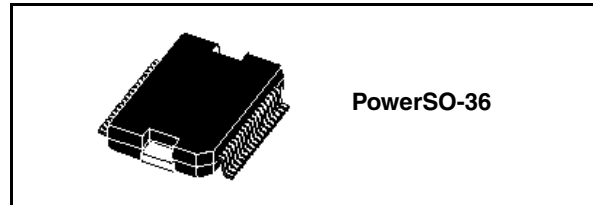


## Low threshold octal high side driver

### General features

Type	$R_{DS(on)}$	$I_{out}$	$V_{CC}$
VN808CM-E	160m $\Omega$	0.7A	45V

- CMOS compatible input
- Junction over-temperature protection
- Case over-temperature protection for thermal independence of the channels
- Current limitation
- Shorted load protections
- Undervoltage shutdown
- Protection against loss of ground
- Very low stand-by current
- Compliance to 61000-4-4 IEC test up to 4kV



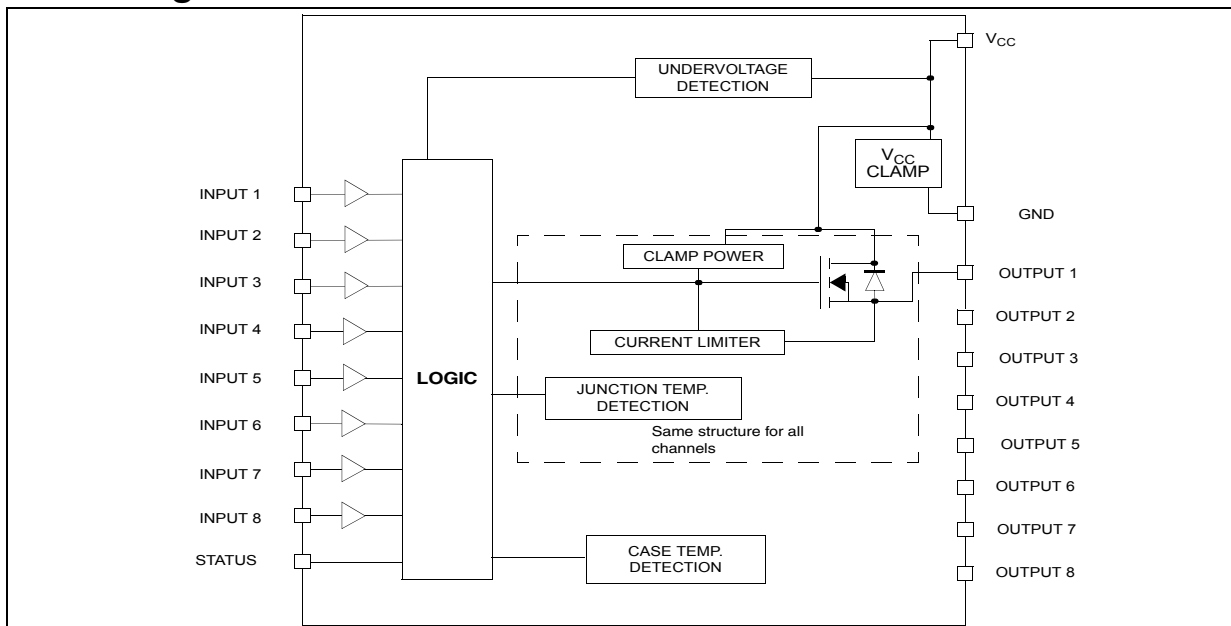
It can be driven by using a 3.3V logic supply. Active current limitation, combined with thermal shutdown and automatic restart, protect the device against overload. In overload condition, the channel turns OFF, then back ON automatically so as to maintain junction temperature between  $T_{TSD}$  and  $T_R$ . If this condition makes the case temperature reach  $T_{CSD}$ , the overloaded channel is turned OFF and will restart only when the case temperature has decreased down to  $T_{CR}$  (see Figures 6-7). Channels that are not overloaded continue to operate normally.

### Description

The VN808CM-E is a monolithic device designed with STMicroelectronics VIPower M0-3 Technology, and is intended for driving any kind of load with one side connected to ground.

The device automatically turns OFF when the Ground pin is disconnected. This device is especially suitable for industrial applications which conform to IEC 61131 (Programmable Controllers International Standard)

### 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
$V_{ESD}$	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	-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  $0.5\text{cm}^2$  of copper area ( at least  $35\mu$  think ) connected to all TAB pins.

## 2 Pin connections

**Table 3. Pin definitions and 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
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)

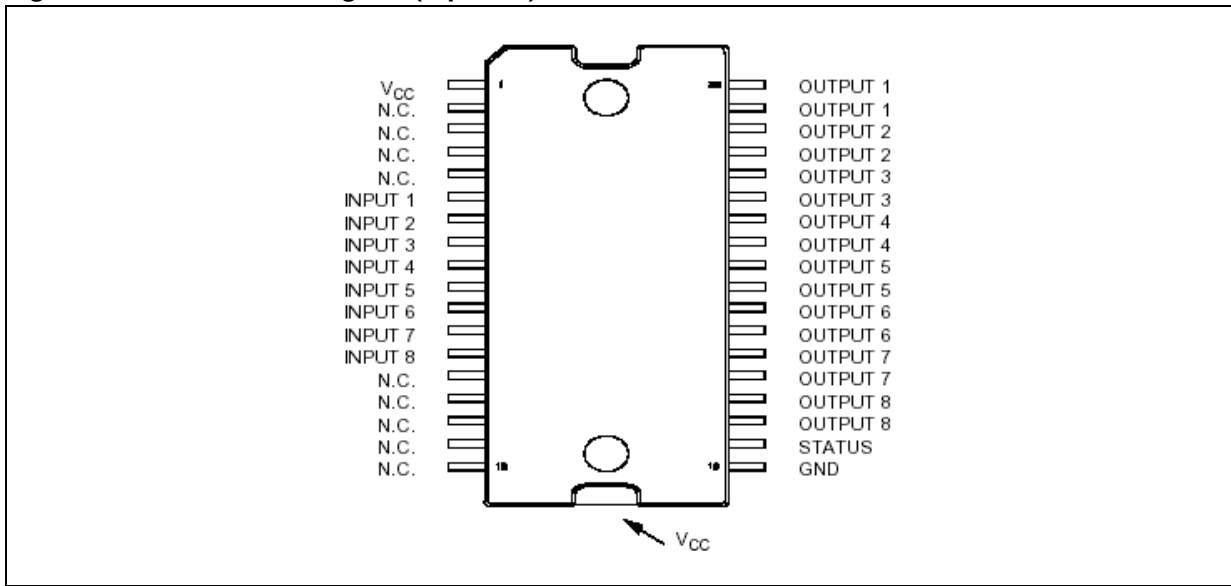
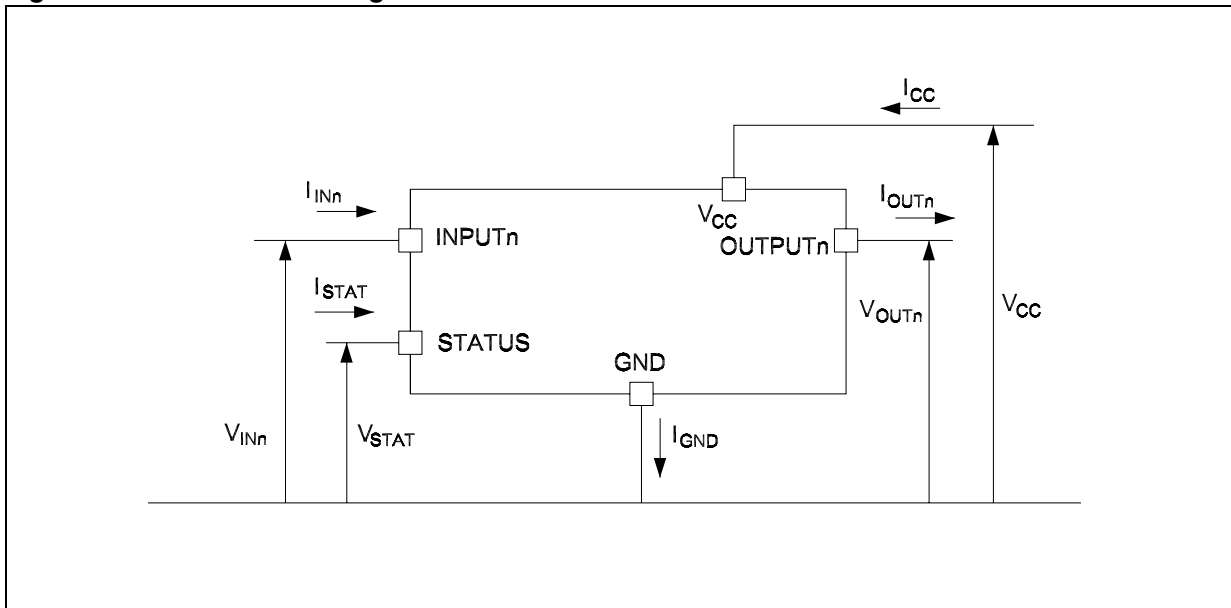


Figure 2. Current and voltage conventions



### 3 Electrical characteristics

10.5V < V<sub>CC</sub> < 32V; -40°C < T<sub>J</sub> < 125°C; unless otherwise specified

**Table 4. Power Section**

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V <sub>CC</sub>	Operating supply voltage		10.5		45	V
V <sub>USD</sub>	Undervoltage shutdown		7		10.5	V
R <sub>ON</sub>	On state resistance	I <sub>OUT</sub> = 0.5A; T <sub>J</sub> = 25°C I <sub>OUT</sub> = 0.5A;			160 280	mΩ mΩ
I <sub>S</sub>	Supply current	OFF state; V <sub>CC</sub> = 24V; T <sub>CASE</sub> = 25°C ON state( all channels ON); V <sub>CC</sub> = 24V T <sub>CASE</sub> = 100°C			150 12	μA mA
I <sub>LGND</sub>	Output current at turn-off	V <sub>CC</sub> = V <sub>STAT</sub> = V <sub>IN</sub> = V <sub>GND</sub> = 24V V <sub>OUT</sub> = 0V			1	mA
I <sub>L(off)</sub>	OFF state output current	V <sub>IN</sub> = V <sub>OUT</sub> = 0V;	0		5	μA
V <sub>OUT(off)</sub>	OFF state output voltage	V <sub>IN</sub> = 0V; I <sub>OUT</sub> = 0A;			3	V
t <sub>d(Vccon)</sub>	Power-on delay time from V <sub>CC</sub> rising edge	Figure 4.		1		ms

**Table 5. Switching ( V<sub>CC</sub> = 24V )**

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
t <sub>ON</sub>	Turn-on time	R <sub>L</sub> = 48Ω from 80% V <sub>OUT</sub> Figure 3.		50	100	μs
t <sub>OFF</sub>	Turn-off time	R <sub>L</sub> = 48Ω to 10% V <sub>OUT</sub> Figure 3.		75	150	μs
dV <sub>OUT</sub> /dt <sub>(on)</sub>	Turn-on voltage slope	R <sub>L</sub> = 48Ω from V <sub>OUT</sub> = 2.4V to V <sub>OUT</sub> = 19.2V Figure 3.		0.7		V/ μs
dV <sub>OUT</sub> /dt <sub>(off)</sub>	Turn-off voltage slope	R <sub>L</sub> = 48Ω from V <sub>OUT</sub> = 21.6V to V <sub>OUT</sub> = 2.4V Figure 3.		1.5		V/ μs

**Table 6. Input Pin**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>INL</sub>	Input low level				1.25	V
I <sub>INL</sub>	Low level input current	V <sub>IN</sub> = 1.25V	1			μA
V <sub>INH</sub>	Input high level		2.25			V
I <sub>INH</sub>	High level input current	V <sub>IN</sub> = 2.25V			10	μA
V <sub>I(HYST)</sub>	Input hysteresis voltage		0.25			V
V <sub>ICL</sub>	Input Clamp Voltage	I <sub>IN</sub> = 1mA I <sub>IN</sub> = -1mA	6.0	6.8 -0.7	8.0	V V

Table 7. Protections

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$T_{CSD}$	Case shut-down temperature		125	130	135	°C
$T_{CR}$	Case reset temperature		110			°C
$T_{CHYST}$	Case thermal hysteresis		7	15		°C
$T_{TSD}$	Junction shutdown temperature		150	175	200	°C
$T_R$	Junction reset temperature		135			°C
$T_{HYST}$	Junction thermal hysteresis		7	15		°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

# 4 Switching time waveforms and truth table

Figure 3. Turn-ON & turn-OFF

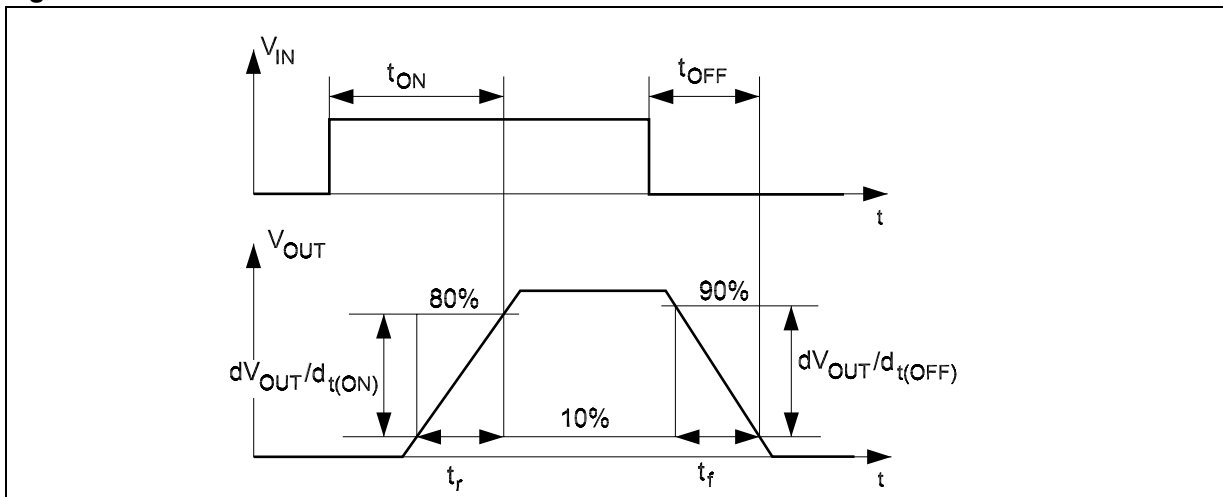


Figure 4.  $V_{CC}$  turn-on

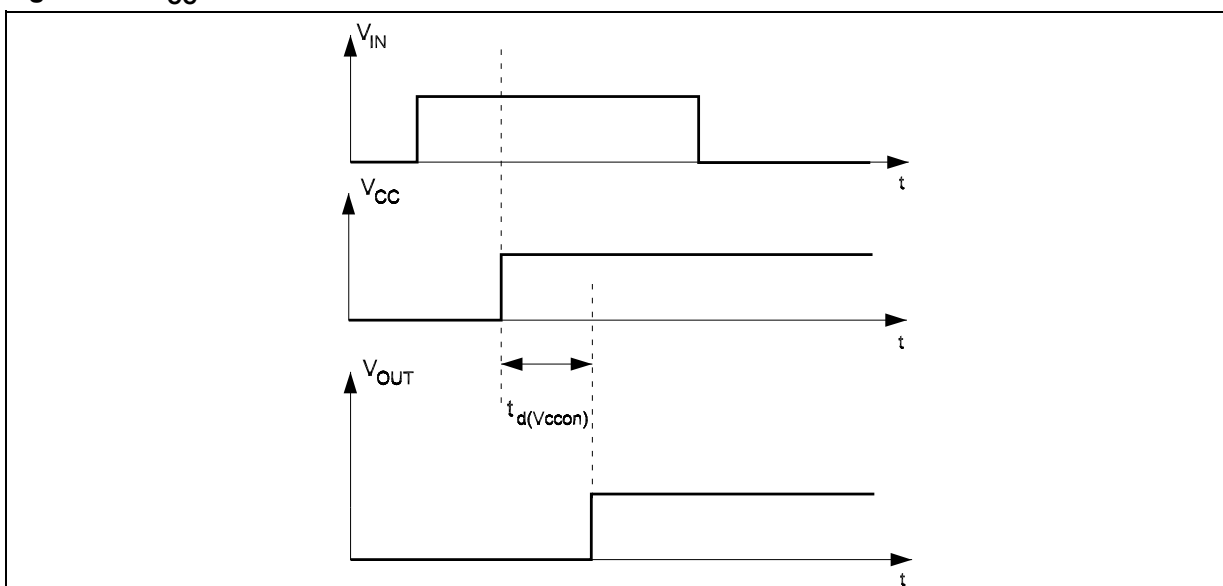
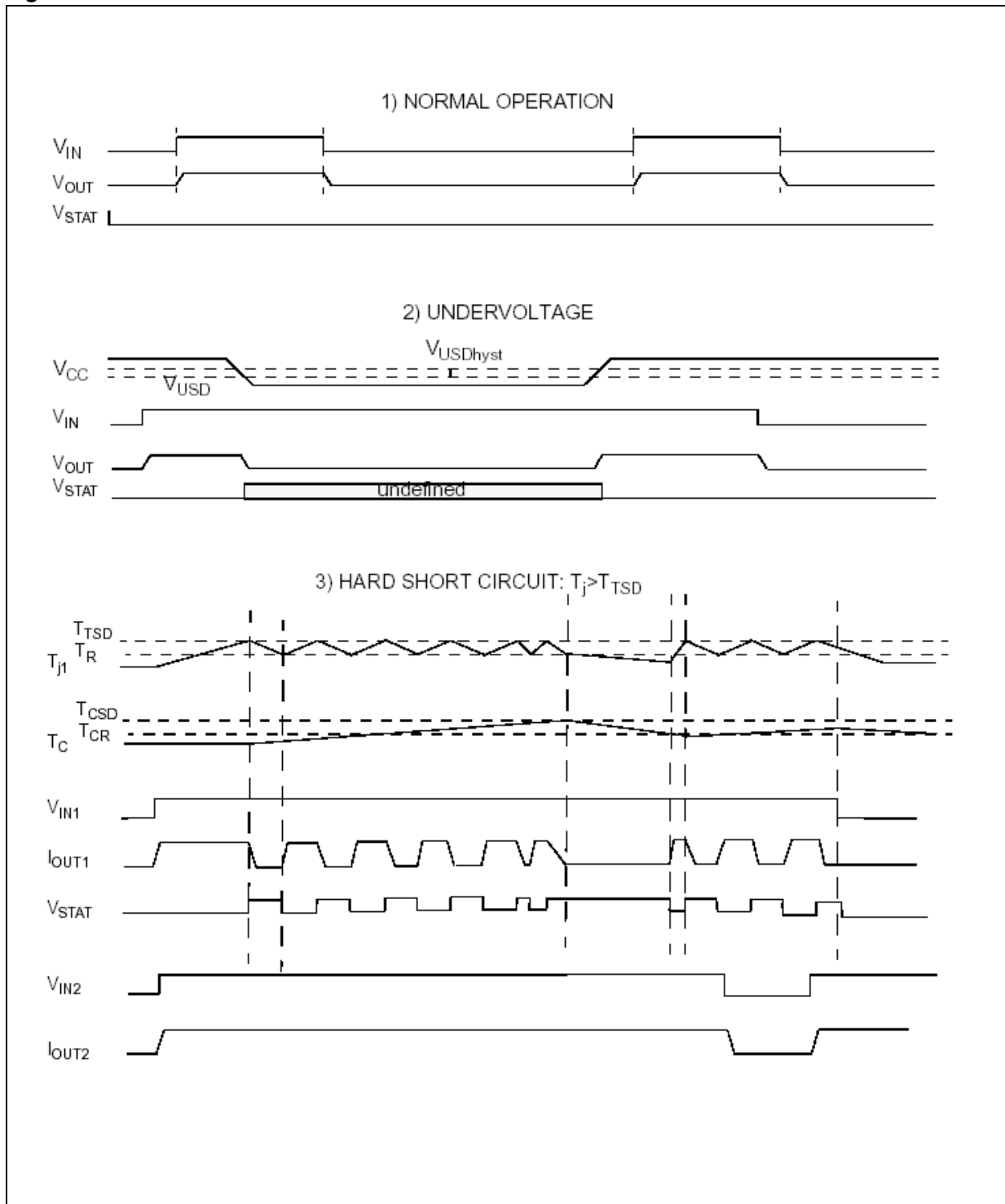
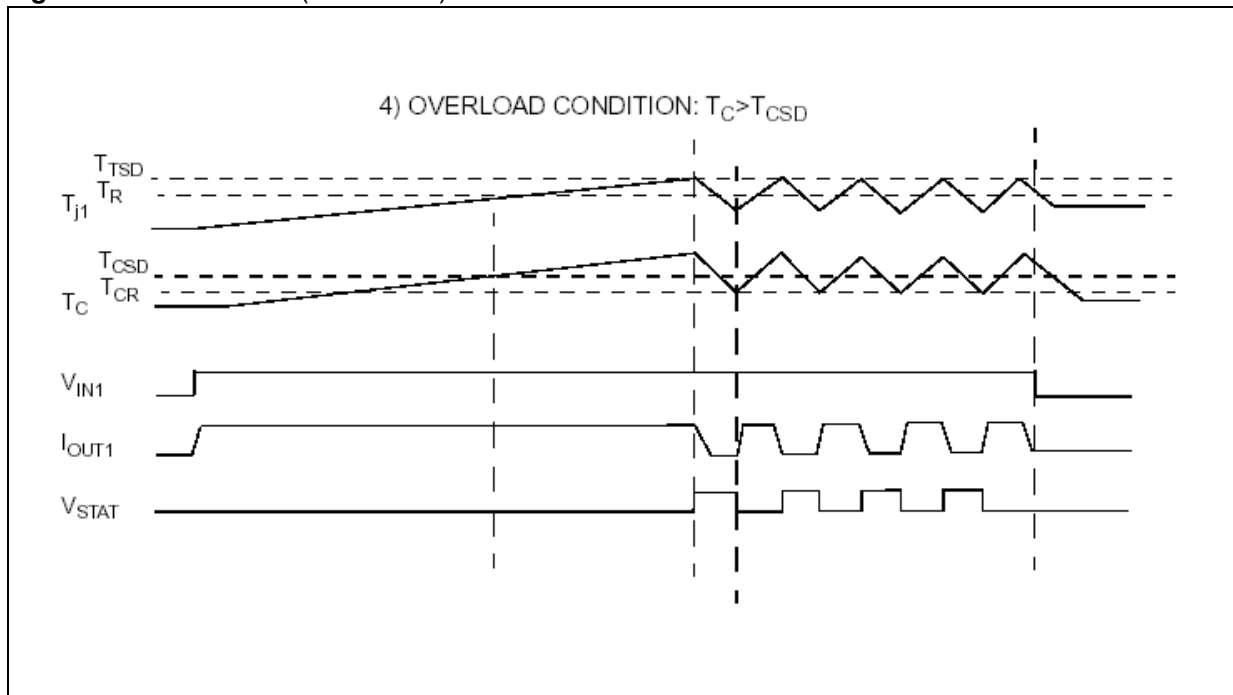




Figure 5. Waveforms



**Figure 6. Waveforms ( continued )**

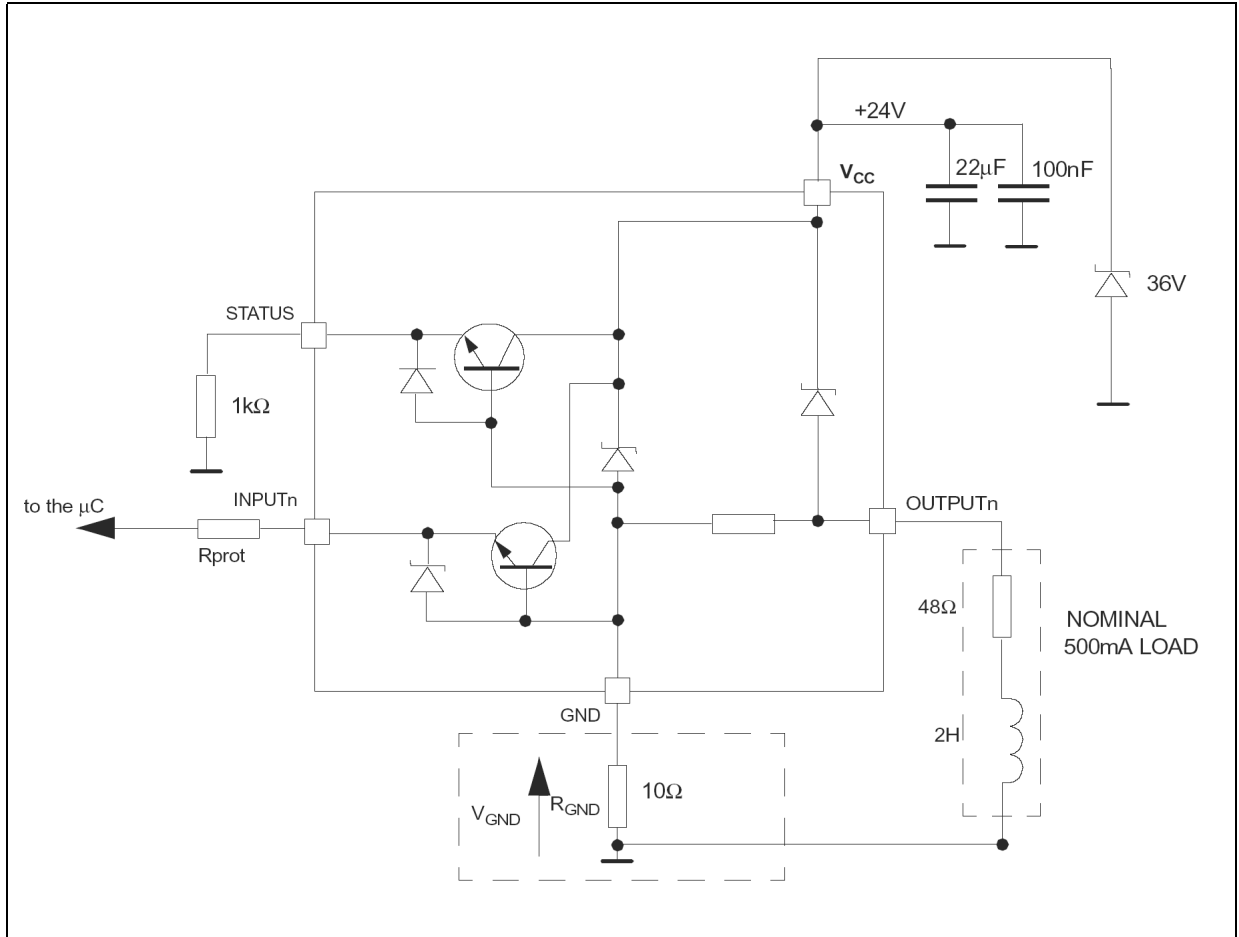


**Table 9. Truth table**

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 5</a> . <a href="#">Figure 6</a> .) -> $T_J > T_{TSD}$	L	L	L
	H	L	H
Undervoltage	L	L	X
	H	L	X

# 5 Application schematic

Figure 7. Application schematic



## 6 Package mechanical data

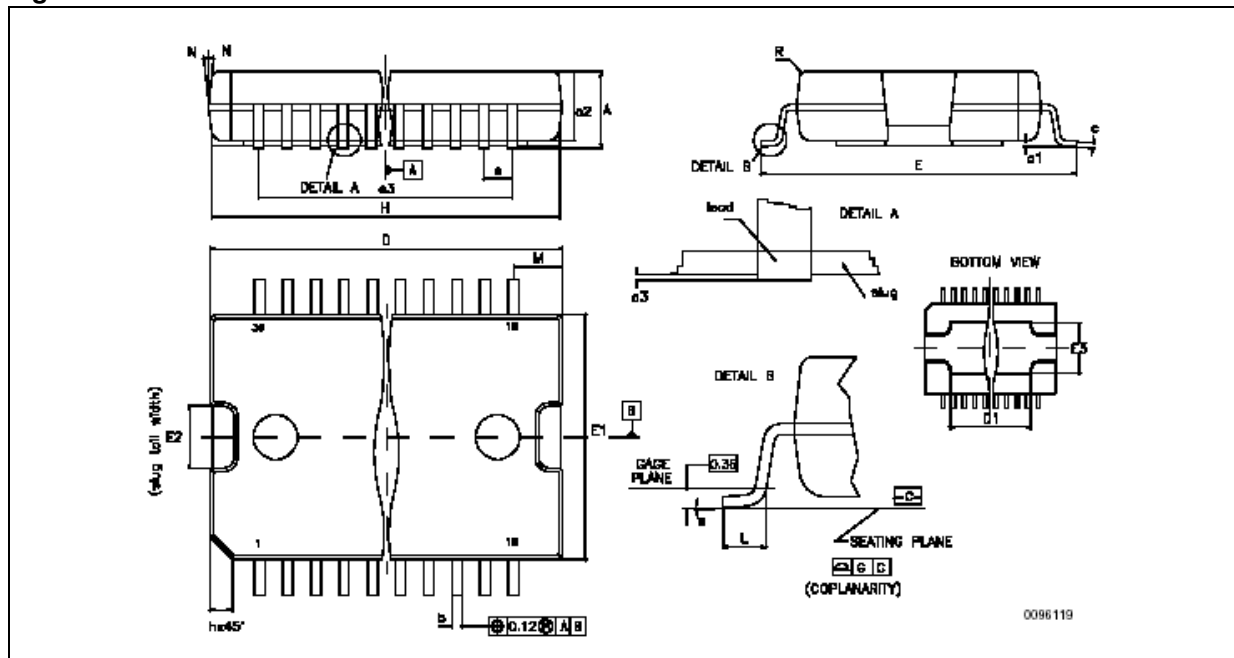
In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings 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 8. PowerSO-36 scheme



## 7 Order code

**Table 11. Order code**

Part number	Package	Packaging
VN808CM-E	PowerSO-36	Tube
VN808CMTR-E	PowerSO-36	Tape and Reel

## 8 Revision history

**Table 12. Revision history**

<b>Date</b>	<b>Revision</b>	<b>Changes</b>
29-Jun-2005	1	Final release
12-Sep-2005	2	New template
28-Jun-2006	3	Application schematic updated

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