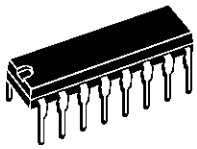
SGS-THOMSON MICROELECTRONICS

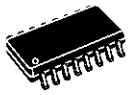
TD310

TRIPLE IGBT/MOS DRIVER

- THREE POWER IGBT/MOS AND PULSE TRANSFORMER DRIVERS
- CURRENT SENSE COMPARATOR WITH 1ms INHIBITION TIME FUNCTION
- INSTANTANEOUS SIGNAL TRANSMISSION
- 0.6 Amp PER CHANNEL PEAK OUTPUT CURRENT CAPABILITY
- LOW OUTPUT IMPEDANCE TYP : 7Ω at 200mA
- CMOS/LSTTL COMPATIBLE INVERTING INPUT WITH HYSTERESIS
- 4V TO 16V SINGLE SUPPLY OPERATION
- CURRENT AMPLIFIER
- LOW BIAS CURRENT TYP : 1.5mA
- ADJUSTABLE UNDERVOLTAGE LOCKOUT LEVEL
- STAND-BY MODE
- DURING POWER UP NO RANDOM OUTPUT STATE
- ENHANCED LATCH-UP IMMUNITY
- CHANNEL PARALLELING CAPABILITY



N
DIP16
(Plastic Package)



D
SO16
(Plastic Micropackage)

ORDER CODES

Part Number	Temperature Range	Package	
		N	D
TD310I	-40°C, +125°C	•	•

DESCRIPTION

The TD310 is designed to drive one, two or three Power IGBT/MOS and has driving capability for pulse transformer. So it is perfectly suited to interface control IC with Power Switches in low side or half-bridge configuration.

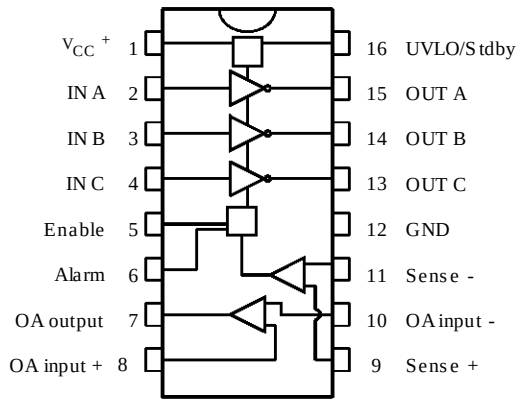
The typical application shown figure 1 implements the TD310 in a pulse controlled half-bridge drive. Positive and negative pulses are applied to the pulse transformer to charge and discharge the IGBT/MOS gate capacitance. More sophisticated secondary circuits provide low impedance gate drive and short-circuit protection as shown in application note n° AN461.

On Figure 2, TD310 is implemented as a low side driver in a typical 3 phase motor drive.

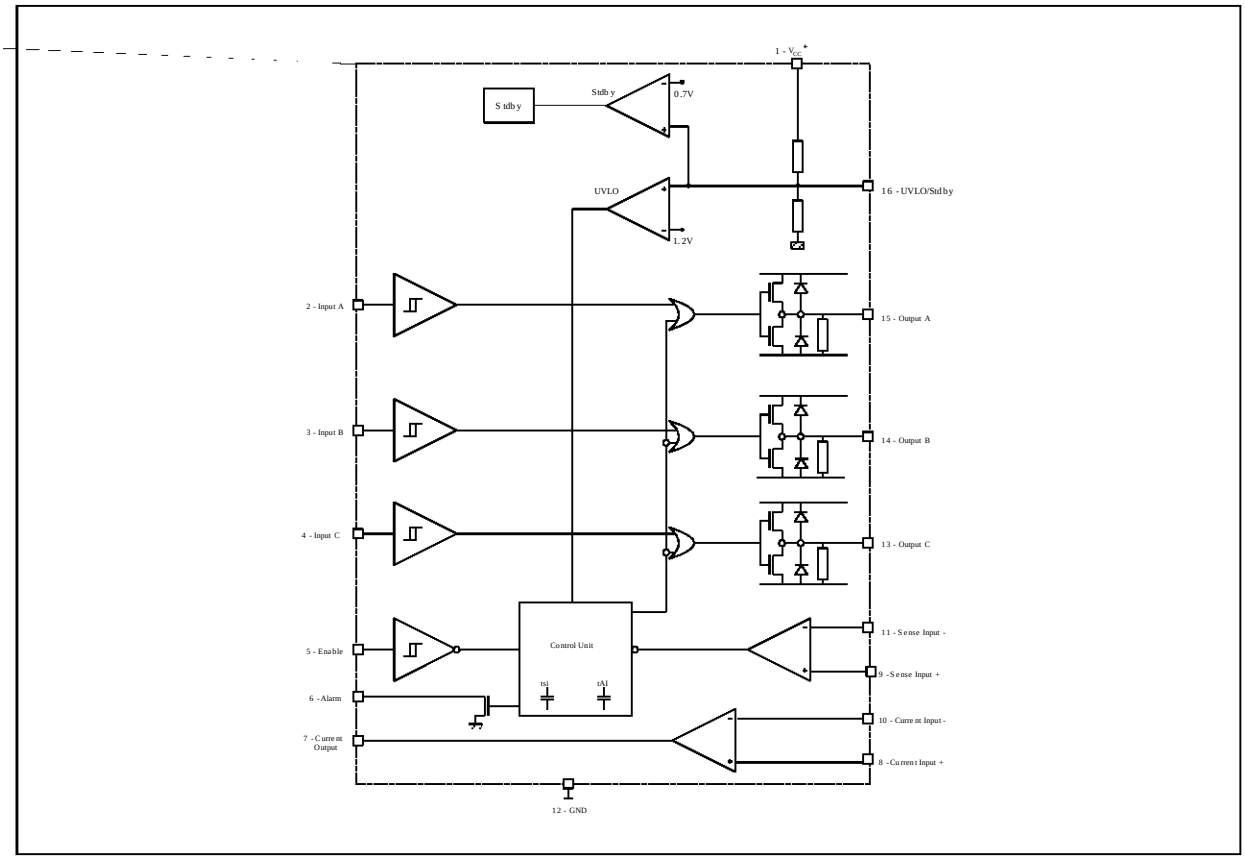
Figure 3 presents a general purpose low side gate drive.

In both case, the current amplifier provides interfacing between a sense resistor and an A/D converter.

PIN CONNECTIONS



BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	18	V
V_i	Input Voltage	0 to V_{CC}	V
V_{is}	Sense Input Voltage	-0.3 to V_{CC}	V
T_j	Junction Temperature	-40 to 150	^oC
T_{amb}	Ambient Temperature	-40 to 125	^oC

OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	4 to 16	V

INSTRUCTIONS FOR USE

1 - The TD310 supply voltage must be decoupled with a 1µF min. capacitor.

2 - If the application involving TD310 requires maximum output current capability, this current must be pulsed : pulse width 1µsec, duty cycle 1% at T_{amb}.

ELECTRICAL CHARACTERISTICS

V_{CC} = 15V, T_{amb} = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
I_{CC}	Supply Current with Inputs in High State		1.5	2	mA
	LOGIC INPUT (all inputs)				
V_{IH}	High Input Voltage	2			V
V_{IL}	Low Input Voltage			0.8	V
I_{IH}	High Input Current		10		pA
I_{IL}	Low Input Current		10		pA
t_{dH},t_{eH} t_{dL},t_{eL}	Propagation Delay (10% input to 10% output) Output Rise Output Fall $T_{min.} \le T_{amb} \le T_{max.}$		 200 60	 400 400	ns
t_{ii}	Input Inhibiting Time		100		ns
t_{dd}	Differential Delay Time Between Channels		20		ns
	OUTPUT DRIVERS				
V_{sod}	Sourcing Drop Voltage (A/B/C outputs) I_{source} = 200mA			3	V
V_{sid}	Sinking Drop Voltage (A/B/C outputs) I_{sink} = 200mA			5	V
V_{dem}	Demagnetising Drop Voltage (A/B/C outputs) $I_{demag.}$ = 100mA			2	V
R_{opd}	Output Pull Down Resistor		47		kΩ
	ALARM OUTPUT				
I_s	Low Level Sinking Current V_O = 0.8V	5	35		mA
I_{sh}	High Level Sinking Current			1	µA
t_A	Alarm Output : Delay Time to Alarm Fall if Sense Input Triggered			500	ns
	SENSE INPUT				
V_{ios}	Input Offset Voltage			20	mV
t_{Ai}	Inhibition Time if Sense Input Triggered		1		ms
t_s	Delay Time to Output Fall if Sense Input Triggered All outputs inhibited			600	ns
t_{si}	Inhibition Time of Sense Input		300		ns
V_{shys}	Sense Hysteresis		40		mV
	OPERATIONAL AMPLIFIER				
V_{icm}	Common Mode Input Voltage Range	0 to V_{CC}^+ -1.5			V
V_{io}	Input Offset Voltage			10	mV
GBP	Gain Bandwidth Product		1		MHz
A_{vd}	Open Loop Gain	60			dB
SR	Slew Rate at Unity Gain R_L = 100kΩ, CL = 100pF, V_i = 3 to 7V		0.6		V/µs
	STAND-BY				
V_{stdby}	Standby Mode Threshold Voltage	0.3		1.1	V
I_{stdby}	Standby Mode Supply Current		30		µA
	UNDER VOLTAGE LOCKOUT				
I_{adj}	Under Voltage Level Adjust Current		1		µA/V
V_{st1}	Internal Stop Threshold (without external adjustement)	10.7		13.3	V
V_{hys}	Threshold Hysteresis		0.8		V

UVLO/stbdy pin functionning modes

Due to the wide supply voltage range of the TD310, the UVLO function (Under Voltage Lock Out) is externally adjustable by a resistor bridge.

The bridge rate can be calculated in relation with the expected UVLO protection level as follows :

$$V_{UVLO} \times \frac{R1}{R1+R2} = 1.2V$$ (where R1 is the lower resistor of the bridge)

The internal resistor sets the default UVLO value to 12V (*) and might influence the external bridge rate if the values of the external resistors are too high.

The standby threshold value depends of the UVLO value as follows :

$V_{stdby} = {}^{0.7}\!/_{1.2}\, V_{UVLO}$

Both UVLO and stdby functions can be inhibited by connecting the UVLO/stdby pin to V_{CC}^{+} via a pull up resistor (ex 150kΩ).

The following table summarizes the functions of the TD310 :

	Pin	16	9/11	5	2/3/4	15/14 /13	6	7/8/10	
	Configuration	UVLO/stdby	Sense+/Sense-	Enable	In A/B/C	Out A/B/C	Alarm	Op. Amp.	Consumption
Normal	1	H	+ > -	X	X	L	L	OK	H (1.5mA)
			+ < -	H	IN	$\overline{IN}$	H		
				L	X	L			
Stdby	2	L	+ > -	X	X	L	L	HZ	L (30µA)
			+ < -				H		
UVLO	3	M	X	X	X	L	L	OK	H

Configuration 1 : UVLO/stdby = H

The TD310 is in a normal consumption state (1.5mA), the operational amplifier is normally functionning and the buffer outputs are determined by the sense comparator inputs, the enable inputs and the buffer inputs.

Configuration 2 : UVLO/stdby = L

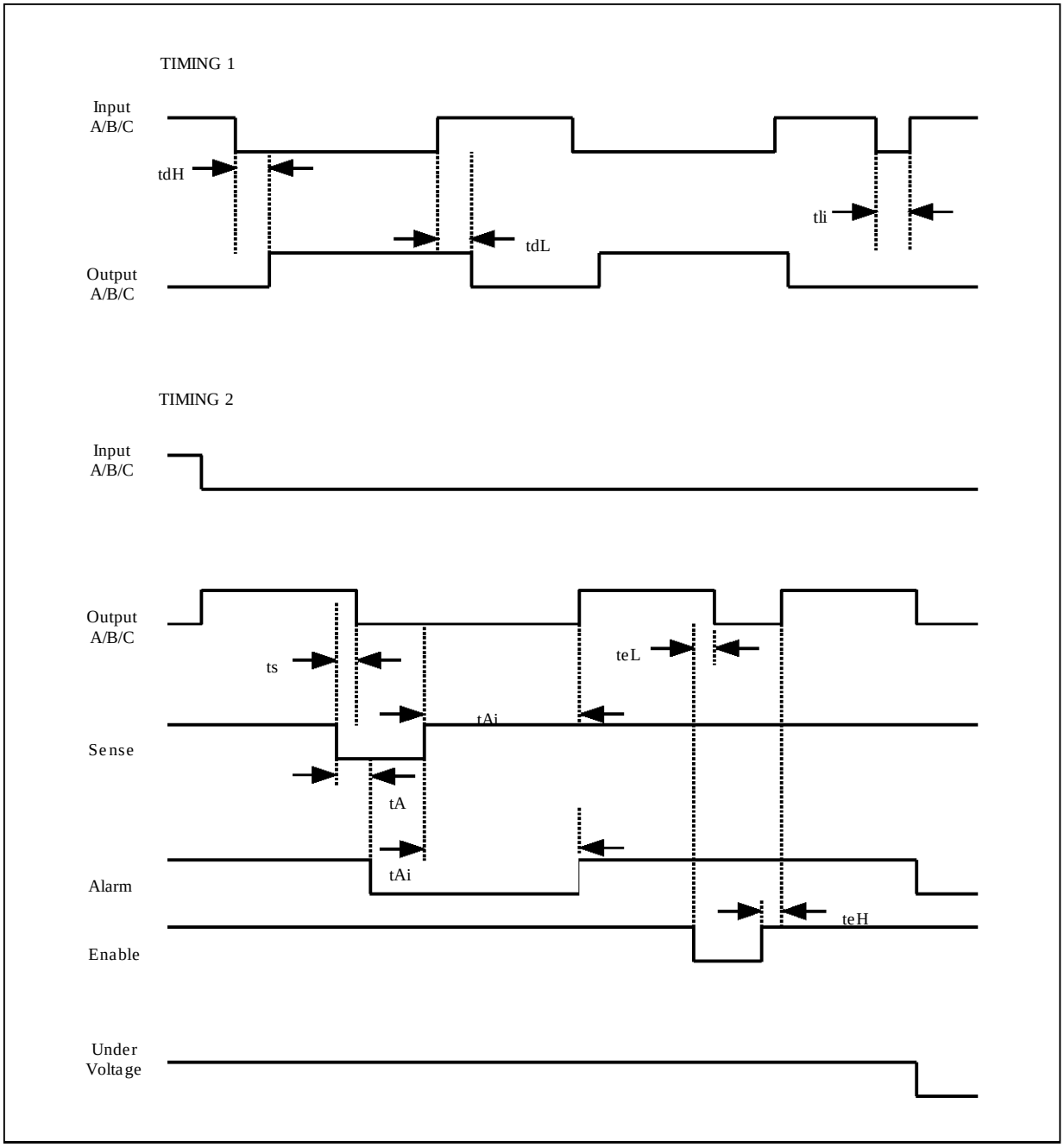
The TD310 is in a low consumption state (standby mode 30µA), the buffer outputs are set to low state and the operational amplifier is in high impedance state.

Configuration 3 : UVLO/stdby = M

The V_{CC} supply voltage is between V_{UVLO} and V_{stdby} (**). The TD310 remains in a normal consumption state and the operational amplifier is normally functionning but the buffer outputs and the alarm pin are set to low state.

(*) If the UVLO level remains unadjusted, it is recommended to bypass the UVLO/stdby pin with a 1nF capacitor.
(**) If the supply voltage falls below V_{stdby}, the TD310 is set in standby mode (configuration 2).

TIMING DIAGRAM



TYPICAL APPLICATIONS

Figure 1 : THREE PHASE MOTOR DRIVE

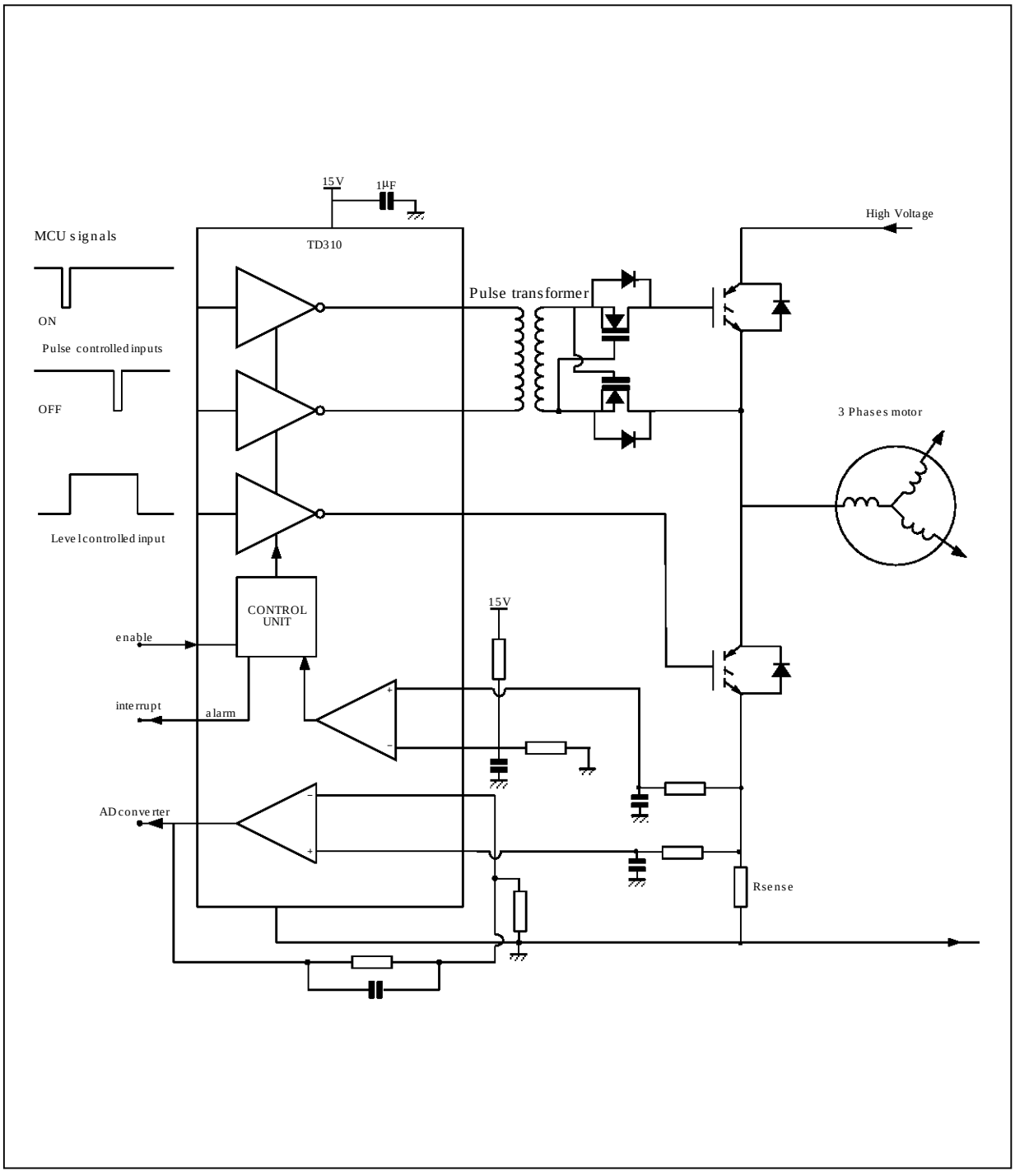


Figure 2 : THREE PHASE MOTOR LOW SIDE DRIVE

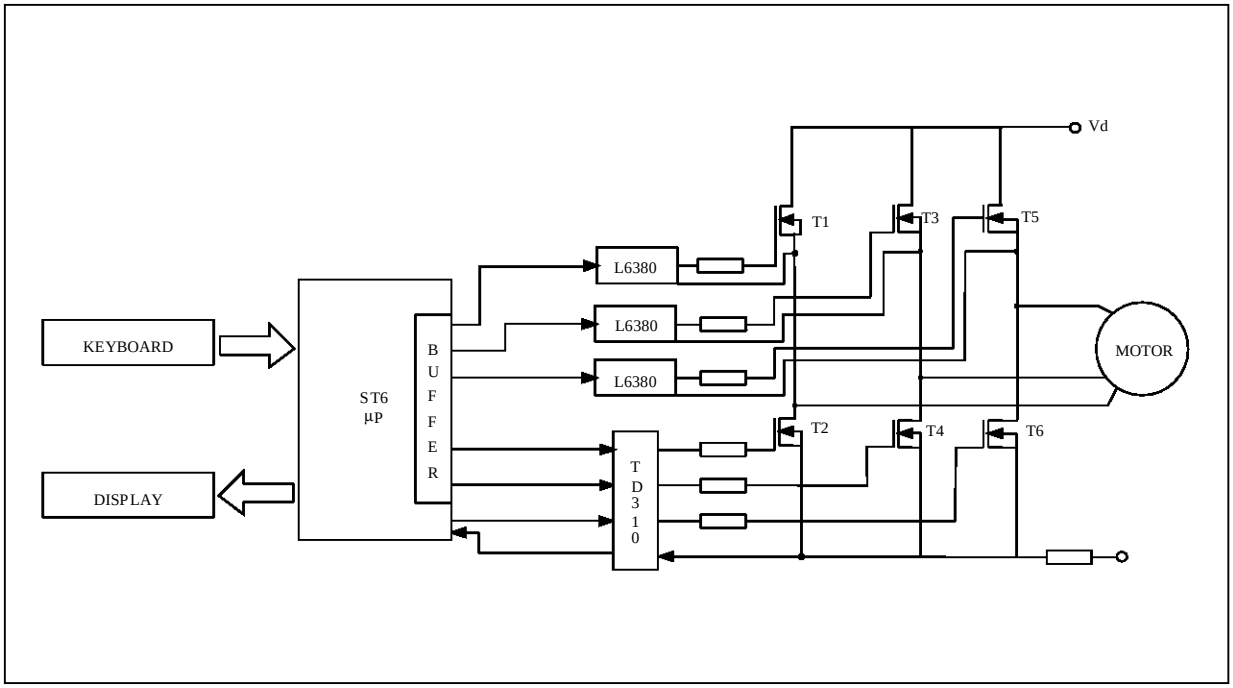
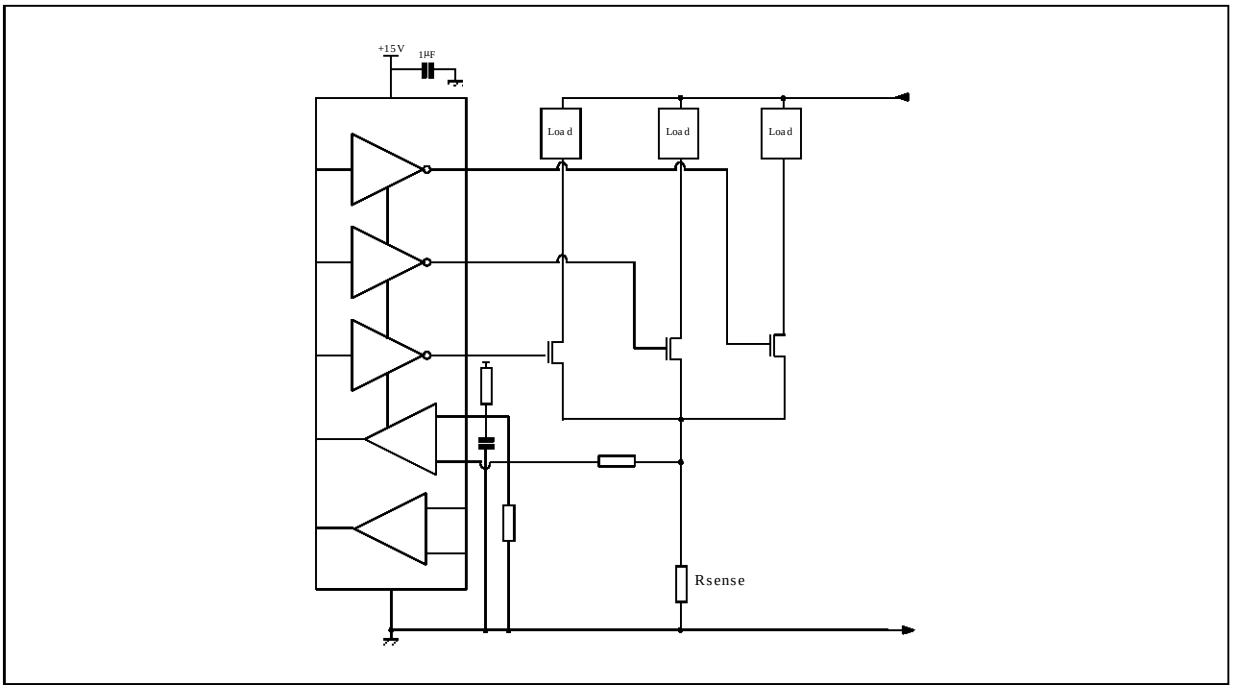
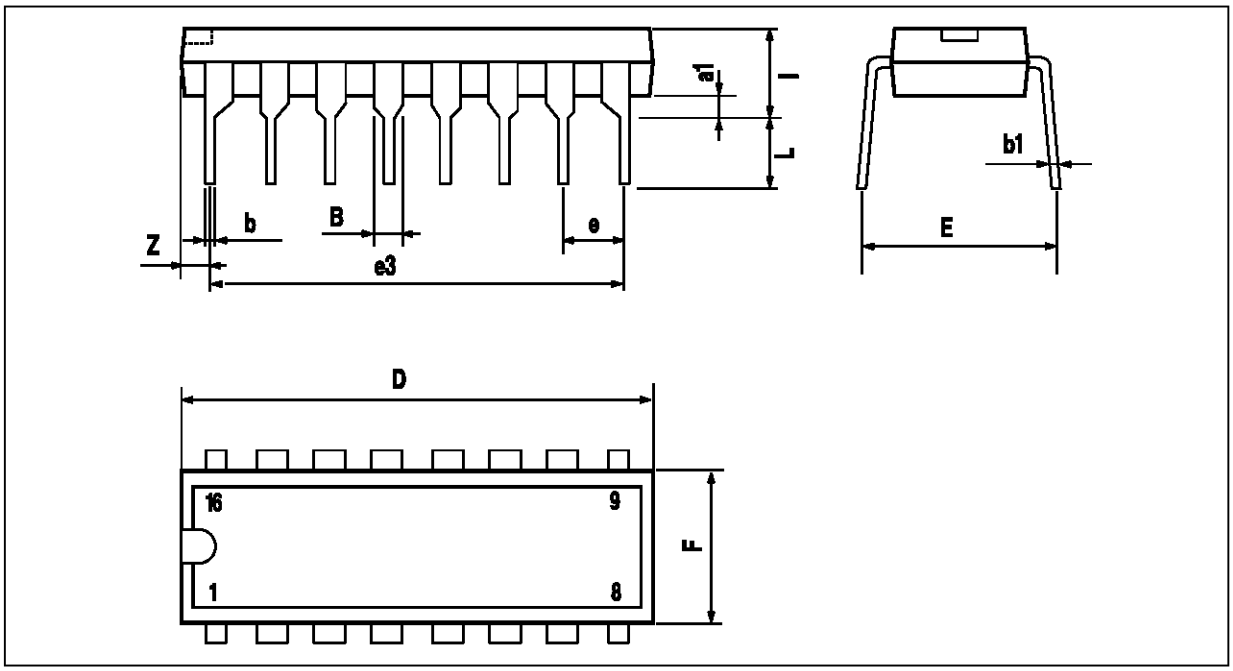


Figure 3 : LOW SIDE DRIVE



PACKAGE MECHANICAL DATA

16 PINS - PLASTIC DIP



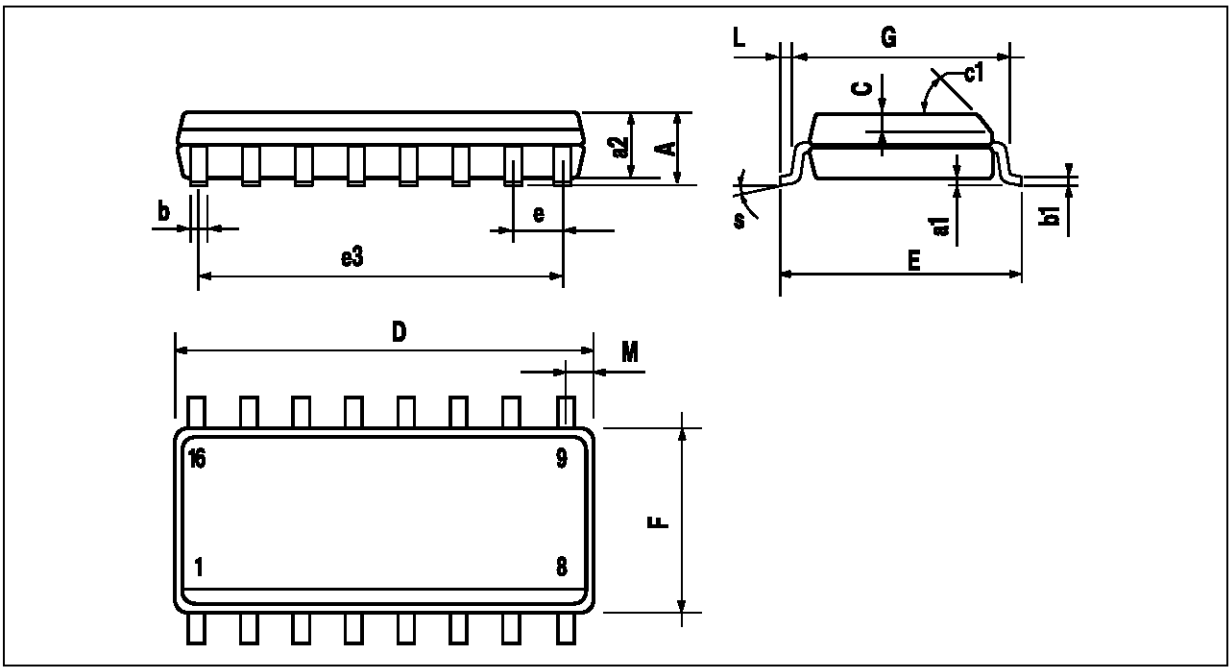
PM-DIP16.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
i			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050

DIP16.TBL

PACKAGE MECHANICAL DATA

16 PINS - PLASTIC MICROPACKAGE (SO)



PM-SO16.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.2	0.004		0.008
a2			1.6			0.063
b	0.35		0.46	0.014		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.020	
c1	45^{o} (typ.)					
D	9.8		10	0.386		0.394
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.150		0.157
G	4.6		5.3	0.181		0.209
L	0.5		1.27	0.020		0.050
M			0.62			0.024

SO16.TBL

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