VN808CM-E

Low threshold octal high side driver

General features

Type	$R_{DS(on)}$	I_{out}	V_{CC}
VN808CM-E	160mΩ	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

PowerSO-36

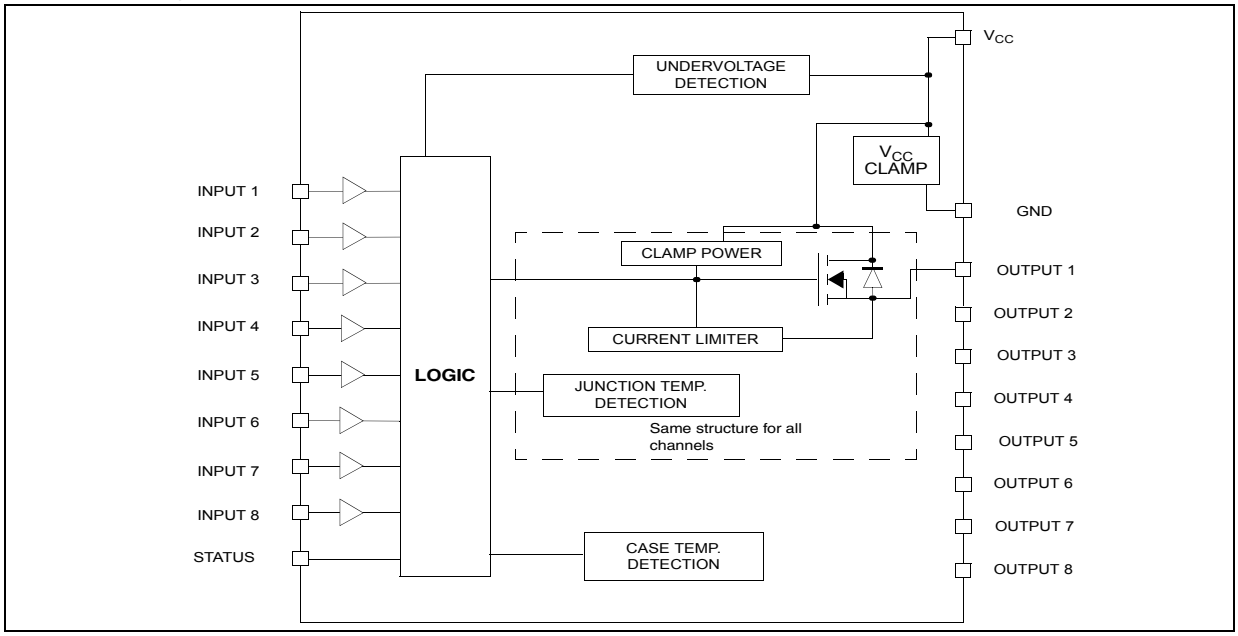
Description

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.

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.

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



Contents

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	± 10	mA
V_{ESD}	Electrostatic discharge (R = 1.5KW; C = 100pF)	2000	V
P_{TOT}	Power dissipation at T_c = 25°C	96	W
L_{MAX}	Max inductive load (V_{CC} = 24V, R_{LOAD} = 48Ω, T_A = 100° C)	2	H
T_J	Junction operating temperature	Internally limited	°C
T_C	Case operating temperature	Internally limited	°C
T_{STG}	Storage Temperature	-40 to 150	°C

Table 2. Thermal data

Symbol	Parameter		Value	Unit
R_{thJC}	Thermal resistance junction-case	Max	1.3	°C/W
R_{thJA}	Thermal resistance junction-ambient (1)	Max	50	°C/W

1. *When mounted on FR4 printed circuit board with 0.5cm^2 of copper area (at least 35µ think) connected to all TAB pins.*

2 Pin connections

Table 3. Pin definitions and functions

Pin N°	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)

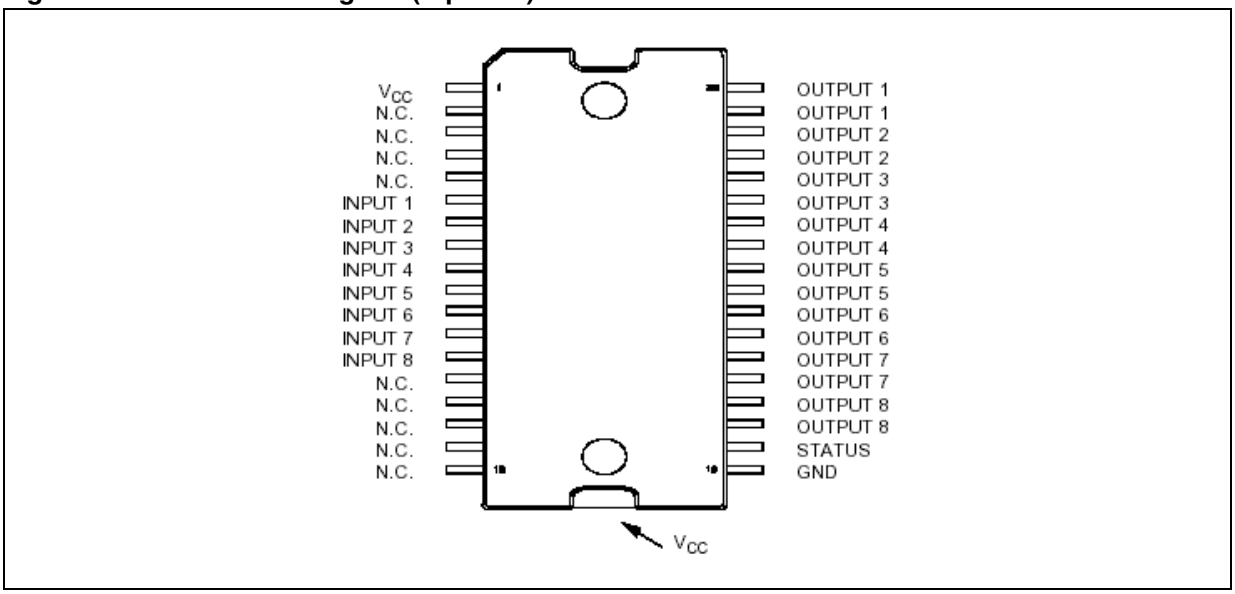
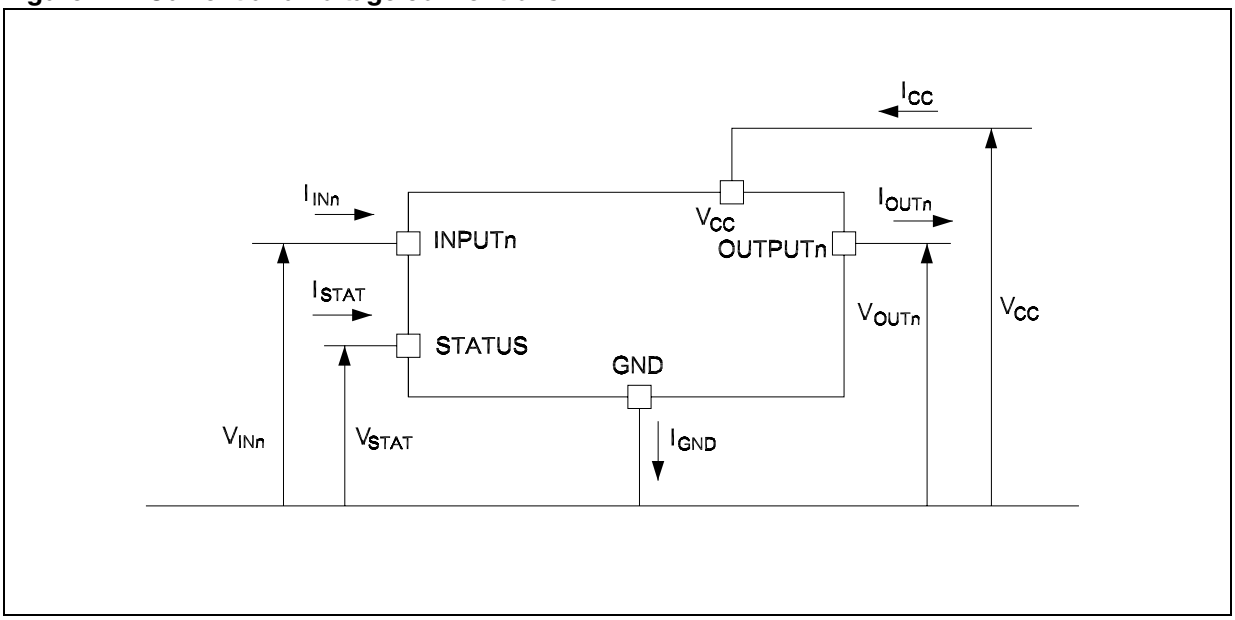


Figure 2. Current and voltage conventions



3 Electrical characteristics

10.5V < V_{CC} < 32V; -40°C < T_J < 125°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} = 0.5A; T_J = 25°C I_{OUT} = 0.5A;			160 280	mΩ mΩ
I_S	Supply current	OFF state; V_{CC} = 24V; T_{CASE} = 25°C ON state(all channels ON); V_{CC} = 24V T_{CASE} = 100°C			150 12	µA 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	µA
$V_{OUT(off)}$	OFF state output voltage	V_{IN} = 0V; I_{OUT} = 0A;			3	V
$t_{d(Vccon)}$	Power-on delay time from V_{CC} rising edge	*Figure 4.*		1		ms

Table 5. Switching (V_{CC} = 24V)

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
t_{ON}	Turn-on time	R_L = 48Ω from 80% V_{OUT} *Figure 3.*		50	100	µs
t_{OFF}	Turn-off time	R_L = 48Ω to 10% V_{OUT} *Figure 3.*		75	150	µs
$dV_{OUT}/dt_{(on)}$	Turn-on voltage slope	R_L = 48Ω from V_{OUT} = 2.4V to V_{OUT} = 19.2V *Figure 3.*		0.7		V/ µs
$dV_{OUT}/dt_{(off)}$	Turn-off voltage slope	R_L = 48Ω from V_{OUT} = 21.6V to V_{OUT} = 2.4V *Figure 3.*		1.5		V/ µs

Table 6. Input Pin

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{INL}	Input low level				1.25	V
I_{INL}	Low level input current	V_{IN} = 1.25V	1			µA
V_{INH}	Input high level		2.25			V
I_{INH}	High level input current	V_{IN} = 2.25V			10	µA
$V_{I(HYST)}$	Input hysteresis voltage		0.25			V
V_{ICL}	Input Clamp Voltage	I_{IN} = 1mA I_{IN} = -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} = 10mΩ	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} = 1KΩ (Fault condition)	2	3	4	mA
I_{LSTAT}	Leakage current	Normal operation; V_{CC} = 32V			0.1	µA
V_{CLSTAT}	Clamp voltage	I_{STAT} = 1mA I_{STAT} = -1mA	6.0	6.8 -0.7	8.0	V V

4 Switching time waveforms and truth table

Figure 3. Turn-ON & turn-OFF

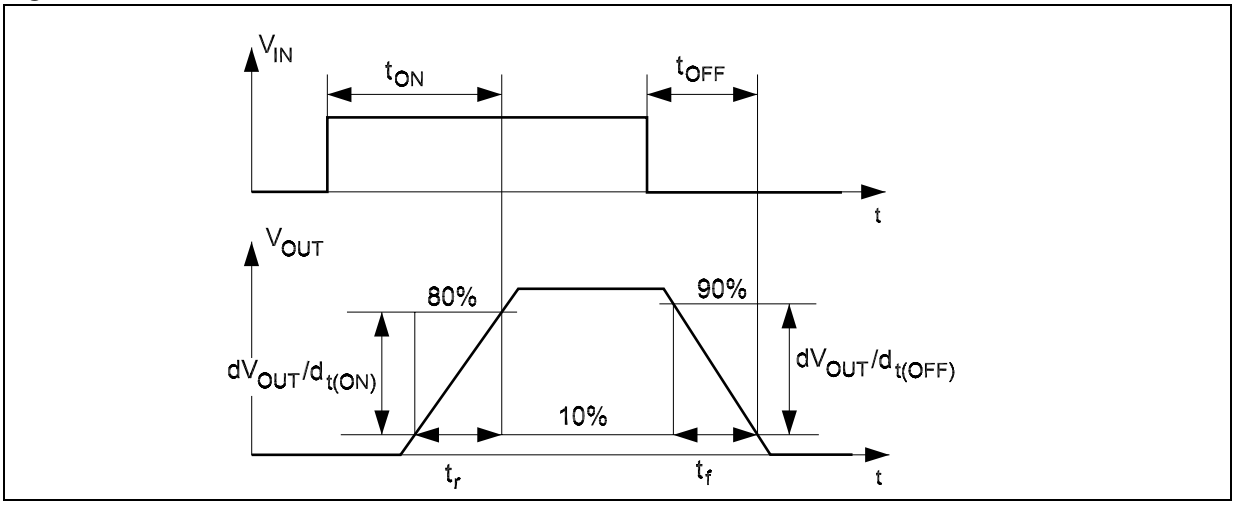


Figure 4. V_{CC} turn-on

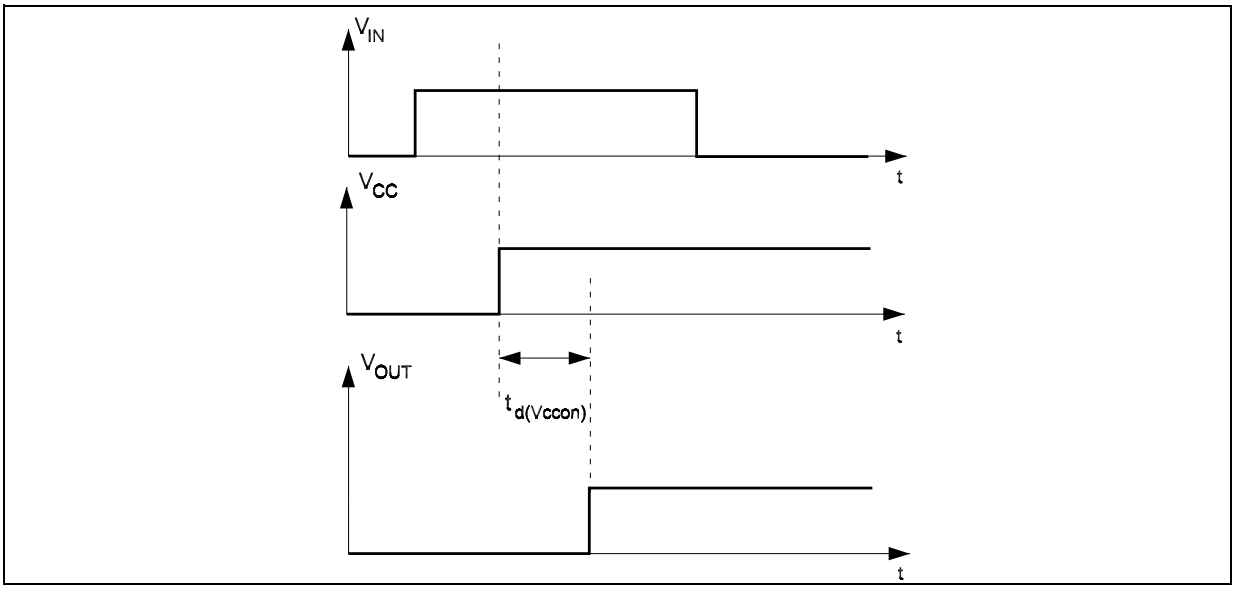


Figure 5. Waveforms

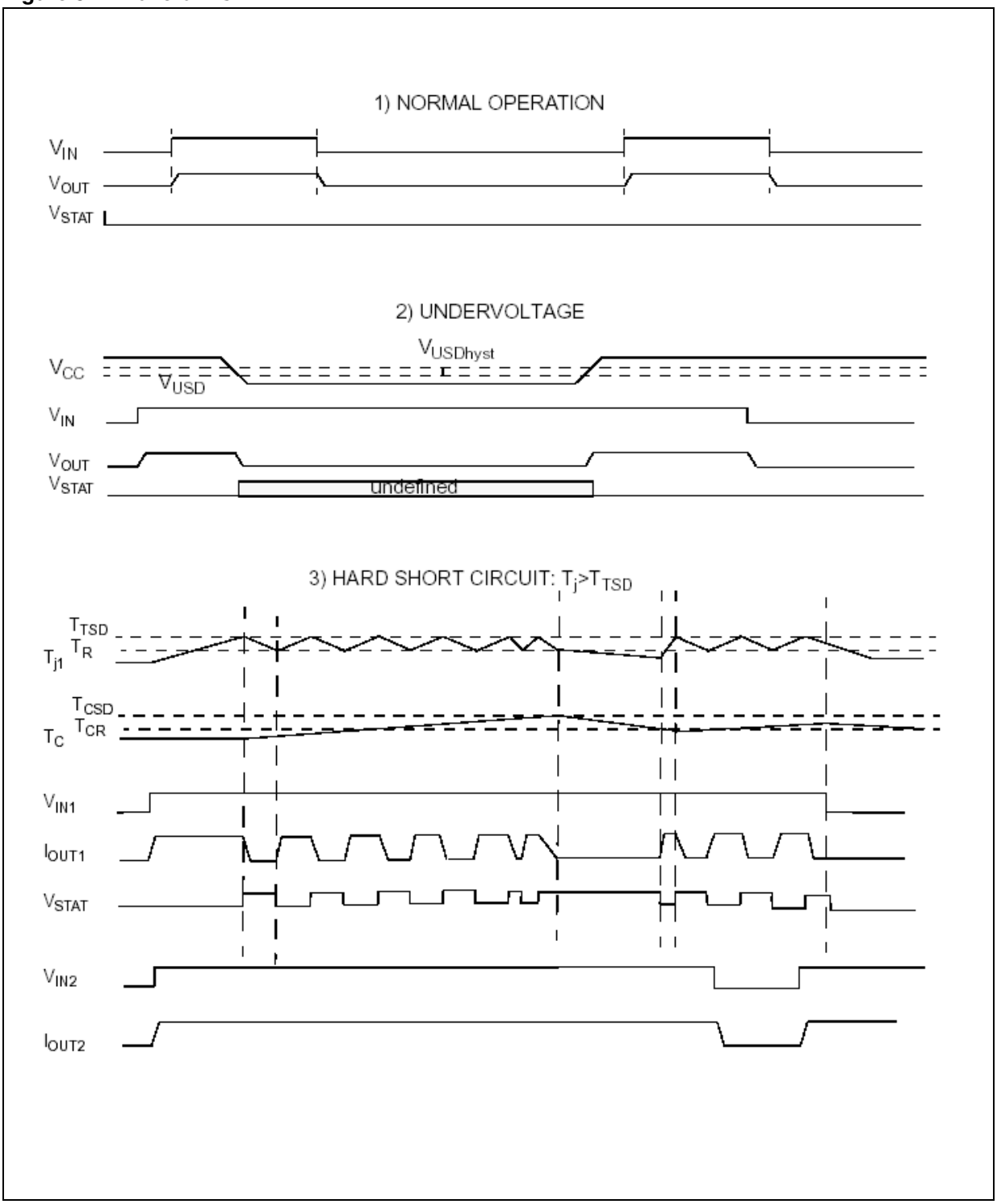


Figure 6. Waveforms (continued)

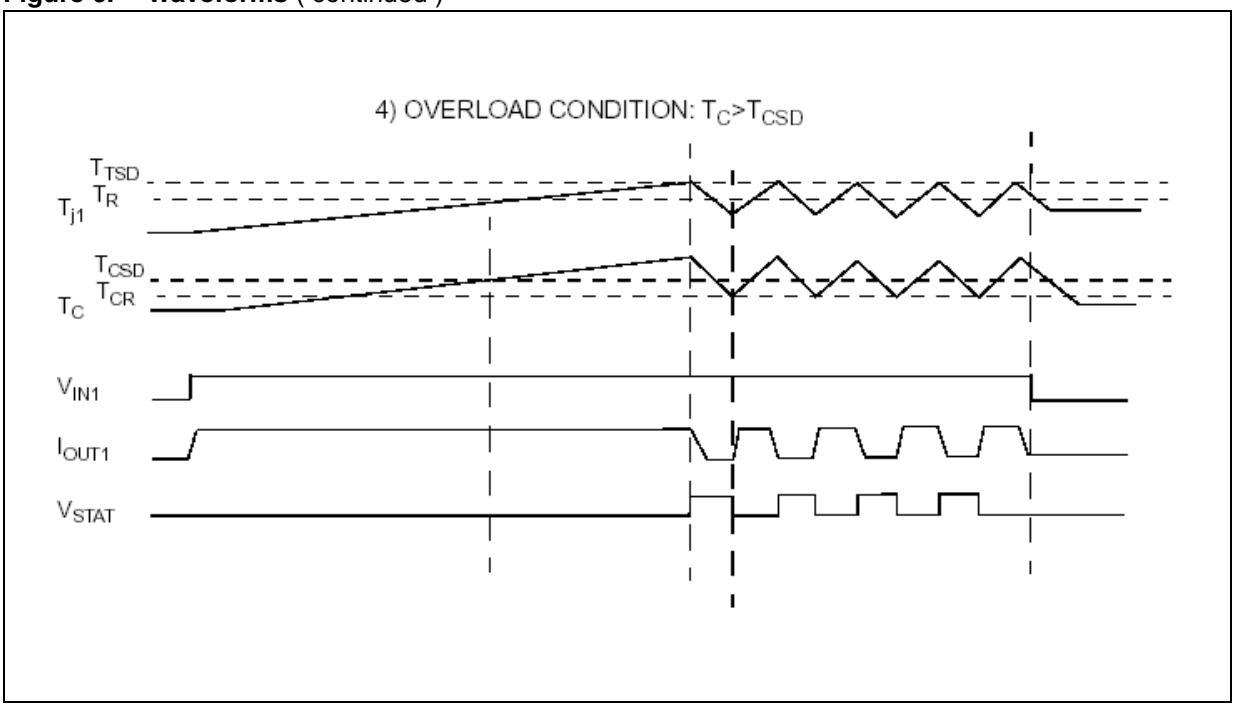
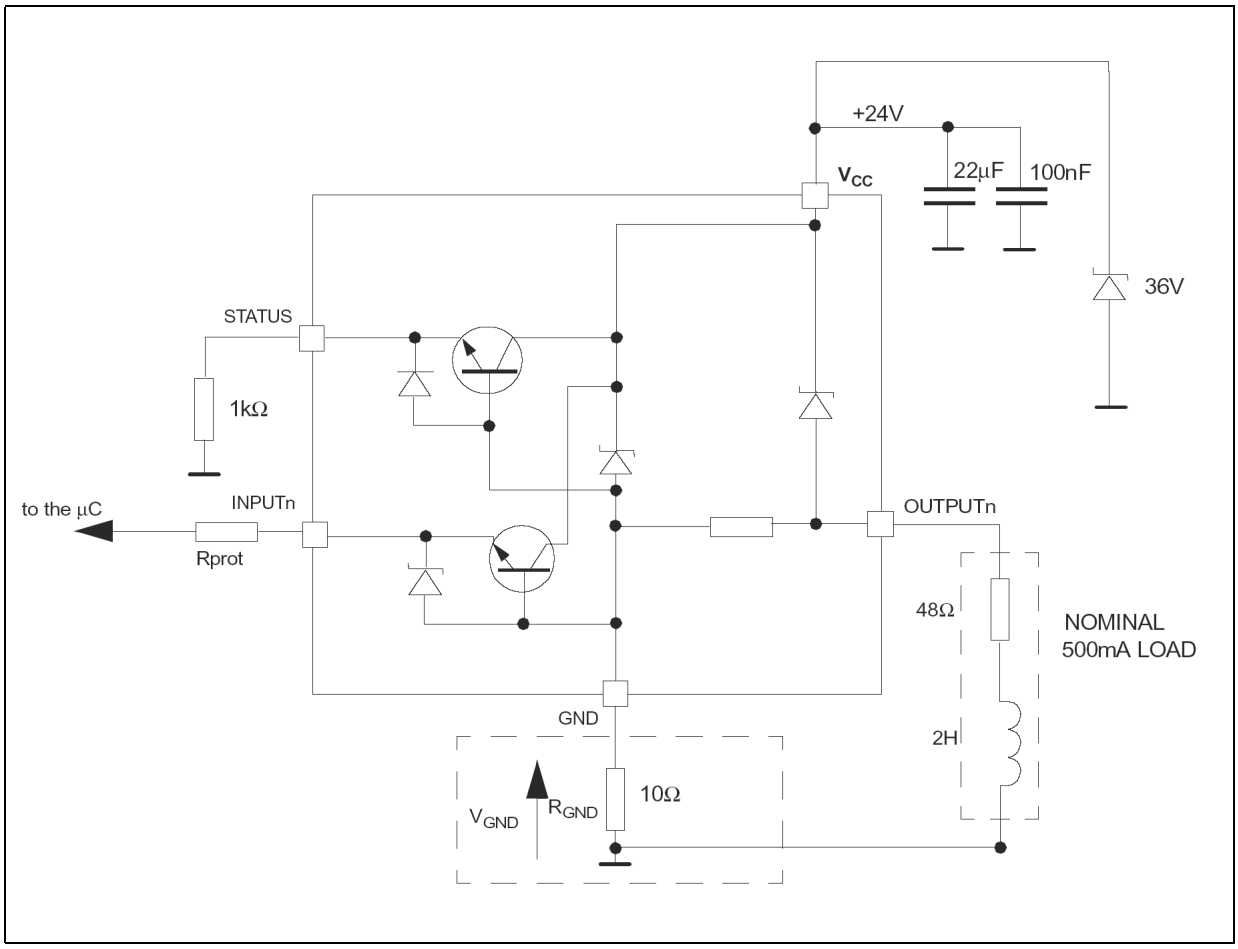


Table 9. Truth table

Conditions	INPUTn	OUTPUTn	STATUS
Normal operation	L H	L H	L L
Current limitation	L H	L X	L L
Overtemperature (see waveforms 3, 4 *Figure 5. Figure 6.*) -> $T_J > T_{TSD}$	L H	L L	L H
Undervoltage	L H	L L	X X

5 Application schematic

Figure 7. Application schematic



6 Package mechanical data

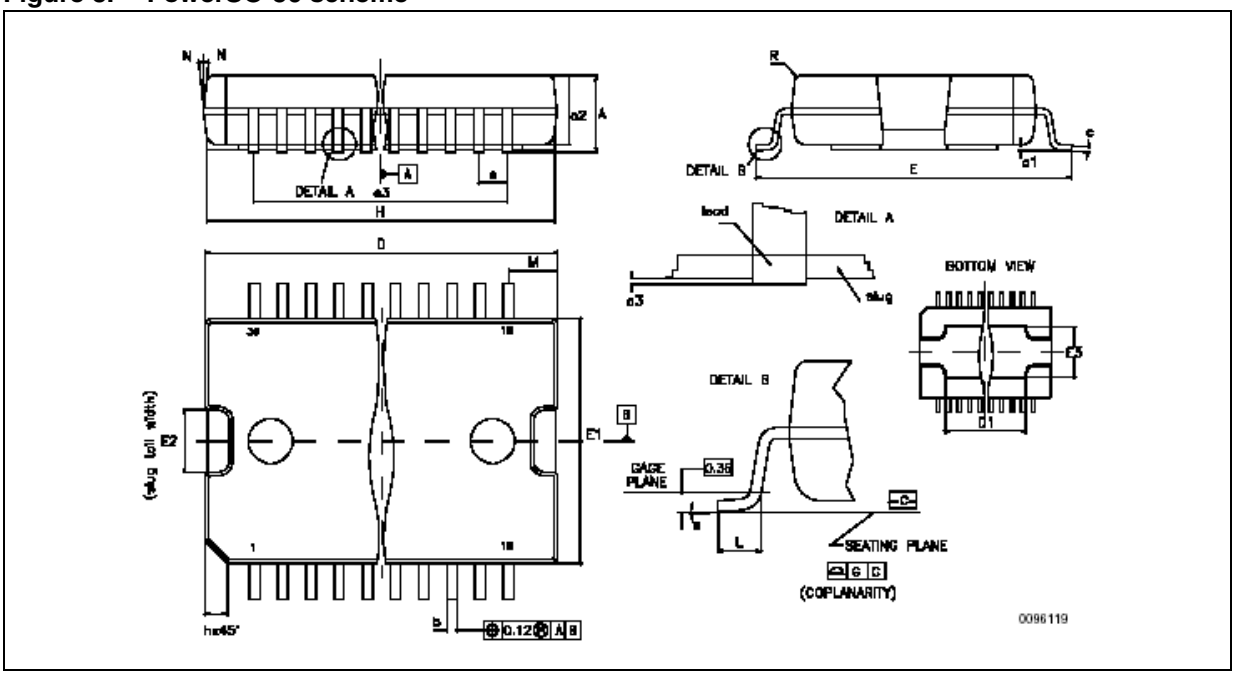
In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings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

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

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

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