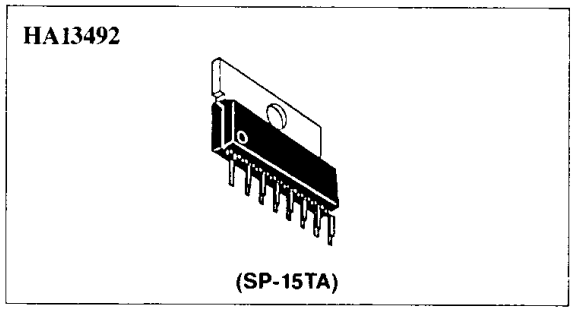
HA13492

Quad Solenoid Driver

Description

The HA13492, a monolithic power IC, is a driver for inductive loads especially for automotive application. Packaged in Single-in-Line 15 pin, contains four driving circuits of 0.8 A. Each driver has OCL* and independent OTSD** circuit to protect the IC from the short circuit of loads. Also include input open circuit protector and all of the failure condition can be reported by diagnostic circuit.

* OCL : Over current limiter
** OTSD : Over temperature shut down



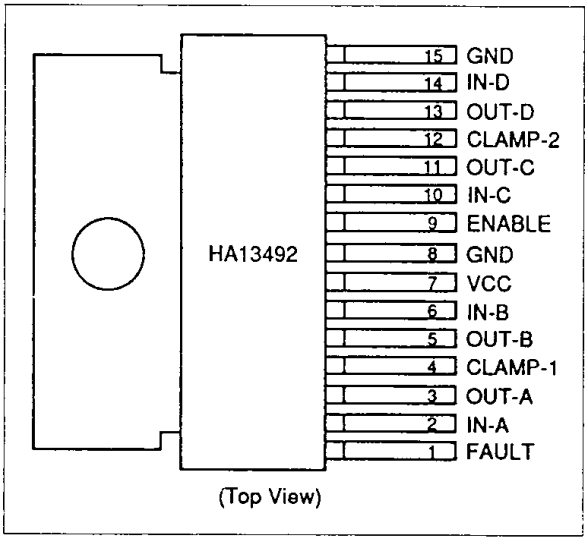
Functions

- 0.8 A quad driver
- With clamp diodes
- With chip Enable
- With over voltage protector circuit
- With short circuit protector (OCL & OTSD)
- With diagnostic circuit
- With fail safe function under input open circuit condition

Features

- High sustaining voltage (45 V)
- Low saturation voltage
- Wide operating supply voltage range (V_{CC} = 7 to 25 V)
- Can stand for reverse voltage
- Low standby current (200 µA max)
- With independent short circuit protector for each channel
- Compatible with TTL, LS-TTL and 5 V CMOS

Pin Arrangement



Ordering Information

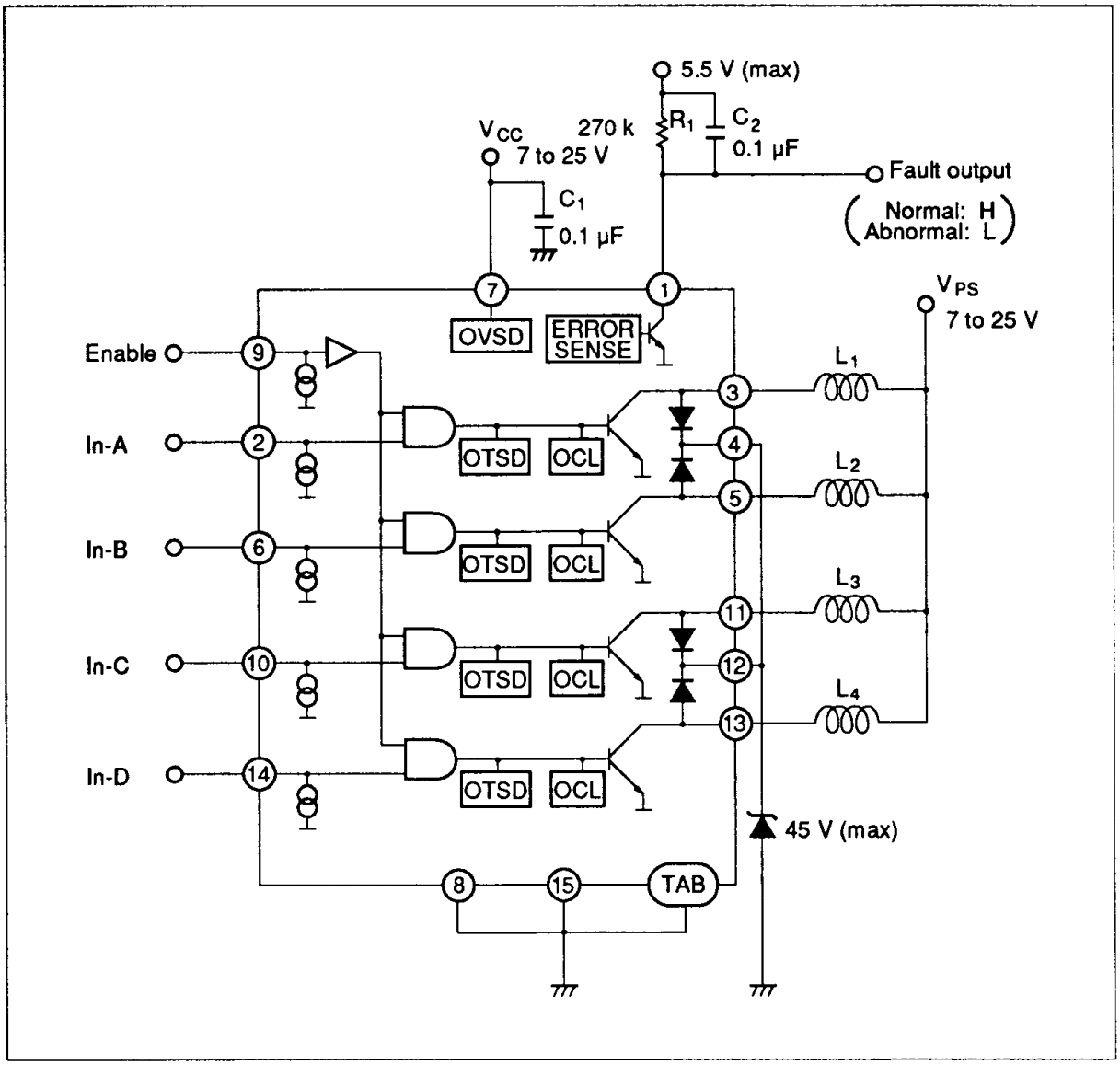
Type No.	Package
HA13492	SP-15TA

Truth Table

Enable	In	Out	Fault	Operating condition
L	X	H	H	Normal condition
H	H	L	H	
H	L	H	H	
H	H	H	L	Short circuit of load, OCL, OTSD, OVSD
H	L	L	L	Open circuit of load

Enable, in { H : High level ; 2.0 V
L : Low level ; 0.8 V
X : Don't care

Block Diagram



Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings	Units	Note
Supply voltage	V_{CC}	–13 to 45	V	1
Input voltage	V_{IN}	–0.6 to 7	V	
Output voltage	V_{CEX}	45	V	
Output current	I_O	1.5	A	2
Power dissipation	P_T	3.5	W	
Junction temperature	T_j	150	°C	
Operating junction temperature range	T_{jop}	–40 to +135	°C	
Storage temperature range	T_{stg}	–55 to +150	°C	
Package thermal resistance	θj–c	3	°C/W	3
	θj–a	60	°C/W	

The absolute maximum ratings are limiting values, to be applied individually, beyond which the device may be permanently damaged. Functional operation under any of these conditions is not guaranteed. Exposing a circuit to its absolute maximum rating for extended periods of time may affect the device's reliability.

Notes: 1. Recommended operating voltage
V_{CC} = 7 to 16 V (normal)
16 to 25 V (jump start)

2. Internally limited.

3. θj–c; Thermal resistance from junction to case
θj–a; Thermal resistance from junction to air

Electrical Characteristics (Ta = 25°C, V_{CC} = 12 V ±10%)

Item		Symbol	Min	Typ	Max	Units	Test condition	Applicable pin	Note
Supply current		I_{CCO}	—	55	200	µA	Enable = 0.8 V	7	
		I_{CC}	—	80	100	mA	Enable = 2 V, I_{out} = 0 to 0.8 A × 4 CH		
Input	Low level voltage	V_{IL}	—	—	0.8	V		9, 2, 6 10, 14	
	High level voltage	V_{IH}	2.0	—	—	V			
	Low level current	I_{IL}	–10	—	40	µA	V_{IN} = 0 to 0.8 V (Enable = 2 V)	2, 6 10, 14	
			–10	—	40	µA	Enable = 0 to 0.8 V	9	
	High level current	I_{IH}	10	35	60	µA	V_{IN} = 2.0 to 5.5 V (Enable = 2 V)	2, 6 10, 14	
			10	40	60	µA	Enable = 2.0 to 5.5 V	9	
			–5	—	10	µA	V_{IN} = 5.5 V (Enable = 0.8 V)	2, 6 10, 14	
Output	Low level voltage	V_{CE}(sat)	—	0.08	0.15	V	I_{out} = 0.1 A	3, 5, 11 13	
			—	0.30	0.40	V	I_{out} = 0.5 A		
			—	0.60	0.75	V	I_{out} = 0.8 A		
	Leakage current	I_{CEX1}	—	0.5	5	mA	Enable = 2 V, V_{IN} = 0.8 V V_{CE} = 45 V		
		I_{CEX2}	200	400	600	µA	Enable = 2 V, V_{IN} = 0.8 V V_{CE} = 12 V		
		I_{CEX3}	—	—	100	µA	Enable = 0.8 V, V_{CE} = 45 V		
	Sustaining voltage	V_{CE}(sus)	45	—	—	V			1
Clamp diode	Forward voltage	V_F	—	1.3	2.0	V	I_F = 1.0 A	3, 4, 5, 11 12, 13	2
			—	1.5	2.5	V	I_F = 1.5 A		
	Leakage current	I_R	—	—	100	µA	V_R = 50 V		
Fault out	Sink current	I_{OL}	30	—	125	µA	V_{Fault} = 1 to 5.5 V	1	
	Low level voltage	V_{OL}	—	0.2	0.4	V	I_{Fault} = 30 µA		
	Leakage current	I_{LEAK}	—	—	2	µA	V_{Fault} = 1 to 5.5 V		

Electrical Characteristics (Ta = 25°C, Vcc = 12 V ±10%) (cont)

Item		Symbol	Min	Typ	Max	Units	Test condition	Applicable pin	Note
Output error sense threshold voltage		V^+	—	—	7	V	Enable = 2 V, V_{IN} = 2 V	3, 5, 11 13	3
		V^-	3	—	—	V	Enable = 2 V, V_{IN} = 0.8 V		
Turn on and turn off delay		t_{PHL}	—	8	15	µs	I_{out} = 0.5 A	2, 6, 10 14, 3, 5 11, 13	
		t_{PLH}	—	3	15	µs			
OVSD	Starting voltage	V_{OVSD}	25.5	—	31	V		7	
	Hysteresis	V_{HYS}	0.25	—	—	V			
OCL starting current		I_{OCL}	—	1.2	1.5	A		3, 5, 11 13	4
OTSD	Starting temp	OTSD	145	—	—	°C			5
	Hysteresis	T_{HYS}	—	—	20	°C			

Notes:
1. See figure 1
2. See figure 2
3. See figure 3
4. See figure 4
5. Design parameter only

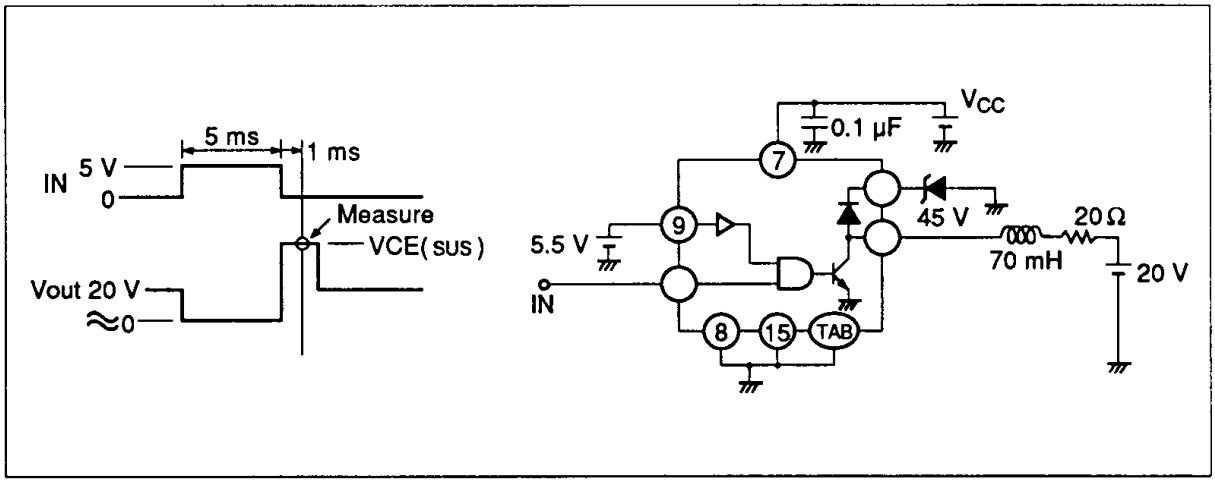


Figure 1 Output Sustaining Voltage Test

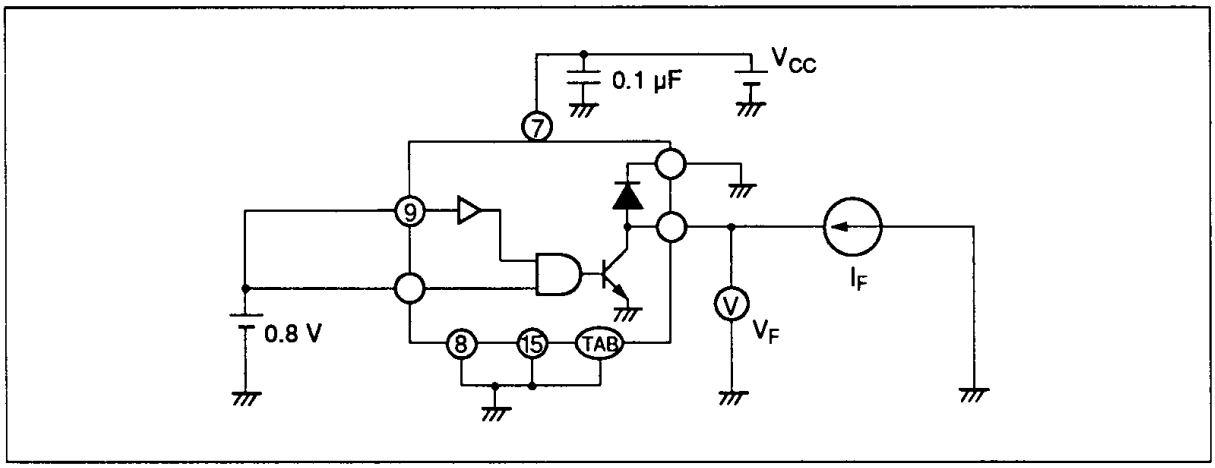


Figure 2 Clamp Diode V_F Test

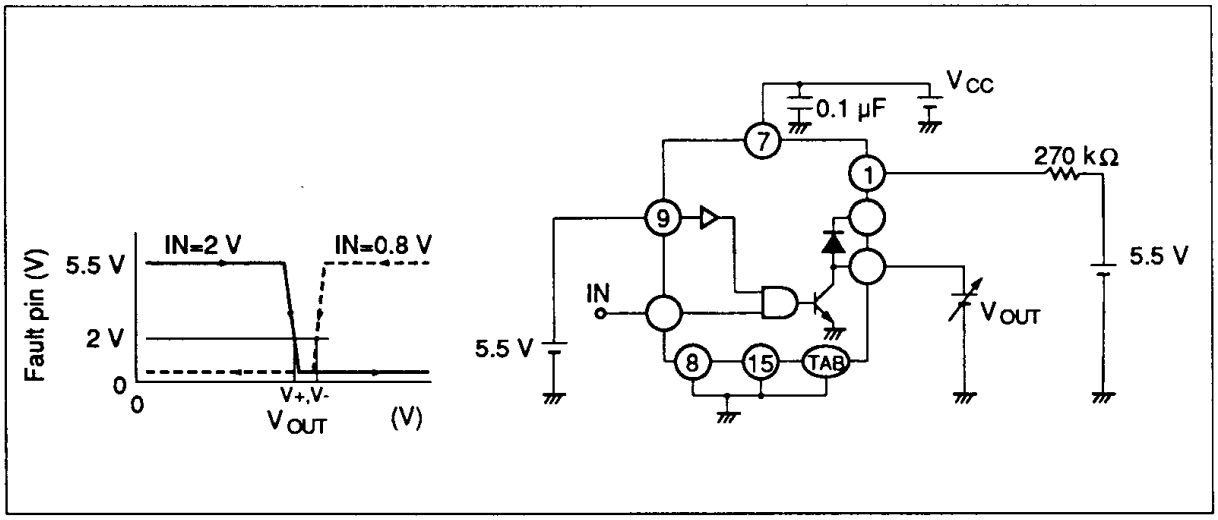


Figure 3 Output Error Sense Threshold Voltage Test

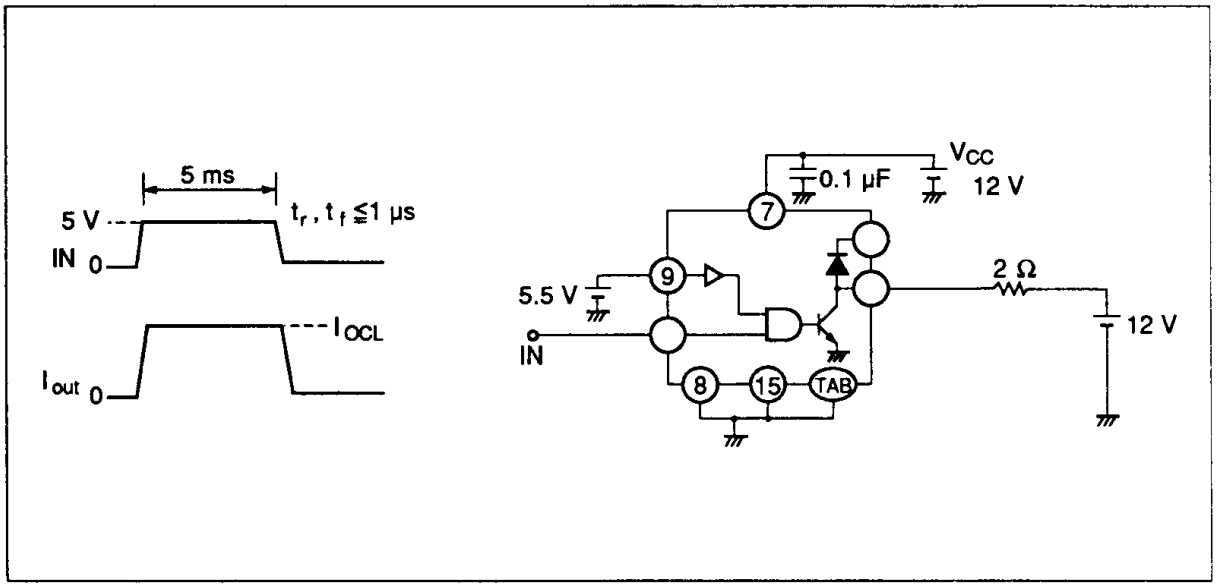


Figure 4 Over Current Limiter Test