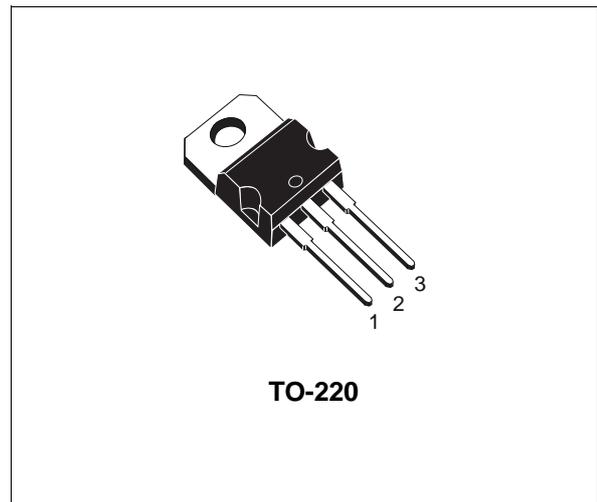


"OMNIFET": FULLY AUTOPROTECTED POWER MOSFET

TYPE	V _{clamp}	R _{DS(on)}	I _{lim}
VNP20N07	70 V	0.05 Ω	20 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

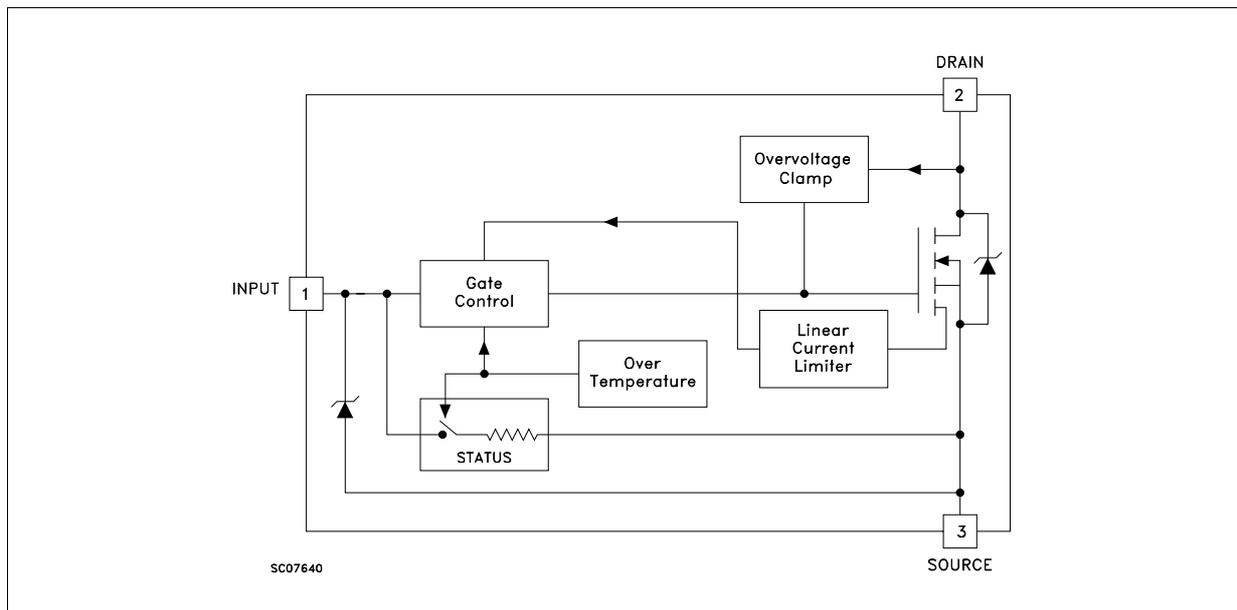


DESCRIPTION

The VNP20N07 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 limi-

tation and overvoltage clamp protect the chip in harsh environments. Fault feedback can be detected by monitoring the voltage at the input pin.

BLOCK DIAGRAM



VNP20N07

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	-28	A
V_{esd}	Electrostatic Discharge (C= 100 pF, R=1.5 K Ω)	2000	V
P_{tot}	Total Dissipation at $T_c = 25$ °C	83	W
T_j	Operating Junction Temperature	Internally Limited	°C
T_c	Case Operating Temperature	Internally Limited	°C
T_{stg}	Storage Temperature	-55 to 150	°C

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.5	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{CLAMP}	Drain-source Clamp Voltage	$I_D = 200$ mA $V_{in} = 0$	60	70	80	V
V_{CLTH}	Drain-source Clamp Threshold Voltage	$I_D = 2$ mA $V_{in} = 0$	55			V
V_{INCL}	Input-Source Reverse Clamp Voltage	$I_{in} = -1$ mA	-1		-0.3	V
I_{DSS}	Zero Input Voltage Drain Current ($V_{in} = 0$)	$V_{DS} = 13$ V $V_{in} = 0$ $V_{DS} = 25$ V $V_{in} = 0$			50 200	μ A μ A
I_{ISS}	Supply Current from Input Pin	$V_{DS} = 0$ V $V_{in} = 10$ V		250	500	μ A

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{IN(th)}$	Input Threshold Voltage	$V_{DS} = V_{in}$ $I_D + I_{in} = 1$ mA	0.8		3	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{in} = 10$ V $I_D = 10$ A $V_{in} = 5$ V $I_D = 10$ A			0.05 0.07	Ω Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} = 13$ V $I_D = 10$ A	13	17		S
C_{oss}	Output Capacitance	$V_{DS} = 13$ V $f = 1$ MHz $V_{in} = 0$		500	800	pF

ELECTRICAL CHARACTERISTICS (continued)
SWITCHING ()**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 15\text{ V}$ $I_d = 10\text{ A}$		90	180	ns
t_r	Rise Time	$V_{gen} = 10\text{ V}$ $R_{gen} = 10\ \Omega$		240	400	ns
$t_{d(off)}$	Turn-off Delay Time	(see figure 3)		430	800	ns
t_f	Fall Time			150	300	ns
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 15\text{ V}$ $I_d = 10\text{ A}$		800	1200	ns
t_r	Rise Time	$V_{gen} = 10\text{ V}$ $R_{gen} = 1000\ \Omega$		1.5	2.2	μs
$t_{d(off)}$	Turn-off Delay Time	(see figure 3)		6	10	μs
t_f	Fall Time			3.5	5.5	μs
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 15\text{ V}$ $I_D = 10\text{ A}$ $V_{in} = 10\text{ V}$ $R_{gen} = 10\ \Omega$		60		A/ μs
Q_i	Total Input Charge	$V_{DD} = 12\text{ V}$ $I_D = 10\text{ A}$ $V_{in} = 10\text{ V}$		60		nC

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 10\text{ A}$ $V_{in} = 0$			1.6	V
$t_{rr}(**)$	Reverse Recovery Time	$I_{SD} = 10\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 30\text{ V}$ $T_j = 25\text{ }^\circ\text{C}$		165		ns
$Q_{rr}(**)$	Reverse Recovery Charge	(see test circuit, figure 5)		0.55		μC
$I_{RRM}(**)$	Reverse Recovery Current			6.5		A

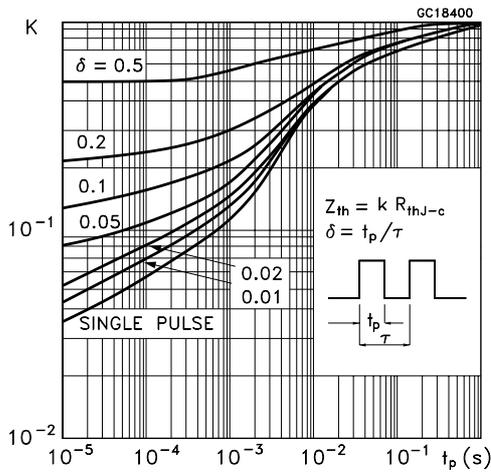
PROTECTION

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{lim}	Drain Current Limit	$V_{in} = 10\text{ V}$ $V_{DS} = 13\text{ V}$ $V_{in} = 5\text{ V}$ $V_{DS} = 13\text{ V}$	14 14	20 20	28 28	A A
$t_{dlim}(**)$	Step Response Current Limit	$V_{in} = 10\text{ V}$ $V_{in} = 5\text{ V}$		29 70	60 140	μs μs
$T_{jsh}(**)$	Overtemperature Shutdown		150			$^\circ\text{C}$
$T_{jrs}(**)$	Overtemperature Reset		135			$^\circ\text{C}$
$I_{gf}(**)$	Fault Sink Current	$V_{in} = 10\text{ V}$ $V_{in} = 5\text{ V}$		50 20		mA mA
$E_{as}(**)$	Single Pulse Avalanche Energy	starting $T_j = 25\text{ }^\circ\text{C}$ $V_{DD} = 20\text{ V}$ $V_{in} = 10\text{ V}$ $R_{gen} = 1\text{ K}\Omega$ $L = 10\text{ mH}$	0.95			J

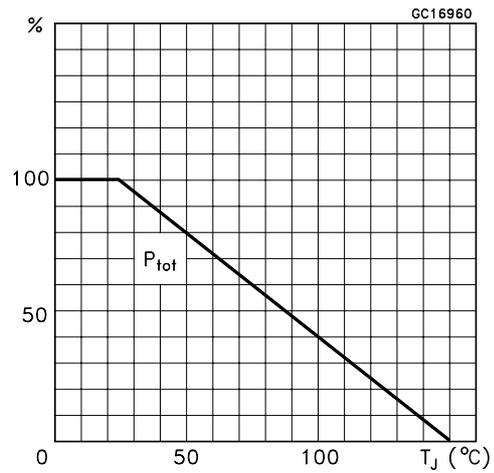
(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

(**) Parameters guaranteed by design/characterization

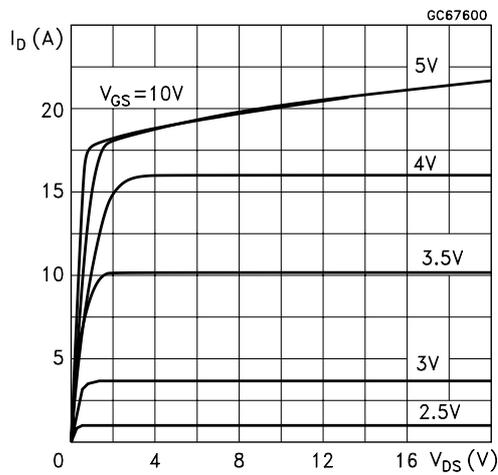
Thermal Impedance



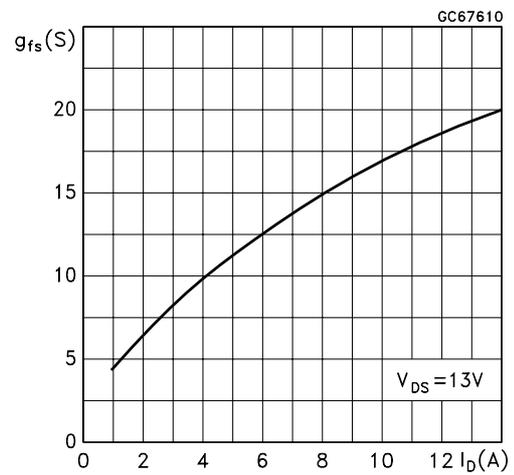
Derating Curve



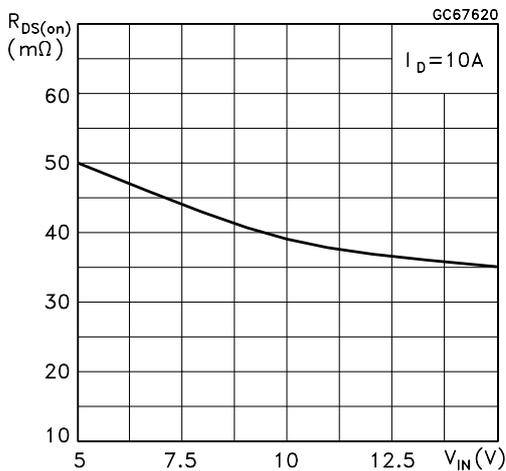
Output Characteristics



Transconductance



Static Drain-Source On Resistance vs Input Voltage



Static Drain-Source On Resistance

