SGS-THOMSON MICROELECTRONICS

VN330SP

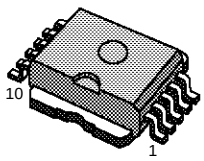
QUAD HIGH SIDE SMART POWER SOLID STATE RELAY

TARGET DATA

TYPE	V_{demag} *	$R_{DS(on)}$ *	I_{OUT} *	V_{CC}
VN330SP	V_{CC}-55V	0.2 Ω	1 A	36 V

* per Channel

- OUTPUT CURRENT (CONTINUOUS): 1A PER CHANNEL
- DIGITAL INPUTS WITH 30V MAX VOLTAGE
- SHORTED LOAD AND OVERTEMPERATURE PROTECTIONS
- 1A (EACH CHANNEL) CURRENT LIMITER
- UNDER VOLTAGE SHUT DOWN
- OPEN DRAIN DIAGNOSTIC OUTPUT
- FAST DEMAGNETIZATION OF INDUCTIVE LOADS



Power SO-10™

DESCRIPTION

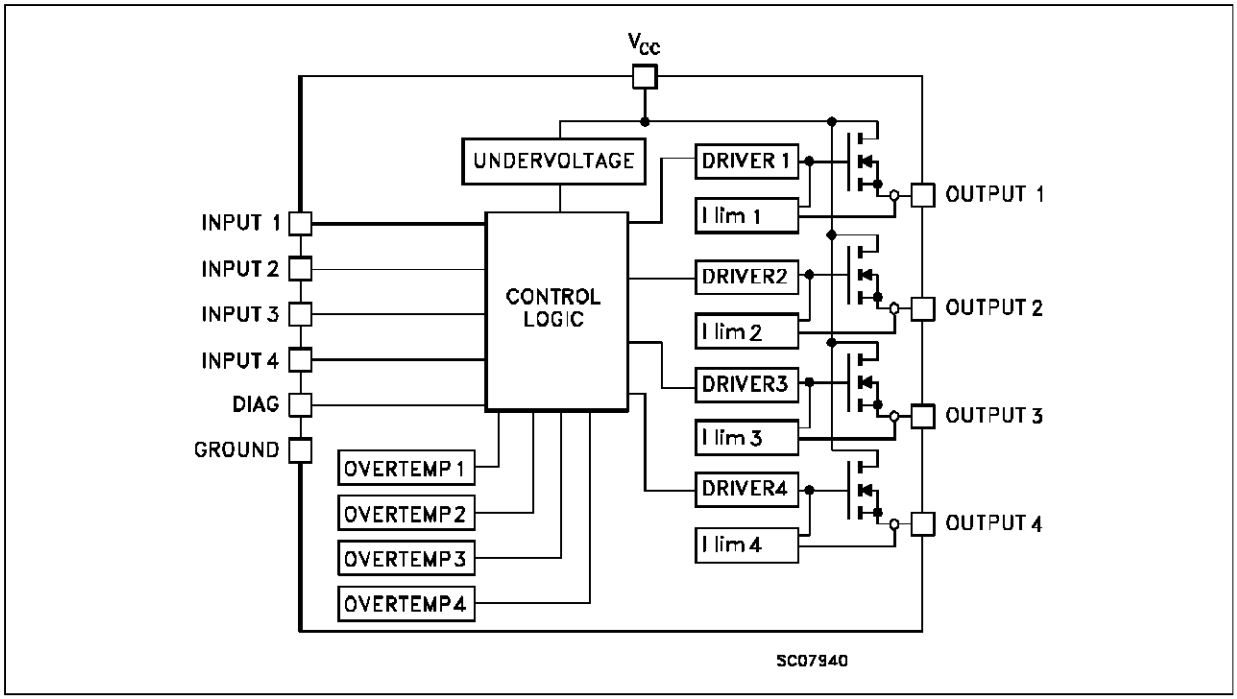
The VN330SP is a monolithic device made using SGS-THOMSON Vertical Intelligent Power Technology, intended for driving four indipendent resistive or inductive loads with one side connected to ground.

Active current limitation avoids dropping the system power supply in case of shorted load.

Built-in thermal shut-down protects the chip from over temperature and short circuit.

The open drain diagnostic output indicates short circuit and over temperature conditions.

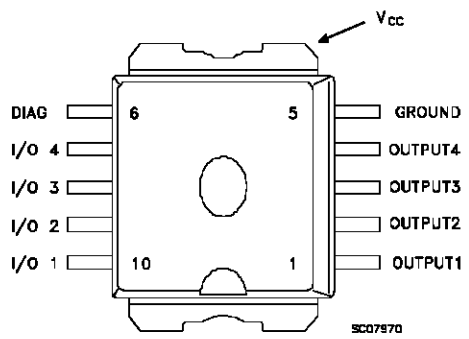
BLOCK DIAGRAM



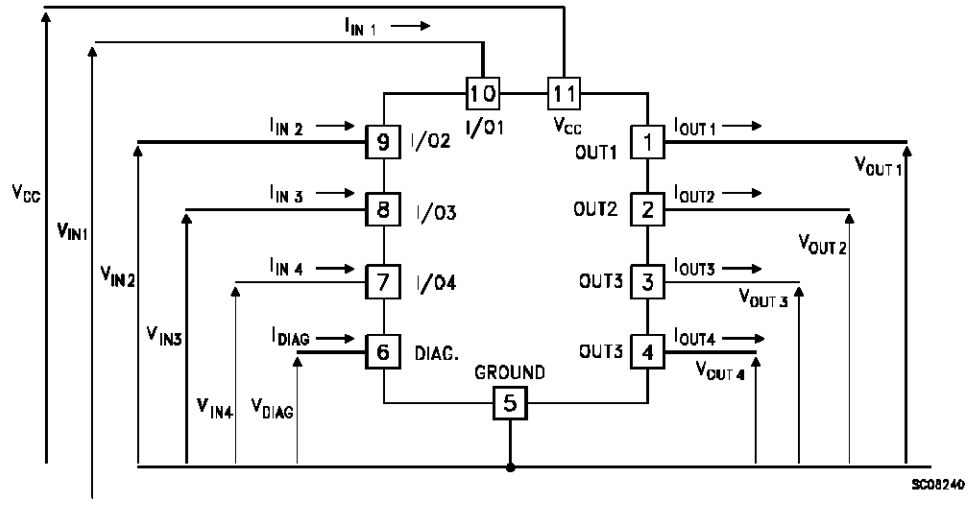
ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Value	Unit
V_{CC}	Power Supply Voltage	45	V
$-V_{CC}$	Reverse Supply Voltage	-0.3	V
I_{OUT}	Output Current (cont.)	Internally Limited	A
I_R	Reverse Output Current (per channel)	-6	A
I_{IN}	Input Current (per channel)	±10	mA
I_{DIAG}	DIAG Pin Current	±10	mA
V_{ESD}	Electrostatic Discharge (1.5 kΩ, 100 pF)	2000	V
P_{tot}	Power Dissipation at $T_c \leq 25\ ^oC$	Internally Limited	W
T_j	Junction Operating Temperature	Internally Limited	^oC
T_{stg}	Storage Temperature	-55 to 150	^oC

CONNECTION DIAGRAM



CURRENT AND VOLTAGE CONVENTIONS



THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case (1)	Max	2	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient ($)	Max	50	°C/W

(1) All channels ON
($) When mounted using minimum recommended pad size on FR-4 board

ELECTRICAL CHARACTERISTICS (V_{CC} 10 to 36 V; -25 < T_{case} < 85 °C unless otherwise specified)

POWER

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{CC}	Supply Voltage		10		36	V
R_{on}	On State Resistance	I_{OUT} = 0.5 A I_{OUT} = 0.5 A T_j = 25 °C			0.4 0.2	Ω Ω
I_S	Supply Current	All Channel Off On State (T_c =100°C) I_{out1} .. I_{out4} =0			1 10	mA mA
V_{demag}	Output Voltage at Turn-Off	I_{out} = 0.5A L_{LOAD} = 1 mH	V_{CC}-65	V_{CC}-55	V_{CC}-45	V

SWITCHING

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time Of Output Current	I_{OUT} = 0.5 A Resistive Load Input Rise Time < 0.1 µs T_j = 25 °C		10	20	µs
t_r	Rise Time Of Output Current	I_{OUT} = 0.5 A Resistive Load Input Rise Time < 0.1 µs T_j = 25 °C		15	45	µs
$t_{d(off)}$	Turn-off Delay Time Of Output Current	I_{OUT} = 0.5 A Resistive Load Input Rise Time < 0.1 µs T_j = 25 °C		15	30	µs
t_f	Fall Time Of Output Current	I_{OUT} = 0.5 A Resistive Load Input Rise Time < 0.1 µs T_j = 25 °C		6	15	µs
$(di/dt)_{on}$	Turn-on Current Slope	I_{OUT} = 0.5 A I_{OUT} = I_{lim} 25 < T_j < 140 °C			0.5 2	A/µs A/µs
$(di/dt)_{off}$	Turn-off Current Slope	I_{OUT} = 0.5 A I_{OUT} = I_{li} 25 < T_j < 140 °C			2 4	A/µs A/µs

LOGIC INPUT

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{IL}	Input Low Level Voltage				2	V
V_{IH}	Input High Level Voltage		3.5			V
$V_{I(hyst.)}$	Input Hysteresis Voltage			0.5		V
I_{IN}	Input Current	V_{IN} = 0 to 30 V V_{IN} = 0 to 2 V	 25		600	µA µA
V_{ICL}	Input Clamp Voltage	I_{IN} = 1 mA I_{IN} = -1 mA	31	36 -0.7		V V

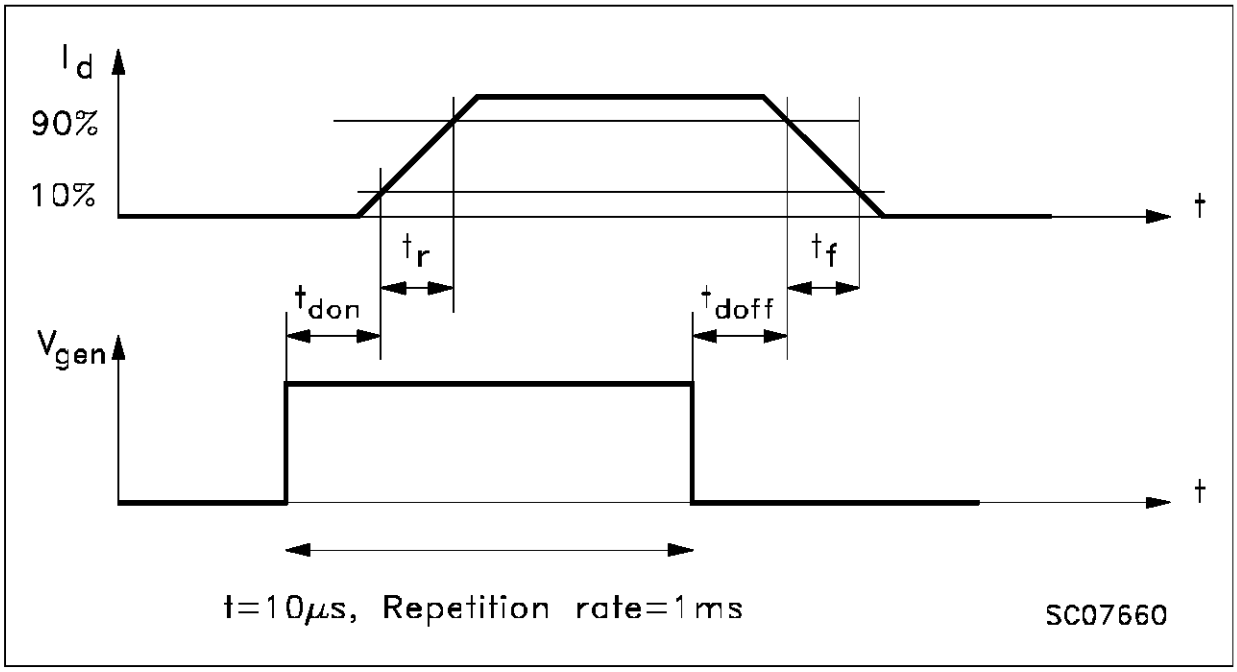
ELECTRICAL CHARACTERISTICS (continued)

PROTECTION AND DIAGNOSTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{STAT} (•)	Status Voltage Output Low	I_{STAT} = 5 mA (Fault Condition)			1	V
V_{SCL} (•)	Status Clamp Voltage	I_{STAT} = 1 mA I_{STAT} = -1 mA	31	36 -0.7		V V
V_{USD}	Under Voltage Shut Down		5		8	A
I_{LIM}	DC Short Circuit Current	V_{CC} = 24 V R_{LOAD} < 100 mΩ	0.7	1	1.5	A
t_{SC}	Switch-off Time in Short Circuit Condition at Start-Up				100	µs
I_{OVPK}	Peak Short Circuit Current				TBD	A
T_{TSD}	Thermal Shut-down Temperature		150	170		°C
T_R	Reset Temperature		135	155		°C

(*) The V_{IH} is internally clamped at 6V about. It is possible to connect this pin to an higher voltage via an external resistor calculated to not exceed 10 mA at the input pin.
(•) Status determination > 100 µs after the switching edge.
Note: If INPUTn pin is left floating the corresponding channel will automatically switch off. If GND pin is disconnetted, all channels will switch off provided V_{CC} does not exceed 36V

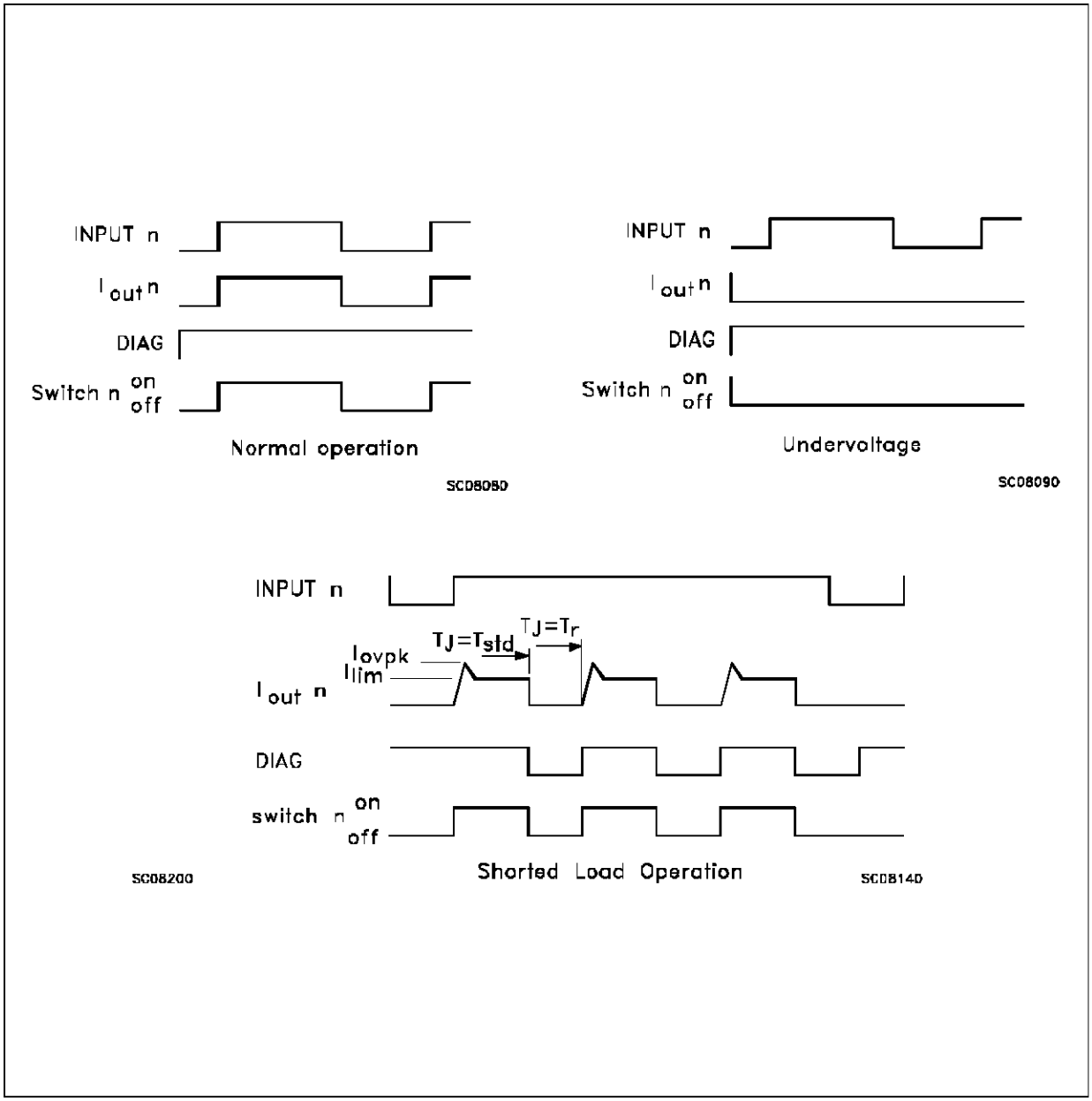
Figure 1: SWITCHING PARAMETERS TEST CONDITIONS



TRUTH TABLE

	INPUTn	OUTPUTn	DIAGNOSTIC
Normal Operation	L H	L H	H H
Over-temperature	L H	L L	H L
Under-voltage	L H	L L	H H
Shorted Load (current limitation)	L H	L H	H H

Figure 1: Waveforms



Power SO-10 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	3.45	3.5	3.55	0.135	0.137	0.140
B		1.28	1.30		0.050	0.051
C			0.15			0.006
D	9.40	9.50	9.60	0.370	0.374	0.378
E	4.98	5.08	5.48	0.196	0.200	0.216
E1	0.40	0.45	0.60	0.016	0.018	0.024
E2	1.17	1.27	1.37	0.046	0.050	0.054
F	9.30	9.40	9.50	0.366	0.370	0.374
F1	7.95	8.00	8.15	0.313	0.315	0.321
G	7.40	7.50	7.60	0.291	0.295	0.299
H	6.80	6.90	7.00	0.267	0.417	0.421
I		0.10			0.004	
K	13.80	14.10	14.40	0.543	0.555	0.567
L		0.40	0.50		0.016	0.020
M	1.60	1.67	1.80	0.063	0.066	0.071
N	0.60	0.08	1.00	0.024	0.031	0.039