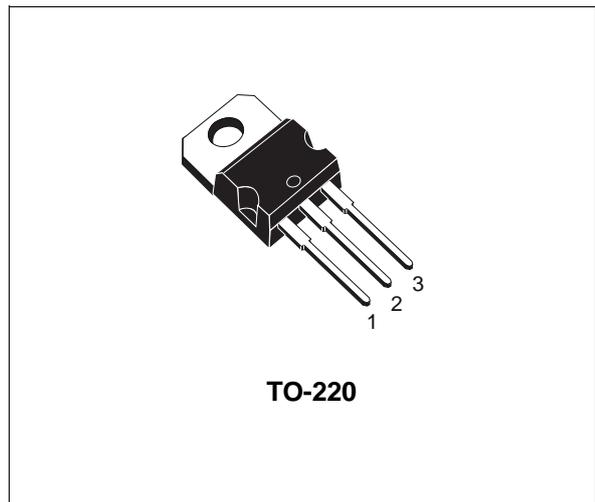


"OMNIFET": FULLY AUTOPROTECTED POWER MOSFET

TYPE	V _{clamp}	R _{DS(on)}	I _{lim}
VNP5N07	70 V	0.2 Ω	5 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



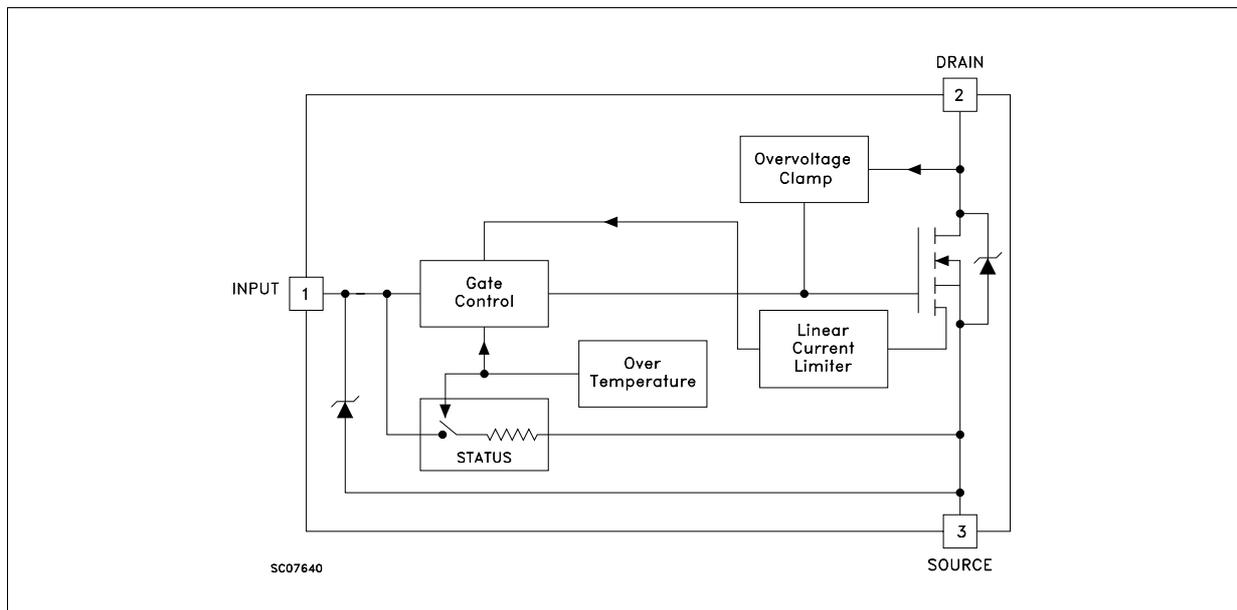
DESCRIPTION

The VNP5N07 is a monolithic device made using STMicroelectronics VIPower M0 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



VNP5N07

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	-7	A
V_{esd}	Electrostatic Discharge (C= 100 pF, R=1.5 K Ω)	2000	V
P_{tot}	Total Dissipation at $T_c = 25$ °C	31	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	4	°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
$V_{IS(th)}$	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 $I_D = 2.5$ A $V_{in} = 5$ V $I_D = 2.5$ A			0.200 0.280	Ω Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} = 13$ V $I_D = 2.5$ A	3	4		S
C_{oss}	Output Capacitance	$V_{DS} = 13$ V $f = 1$ MHz $V_{in} = 0$		200	300	pF

ELECTRICAL CHARACTERISTICS (continued)**SWITCHING (**)**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 15\text{ V}$ $I_d = 2.5\text{ A}$		50	100	ns
t_r	Rise Time	$V_{gen} = 10\text{ V}$ $R_{gen} = 10\ \Omega$		60	100	ns
$t_{d(off)}$	Turn-off Delay Time	(see figure 3)		150	300	ns
t_f	Fall Time			40	80	ns
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 15\text{ V}$ $I_d = 2.5\text{ A}$		150	250	ns
t_r	Rise Time	$V_{gen} = 10\text{ V}$ $R_{gen} = 1000\ \Omega$		400	600	ns
$t_{d(off)}$	Turn-off Delay Time	(see figure 3)		3900	5000	ns
t_f	Fall Time			1100	1600	ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 15\text{ V}$ $I_D = 2.5\text{ A}$ $V_{in} = 10\text{ V}$ $R_{gen} = 10\ \Omega$		35		A/ μ s
Q_i	Total Input Charge	$V_{DD} = 12\text{ V}$ $I_D = 2.5\text{ A}$ $V_{in} = 10\text{ V}$		18		nC

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 2.5\text{ A}$ $V_{IN} = 0$			1.6	V
$t_{rr} (**)$	Reverse Recovery Time	$I_{SD} = 2.5\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 30\text{ V}$ $T_j = 25\text{ }^\circ\text{C}$		150		ns
$Q_{rr} (**)$	Reverse Recovery Charge	(see test circuit, figure 5)		0.3		μC
$I_{RRM} (**)$	Reverse Recovery Current			5.7		A

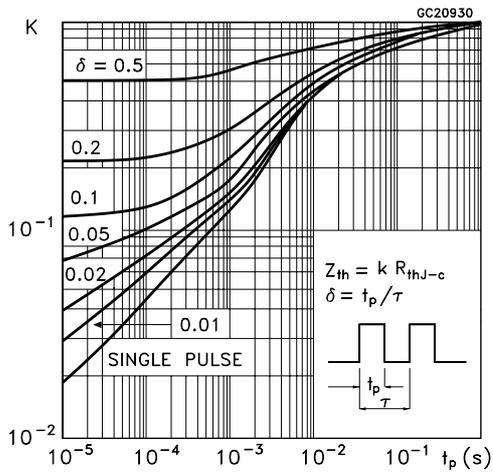
PROTECTION

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{lim}	Drain Current Limit	$V_{in} = 10\text{ V}$ $V_{DS} = 13\text{ V}$ $V_{in} = 5\text{ V}$ $V_{DS} = 13\text{ V}$	3.5 3.5	5 5	7 7	A A
$t_{dim} (**)$	Step Response Current Limit	$V_{in} = 10\text{ V}$ $V_{in} = 5\text{ V}$		15 40	20 60	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
$E_{as} (**)$	Single Pulse Avalanche Energy	starting $T_j = 25\text{ }^\circ\text{C}$ $V_{DD} = 20\text{ V}$ $V_{in} = 10\text{ V}$ $R_{gen} = 1\text{ K}\Omega$ $L = 30\text{ mH}$	0.2			J

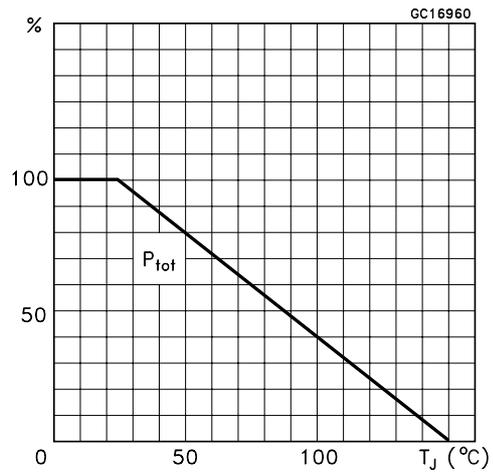
(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

(**) Parameters guaranteed by design/characterization

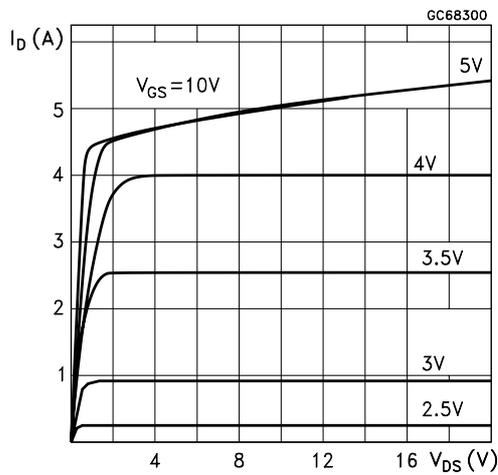
Thermal Impedance



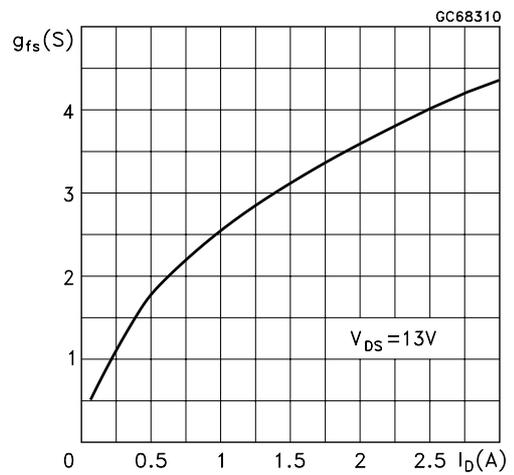
Derating Curve



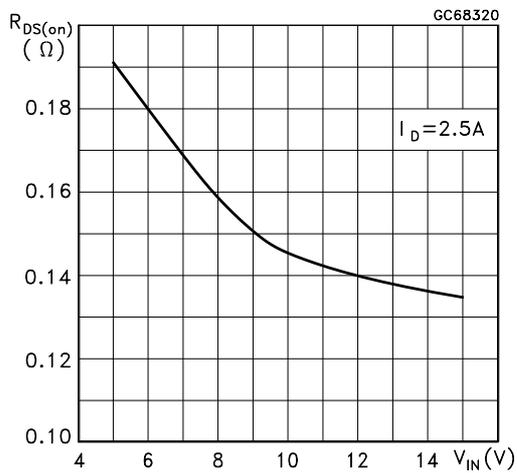
Output Characteristics



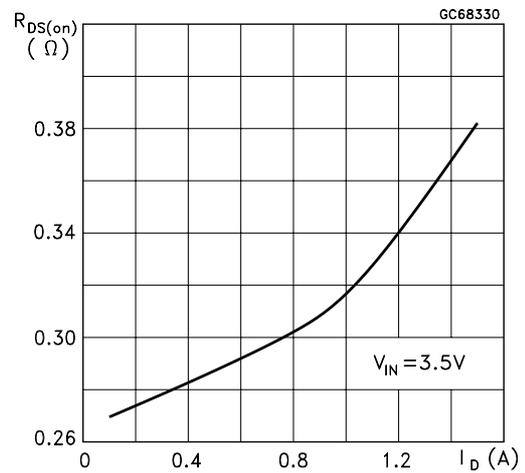
Transconductance



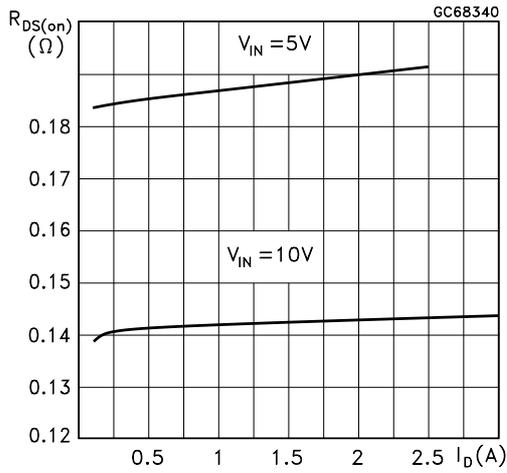
Static Drain-Source On Resistance vs Input Voltage



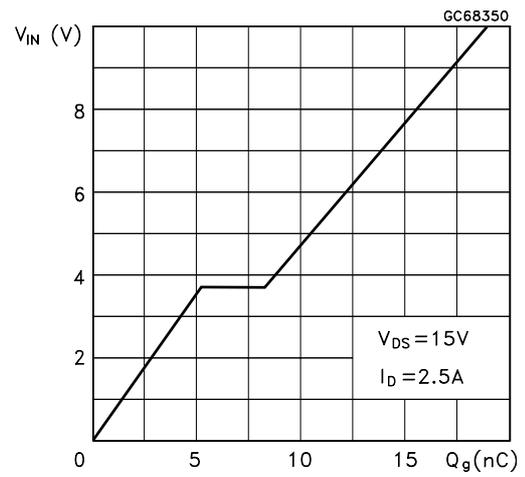
Static Drain-Source On Resistance



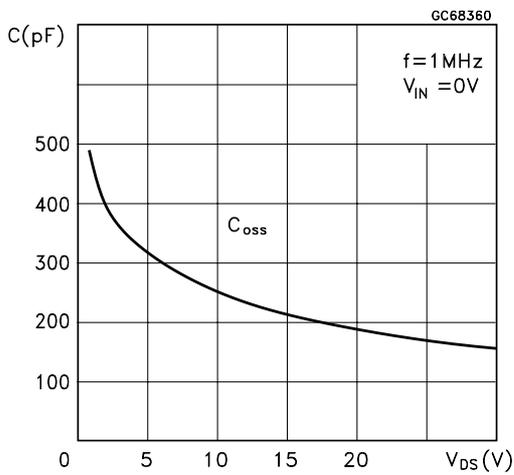
Static Drain-Source On Resistance



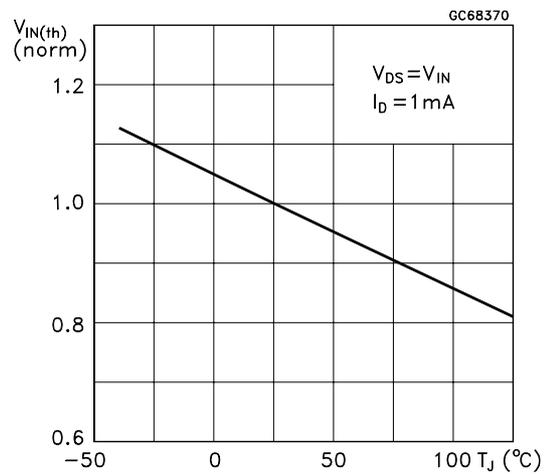
Input Charge vs Input Voltage



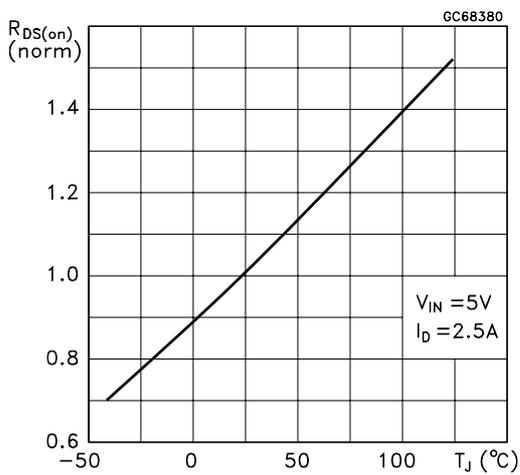
Capacitance Variations



Normalized Input Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Normalized On Resistance vs Temperature

