

DUAL FULL BRIDGE

PRODUCT PREVIEW

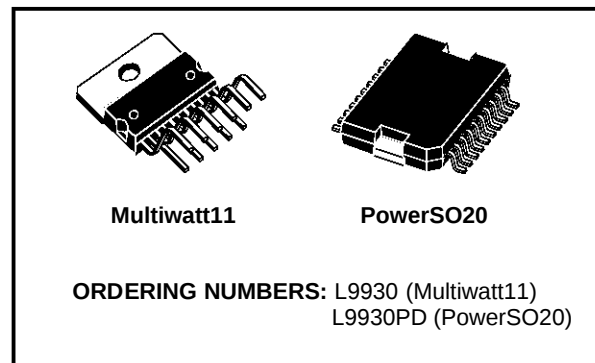
- $R_{DS\ ON} = 2\Omega$
- INTERNAL CLAMPING VOLTAGE = 32V
- INTERNAL FREE WHEELING DIODES
- PARALLEL DRIVE CAPABILITY
- RESISTIVE OR INDUCTIVE LOAD

PROTECTION:

- TEMPERATURE PROTECTION
- SHORT-CIRCUIT PROTECTION (V_{bat} , LOAD, GND)

DETECTION:

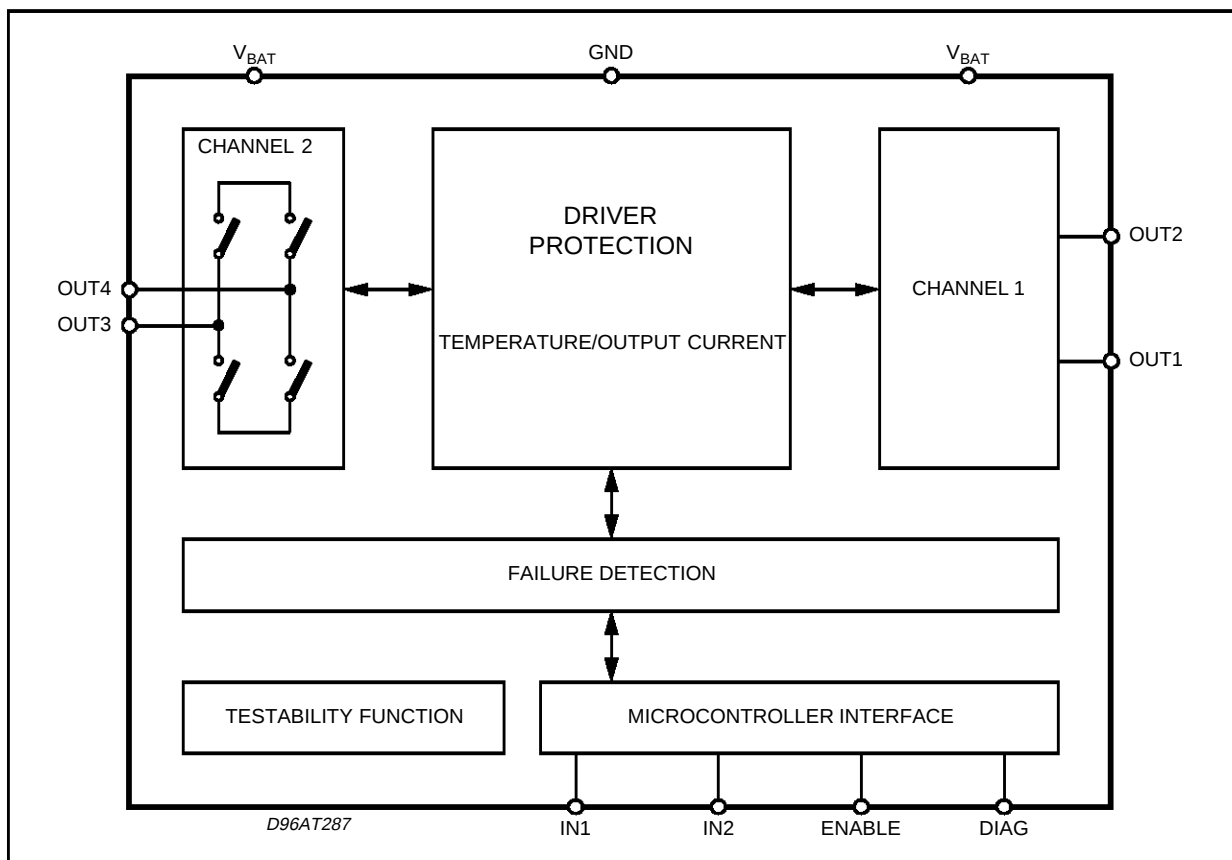
- SHORTED LOAD
- OPEN LOAD
- OVERTEMPERATURE



DESCRIPTION

The L9930 is a dual full-bridge. The output stages are Power Mos switches.

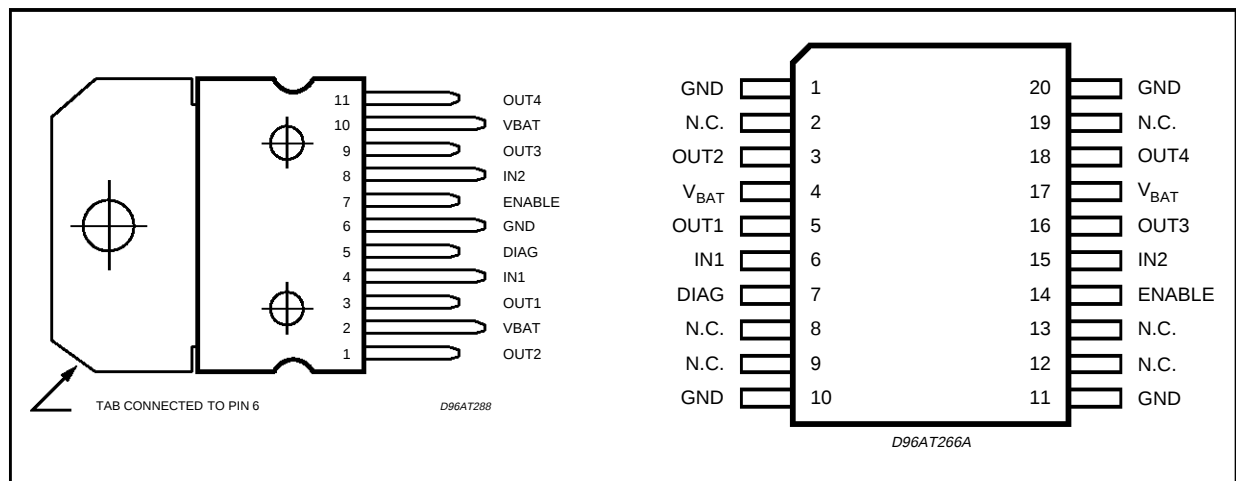
BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
E	Clamped Energy at the Switching off	6 (max)	mJ
V _{out DC}	Continuous Output Voltage	24 (max)	V
V _{out tr}	Transient Output Voltage	32 (max)	V
V _{bat DC}	Continuous Battery Voltage	8 to 24	V
V _{bat tr}	Transient Battery Voltage	45 (max)	V
I _{out}	Reverse Output Current	– 2 (max)	A
f _{in}	Input Frequency	500 (max)	Hz
V _{in}	Input Voltage	– 0.3 to +7	V
V _{diag}	Diagnostic Voltage	– 0.3 to +7	V
T _s	Storage Temperature	– 55 to 150	°C
T _j	Operating Junction Temperature	– 40 to 150	°C
V _{ESD}	V _{ESD} (Note MIL STD 883C)	3000	V

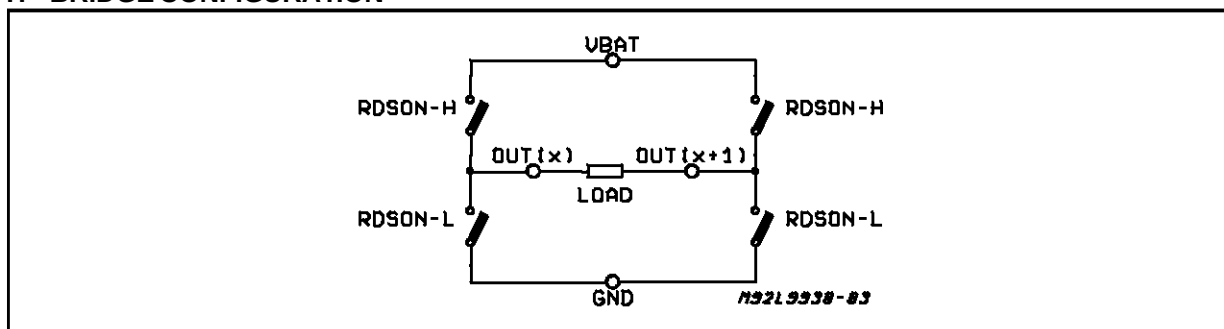
PIN CONNECTION



PIN FUNCTIONS

MW11	PowerSO20	Name	Function
1	3	OUT 2	Output Channel 1
2	4	V _{BAT}	Power Supply
3	5	OUT 1	Output Channel 1
4	6	IN 1	Input Channel 1
5	7	DIAG	Diagnostic Output Common for the 2 Channels
6	1, 10, 11, 20	GND	Ground
7	14	ENABLE	Enable
8	15	IN 2	Input Channel 2
9	16	OUT 3	Output Channel 2
10	17	V _{BAT}	Power Supply
11	18	OUT 4	Output Channel 2
	2, 8, 9, 12, 13, 19	NC	Not Connected

H - BRIDGE CONFIGURATION



THERMAL DATA

Symbol	Parameter	Value	Unit
$R_{th\ j-case}$	Thermal Resistance Junction to Case	max.	$^{\circ}C/W$
$R_{th\ j-amb}$	Thermal resistance Junction to Ambient	max.	$^{\circ}C/W$

ELECTRICAL CHARACTERISTICS ($V_{bat} = 8$ to $18V$ $t_J = -40$ to $+150^{\circ}C$, unless otherwise specified.)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
R_{DSon-H}	ON Resistance	$I_{out} = 0.5A$		2	4.3	Ω
R_{DSon-L}	ON Resistance	$I_{out} = 0.5A$		2	4.3	Ω
V_{OCL}	Clamping Voltage	$I_{out} = 0.1A$		32		V
V_F	Clamp Diode Forward Voltage	$I_{out} = 0.5A$		1.3		V
T_R	Output Voltage Rise Time	$V_{out}; 0.1$ to $0.9 V_{out}$ (see fig. 1) NOT LOADED		50	100	μs
T_F	Output Voltage Fall Time	$V_{out}; 0.9$ to $0.1 V_{out}$ (see fig. 1) NOT LOADED		50	100	μs
T_{DR}	Input to Output Rising edge Delay	$0.5 V_{IN}$ to $0.1 V_{out}$ (see fig. 1) NOT LOADED			50	μs
T_{DF}	Input to Output Falling Edge Delay	$0.5 V_{IN}$ to $0.9 V_{out}$ (see fig. 1) NOT LOADED			50	μs

OUTPUT PROTECTIONS CHARACTERISTICS

I_{SC}	Short Circuit Typical Application (see fig 2)	$T_{amb} = -40^{\circ}C$	0.45		2.6	A
		$T_{amb} = 25^{\circ}C$	0.38		2.6	A
		$T_{amb} = 125^{\circ}C$	0.28		2.6	A
I_{SC}	Short Circuit Typical Application with Shottky Diodes (see fig 3)		0.8		2.6	A
T_{SD}	Temperature		160			$^{\circ}C$
T_{HYST}	Temperature Hysteresis			20		$^{\circ}C$

These protections switch off the full bridge.

OUTPUT DETECTIONS CHARACTERISTICS

R_{OPL-L}	Open-load Threshold Resistor	80			Ω
R_{OPL-H}		100			Ω

SUPPLY CHARACTERISTICS

I_{QHI}	Supply Current	$R_{LOAD1} = R_{LOAD2} = \infty$ $V_{BAT} = 14V$, $IN1 = IN2 = ENABLE = 5V$			15	mA
I_{QLO}		$R_{load1} = R_{load2} = 50\Omega$ $V_{BAT} = 12V$, $ENABLE = 0V$ $IN1 = IN2 = 0V$			0.5	mA

ELECTRICAL CHARACTERISTICS**INPUTS CHARACTERISTICS (normal and standby mode)**

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_{IH}	High Threshold				4	V
V_{IL}	Low Threshold		1			V
I_{NH}	Input Current 1	$V_{IN} = 4V$			200	μA
I_{NLO}	Input Current 2	$V_{IN} = 1V$			50	μA

DIAGNOSTIC CHARACTERISTICS

V_{DIAGL}	Low Level Voltage	$I_{DIAG} = 2mA$		0.6	0.8	V
I_{DIAGH}	Leakage Current	$V_{DIAG} = 5.25V$		5	10	μA

INITIALIZATION CHARACTERISTICS

T_{INIT}	Initialization Timing	$V_{BAT} = 12V$	10			μs
T_{STUP}	Start-Up Timing	$V_{BAT} = 12V$	1			ms
T_{RESET}	Reset		10			μs

FILTER CHARACTERISTICS

T_{FILTER}			64	112	170	μs
T_{DIAG}			4	6	10	μs
T_{SYNC}			4	6	10	μs

TRUE TABLE

ENAB	IN1	IN2	OUT1	OUT2	OUT3	OUT4	MODE	DIAG
0	0	0	HZ	HZ	HZ	HZ	STANDBY	?
0	0	1	HZ	HZ	HZ	HZ	NORMAL	?
0	1	0	HZ	HZ	HZ	HZ	NORMAL	?
0	1	1	HZ	HZ	HZ	HZ	NORMAL	?
1	0	0	HSD	LSD	HSD	LSD	NORMAL	VALID
1	0	1	HSD	LSD	LSD	HSD	NORMAL	VALID
1	1	0	LSD	HSD	HSD	LSD	NORMAL	VALID
1	1	1	LSD	HSD	LSD	HSD	NORMAL	VALID

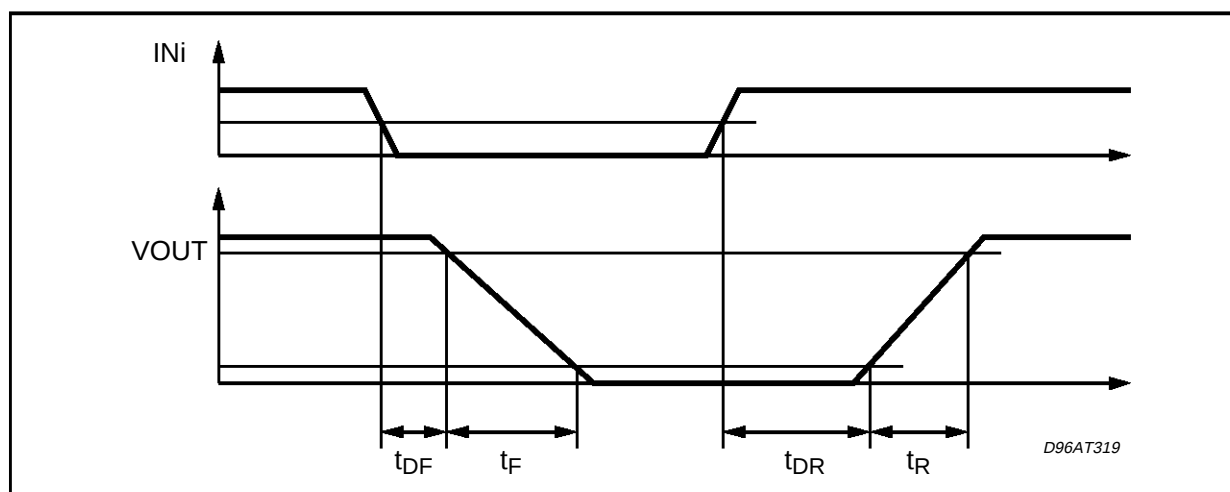
Figure 1:

Figure 2: Typical Application

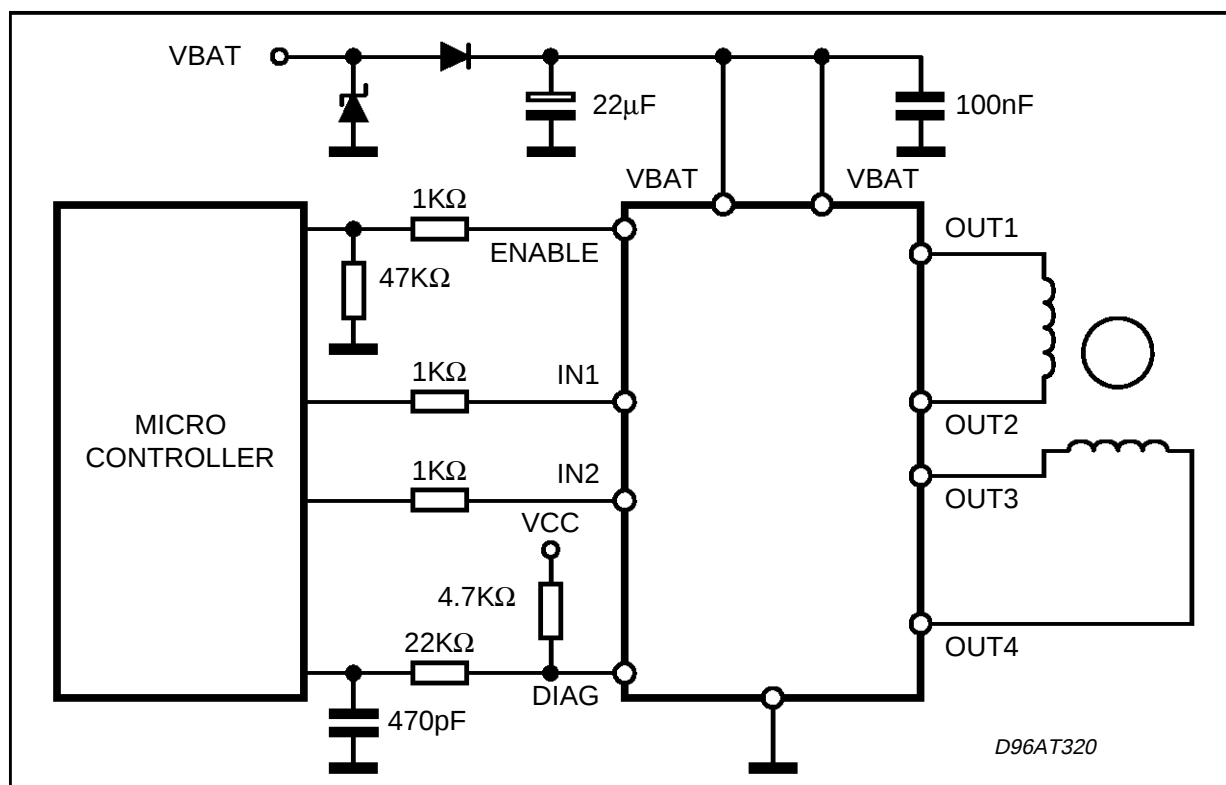


Figure 3: Typical Application with Shottky Diodes

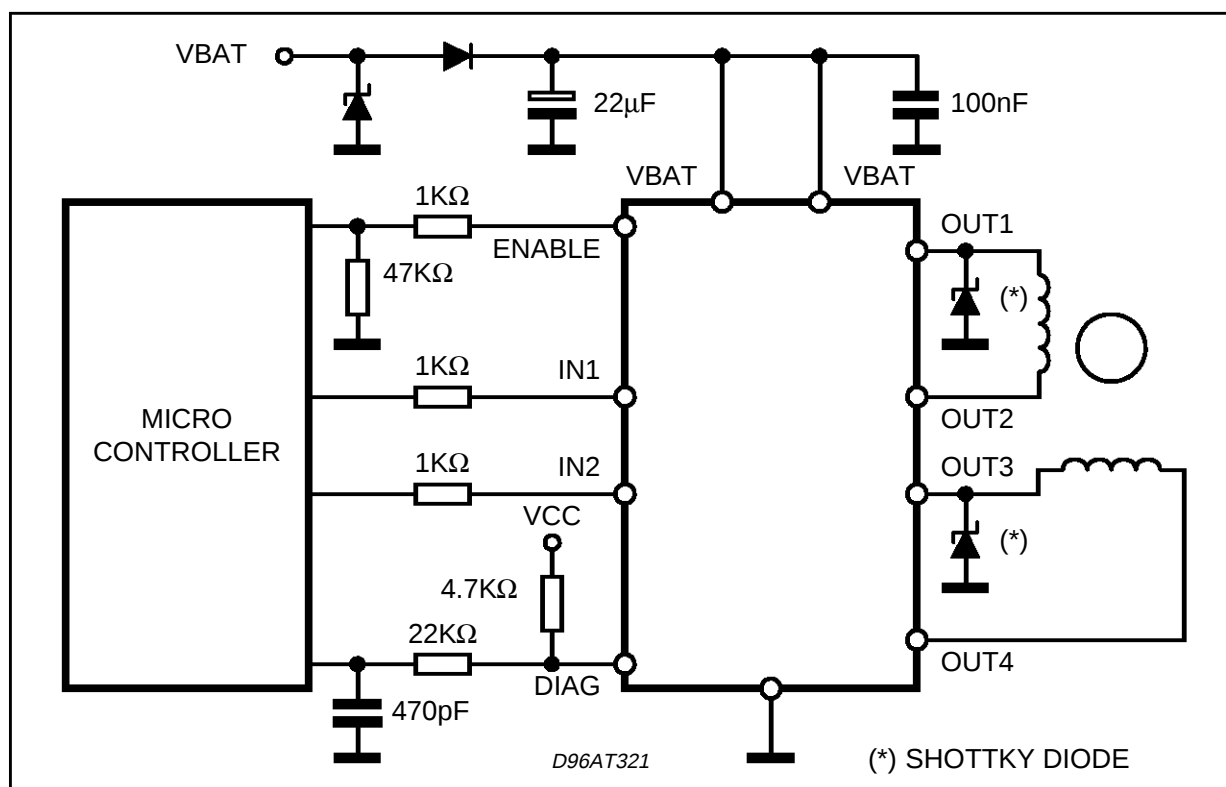


Figure 4: Initialization.

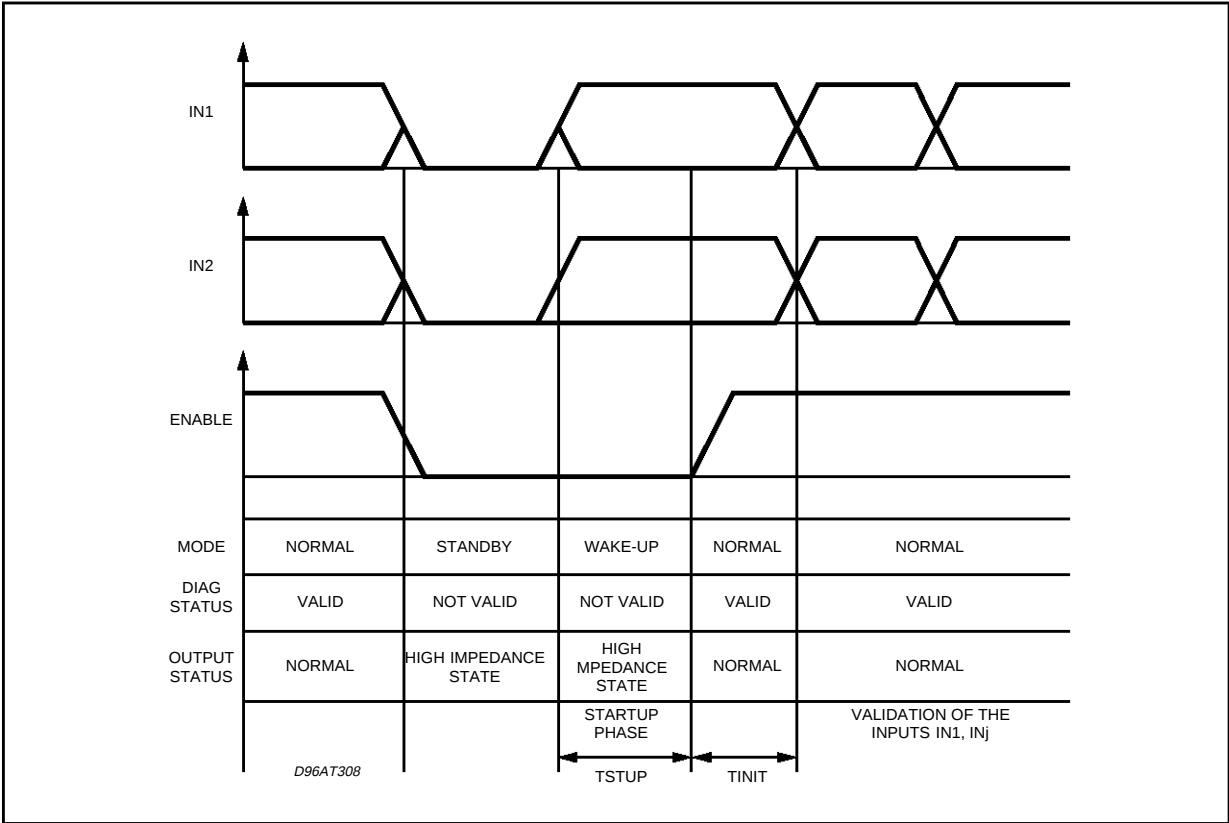


Figure 5: Normal Condition.

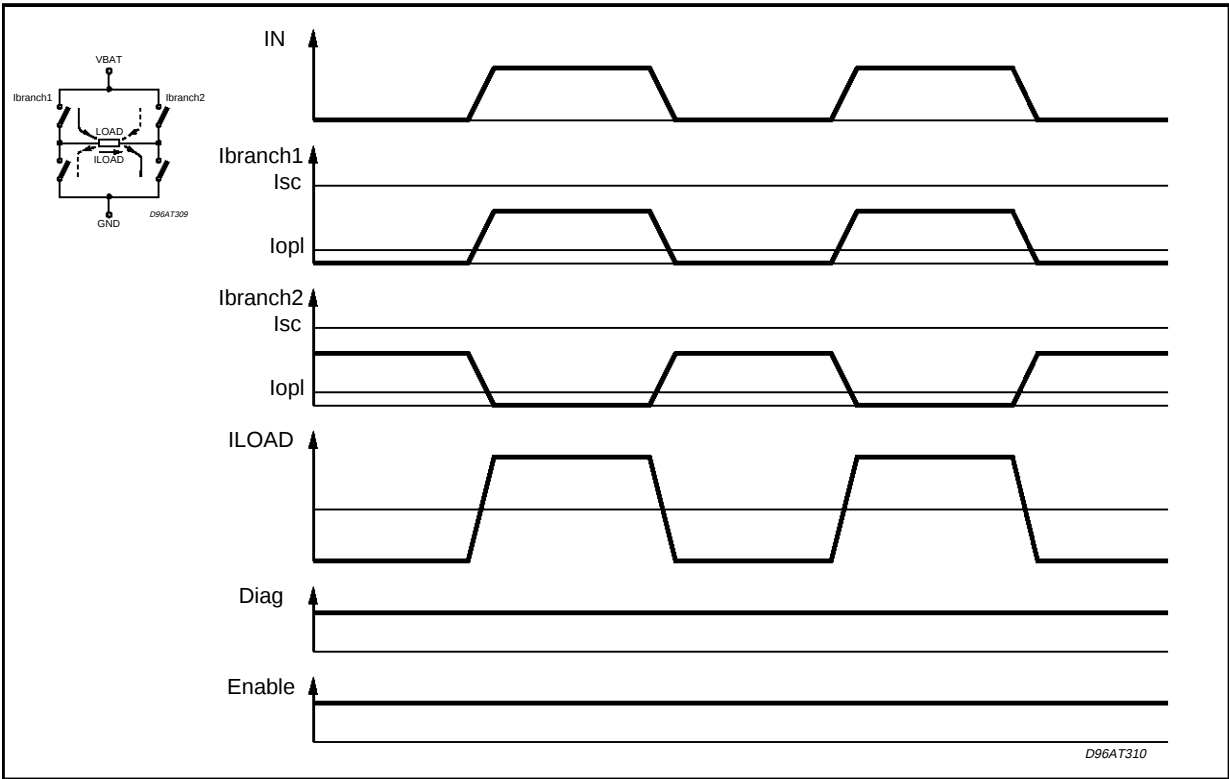


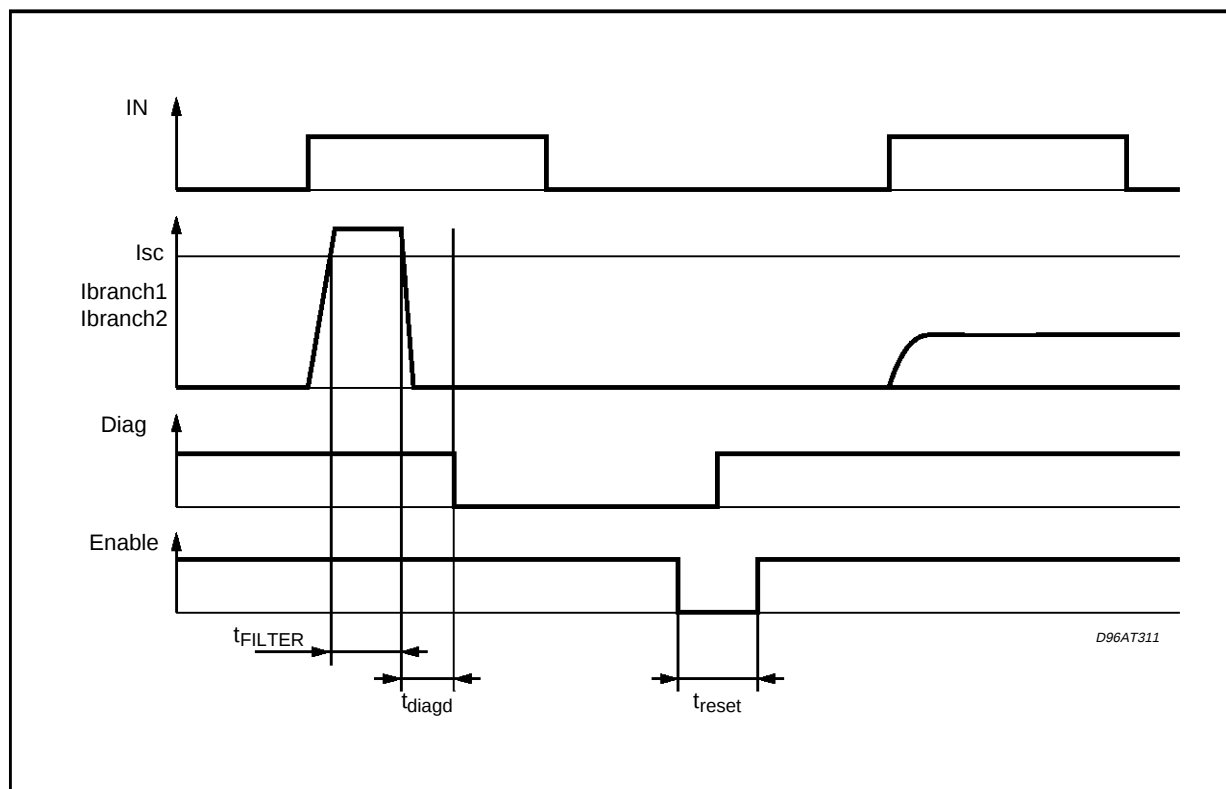
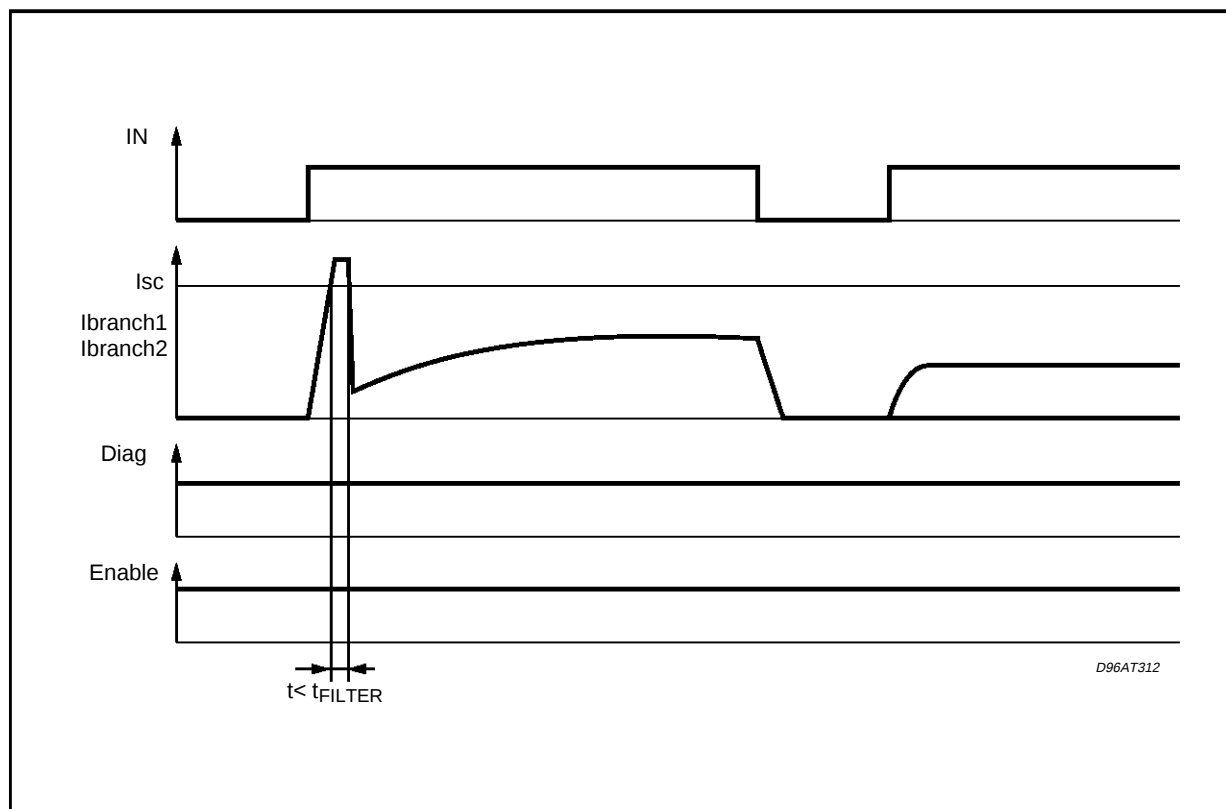
Figure 6: Short-circuit Condition.**Figure 7:** short circuit condition: no detection (NOT TESTED)

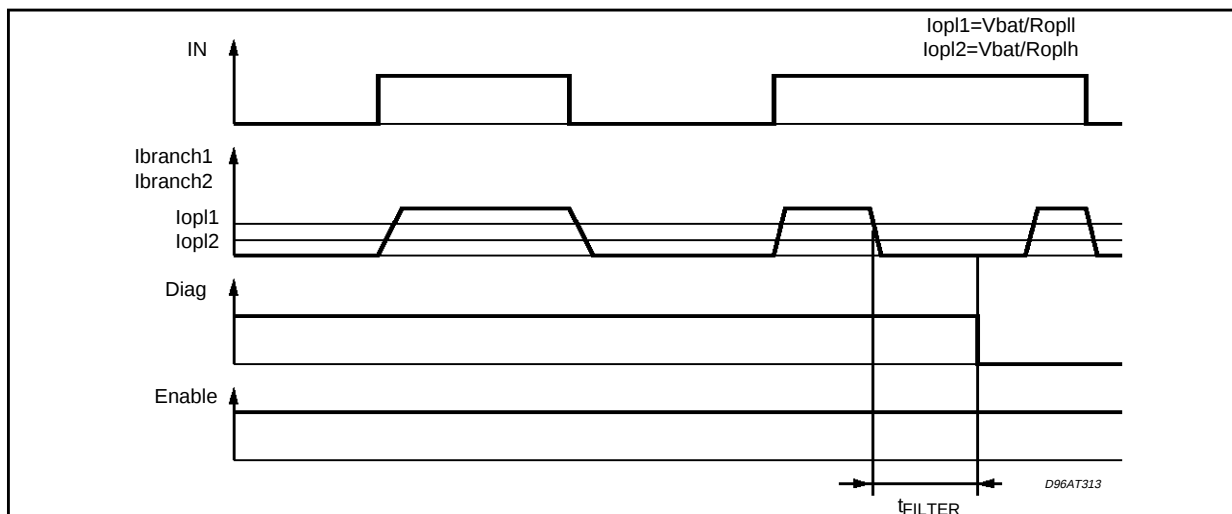
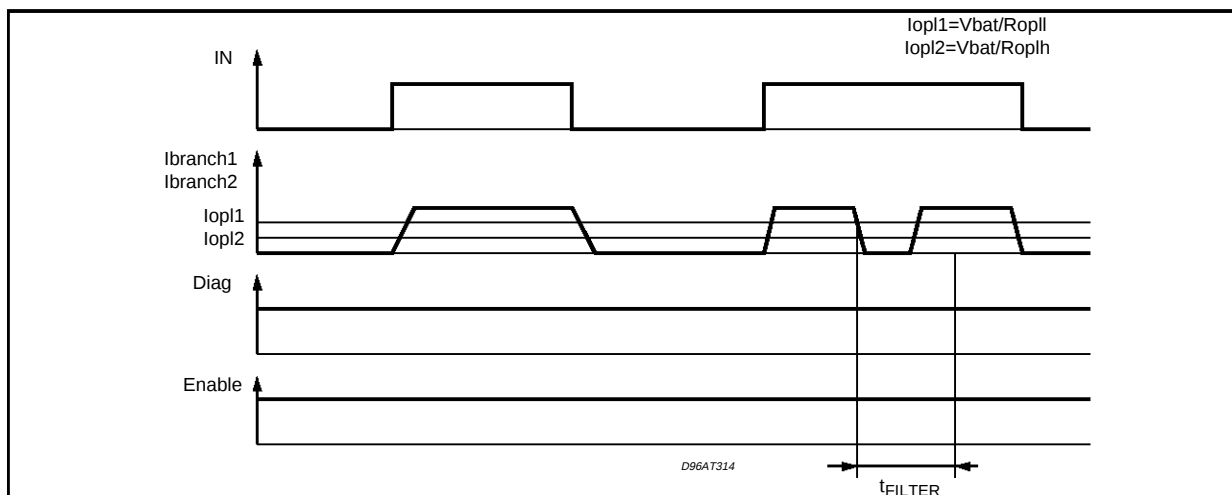
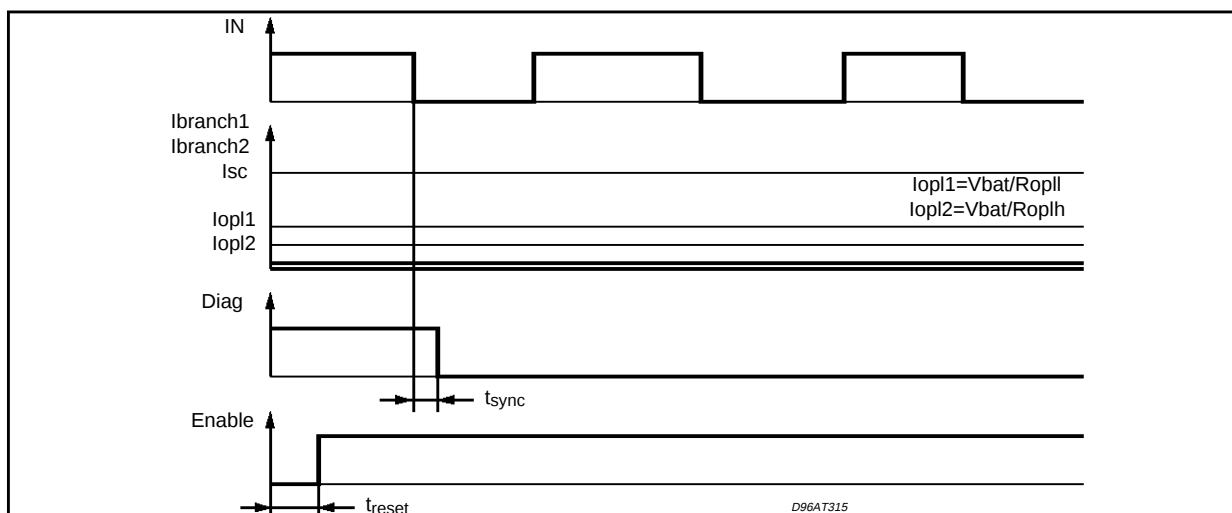
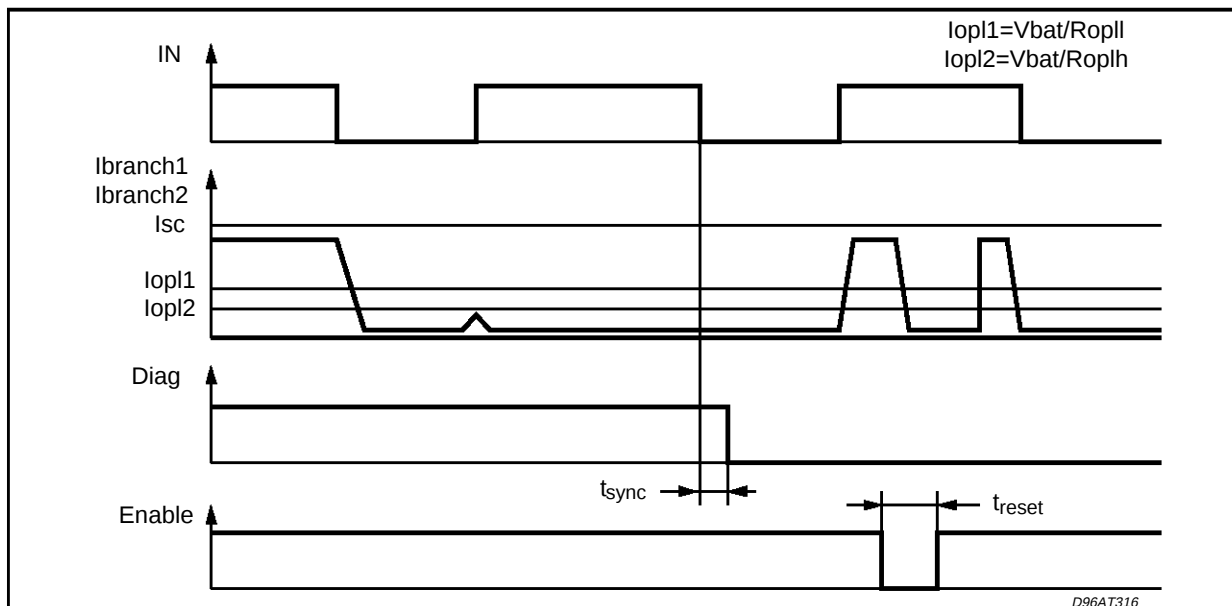
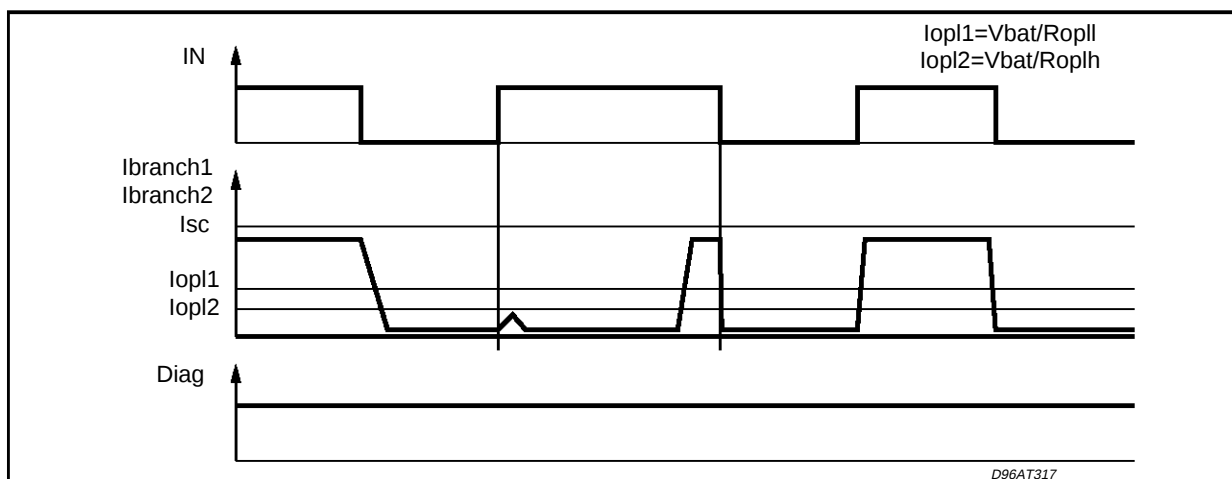
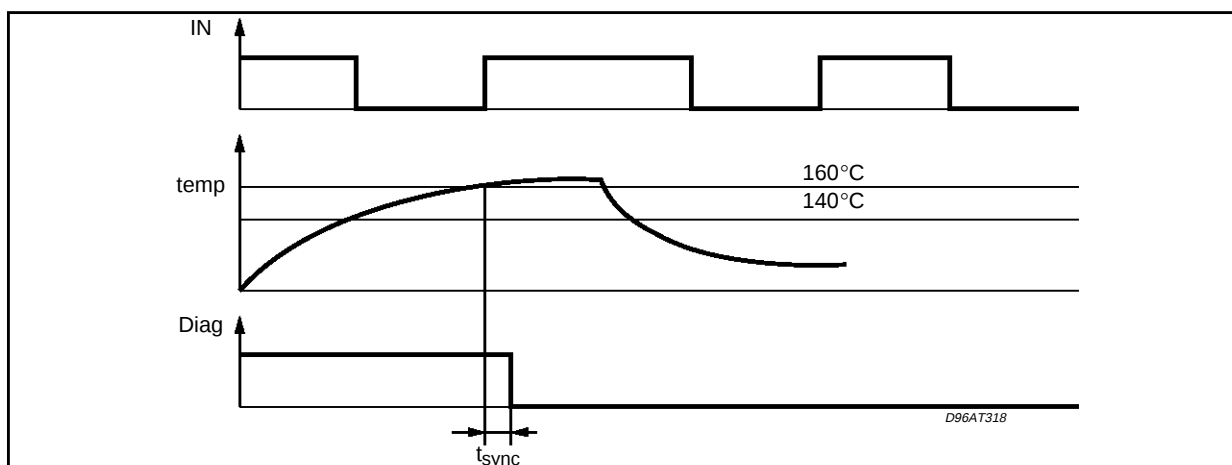
Figure 8: Open Load Condition 1: Detection**Figure 9:** Open Load Condition 1: No Detection (NOT TESTED)**Figure 10:** Open Load Condition 2: No Current after (ENABLE)

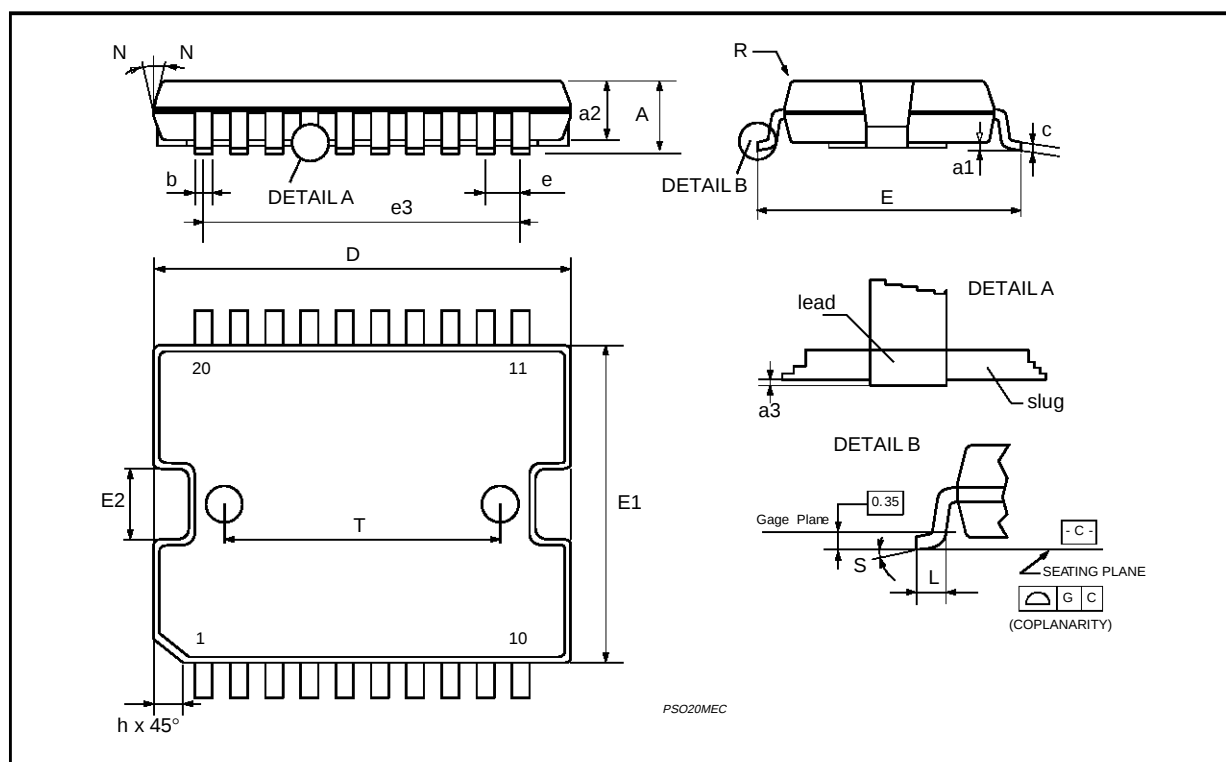
Figure 11: Open Load Condition 3**Figure 12:** Open Load Condition 4: No Detection**Figure 13:** Overtemperature Detection

[illegible]

PowerSO20 PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			3.60			0.1417
a1	0.10		0.30	0.0039		0.0118
a2			3.30			0.1299
a3	0		0.10	0		0.0039
b	0.40		0.53	0.0157		0.0209
c	0.23		0.32	0.009		0.0126
D (1)	15.80		16.00	0.6220		0.6299
E	13.90		14.50	0.5472		0.570
e		1.27			0.050	
e3		11.43			0.450	
E1 (1)	10.90		11.10	0.4291		0.437
E2			2.90			0.1141
G	0		0.10	0		0.0039
h			1.10			
L	0.80		1.10	0.0314		0.0433
N	10° (max.)					
S	8° (max.)					
T		10.0			0.3937	

(1) "D and E1" do not include mold flash or protrusions
- Mold flash or protrusions shall not exceed 0.15mm (0.006")



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