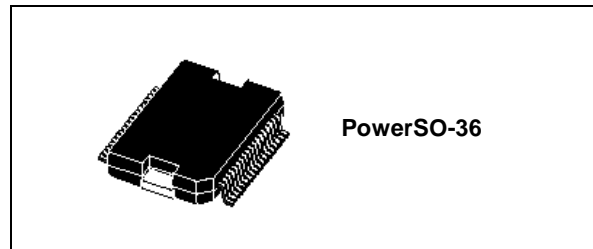


## OCTAL CHANNEL HIGH SIDE DRIVER

### General Features

Type	$R_{DS(on)}$	$I_{out}$	$V_{CC}$
VN808	150mΩ	0.7A	45V

- $V_{CC}/2$  COMPATIBLE INPUT
- JUNCTION OVER-TEMPERATURE PROTECTION
- CASE OVER-TEMPERATURE PROTECTION FOR THERMAL INDEPENDENCE OF THE CHANNELS
- CURRENT LIMITATION
- SHORTED LOAD PROTECTION
- UNDERVOLTAGE SHUTDOWN
- PROTECTION AGAINST LOSS OF GROUND
- VERY LOW STAND-BY CURRENT
- COMPLIANCE TO 61000-4-4 IEC TEST UP TO 4KV

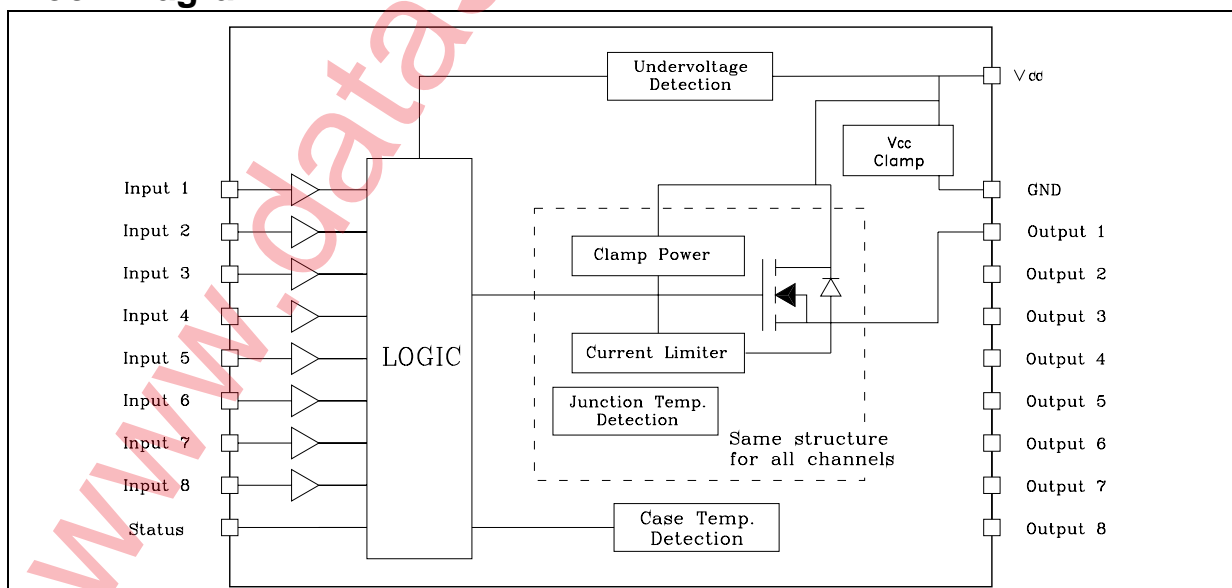


intended for driving any kind of load with one side connected to ground. Active current limitation combined with thermal shutdown and automatic restart, protect the device against overload. In overload condition, channel turns OFF and back ON automatically so as to maintain junction temperature between  $T_{TSD}$  and  $T_R$ . If this condition makes case temperature reach  $T_{CSD}$ , overloaded channel is turned OFF and will restart only when case temperature has decreased down to  $T_{CR}$  ( see waveform 3 [Figure 7 on page 9](#) ). Non overloaded channels continue to operate normally. Device automatically turns OFF in case of ground pin disconnection. This device is especially suitable for industrial applications conform to IEC 61131

### Description

The VN808 is a monolithic device designed in STMicroelectronics VIPower M0-3 technology,

### Block Diagram



**Table 1. Absolute Maximum Rating**

Symbol	Parameter	Value	Unit
$V_{CC}$	DC Supply voltage	45	V
$-I_{GND}$	DC ground pin reverse current TRAN Ground pin reverse current ( pulse duration < 1ms)	-250 -6	mA A
$I_{OUT}$	DC Output current	Internally limited	A
$-I_{OUT}$	Reverse DC output current	-2	A
$I_{IN}$	DC Input current	$\pm 10$	mA
$V_{IN}$	Input voltage range	$-3/+V_{CC}$	V
$V_{ESD}$	Electrostatic discharge (R = 1.5KW; C = 100pF)	2000	V
$P_{TOT}$	Power dissipation at $T_c = 25^\circ\text{C}$	96	W
$L_{MAX}$	Max inductive load ( $V_{CC} = 24\text{V}$ , $R_{LOAD} = 48\Omega$ , $T_A = 100^\circ\text{C}$ )	2	H
$T_J$	Junction operating temperature	Internally limited	$^\circ\text{C}$
$T_C$	Case operating temperature	Internally limited	$^\circ\text{C}$
$T_{STG}$	Storage Temperature	-55 to 150	$^\circ\text{C}$

**Table 2. Pin Definitions and Functions**

Pin No.	Symbol	Function
TAB	$V_{CC}$	Positive power supply voltage
1	$V_{CC}$	Positive power supply voltage
2,3,4,5	NC	Not connected
6	Input 1	Input of channel 1
7	Input 2	Input of channel 2
8	Input 3	Input of channel 3
9	Input 4	Input of channel 4
10	Input 5	Input of channel 5
11	Input 6	Input of channel 6
12	Input 7	Input of channel 7
13	Input 8	Input of channel 8
14,15,16,17,18	NC	Not connected
19	GND	Logic ground
20	STATUS	Common open source diagnostic for over-temperature
21,22	Output 8	High-Side output of channel 8
23,24	Output 7	High-Side output of channel 7
25,26	Output 6	High-Side output of channel 6
27,28	Output 5	High-Side output of channel 5
29,30	Output 4	High-Side output of channel 4
31,32	Output 3	High-Side output of channel 3
33,34	Output 2	High-Side output of channel 2
35,36	Output 1	High-Side output of channel 1

Figure 1. Connection Diagram (Top View)

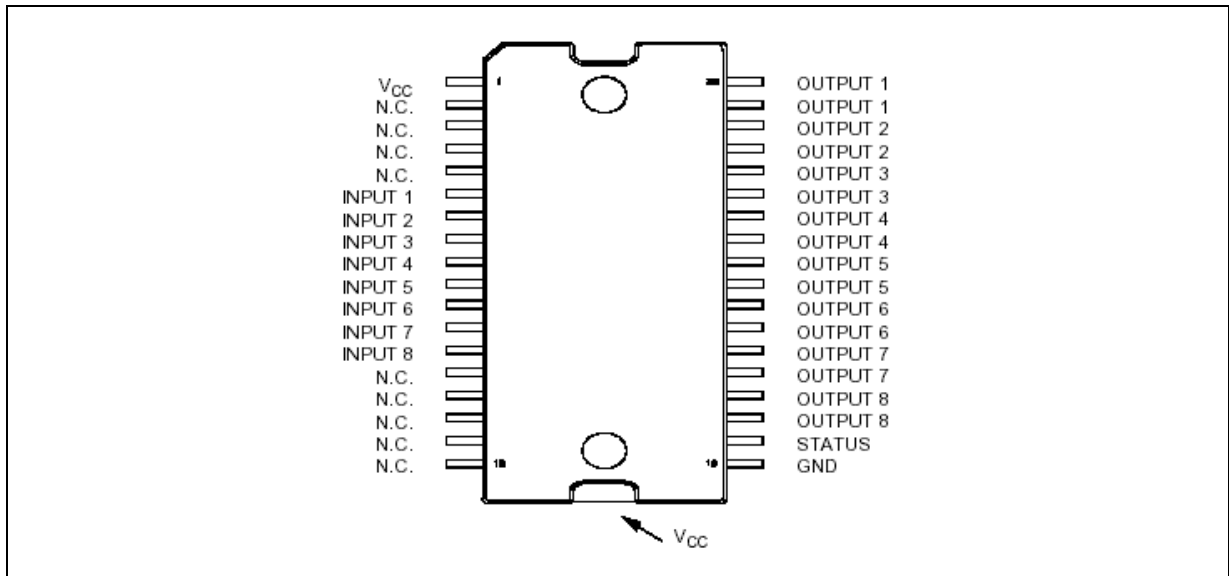
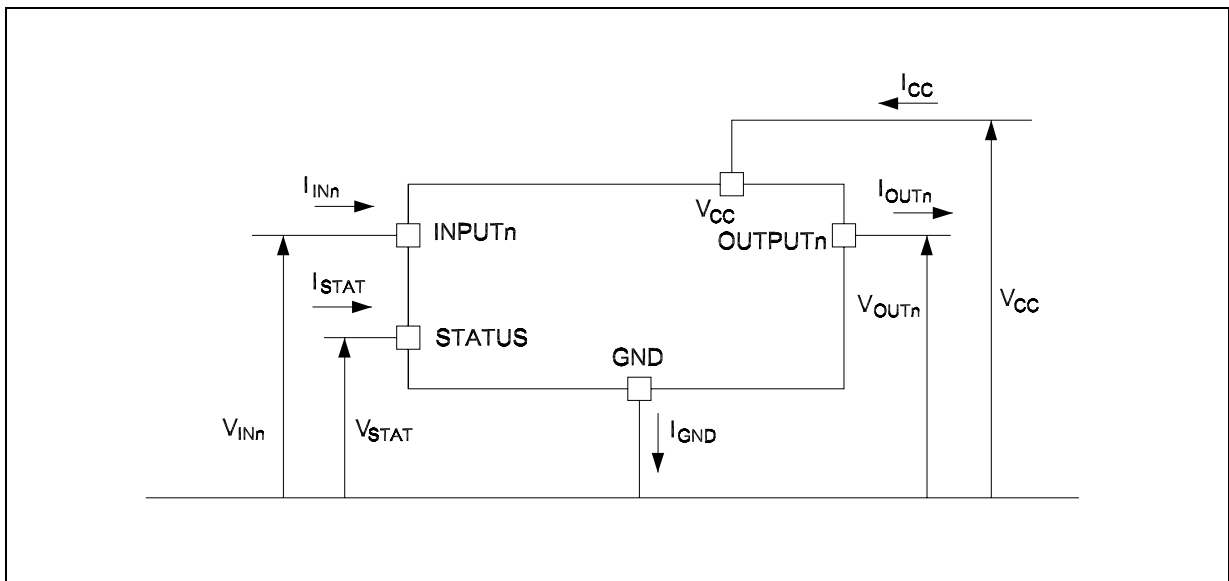


Figure 2. Current and Voltage Conventions



**Table 3. Thermal data**

Symbol	Parameter		Value	Unit
$R_{thJC}$	Thermal resistance junction-case	Max	1.3	°C/W
$R_{thJA}$	Thermal resistance junction-ambient <i>Note:1</i>	Max	50	°C/W

*Note:* 1. When mounted on FR4 printed circuit board with  $0.5\text{cm}^2$  of copper area (at least  $35\mu$  thick) connected to all TAB pins.

**Electrical Characteristics** ( $10.5\text{V} < V_{CC} < 32\text{V}$ ;  $-40^\circ\text{C} < T_J < 100^\circ\text{C}$ ; unless otherwise specified)

**Table 4. Power Section**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CC}$	Operating supply voltage		10.5		45	V
$V_{USD}$	Undervoltage shutdown		7		10.5	V
$R_{ON}$	On state resistance	$I_{OUT} = 0.5\text{A}$ ; $T_J = 25^\circ\text{C}$ $I_{OUT} = 0.5\text{A}$ ;		150	185 280	$\text{m}\Omega$ $\text{m}\Omega$
$I_S$	Supply current	OFF state; $V_{CC} = 24\text{V}$ ; $T_{CASE} = 25^\circ\text{C}$ ON state (all channels ON); $V_{CC} = 24\text{V}$ $T_{CASE} = 100^\circ\text{C}$			150 12	$\mu\text{A}$ mA
$I_{LGND}$	Output current at turn-off	$V_{CC} = V_{STAT} = V_{IN} = V_{GND} = 24\text{V}$ $V_{OUT} = 0\text{V}$			1	mA
$I_{L(off)}$	OFF state output current	$V_{IN} = V_{OUT} = 0\text{V}$ ;	0		5	$\mu\text{A}$
$V_{OUT(off)}$	OFF state output voltage	$V_{IN} = 0\text{V}$ , $I_{OUT} = 0\text{A}$			3	V
$t_d(V_{CCon})$	Power-on delay time from $V_{CC}$ rising edge	<i>Figure 6.</i>		1		ms

**Table 5. Switching** ( $V_{CC} = 24\text{V}$ )

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{ON}$	Turn-on time	$R_L = 48\Omega$ from 80% $V_{OUT}$ <i>Figure 5.</i>		50	100	$\mu\text{s}$
$t_{OFF}$	Turn-off time	$R_L = 48\Omega$ to 10% $V_{OUT}$ <i>Figure 5.</i>		75	150	$\mu\text{s}$
$dV_{OUT}/dt_{(on)}$	Turn-on voltage slope	$R_L = 48\Omega$ from $V_{OUT} = 2.4\text{V}$ to $V_{OUT} = 19.2\text{V}$ <i>Figure 5.</i>		0.7		$\text{V}/\mu\text{s}$
$dV_{OUT}/dt_{(off)}$	Turn-off voltage slope	$R_L = 48\Omega$ from $V_{OUT} = 21.6\text{V}$ to $V_{OUT} = 2.4\text{V}$ <i>Figure 5.</i>		1.5		$\text{V}/\mu\text{s}$

**Table 6. Input Pin**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{INL}$	Input low level				$V_{CC}/2-1$	V
$I_{INL}$	Low level input current	$V_{IN} = V_{CC} / 2 - 1V$	80			$\mu A$
$V_{INH}$	Input high level		$V_{CC}/2+1$			V
$I_{INH}$	High level input current	$V_{IN} = V_{CC} / 2 + 1V$		150	260	$\mu A$
$V_{I(HYST)}$	Input hysteresis voltage			0.6		V
$I_{IN}$	Input current	$V_{IN} = V_{CC} = 32V$			300	$\mu A$

**Table 7. Protections**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$T_{CSD}$	Case shut-down temperature		125	130	135	$^{\circ}C$
$T_{CR}$	Case reset temperature		110			$^{\circ}C$
$T_{CHYST}$	Case thermal hysteresis		7	15		$^{\circ}C$
$T_{TSD}$	Junction shutdown temperature		150	175	200	$^{\circ}C$
$T_R$	Junction reset temperature		135			$^{\circ}C$
$T_{HYST}$	Junction thermal hysteresis		7	15		$^{\circ}C$
$I_{lim}$	DC Short circuit current	$V_{CC} = 24V; R_{LOAD} = 10m\Omega$	0.7		1.7	A
$V_{demag}$	Turn-off output clamp voltage	$I_{OUT} = 0.5A; L = 6mH$	$V_{CC}-57$	$V_{CC}-52$	$V_{CC}-47$	V

**Table 8. Status Pin**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{HSTAT}$	High level output current	$V_{CC} = 18...32V; R_{STAT} = 1K\Omega$ ( Fault condition )	2	3	4	mA
$I_{LSTAT}$	Leakage current	Normal operation; $V_{CC} = 32V$			0.1	$\mu A$
$V_{CLSTAT}$	Clamp voltage	$I_{STAT} = 1mA$	6.0	6.8	8.0	V
		$I_{STAT} = -1mA$		-0.7		V

Figure 3. Equivalent Internal Block Diagram ( same structure for all channel )

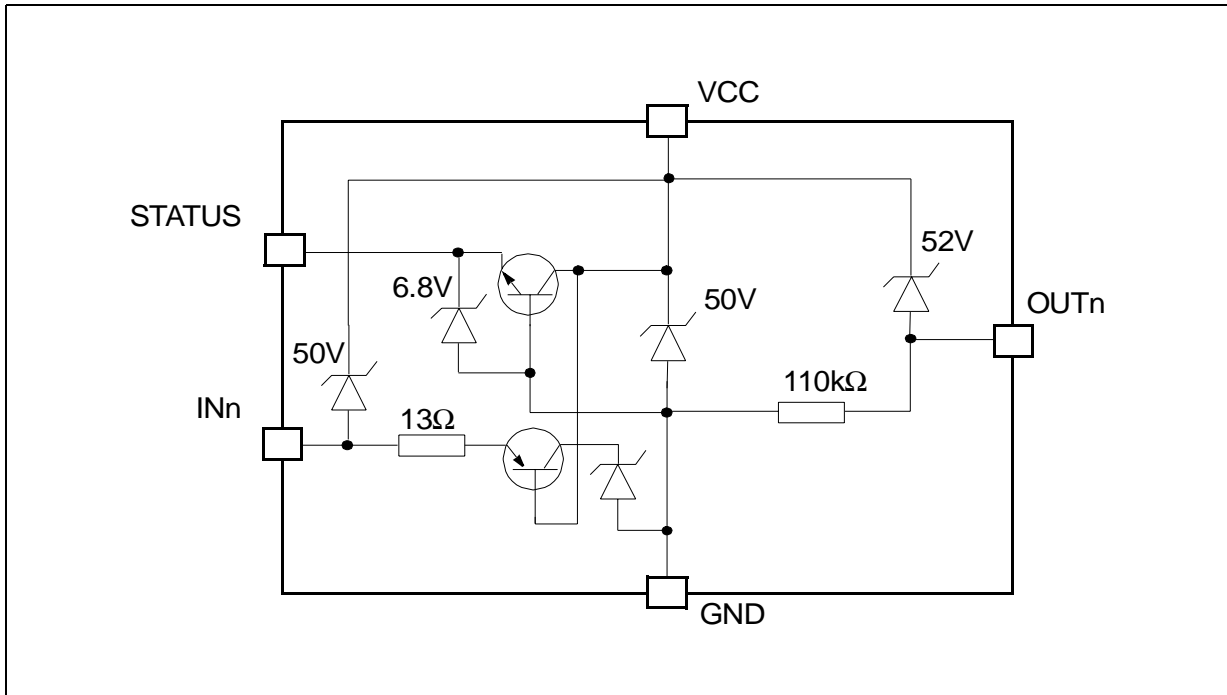
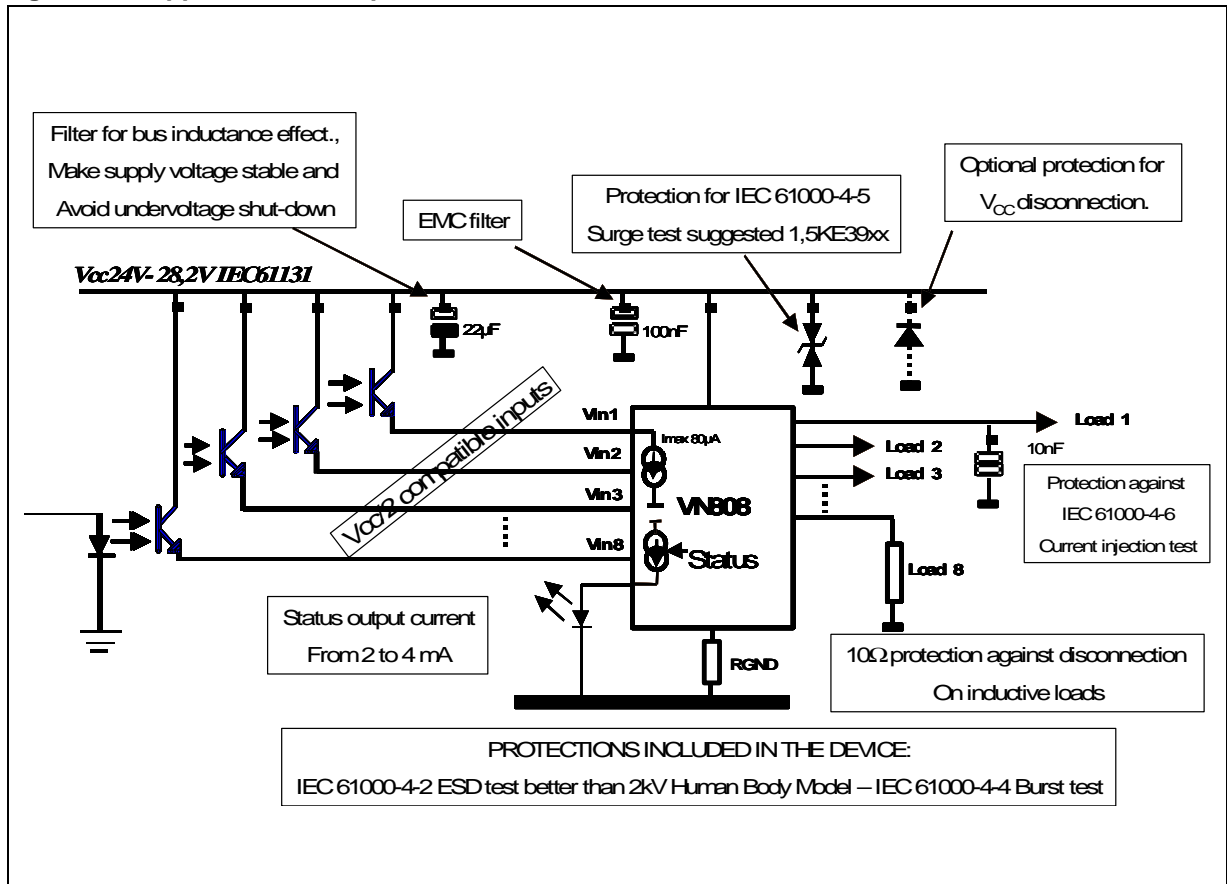


Figure 4. Application Example



## Switching Time Waveforms

Figure 5. Turn-on & Turn-off

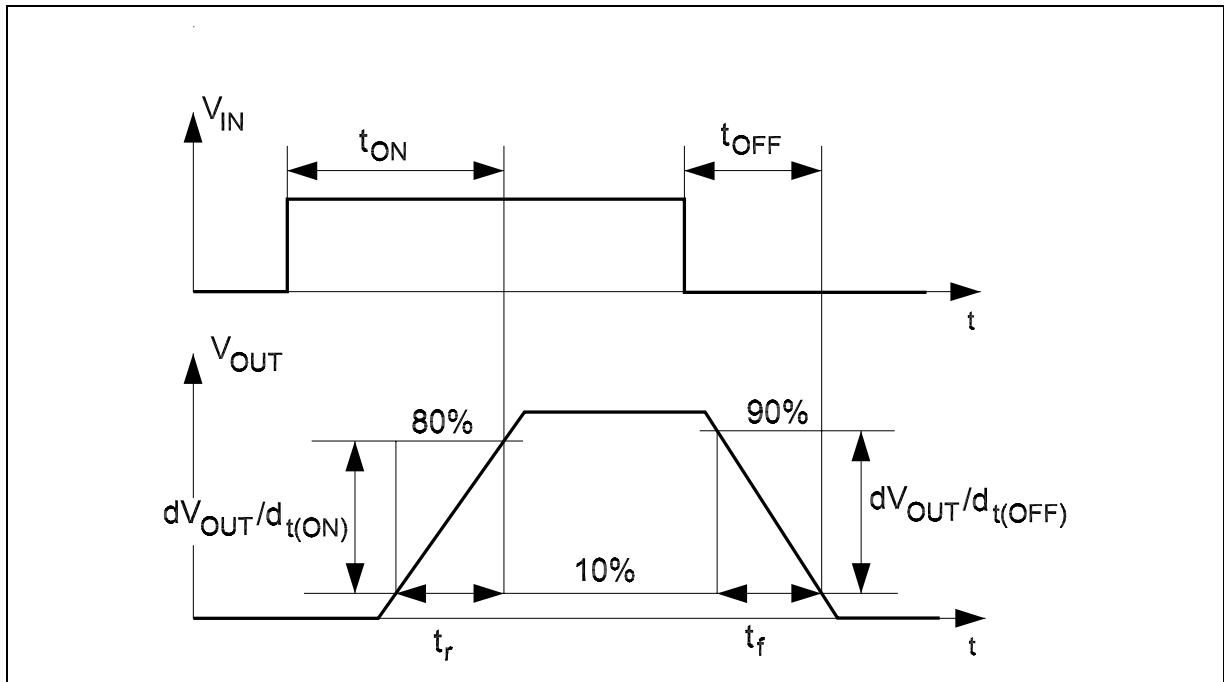
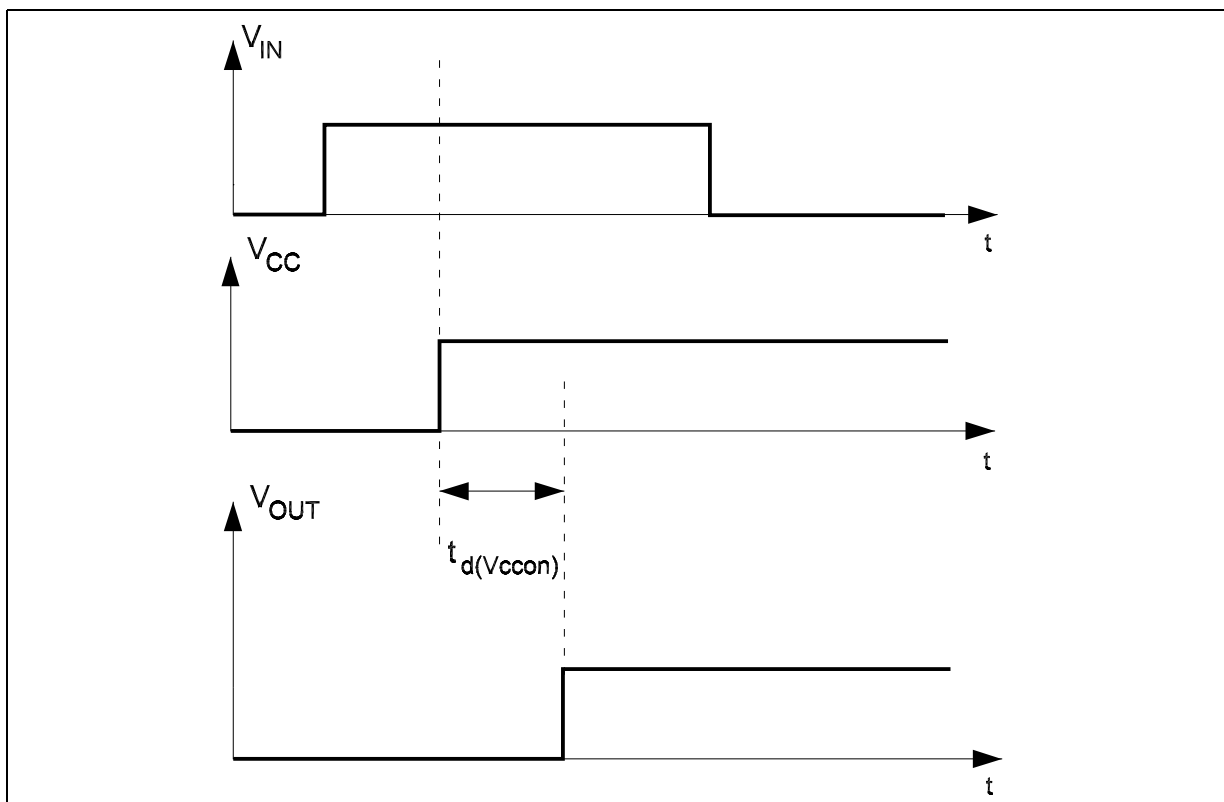


Figure 6.  $V_{CC}$  Turn-on



**Table 9. Truth Table**

Conditions	INPUTn	OUTPUTn	STATUS
Normal operation	L	L	L
	H	H	L
Current limitation	L	L	L
	H	X	L
Overtemperature (see waveforms 3, 4 <a href="#">Figure 7</a> . <a href="#">Figure 8</a> .) -> $T_J > T_{TSD}$	L	L	L
	H	L	H
Undervoltage	L	L	X
	H	L	X



Figure 7. Waveforms

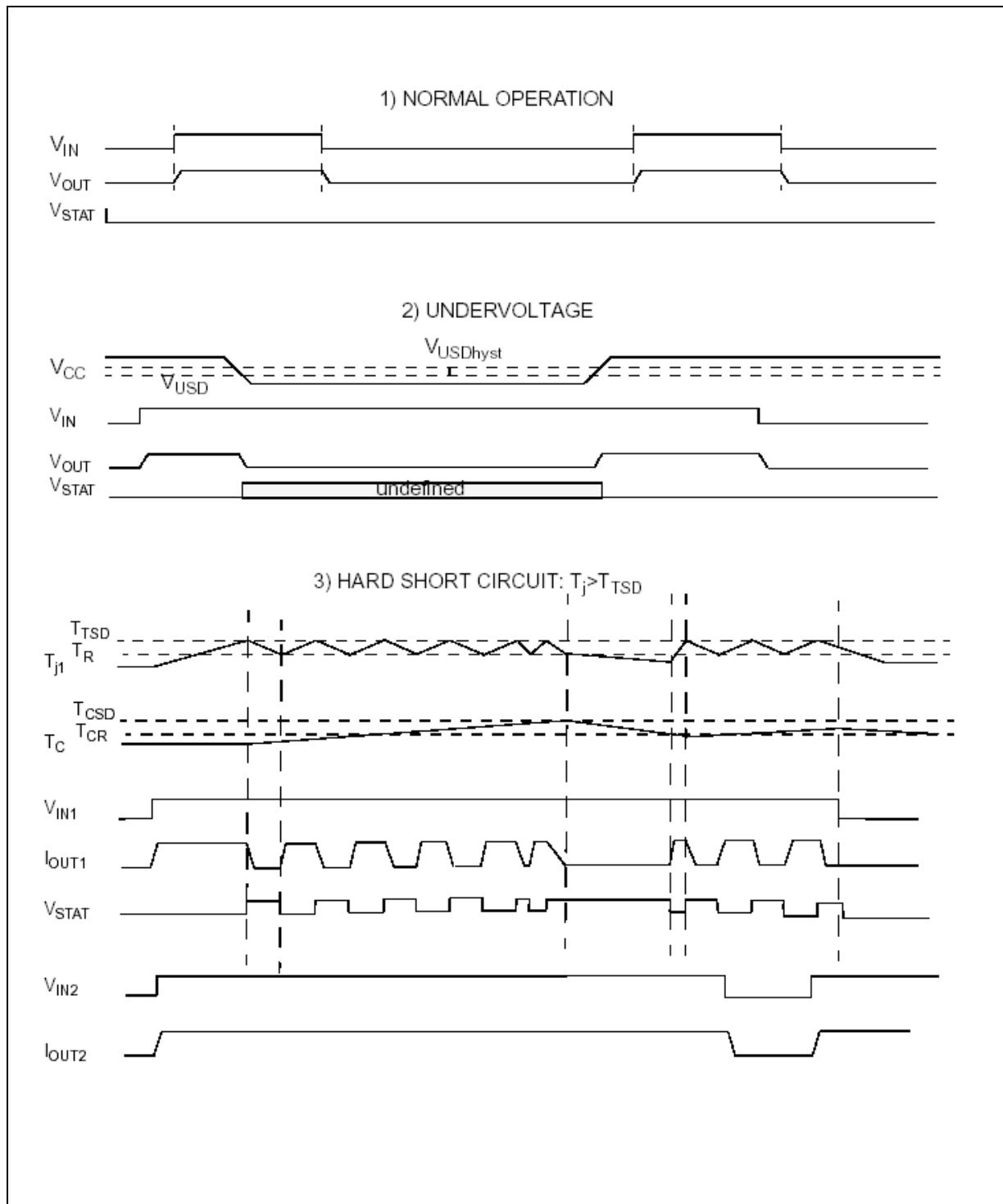
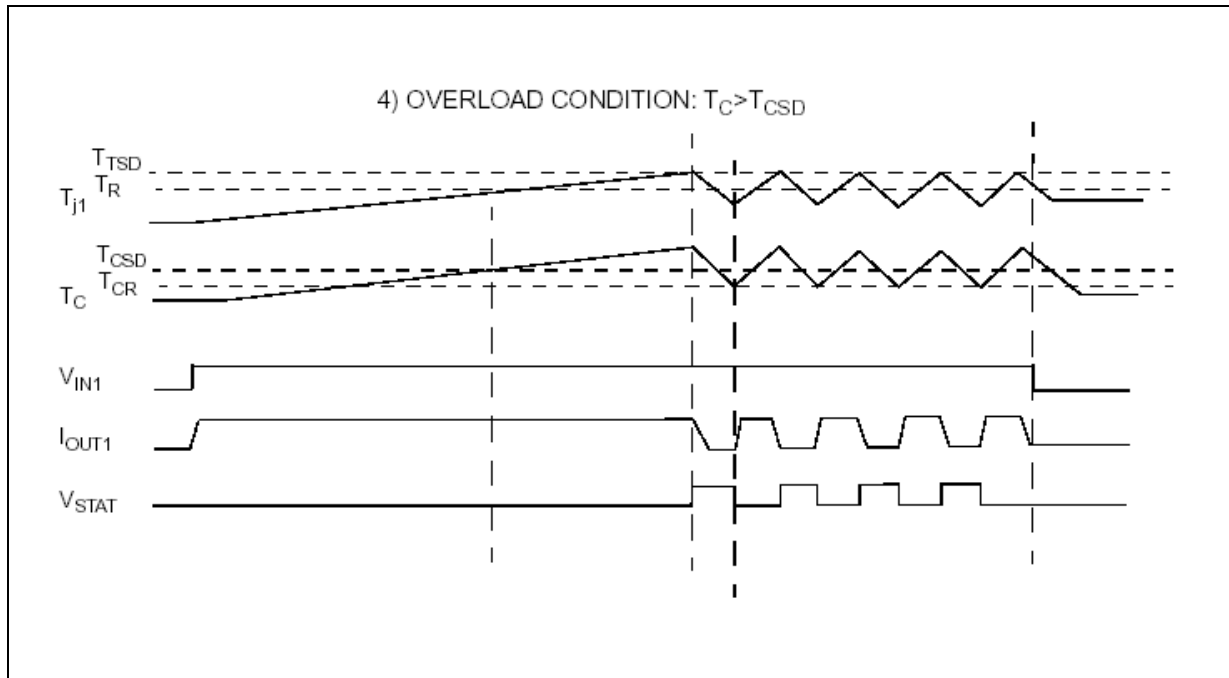


Figure 8. Waveforms ( continued )



## Mechanical Data

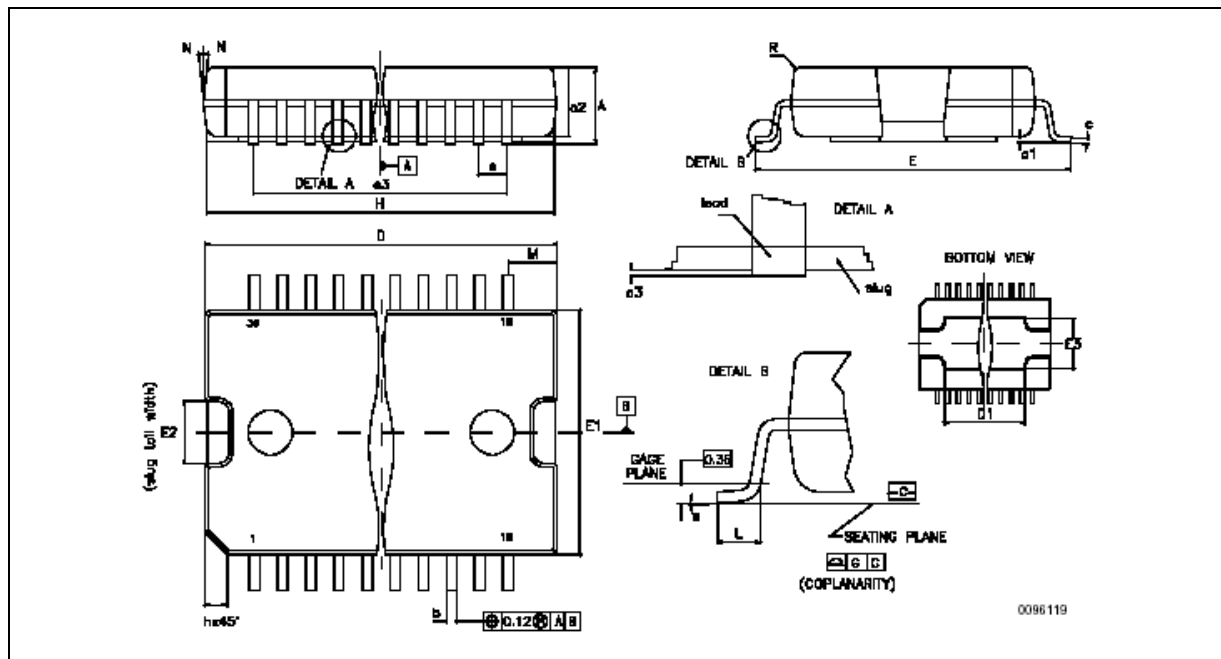
In order to meet environmental requirements, ST offers these devices in ECOPACK<sup>®</sup> packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com)

Table 10. PowerSO-36 Mechanical Data

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			3.60			0.141
a1	0.10		0.30	0.004		0.012
a2			3.30			0.130
a3	0		0.10	0		0.004
b	0.22		0.38	0.008		0.015
c	0.23		0.32	0.009		0.012
D (1)	15.80		16.00	0.622		0.630
D1	9.40		9.80	0.370		0.385
E	13.90		14.50	0.547		0.570
E1 (1)	10.90		11.10	0.429		0.437
E2			2.90			0.114
E3	5.80		6.20	0.228		0.244
e		0.65			0.0256	
e3		11.05			0.435	
G	0		0.10	0		0.004
H	15.50		15.90	0.610		0.626
h			1.10			0.043
L	0.80		1.10	0.031		0.043
N	10° (max)					
S	8° (max)					

1. "D" and "E1" do not include mold flash or protusions
  - Mold flash or protusions shall non exceed 0.15mm (0.006 inch)
  - Critical dimensions are "a3", "E" and "G".

Figure 9. PowerSO-36 Scheme



## VN808

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**Table 11. Order Codes**

<b>Package</b>	<b>Tube</b>	<b>Tape and Reel</b>
PowerSO-36	VN808	VN80813TR

**Table 12. Revision History**

Date	Revision	Changes
13-Sep-2005	4	Final release

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