

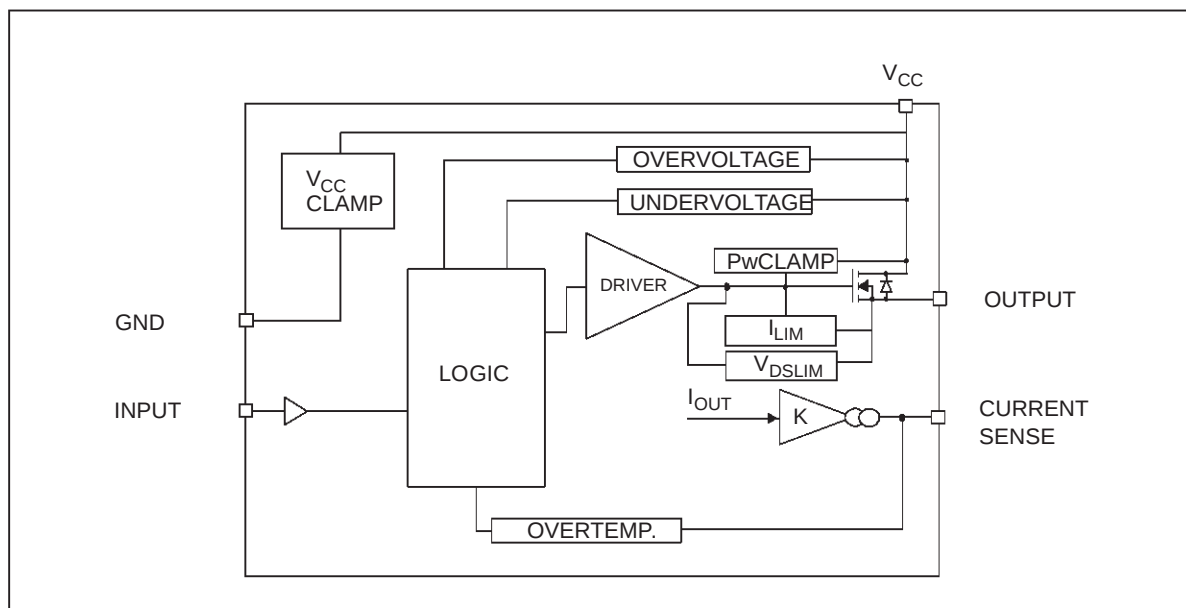
SINGLE CHANNEL HIGH SIDE SOLID STATE RELAY

TYPE	R _{DS(on)}	I _{OUT}	V _{CC}
VN610SP	10mΩ	45A	36 V

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- PowerSO-10™**

voltage clamp protects the device against low energy spikes (see ISO7637 transient compatibility table). This device integrates an analog current sense which delivers a current proportional to the load current (according to a known ratio). Active current limitation combined with thermal shut-down and automatic restart protect the device against overload. Device automatically turns off in case of ground pin disconnection.

BLOCK DIAGRAM

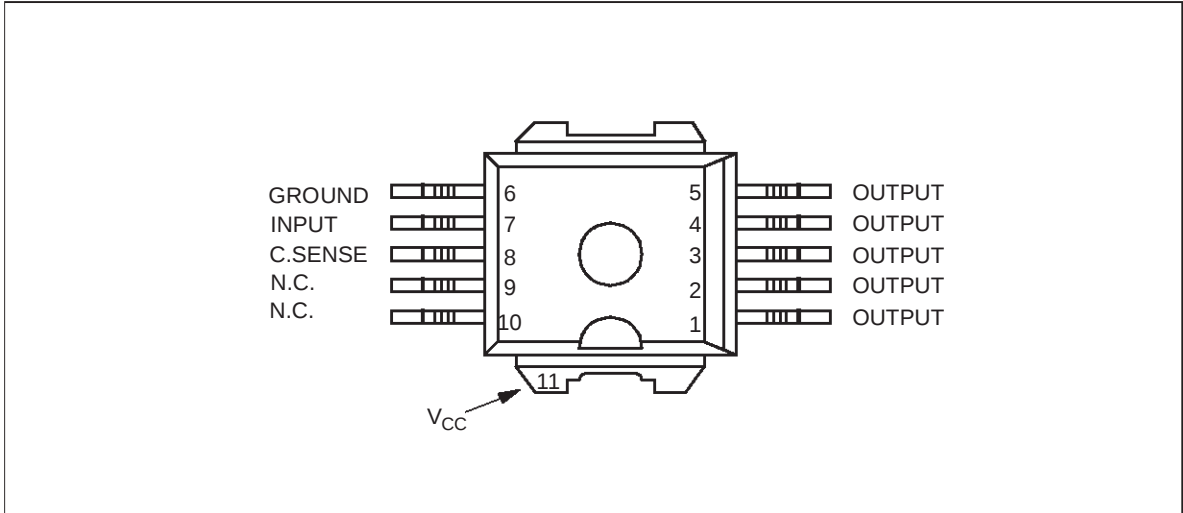


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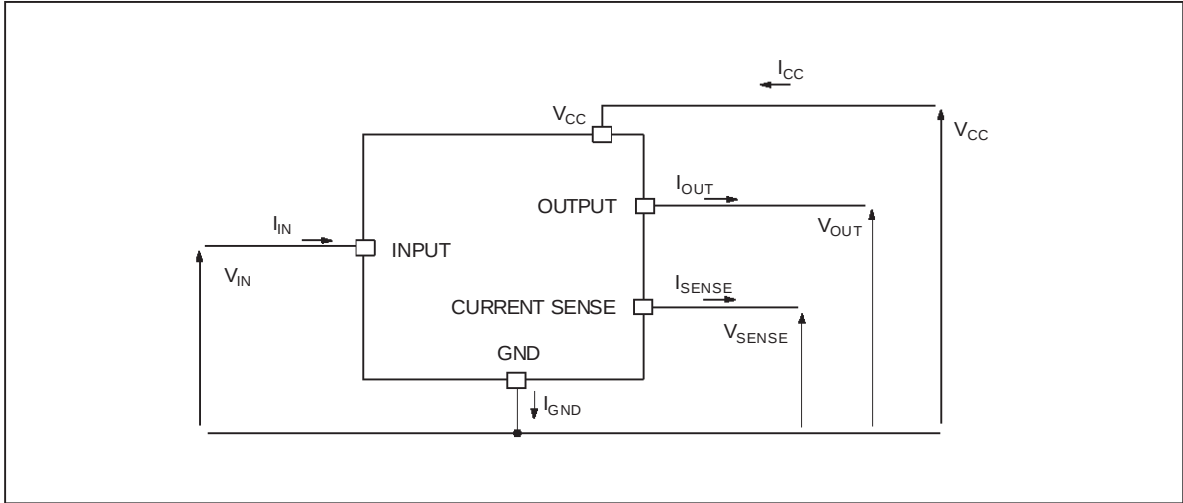
ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Value	Unit
V_{CC}	DC supply voltage	41	V
$-V_{CC}$	Reverse DC supply voltage	-0.3	V
$-I_{GND}$	DC reverse ground pin current	-200	mA
I_{OUT}	DC output current	Internally limited	A
$-I_{OUT}$	Reverse DC output current	-50	A
I_{IN}	DC input current	+/- 10	mA
V_{CSENSE}	Current sense maximum voltage	-3	V
		+15	V
V_{ESD}	Electrostatic discharge (R=1.5k Ω ; C=100pF)	2000	V
P_{TOT}	Power dissipation at $T_C \leq 25^\circ\text{C}$	125	W
T_j	Junction operating temperature	Internally limited	$^\circ\text{C}$
T_C	Case operating temperature	-40 to 150	$^\circ\text{C}$
T_{STG}	Storage temperature	-55 to 150	$^\circ\text{C}$

CONNECTION DIAGRAM (TOP VIEW)



CURRENT AND VOLTAGE CONVENTIONS



THERMAL DATA

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case (MAX)	1	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient (MAX)	50	°C/W

ELECTRICAL CHARACTERISTICS (8V< V_{CC} <36V; -40°C< T_j <150°C; unless otherwise specified)

POWER

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{CC}	Operating supply voltage		5.5	13	36	V
V_{USD}	Undervoltage shutdown		3	4	5.5	V
V_{OV}	Overvoltage shutdown	(See Note 1)	36	42	48	V
R_{ON}	On state resistance	$I_{OUT}=15A$; $T_j=25^\circ C$ $I_{OUT}=15A$; $T_j=150^\circ C$ $I_{OUT}=9A$; $V_{CC}=6V$			10 20 35	mΩ
V_{clamp}	Clamp Voltage	$I_{CC}=20\text{ mA}$ (see note 1)	41	48	55	V
I_S	Supply current	Off state; INPUT= n.c.; $V_{CC}=13V$ On state; $V_{IN}=5V$; $V_{CC}=13V$; $I_{OUT}=0A$; $R_{SENSE}=3.9K$			25 5	μA mA
$I_{L(off)}$	Off state output current	$V_{IN}=V_{OUT}=0V$	0		50	μA

Note 1: V_{clamp} and V_{OV} are correlated. Typical difference is 5V.

SWITCHING ($V_{CC}=13V$)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$t_{d(on)}$	Turn-on delay time	$R1=0.87\Omega$		50		μs
$t_{d(off)}$	Turn-off delay time	$R1=0.87\Omega$		50		μs
$(dV_{OUT}/dt)_{on}$	Turn-on voltage slope	$R1=0.87\Omega$		0.3		V/μs
$(dV_{OUT}/dt)_{off}$	Turn-off voltage slope	$R1=0.87\Omega$		0.3		V/μs
W_{ON}	Switching losses energy at turn-on	$R1=2.6\Omega$		1.0		mJ
W_{OFF}	Switching losses energy at turn-off	$R1=2.6\Omega$		0.5		mJ

PROTECTIONS

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
I_{lim}	DC Short circuit current	$V_{CC}=13V$ $5.5V < V_{CC} < 36V$	45	75	120 120	A A
T_{TSD}	Thermal shutdown temperature		150	175	200	°C
T_R	Thermal reset temperature		135			°C
T_{HYST}	Thermal hysteresis		7	15		°C
V_{DEMAG}	Turn-off output voltage clamp	$I_{OUT}=2A$; $V_{IN}=0$; $L=6mH$	$V_{CC}-41$	$V_{CC}-48$	$V_{CC}-55$	V
V_{ON}	Output voltage drop limitation	$I_{OUT}=1.5A$ $T_j = -40^\circ C \dots +150^\circ C$		50		mV

ELECTRICAL CHARACTERISTICS (continued)CURRENT SENSE ($9V \leq V_{CC} \leq 16V$) (See Fig.1)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
K_1	I_{OUT}/I_{SENSE}	$I_{OUT}=1.5A$; $V_{SENSE}=0.5V$; $T_j = -40^{\circ}C \dots 150^{\circ}C$	3300	4400	6000	
K_2	I_{OUT}/I_{SENSE}	$I_{OUT}=15A$; $V_{SENSE}=4V$; $T_j = -40^{\circ}C$ $T_j = 25^{\circ}C \dots 150^{\circ}C$	4200 4400	4900 4900	6000 5750	
K_3	I_{OUT}/I_{SENSE}	$I_{OUT}=45A$; $V_{SENSE}=4V$; $T_j = -40^{\circ}C$ $T_j = 25^{\circ}C \dots 150^{\circ}C$	4200 4400	4900 4900	5500 5250	
V_{SENSE}	Max analog sense output voltage	$V_{CC}=5V$; $I_{OUT}=7.5A$; $R_{SENSE}=10K\Omega$ $V_{CC}>8V$; $I_{OUT}=15A$; $R_{SENSE}=10K\Omega$	2 4			V V
V_{SENSEH}	Analog sense output voltage in overtemperature condition	$V_{CC}=13V$; $R_{SENSE}=3.9K\Omega$		5.5		V

LOGIC INPUT

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{IL}	Input low level voltage				1.25	V
I_{IL}	Low level input current	$V_{IN}=1.25V$	1			μA
V_{IH}	Input high level voltage		3.25			V
I_{IH}	High level input current	$V_{IN}=3.25V$			10	μA
$V_{I(hyst)}$	Input hysteresis voltage		0.5			V
V_{ICL}	Input clamp voltage	$I_{IN}=1mA$ $I_{IN}=-1mA$	6.5	7.4 -0.7	8.5	V V

TRUTH TABLE

CONDITIONS	INPUT	OUTPUT	SENSE
Normal operation	L	L	0
	H	H	Nominal
Overtemperature	L	L	0
	H	L	V_{SENSEH}
Undervoltage	L	L	0
	H	L	0
Overvoltage	L	L	0
	H	L	0
Short circuit to GND	L	L	0
	H	L	0
Short circuit to V_{CC}	L	H	0
	H	H	< Nominal
Negative output voltage clamp	L	L	0

ELECTRICAL TRANSIENT REQUIREMENTS

ISO T/R 7637/1 Test Pulse	TEST LEVELS				Delays and Impedance
	I	II	III	IV	
1	-25 V	-50 V	-75 V	-100 V	2 ms 10 Ω
2	+25 V	+50 V	+75 V	+100 V	0.2 ms 10 Ω
3a	-25 V	-50 V	-100 V	-150 V	0.1 μ s 50 Ω
3b	+25 V	+50 V	+75 V	+100 V	0.1 μ s 50 Ω
4	-4 V	-5 V	-6 V	-7 V	100 ms, 0.01 Ω
5	+26.5 V	+46.5 V	+66.5 V	+86.5 V	400 ms, 2 Ω

ISO T/R 7637/1 Test Pulse	TEST LEVELS RESULTS			
	I	II	III	IV
1	C	C	C	C
2	C	C	C	C
3a	C	C	C	C
3b	C	C	C	C
4	C	C	C	C
5	C	E	E	E

CLASS	CONTENTS
C	All functions of the device are performed as designed after exposure to disturbance.
E	One or more functions of the device is not performed as designed after exposure to disturbance and cannot be returned to proper operation without replacing the device.

SWITCHING CHARACTERISTICS

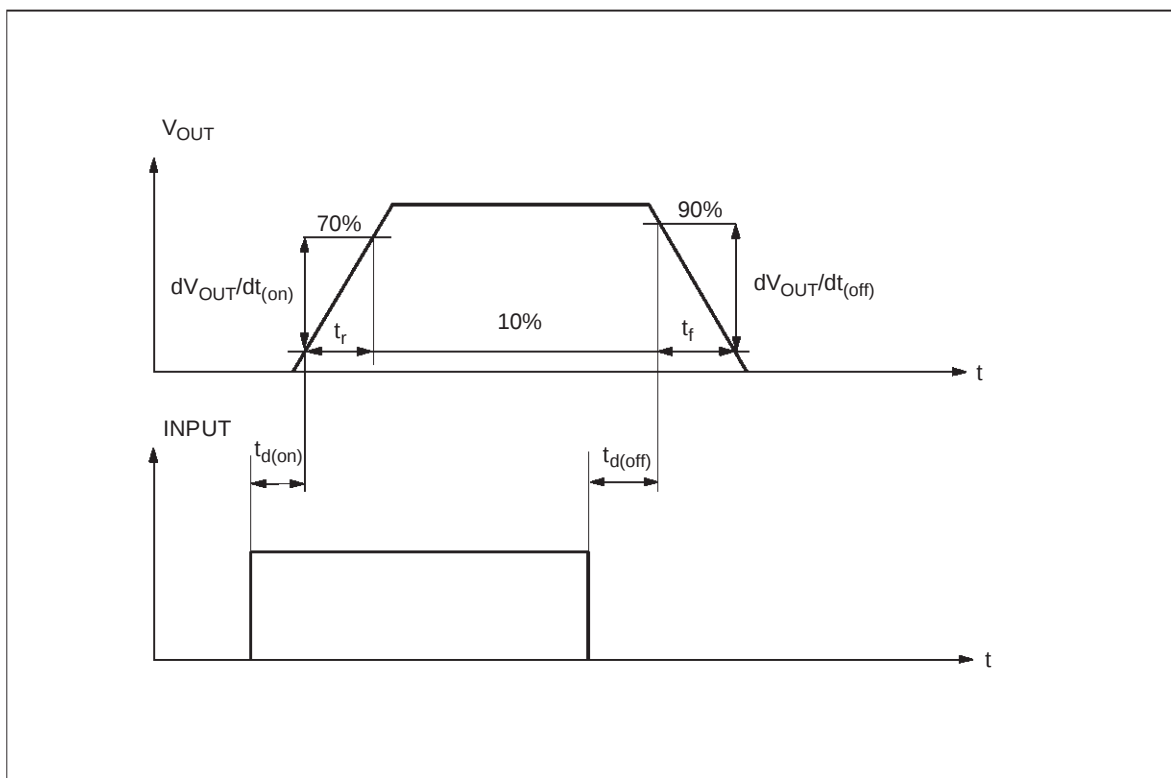


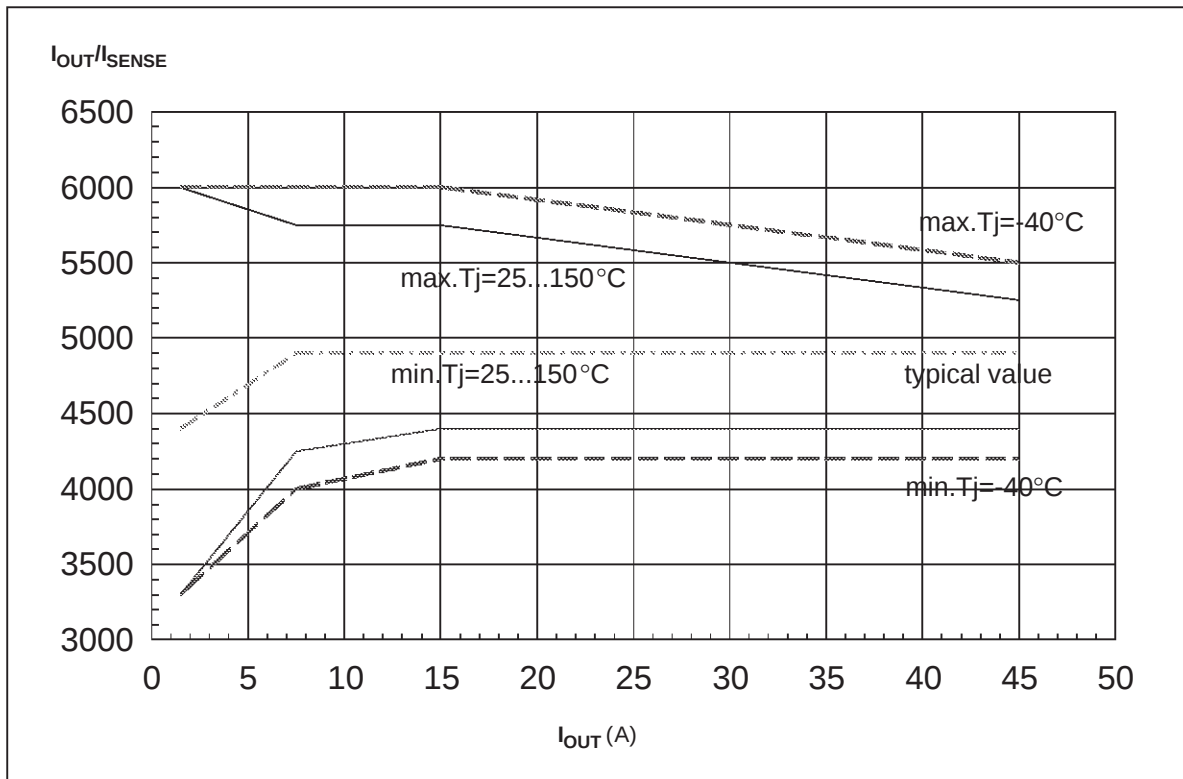
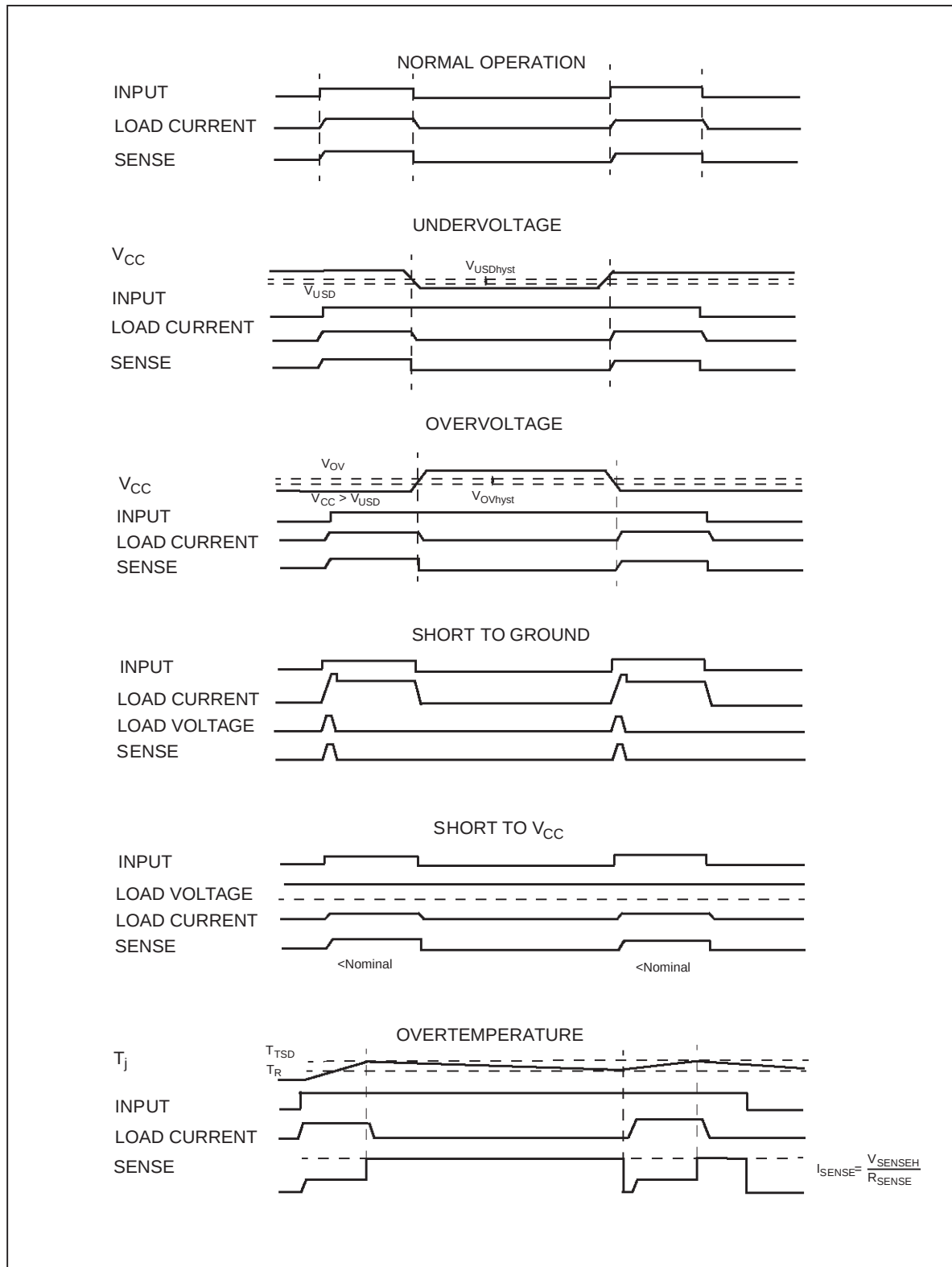
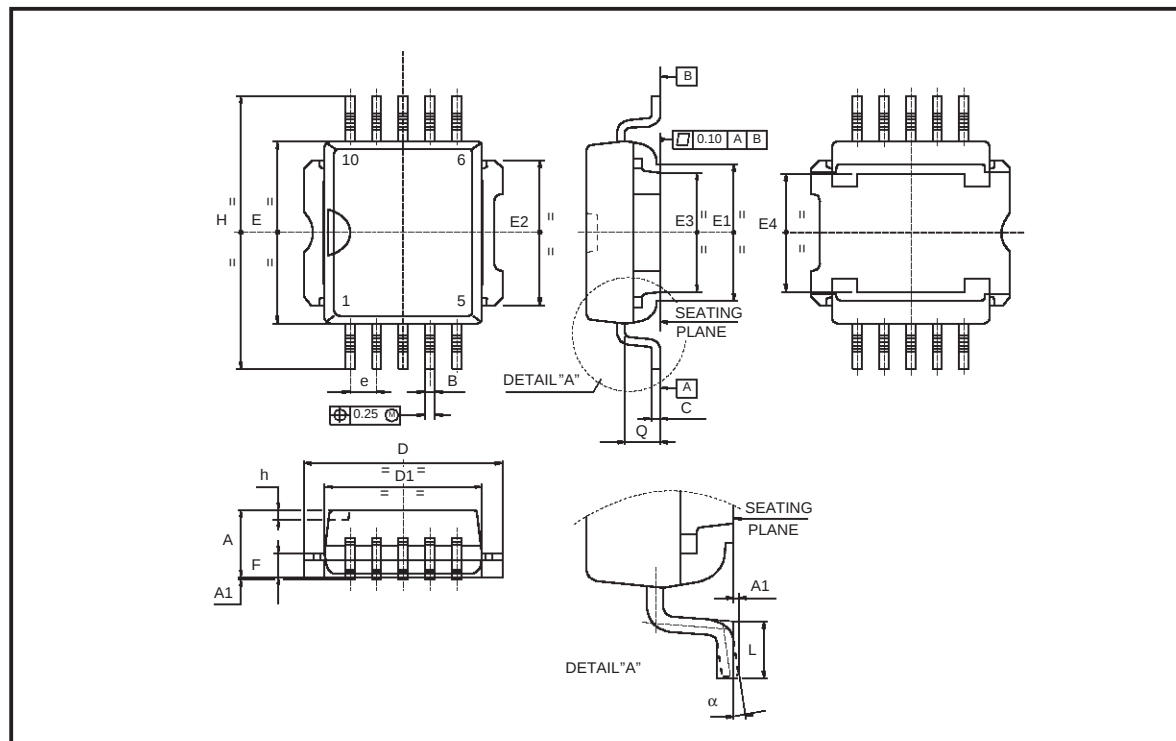
Fig 1: I_{OUT}/I_{SENSE} versus I_{OUT} 

Figure1: Waveforms



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	
Q		1.70			0.067	
α	0°		8°			



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