

## Octal channel high side driver

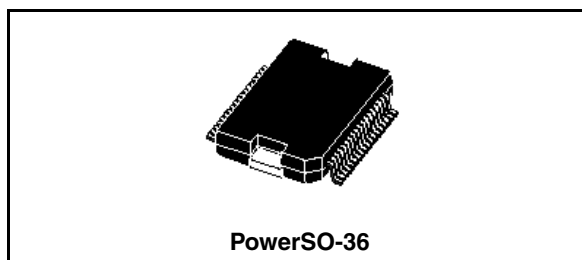
### Features

Type	$R_{DS(on)}$	$I_{out}$	$V_{CC}$
VN808SR	150m $\Omega$	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

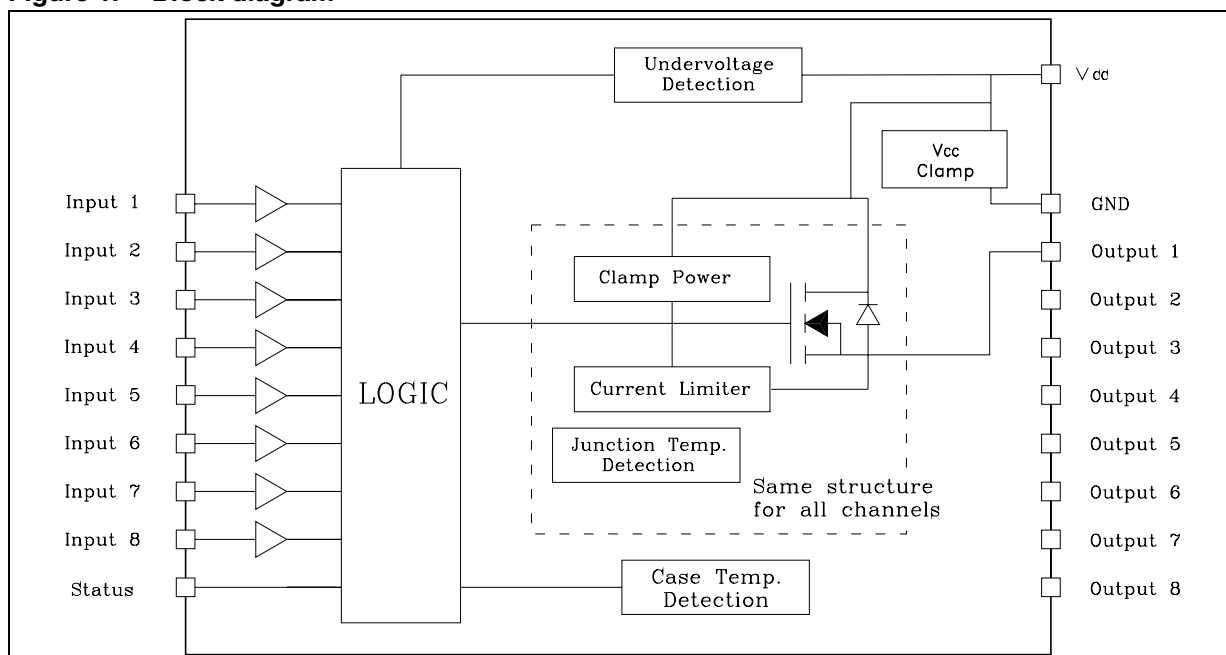
### Description

The VN808SR is a monolithic device designed in STMicroelectronics VIPower M0-3 technology, 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 10](#)). 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

**Figure 1. Block diagram**



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# 1 Maximum ratings

**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 = 1.5K $\Omega$ ; 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	-40 to 150	$^\circ\text{C}$

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJC}$	Thermal resistance junction-case	Max 1.3	$^\circ\text{C}/\text{W}$
$R_{thJA}$	Thermal resistance junction-ambient <sup>(1)</sup>	Max 50	$^\circ\text{C}/\text{W}$

1. When mounted on FR4 printed circuit board with 0.5 cm<sup>2</sup> of copper area ( at least 35 $\mu\text{m}$  thick ) connected to all TAB pins.

## 2 Electrical characteristics

( $10.5V < V_{CC} < 32V$ ;  $-40^{\circ}C < T_J < 125^{\circ}C$ ; unless otherwise specified)

**Table 3. 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	$I_{OUT} = 0.5A$ ; $T_J = 25^{\circ}C$ $I_{OUT} = 0.5A$ ;		150	185 280	$m\Omega$ $m\Omega$
$I_S$	Supply current	OFF state; $V_{CC} = 24V$ ; $T_{CASE} = 25^{\circ}C$ ON state( all channels ON); $V_{CC} = 24V$ , $T_{CASE} = 100^{\circ}C$			150 12	$\mu A$ mA
$I_{LGND}$	Output current at turn-off	$V_{CC} = V_{STAT} = V_{IN} = V_{GND} = 24V$ $V_{OUT} = 0V$			1	mA
$I_{L(off)}$	OFF state output current	$V_{IN} = V_{OUT} = 0V$ ;	0		5	$\mu A$
$t_d(V_{CCon})$	Power-on delay time from $V_{CC}$ rising edge	<a href="#">Table 7.</a>		1		ms

**Table 4. Switching (  $V_{CC} = 24V$  )**

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

**Table 5. 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 6. 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 7. 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	$I_{STAT} = 1mA$ $I_{STAT} = -1mA$	6.0	6.8 -0.7	8.0	V V

### 3 Pin connections

Figure 2. Connection diagram (top view)



Table 8. Pin functions

Pin N°	Symbol	Function
TAB	V <sub>CC</sub>	Positive power supply voltage
1	V <sub>CC</sub>	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

**Table 8. Pin functions (continued)**

Pin N°	Symbol	Function
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

## 4 Current, voltage conventions and internal diagram

Figure 3. Current and voltage conventions

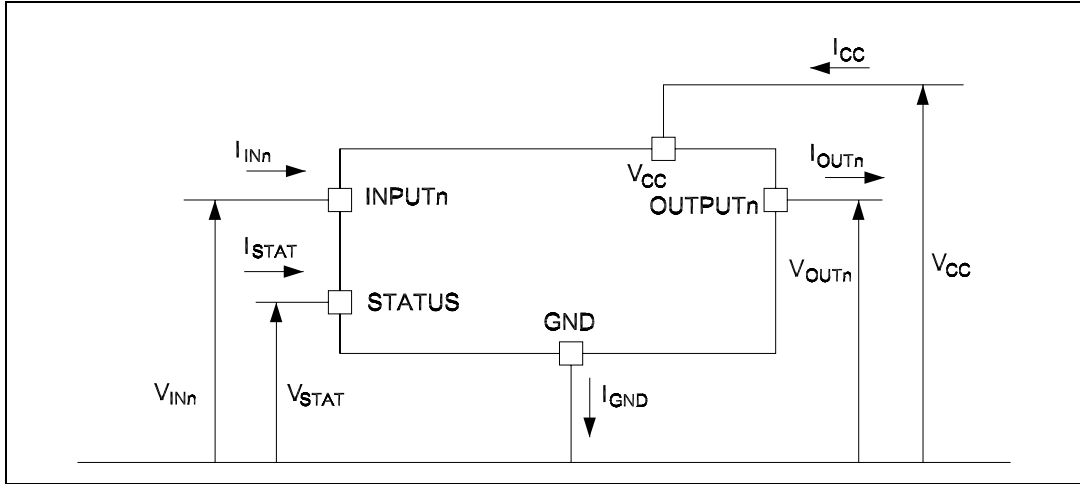


Figure 4. Equivalent internal block diagram (same structure for all channel)

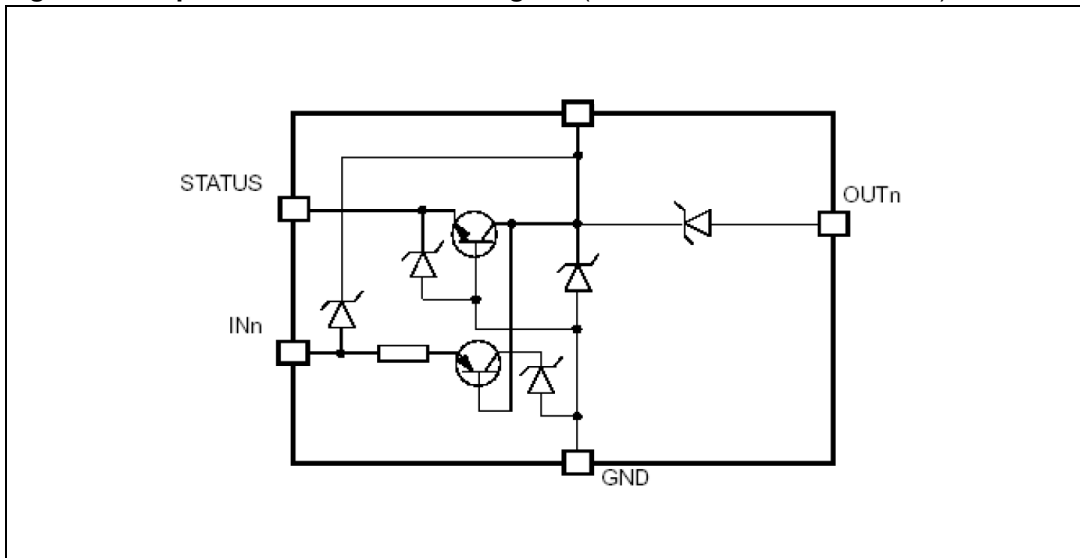


Table 9. Truth table

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> ) -> $T_J > T_{TSD}$	L	L	L
	H	L	H
Undervoltage	L	L	X
	H	L	X



## 5 Switching time waveforms

Figure 5. Turn-ON & turn-OFF

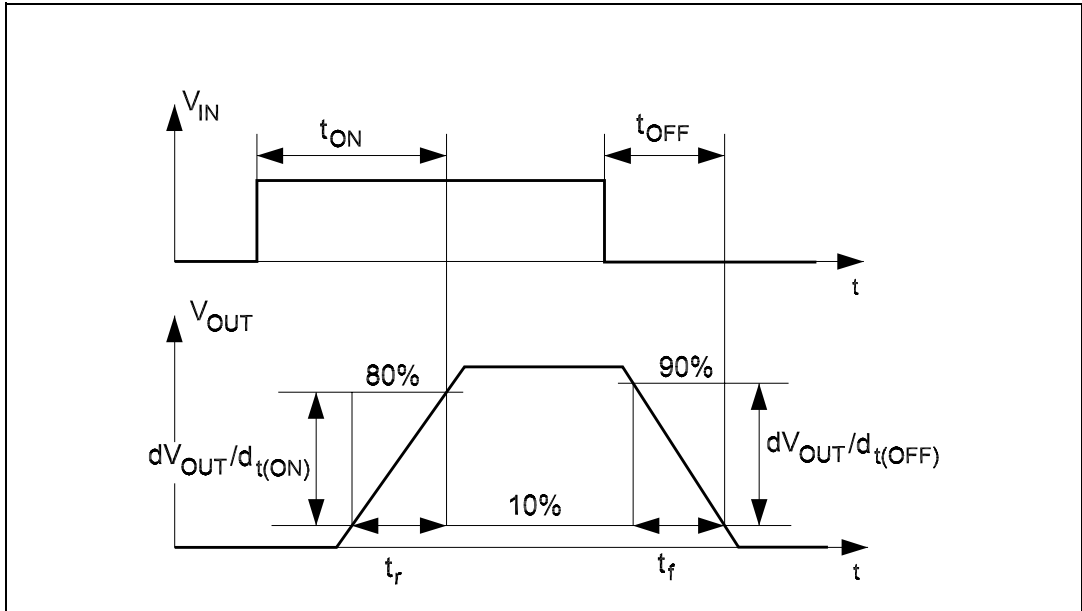


Figure 6. V<sub>CC</sub> turn-ON

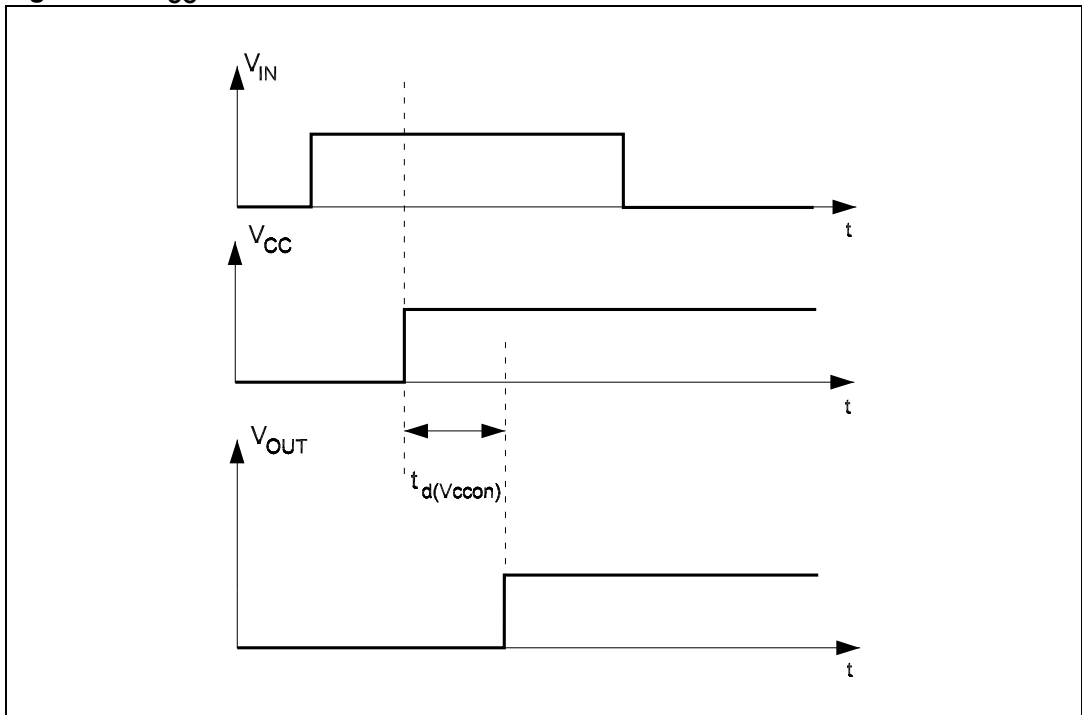


Figure 7. Waveforms

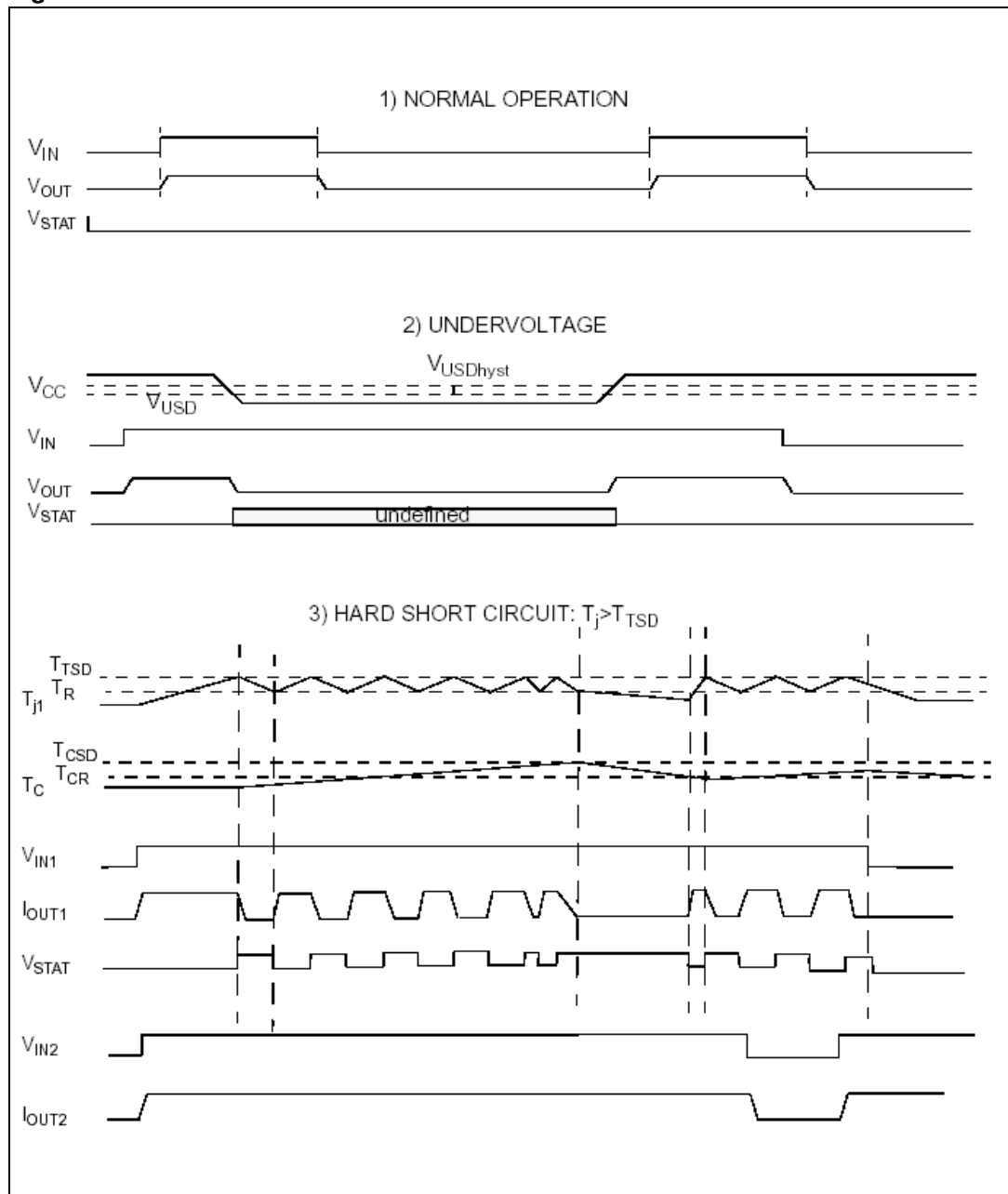
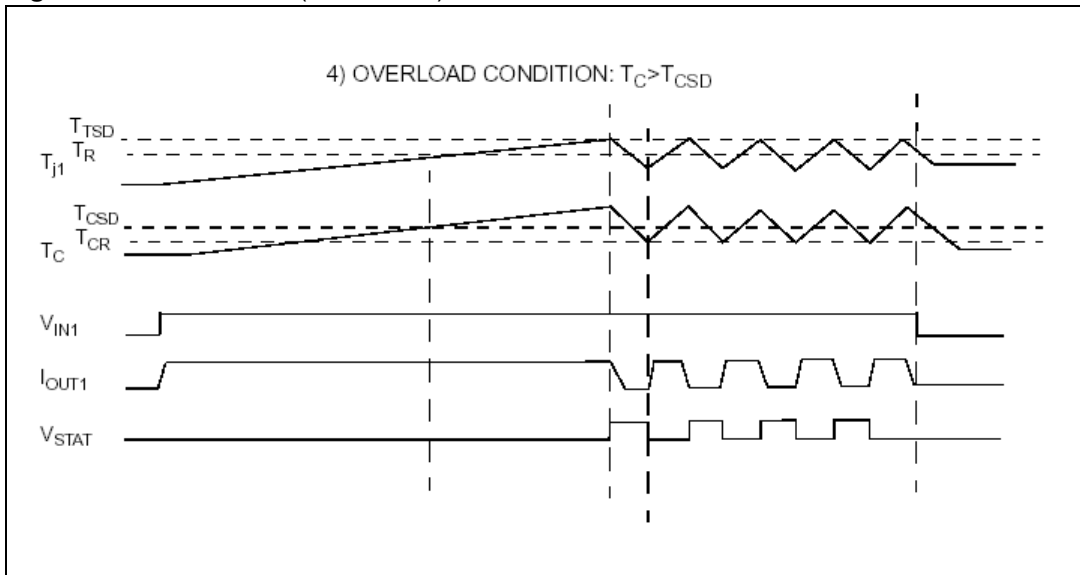


Figure 7. Waveforms ( continued )



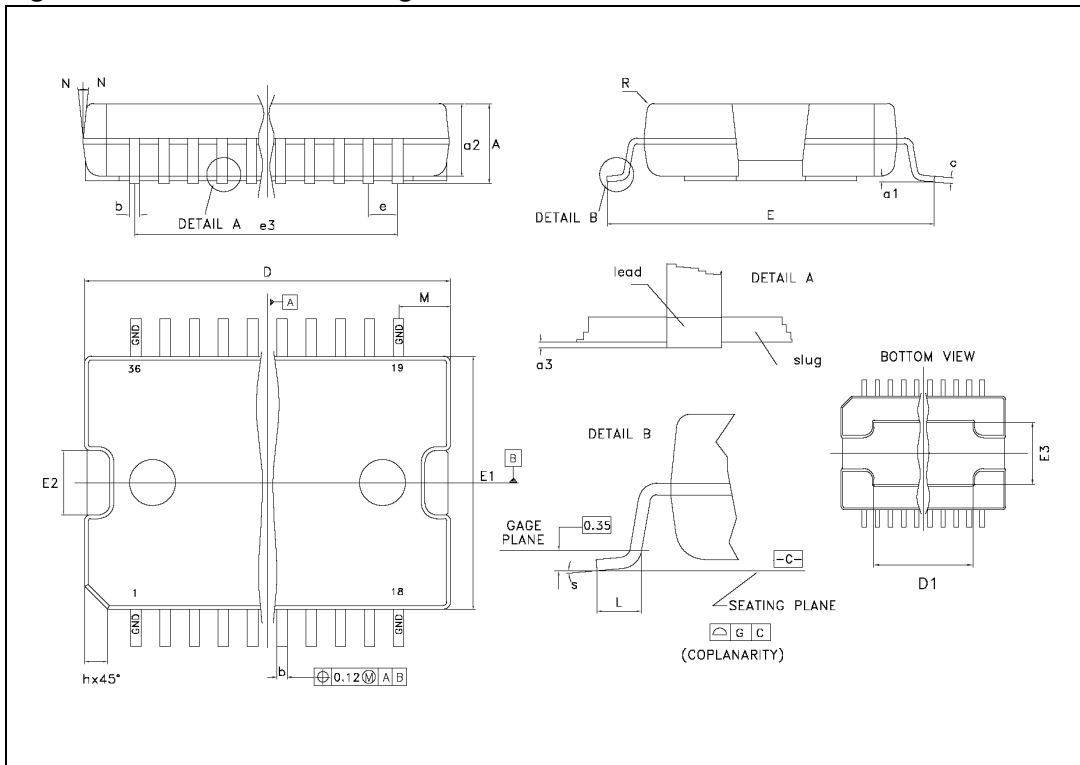
## 6 Mechanical data

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**

Dimensions						
Ref.	mm			inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			3.60			0.1417
a1	0.10		0.30	0.003		0.0118
a2			3.30			0.1299
a3	0		0.10	0		0.0039
b	0.22		0.38	0.008		0.0150
c	0.23		0.32	0.009		0.0126
D (1)	15.80		16.00	0.622		0.6299
D1	9.40		9.80	0.370		0.3858
E	13.90		14.50	0.547		0.5709
E1 (1)	10.90		11.10	0.429		0.4370
E2			2.90			0.1142
E3	5.8		6.2	0.228		0.2441
e		0.65			0.025	
e3		11.05			0.435	
G	0		0.10	0.000		0.0039
H	15.50		15.90	0.610		0.6260
h			1.10			0.0433
L	0.80		1.10	0.031		0.0433
N			10°			10°
S	0°		8°	0°		8°

Figure 8. PowerSO-36 drawings



## 7 Order codes

**Table 11. Order codes**

Part number	Package	Packaging
VN808SR	PowerSO-36	Tube
VN808SR13TR	PowerSO-36	Tape and reel

## 8 Revision history

Table 12. Revision history

Date	Revision	Changes
13-Sep-2005	1	Initial release
1-Mar-2007	2	Document reformatted
26-Mar-2007	3	Typo in <i>Figure 3</i> .

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