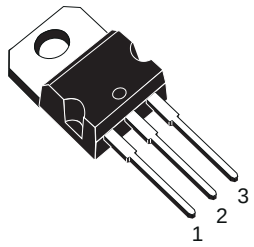
VNP10N06

"OMNIFET": FULLY AUTOPROTECTED POWER MOSFET

TYPE	V_{clamp}	$R_{DS(on)}$	I_{lim}
VNP10N06	60 V	0.3 Ω	10 A

- LINEAR CURRENT LIMITATION
- THERMAL SHUT DOWN
- SHORT CIRCUIT PROTECTION
- INTEGRATED CLAMP
- LOW CURRENT DRAWN FROM INPUT PIN
- LOGIC LEVEL INPUT THRESHOLD
- ESD PROTECTION
- SCHMITT TRIGGER ON INPUT
- HIGH NOISE IMMUNITY
- STANDARD TO-220 PACKAGE

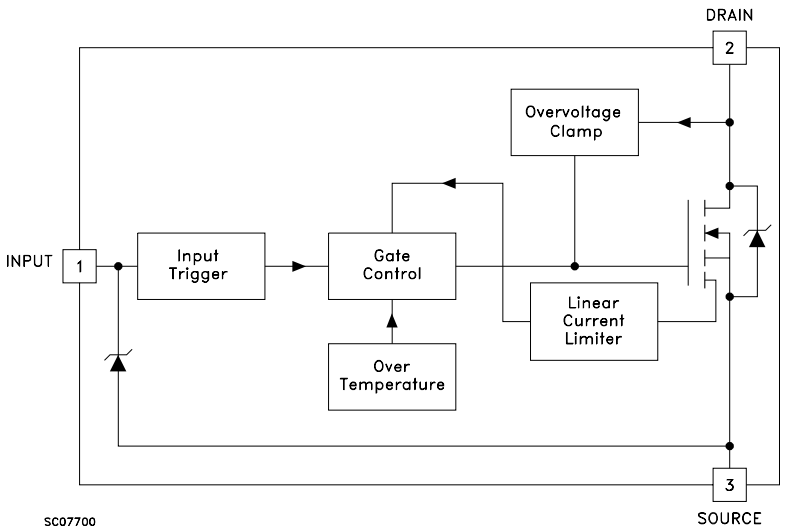


TO-220

DESCRIPTION

The VNP10N06 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 limitation and overvoltage clamp protect the chip n harsh enviroments.

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{in} = 0)	Internally Clamped	V
V_{in}	Input Voltage	Internally Clamped	V
I_{in}	Input Current	± 20	mA
I_D	Drain Current	Internally Limited	A
I_R	Reverse DC Output Current	-15	A
V_{esd}	Electrostatic Discharge (C= 100 pF, R=1.5 KΩ)	4000	V
P_{tot}	Total Dissipation at T_c = 25 ^oC	42	W
T_j	Operating Junction Temperature	Internally Limited	^oC
T_c	Case Operating Temperature	Internally Limited	^oC
T_{stg}	Storage Temperature	-55 to 150	^oC

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case Max	3	$^oC/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	62.5	$^oC/W$

ELECTRICAL CHARACTERISTICS (T_{case} = 25 ^oC 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	50	60	70	V
V_{IL}	Input Low Level Voltage	I_D = 100 µA V_{DS} = 16 V			1.5	V
V_{IH}	Input High Level Voltage	R_L = 27 Ω V_{DD} = 16 V V_{DS} = 0.5 V	3.2			V
V_{INCL}	Input-Source Reverse Clamp Voltage	I_{in} = -1 mA I_{in} = 1 mA	-1 8		-0.3 11	V V
I_{DSS}	Zero Input Voltage Drain Current (V_{in} = 0)	V_{DS} = 50 V V_{in} = V_{IL} V_{DS} < 35 V V_{in} = V_{IL}			250 100	µA µA
I_{ISS}	Supply Current from Input Pin	V_{DS} = 0 V V_{in} = 5 V		150	300	µA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$R_{DS(on)}$	Static Drain-source On Resistance	V_{in} = 7 V I_D = 1 A T_J < 125 ^oC		0.15	0.3	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
C_{oss}	Output Capacitance	V_{DS} = 13 V f = 1 MHz V_{in} = 0		350	500	pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING (**)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Delay Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 16 V I_d = 1 A V_{gen} = 7 V R_{gen} = 10 Ω (see figure 3)		1100 550 200 100	1600 900 400 200	ns ns ns ns
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Delay Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 16 V I_d = 1 A V_{gen} = 7 V R_{gen} = 1000 Ω (see figure 3)		1.2 1 1.6 1.2	1.8 1.5 2.3 1.8	µs µs µs µs
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 16 V I_D = 1 A V_{in} = 7 V R_{gen} = 10 Ω		1.5		A/µs
Q_i	Total Input Charge	V_{DD} = 12 V I_D = 1 A V_{in} = 7 V		13		nC

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{SD} (*)	Forward On Voltage	I_{SD} = 1 A V_{in} = V_{IL}		0.8	1.6	V
t_{rr} (**) Q_{rr} (**) I_{RRM} (**)	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 1 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 25 °C (see test circuit, figure 5)		125 0.22 3.5		ns µC A

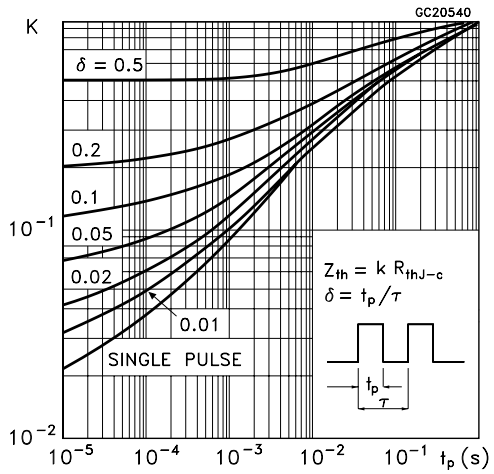
PROTECTION

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{lim}	Drain Current Limit	V_{in} = 7 V V_{DS} = 13 V	6	10	15	A
t_{dlim} (**)	Step Response Current Limit	V_{in} = 7 V V_{DS} step from 0 to 13 V		12	20	µs
T_{jsh} (**)	Overtemperature Shutdown		150			°C
T_{jrs} (**)	Overtemperature Reset		135			°C
E_{as} (**)	Single Pulse Avalanche Energy	starting T_j = 25 °C V_{DD} = 24 V V_{in} = 7 V R_{gen} = 1 KΩ L = 10 mH	250			mJ

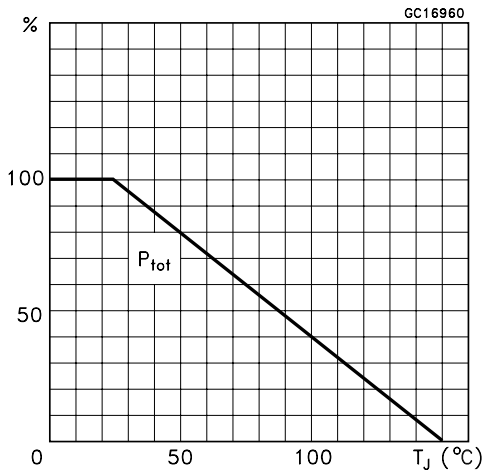
(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %

(**) Parameters guaranteed by design/characterization

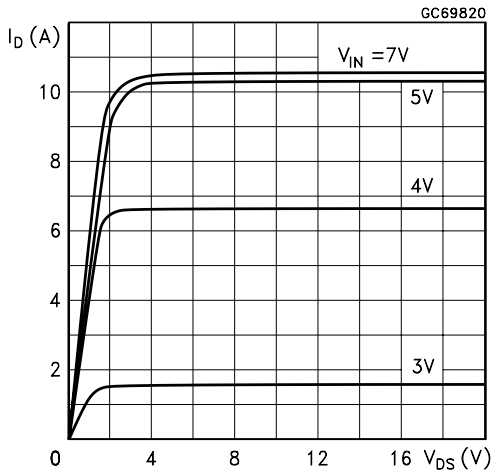
Thermal Impedance



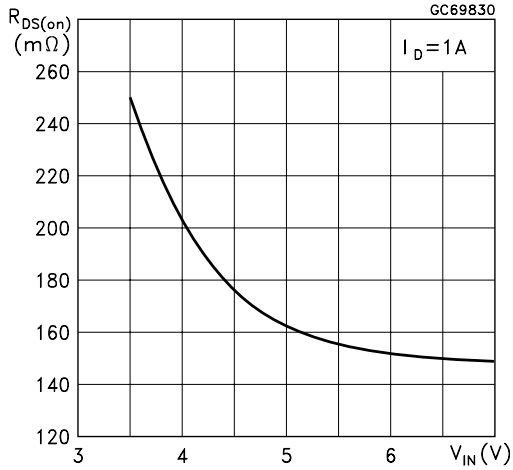
Derating Curve



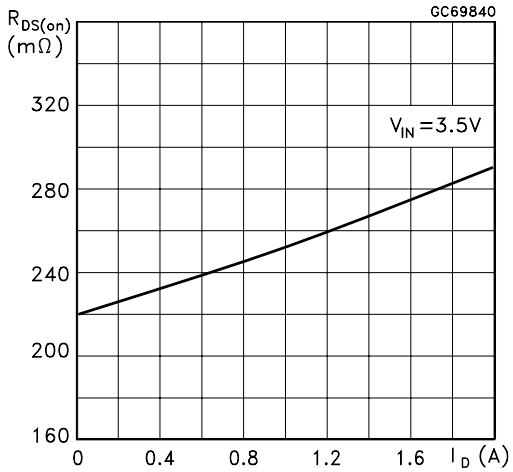
Output Characteristics



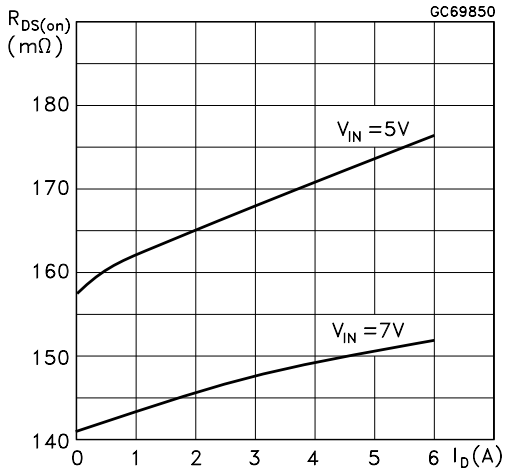
Static Drain-Source On Resistance vs Input Voltage



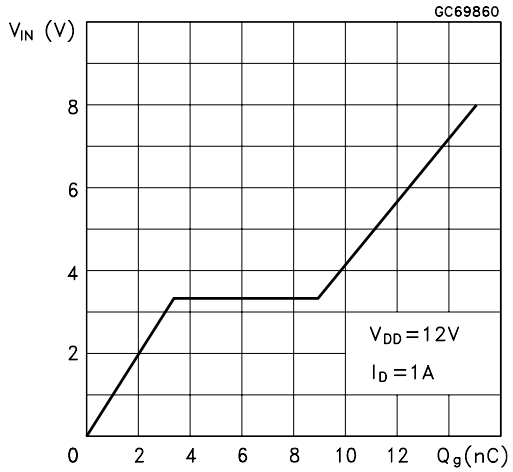
Static Drain-Source On Resistance



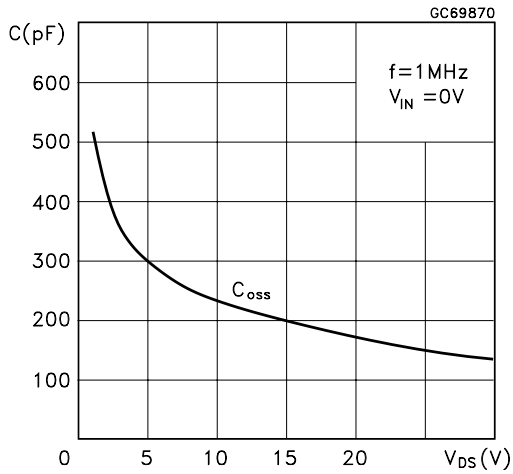
Static Drain-Source On Resistance



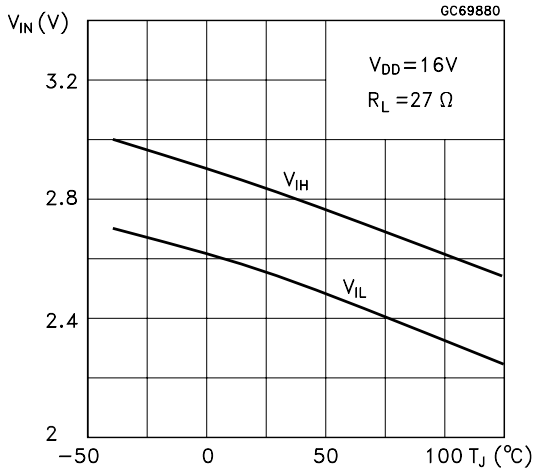
Input Charge vs Input Voltage



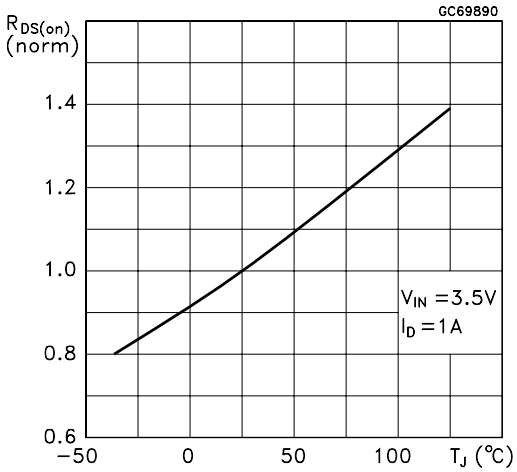
Capacitance Variations



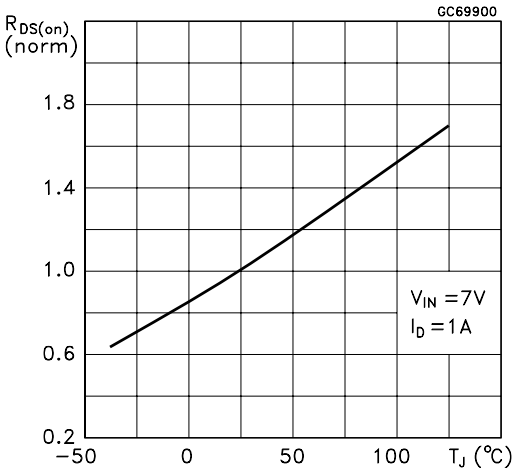
Normalized Input Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Normalized On Resistance vs Temperature



Turn-on Current Slope