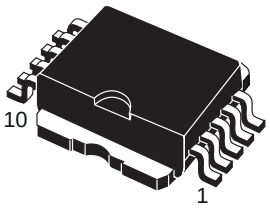
VN340SP

QUAD HIGH SIDE SMART POWER SOLID STATE RELAY

TYPE	V_{demag} *	$R_{DS(on)}$ *	I_{OUT} *	V_{CC}
VN340SP	V_{CC}-55V	0.32 Ω**	0.7 A	36 V

* per Channel
**at T_J = 85 °C

- OUTPUT CURRENT: 0.7A PER CHANNEL
- DIGITAL I/O's CLAMPED AT 32V MINIMUM VOLTAGE
- SHORTED LOAD AND OVERTEMPERATURE PROTECTIONS
- BUILT-IN CURRENT LIMITER
- UNDER VOLTAGE SHUT DOWN
- OPEN DRAIN DIAGNOSTIC OUTPUT
- FAST DEMAGNETIZATION OF INDUCTIVE LOADS
- PROTECTION AGAINST LOSS OF GROUND
- CONFORMS TO IEC 1131-2



Power SO-10 ™

DESCRIPTION

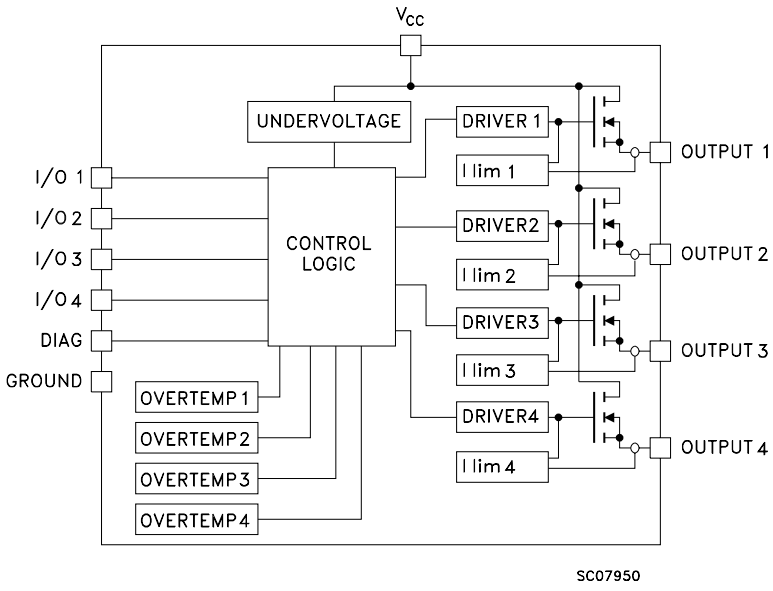
The VN340SP is a monolithic device made using STMicroelectronics VIPower Technology, intended for driving four indipendent resistive or inductive loads with one side connected to ground.

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 overtemperature conditions. Each I/O is pulled down when over temperature condition of the relative channel is verified.

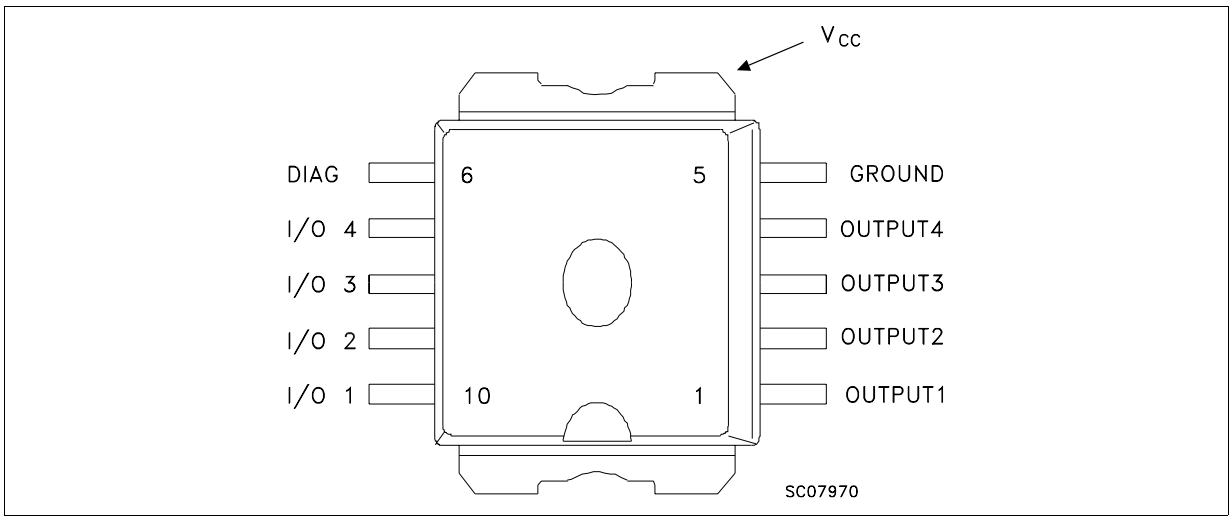
BLOCK DIAGRAM



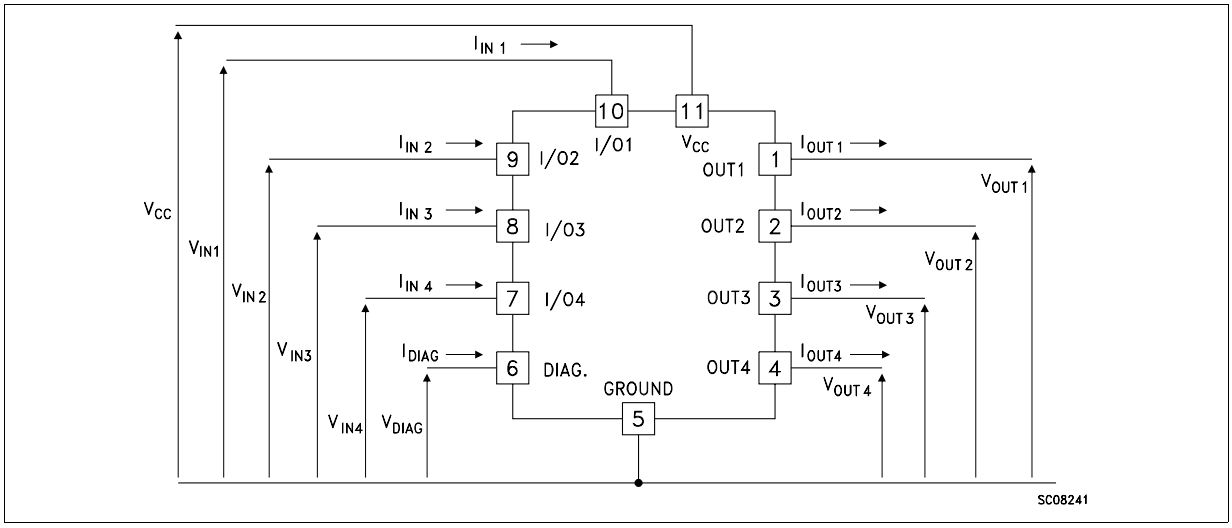
ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Value	Unit
V_{CC}	Power Supply Voltage	45	V
$-V_{CC}$	Reverse Supply Voltage	-4	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
E_{AS}	Single Pulse Avalance Energy per Channel Not Simultaneously (see figure 1)	400	mJ
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	3	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient ($)	Max	50	°C/W

(1) Per channel
($) When mounted using minimum recommended pad size on FR-4 board

ELECTRICAL CHARACTERISTICS (10V < V_{CC} < 36V; -25 °C < T_J < 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 T_j = 125 °C I_{OUT} = 0.5 A			0.4 0.32	Ω Ω
I_S	Supply Current	All Channels Off On State V_{IN} = 30 V I_{out1} .. I_{out4} =0 (T_J =125°C)			1 6	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
V_{OL}	Low State Output Voltage	V_{IN} =V_{IL} R_{LOAD} =10MΩ			1.5	V
I_{lgnd}	Output Current at Turn-Off	VCC = V_{INX} = GND = DIAG = 18 to 30 V T_{amb} = -25°C to 85 °C *			2	mA

* (see test configuration and application description)

SWITCHING (V_{CC} = 24 V)

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		52	100	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		94	250	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		34	50	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		8	20	µs

ELECTRICAL CHARACTERISTICS (continued)

LOGIC INPUT (Each Channel)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{IL}	I/O Input Low Level Voltage				2	V
V_{IH}	I/O Input High Level Voltage (see note1)		3.5			V
$V_{I(hyst.)}$	I/O Input Hysteresis Voltage			0.5		V
I_{IN}	I/O Input Current	V_{IN} = 30 V			25	µA
V_{ICL}	I/O Input Clamp Voltage (see note1)	I_{IN} = 1 mA I_{IN} = -1 mA	32	36 -0.7		V V

note 1 : The input voltage is internally clamped at 32V minimum, it is possible to connect the input pins to an higher voltage via an external resistor calculate to not exceed 10 mA

PROTECTION AND DIAGNOSTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{DIAG} (•)	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	32	36 -0.7		V V
V_{USD}	Under Voltage Shut Down		5		8	V
I_{LIM}	DC Short Circuit Current	V_{CC} = 24 V R_{LOAD} < 10 mΩ	0.7		2	A
I_{OVPK}	Peak Short Circuit Current	V_{CC} = 24 V V_{IN} = 30 V R_{LOAD} < 10 mΩ (see fig.2)			4	A
I_{DIAGH}	Leakage on diag pin in high state	V_{DIAG} = 24 V			25	µA
I_{LOAD}	Output Leakage Current	V_{CC} = 10 to 36 V V_{IN} = V_{IL}			50	µA
t_{SC}	Delay Time of Current Limiter				100	µs
T_{TSD}	Thermal Shut-down Temperature		150	170		°C
T_R	Reset Temperature		135	155		°C

(•) 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: Avalanche Energy Test Circit

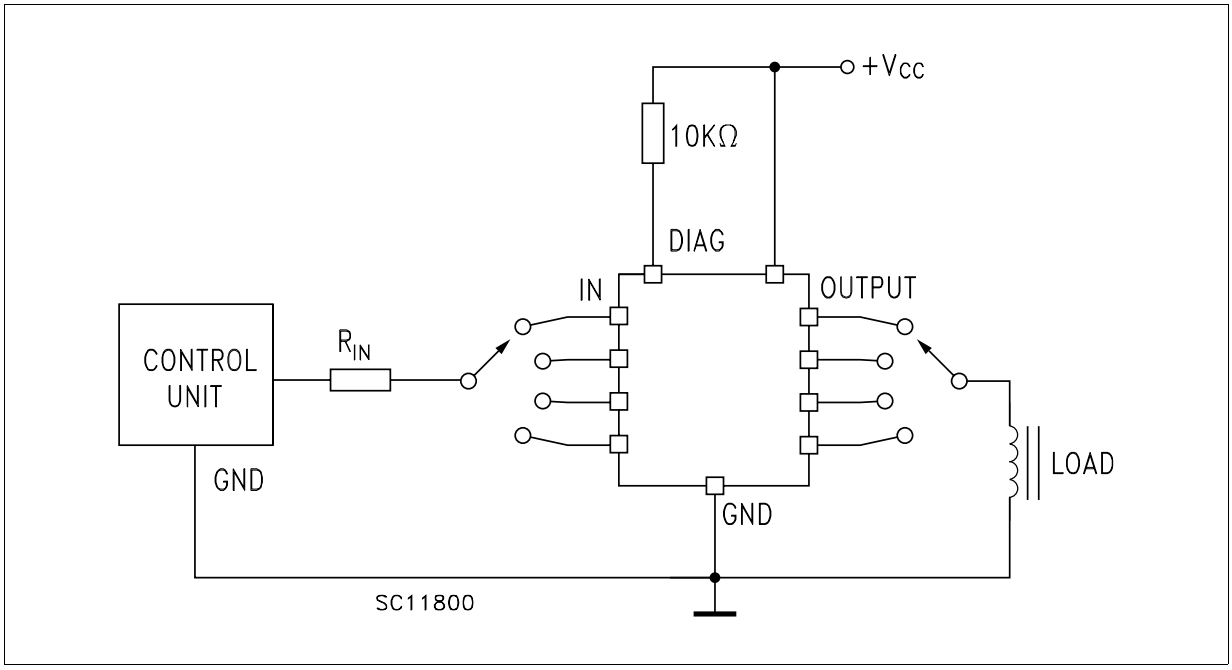
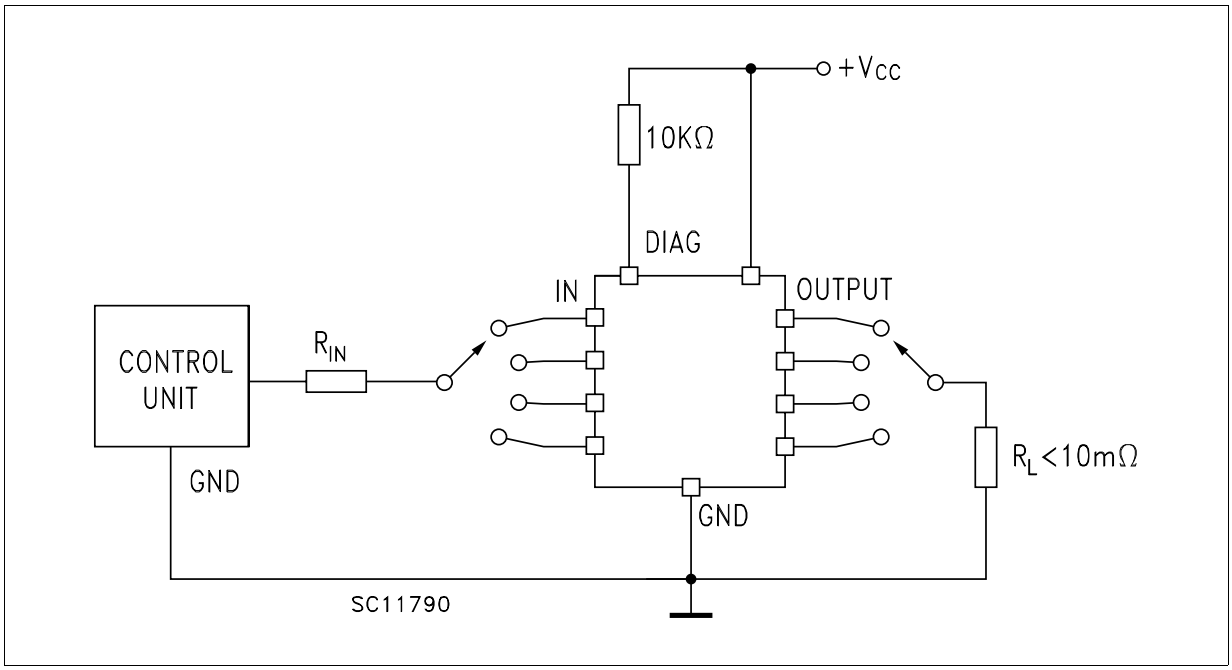


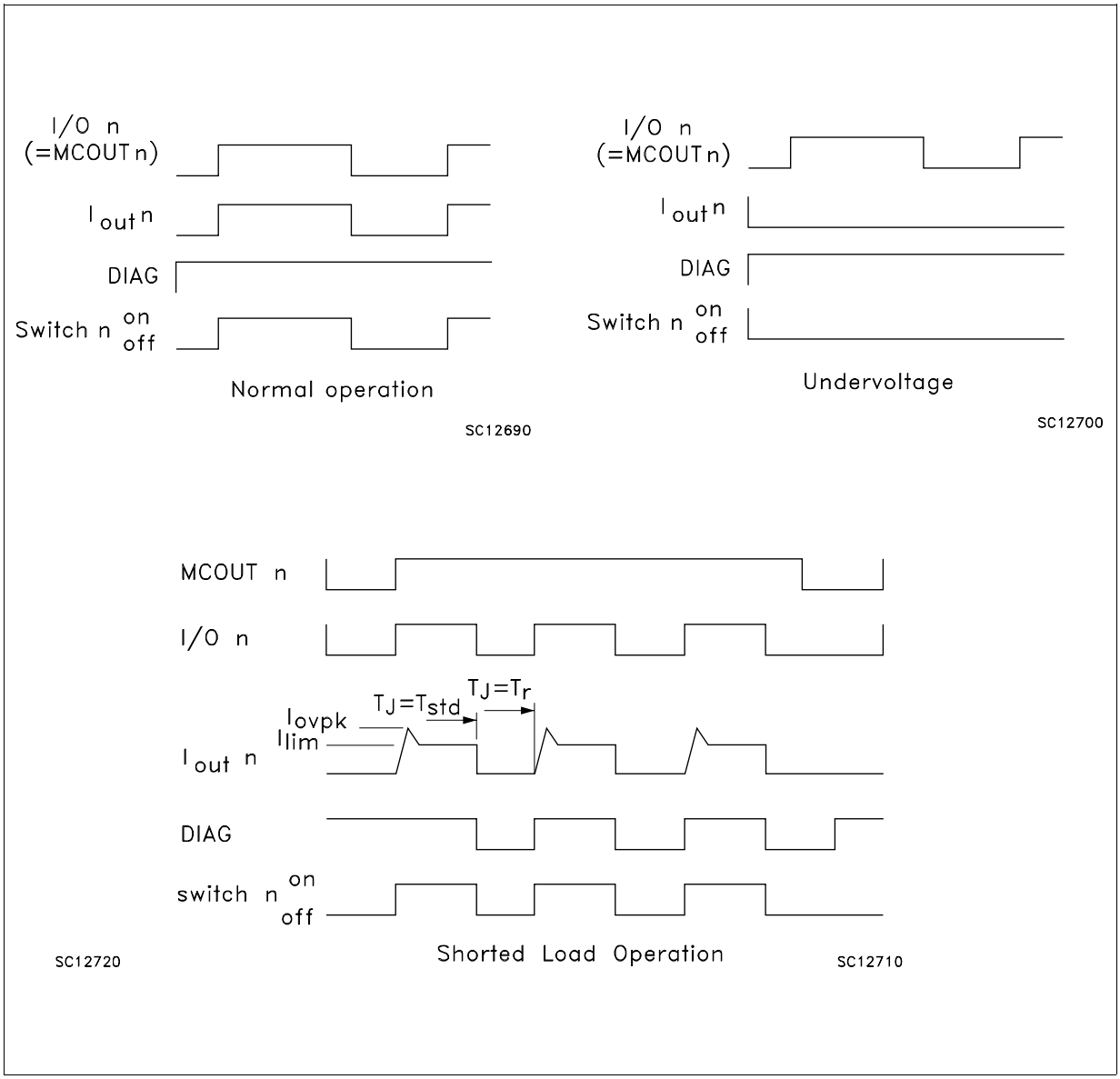
FIGURE 2: Peak Short Circuit Current Test Circuit



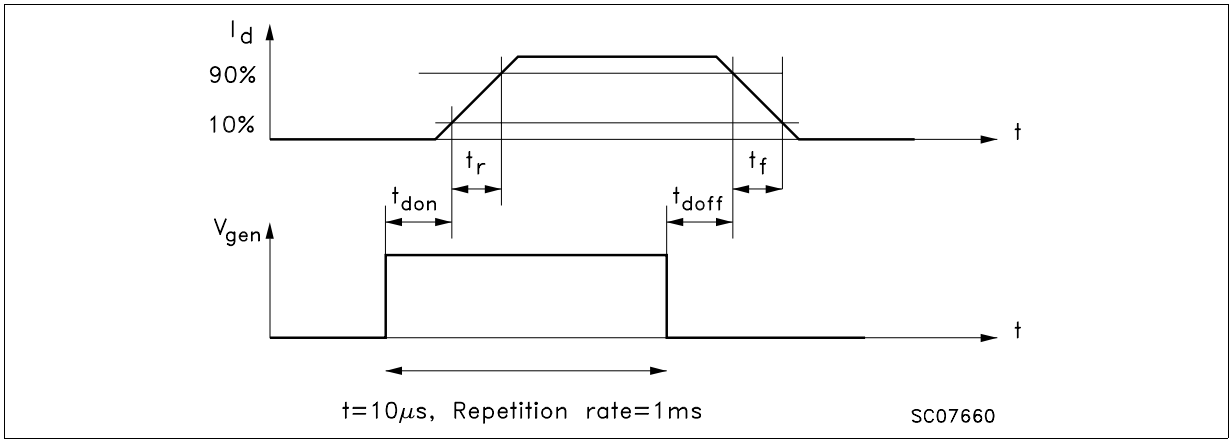
TRUTH TABLE

	MCOUTn	I/On	OUTPUTn	DIAGNOSTIC
Normal Operation	L H	L H	L H	H H
Over-temperature	L H	L L	L L	H L
Under-voltage	L H	L H	L L	H H
Shorted Load (current limitation)	L H	L H	L H	H H

FIGURE 3: Switching Waveforms



SWITCHING PARAMETERS TEST CONDITIONS



DRIVING CIRCUIT

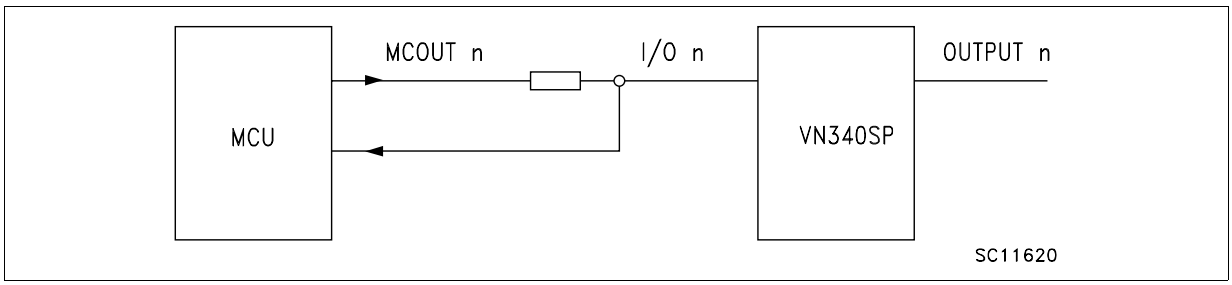
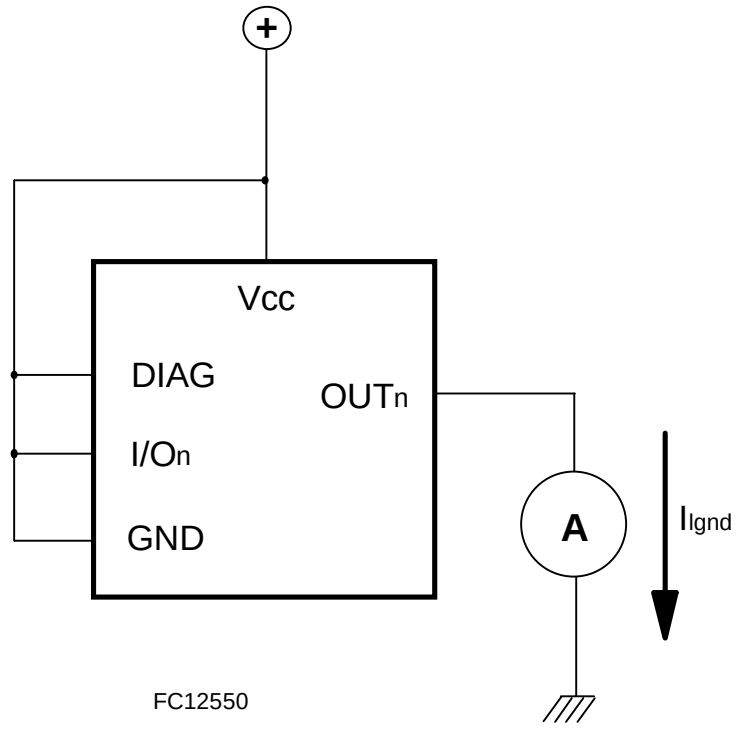
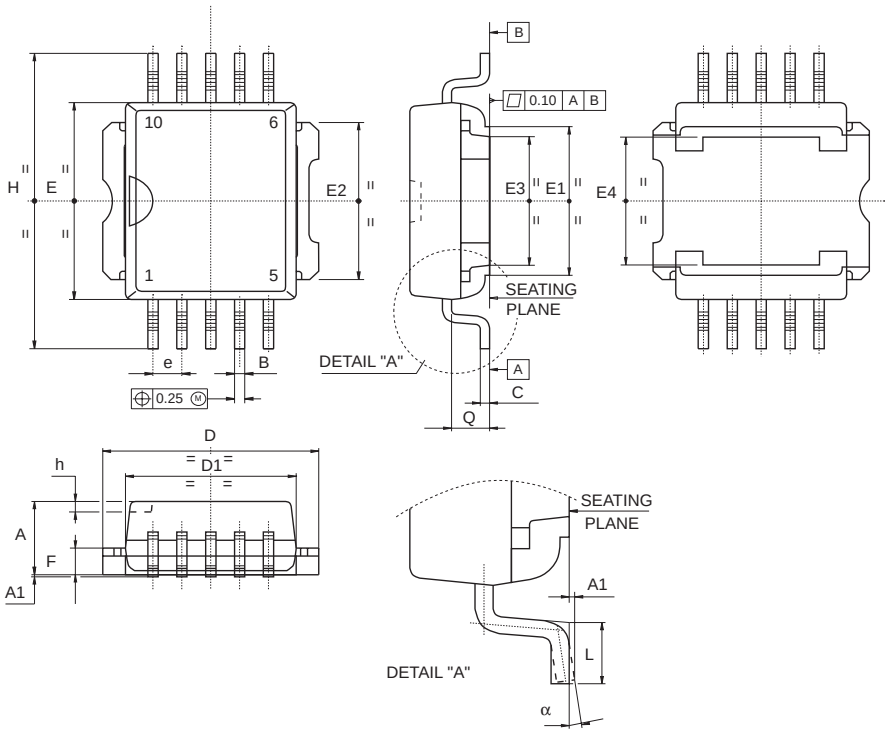


Figure 4: I_{LGND} Test Configuration



PowerSO-10 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	3.35		3.65	0.132		0.144
A1	0.00		0.10	0.000		0.004
B	0.40		0.60	0.016		0.024
c	0.35		0.55	0.013		0.022
D	9.40		9.60	0.370		0.378
D1	7.40		7.60	0.291		0.300
E	9.30		9.50	0.366		0.374
E1	7.20		7.40	0.283		0.291
E2	7.20		7.60	0.283		0.300
E3	6.10		6.35	0.240		0.250
E4	5.90		6.10	0.232		0.240
e		1.27			0.050	
F	1.25		1.35	0.049		0.053
H	13.80		14.40	0.543		0.567
h		0.50			0.002	
L	1.20		1.80	0.047		0.071
q		1.70			0.067	
α	0^o		8^o			



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