



# STP08CL596

## LOW VOLTAGE 8-BIT CONSTANT CURRENT LED SINK DRIVER

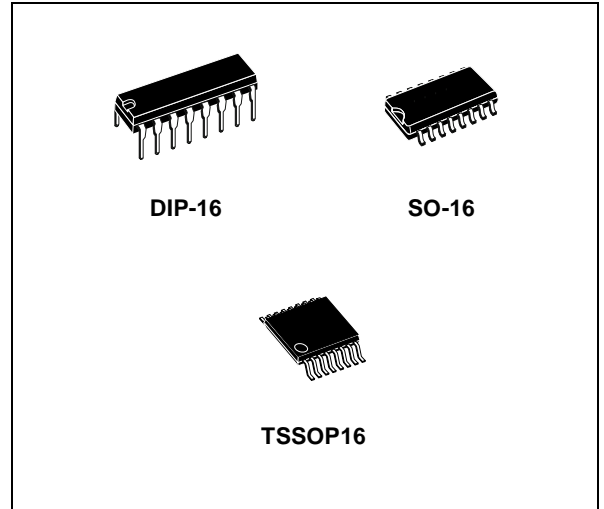
- LOW VOLTAGE POWER SUPPLY DOWN TO 3V
- 8 CONSTANT CURRENT OUTPUT CHANNELS
- ADJUSTABLE OUTPUT CURRENT THROUGH EXTERNAL RESISTOR
- SERIAL DATA IN/PARALLEL DATA OUT
- SERIAL OUT CHANGES STATE ON THE FALLING EDGES OF CLOCK
- 3.3V MICRO DRIVER-ABLE
- OUTPUT CURRENT: 15-90 mA
- 25 MHz CLOCK FREQ.
- AVAILABLE IN HIGH THERMAL EFFICIENCY TSSOP EXPOSED PAD

### DESCRIPTION

The STP8CL596 is a monolithic, medium-voltage, low current power 8-bit shift register designed for LED panel display.

The STP8CL596 contains a 8-bit serial-in, parallel-out shift register that feeds a 8-bit D-type storage register. In the output stage, sixteen regulated current sources were designed to provide 15-90mA constant current to drive the LEDs.

Compared with the STPIC6C595, the device provides great flexibility and improved performance in LED panel system design.



Trough an external resistor, users may adjust the STP8CL596 output current, controlling in this way the light intensity of LEDs.

The STP8CL596 guarantees 16V output driving capability, allowing users to connect more LEDs in series. The high clock frequency, 25 MHz, also satisfies the system requirement of high volume data transmission. The 3.3V of voltage supply is well useful for applications that interface any micro from 3.3V to 5.5V. Compared with a standard TSSOP package, the TSSOP exposed pad increases heat dissipation capability by a 2.5 factor.

**Table 1: Order Codes**

Part Number	Temp. Range	Package	Comments
STP08CL596B1	-40°C to 125°C	DIP-16	25 part per tube
STP08CL596M	-40°C to 125°C	SO-16 (Tube)	50 parts per tube
STP08CL596MTR	-40°C to 125°C	SO-16 (Tape & Reel)	1000 parts per reel
STP08CL596TTR	-40°C to 125°C	TSSOP16 (Tape & Reel)	2500 parts per reel

Table 2: Current Accuracy

Output Voltage	Current accuracy		Output Current
	Between bits	Between ICs	
$\geq 0.7V$	$\pm 3\%$	$\pm 10\%$	15 to 90 mA

Figure 1: Pin Connection

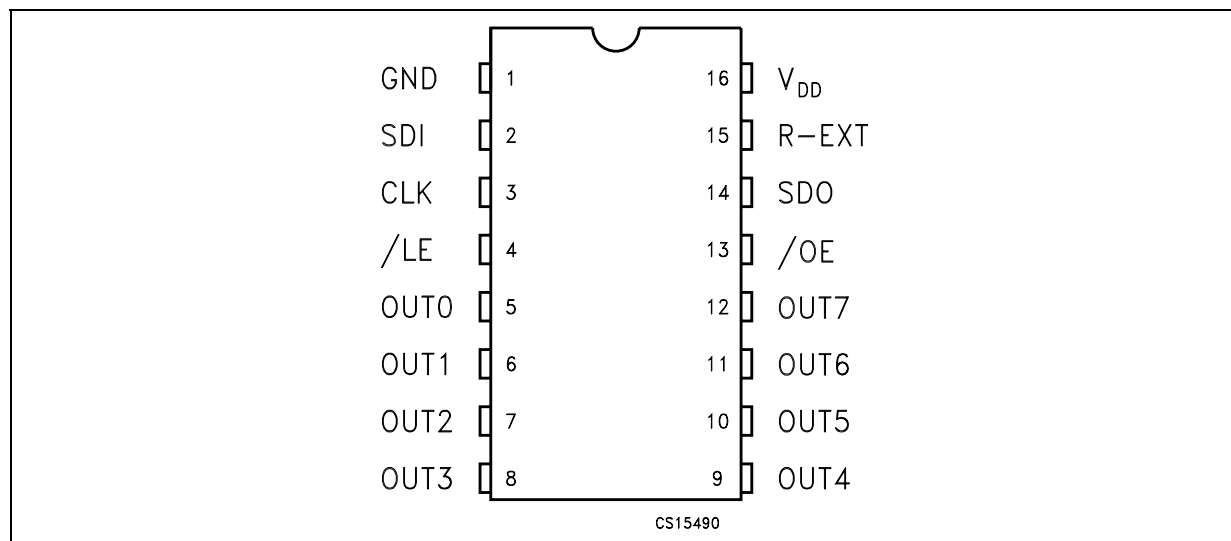


Table 3: Pin Description

PIN N°	Symbol	Name and Function
1	GND	Ground Terminal
2	SDI	Serial data input terminal
3	CLK	Clock input terminal
4	/LE	Latch input terminal
5-12	OUT 0-7	Output terminal
13	/OE	Output enable input terminal (active low)
14	SDO	Serial data out terminal
15	R-EXT	Constant Current programming
16	V <sub>DD</sub>	5V Supply voltage terminal

Table 4: Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V <sub>DD</sub>	Supply Voltage	0 to 7	V
V <sub>O</sub>	Output Voltage	-0.5 to 16	V
I <sub>O</sub>	Output Current	90	mA
V <sub>I</sub>	Input Voltage	-0.4 to V <sub>DD</sub> +0.4	V
I <sub>GND</sub>	GND Terminal Current	720	mA
f <sub>CLK</sub>	Clock Frequency	25	MHz
T <sub>OPR</sub>	Operating Temperature Range	-40 to +125	°C
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

Table 5: Thermal Data

Symbol	Parameter	DIP-16	SO-16	TSSOP16	Unit
$R_{thj-amb}$	Thermal Resistance Junction-ambient	90	125	140	°C/W

Table 6: Recommended Operating Conditions

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{DD}$	Supply Voltage		3.0	3.3	3.6	V
$V_O$	Output Voltage				16.0	V
$I_O$	Output Current	OUTn	15		120	mA
$I_{OH}$	Output Current	SERIAL-OUT			+1	mA
$I_{OL}$	Output Current	SERIAL-OUT			-1	mA
$V_{IH}$	Input Voltage		$0.7V_{DD}$		$V_{DD}+0.3$	V
$V_{IL}$	Input Voltage		-0.3		$0.3V_{DD}$	V
$t_{wLAT}$	/LE Pulse Width	$V_{DD} = 3.0$ to $3.6V$	20			ns
$t_{wCLK}$	CLK Pulse Width		20			ns
$t_{wEN}$	/OE Pulse Width		400			ns
$t_{SETUP(D)}$	Setup Time for DATA		20			ns
$t_{HOLD(D)}$	Hold Time for DATA		15			ns
$t_{SETUP(L)}$	Setup Time for LATCH		15			ns
$f_{CLK}$	Clock Frequency		Cascade Operation			25

Table 7: Electrical Characteristics ( $V_{DD}=3V$ ,  $T = 25^{\circ}C$ , unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{IH}$	Input Voltage High Level		$0.7V_{DD}$		$V_{DD}$	V
$V_{IL}$	Input Voltage Low Level		GND		$0.3V_{DD}$	V
$I_{OH}$	Output Leakage Current	$V_{OH} = 16V$			10	$\mu A$
$V_{OL}$	Output Voltage (Serial-OUT)	$I_{OL} = 1mA$			0.4	V
$V_{OH}$	Output Voltage (Serial-OUT)	$I_{OH} = -1mA$	$V_{DD}-0.4V$			V
$I_{OL1}$	Output Current	$V_O = 0.7V$ $R_{EXT} = 910\ \Omega$	20.0	20.1	20.3	mA
$I_{OL2}$		$V_O = 0.7V$ $R_{EXT} = 360\ \Omega$	49.7	50.2	50.7	mA
$\Delta I_{OL1}$	Output Current Error between bit (All Output ON)	$V_O = 0.7V$ $R_{EXT} = 910\ \Omega$			$\pm 3$	%
$\Delta I_{OL2}$		$V_O = 0.7V$ $R_{EXT} = 360\ \Omega$			$\pm 3$	%
$R_{SIN(up)}$	Pull-up Resistor		150	300	600	K $\Omega$
$R_{SIN(down)}$	Pull-down Resistor		100	200	400	K $\Omega$
$I_{DD(OFF1)}$	Supply Current (OFF)	$R_{EXT} = OPEN$ OUT 0 to 15 = OFF		0.3	0.6	mA
$I_{DD(OFF2)}$		$R_{EXT} = 470\ \Omega$ OUT 0 to 15 = OFF		5.5	7.7	
$I_{DD(OFF3)}$		$R_{EXT} = 250\ \Omega$ OUT 0 to 15 = OFF		10.1	14.1	
$I_{DD(ON1)}$	Supply Current (ON)	$R_{EXT} = 470\ \Omega$ OUT 0 to 15 = ON		5.5	7.7	
$I_{DD(ON2)}$		$R_{EXT} = 250\ \Omega$ OUT 0 to 15 = ON		10.1	14.1	

**Table 8: Switching Characteristics** ( $V_{DD}=3V$ ,  $T = 25^{\circ}C$ , unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{PLH1}$	Propagation Delay Time, CLK-OUTn, /LE = H, /OE = L	$V_{DD} = 3 V$ $V_{IH} = V_{DD}$		250	280	ns
$t_{PLH2}$	Propagation Delay Time, /LE-OUTn, /OE = L	$V_{IL} = GND$ $I_O = 40mA$		220	250	ns
$t_{PLH3}$	Propagation Delay Time, /OE-OUTn, /LE = H	$R_{EXT} = 470 \Omega$ $R_L = 65 \Omega$		200	250	ns
$t_{PLH}$	Propagation Delay Time, CLK-SDO			25	50	ns
$t_{PHL1}$	Propagation Delay Time, CLK-OUTn, /LE = H, /OE = L			25	50	ns
$t_{PHL2}$	Propagation Delay Time, /LE-OUTn, /OE = L			25	50	ns
$t_{PHL3}$	Propagation Delay Time, /OE-OUTn, /LE = H			50	70	ns
$t_{PHL}$	Propagation Delay Time, CLK-SDO			25	50	ns
$t_r$	Output Rise Time			200	250	ns
$t_f$	Output Fall Time			17	25	ns

**EQUIVALENT CIRCUIT OF INPUTS AND OUTPUTS**

**Figure 2: /OE Terminal**

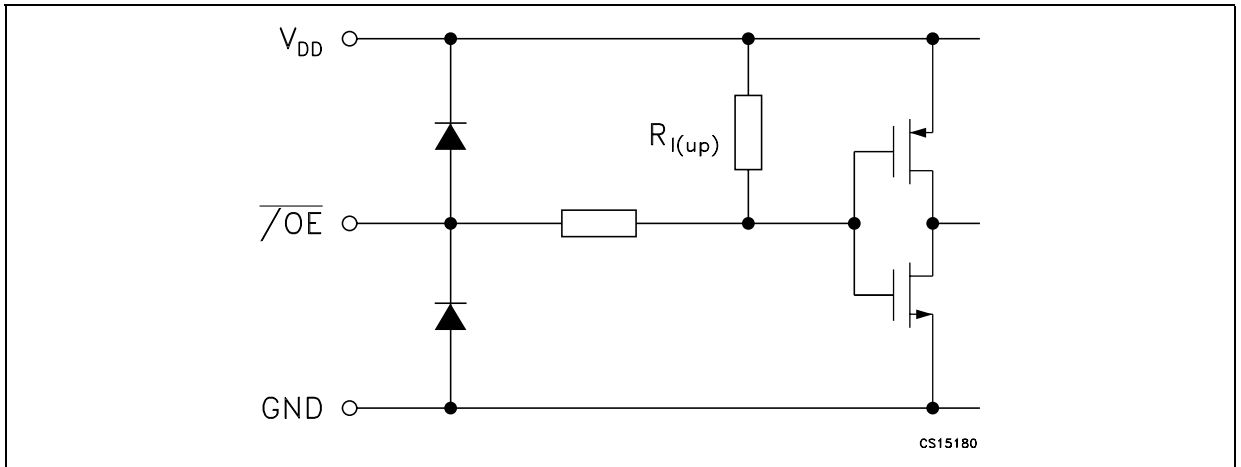


Figure 3: /LE Terminal

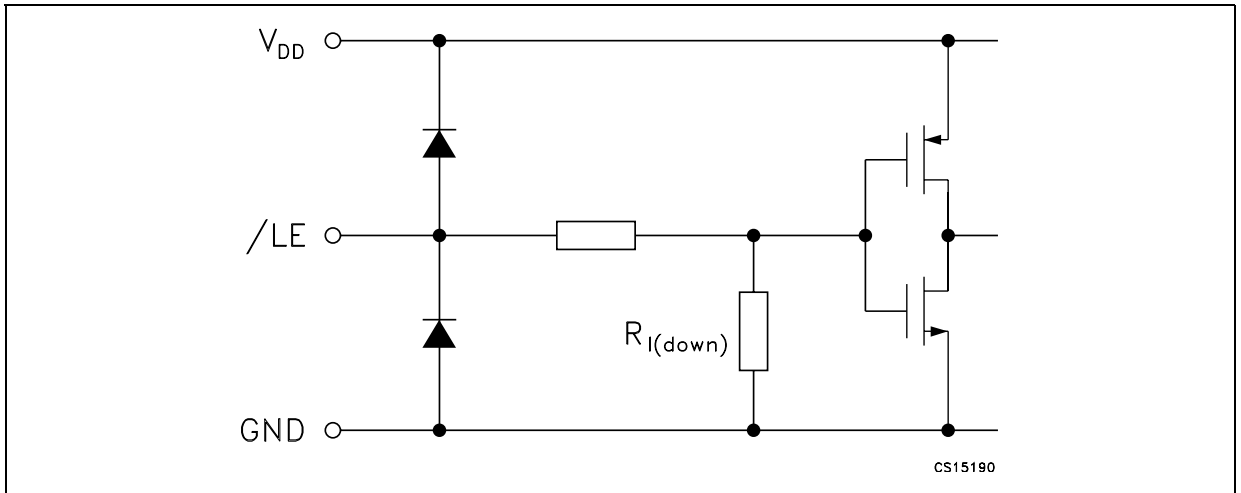


Figure 4: CLK, SDI Terminal

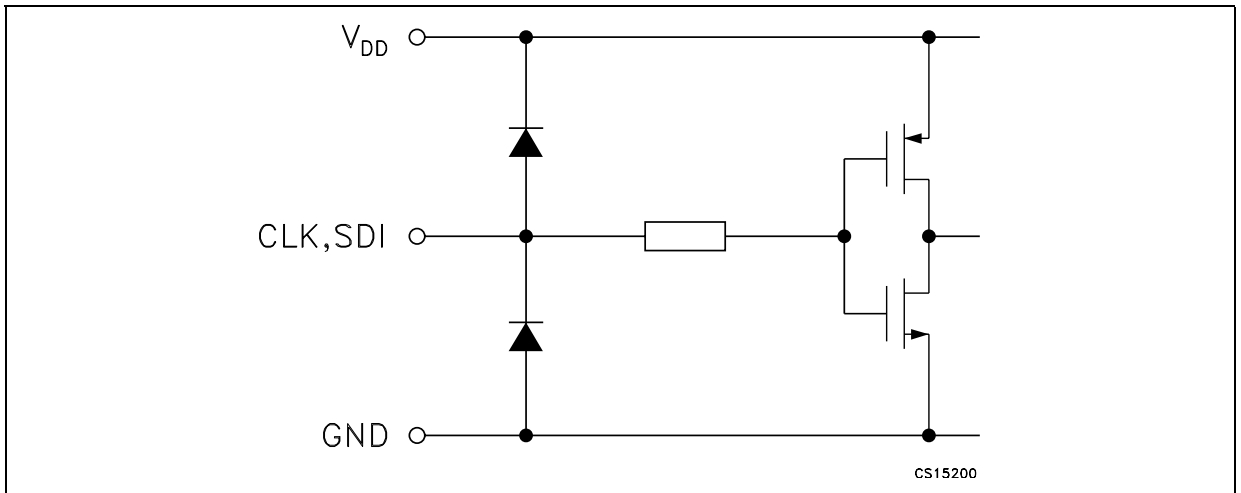


Figure 5: SDO Terminal

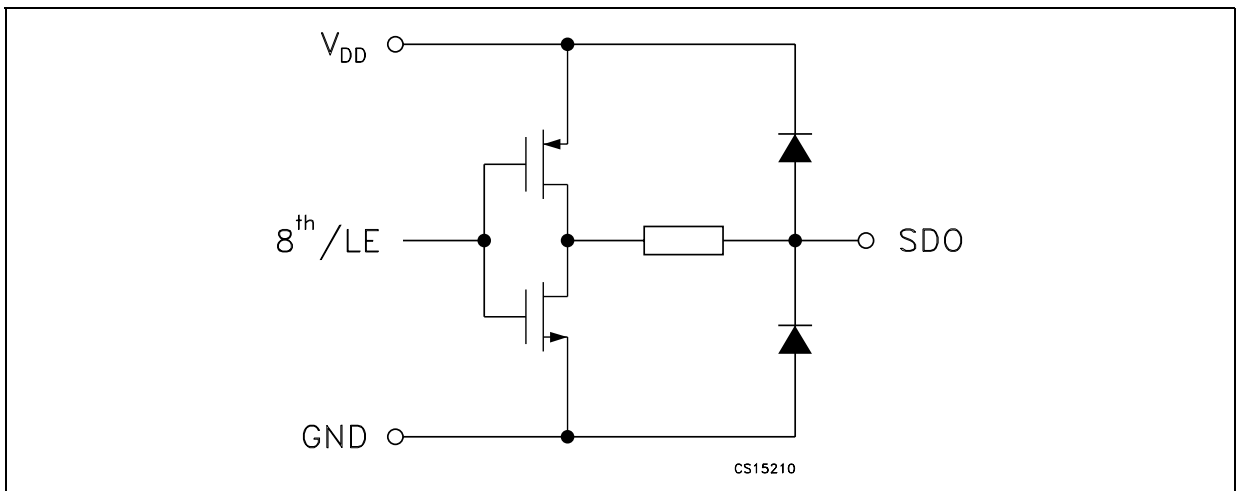


Figure 6: Block Diagram

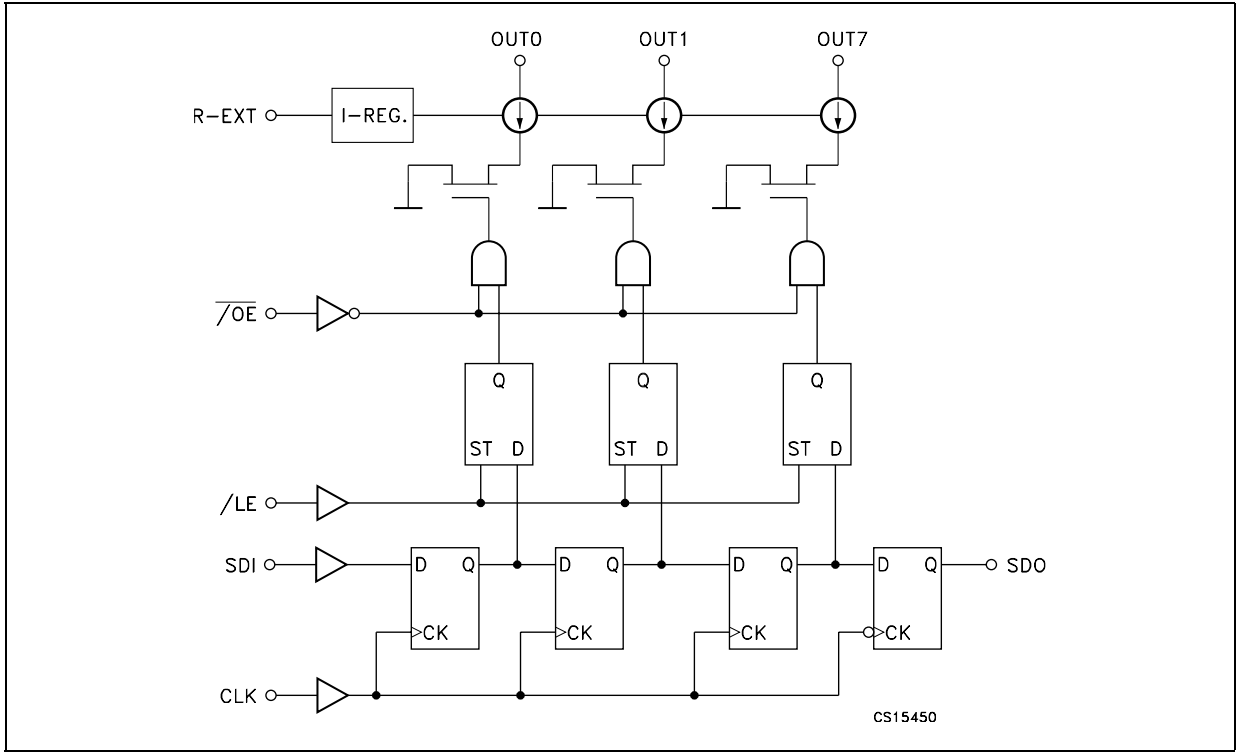


Figure 7: Timing Diagram

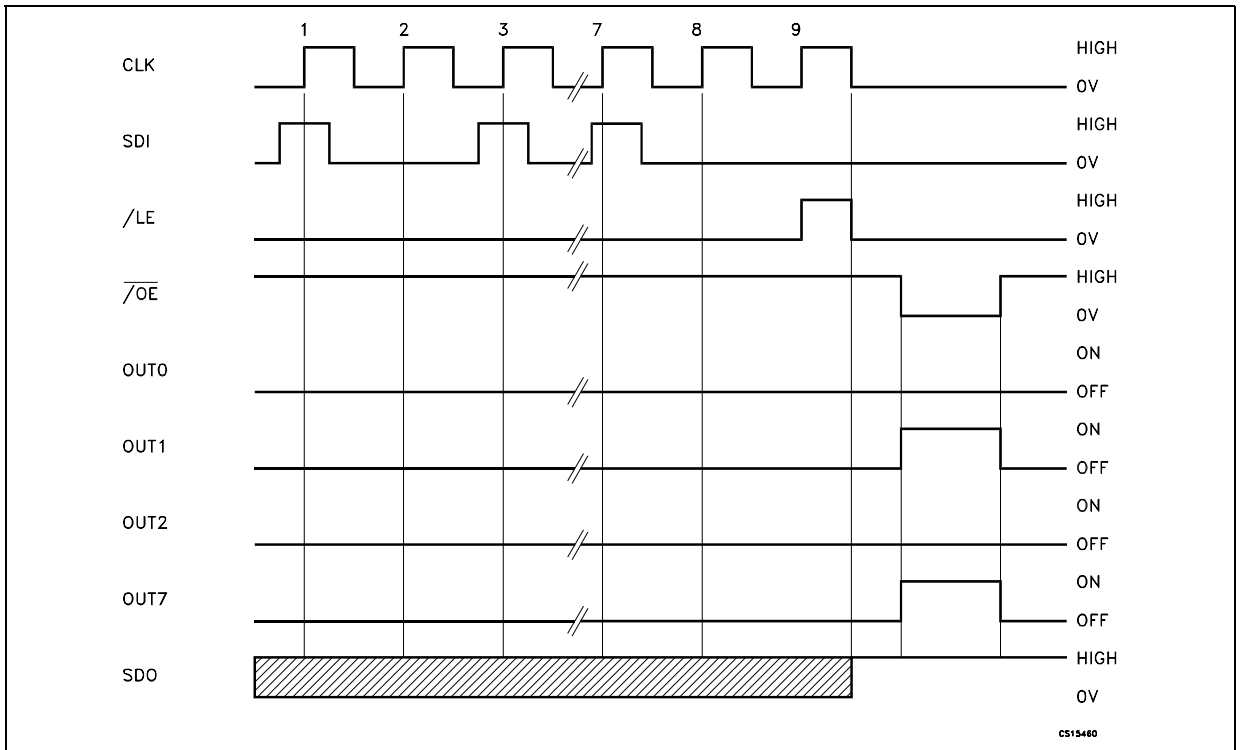


Figure 8: Clock, Serial-In, Serial-Out

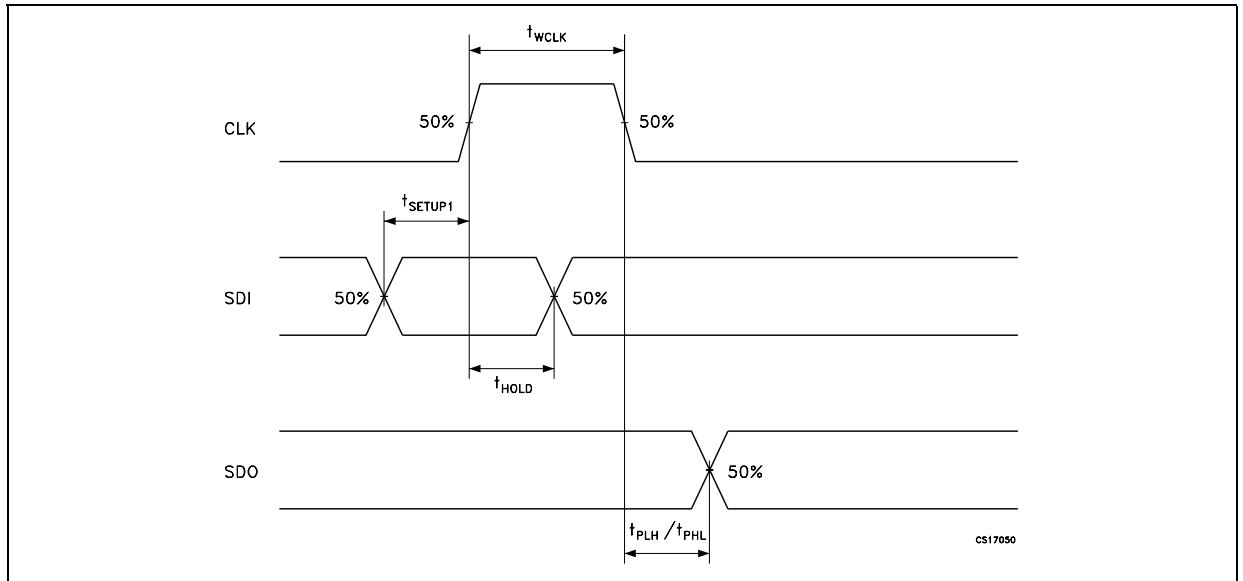


Figure 9: Clock, Serial-in, Latch, Enable, Outputs

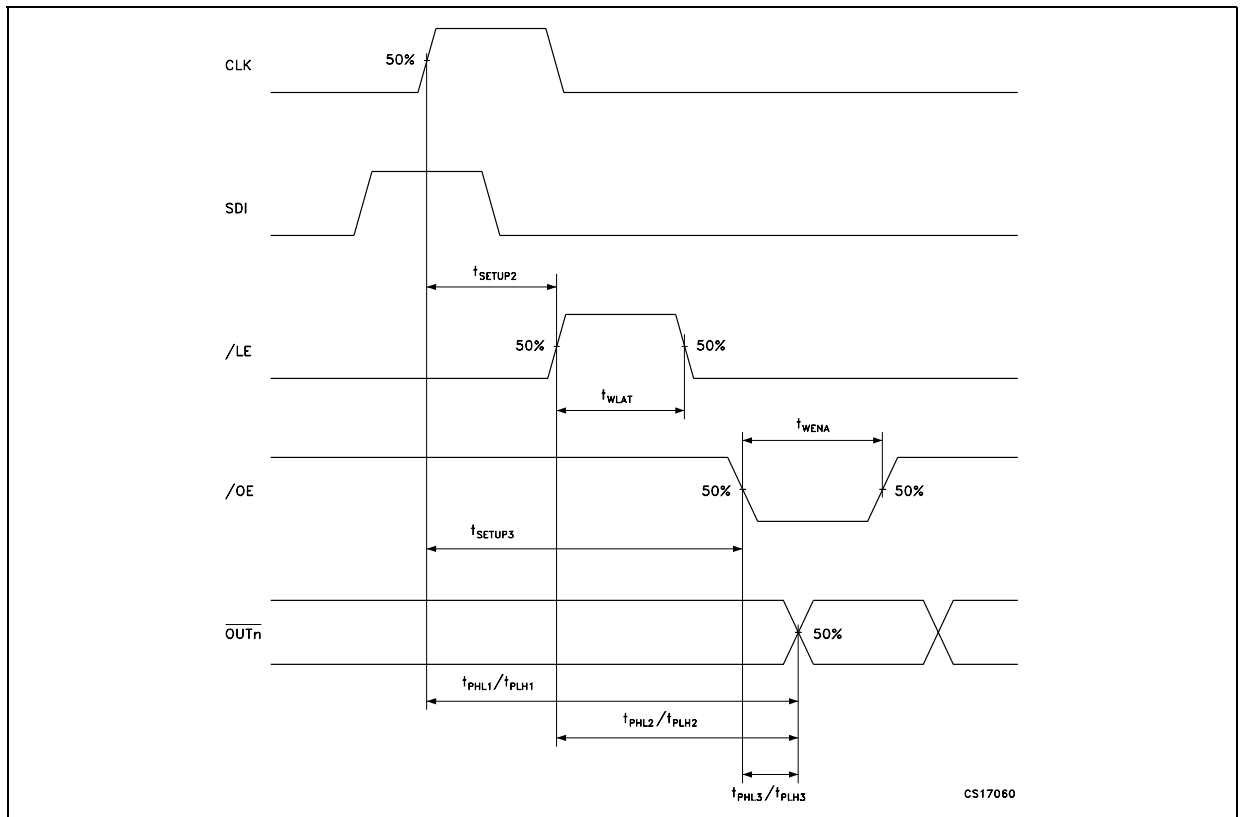
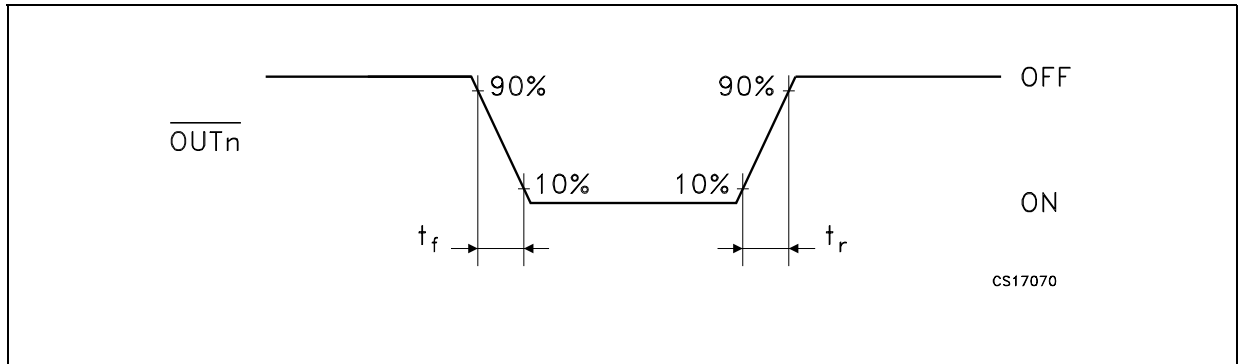


Figure 10: Outputs



TEST CIRCUIT

Figure 11: DC Characteristic

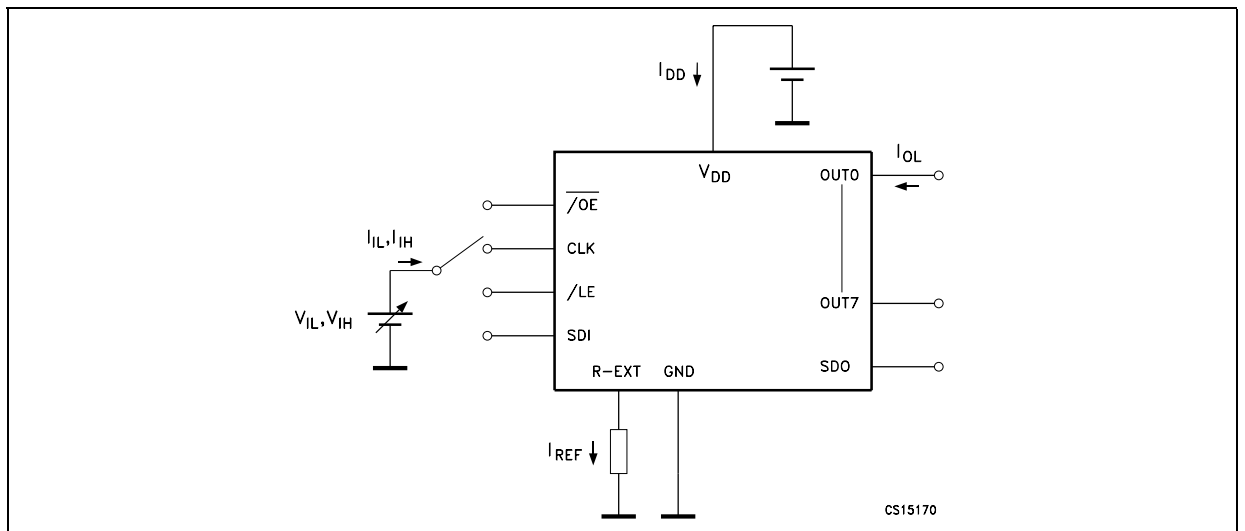
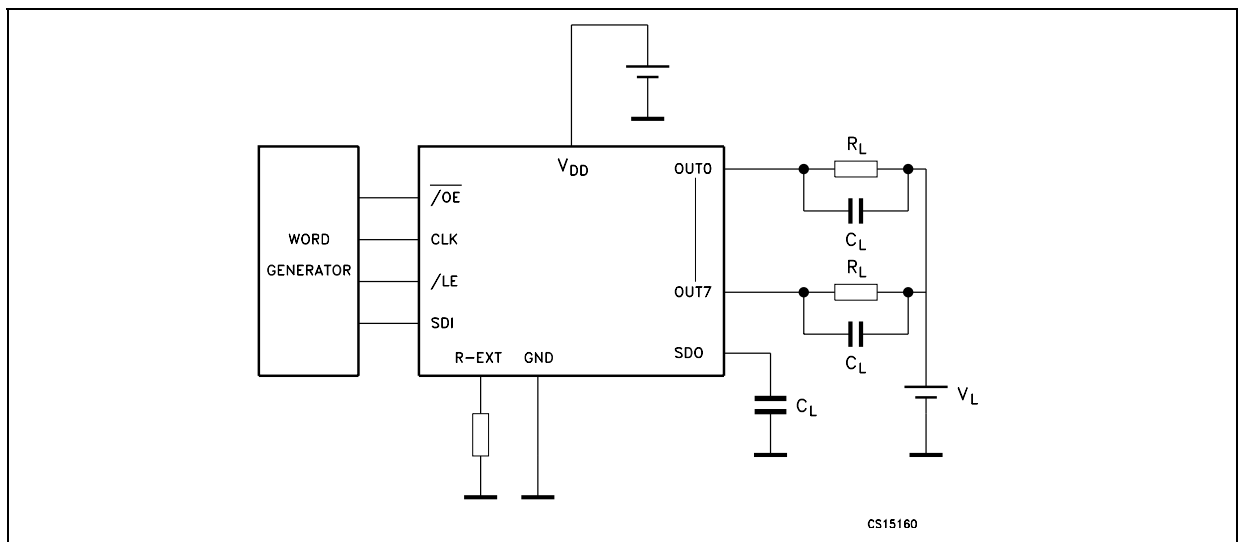
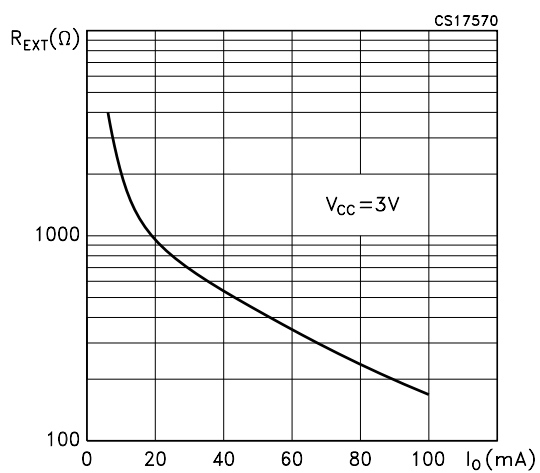
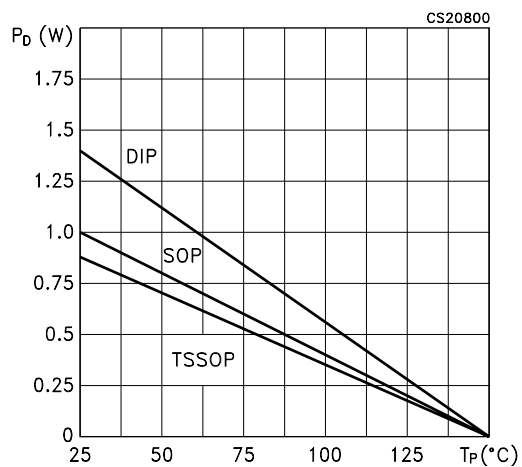


Figure 12: AC Characteristic

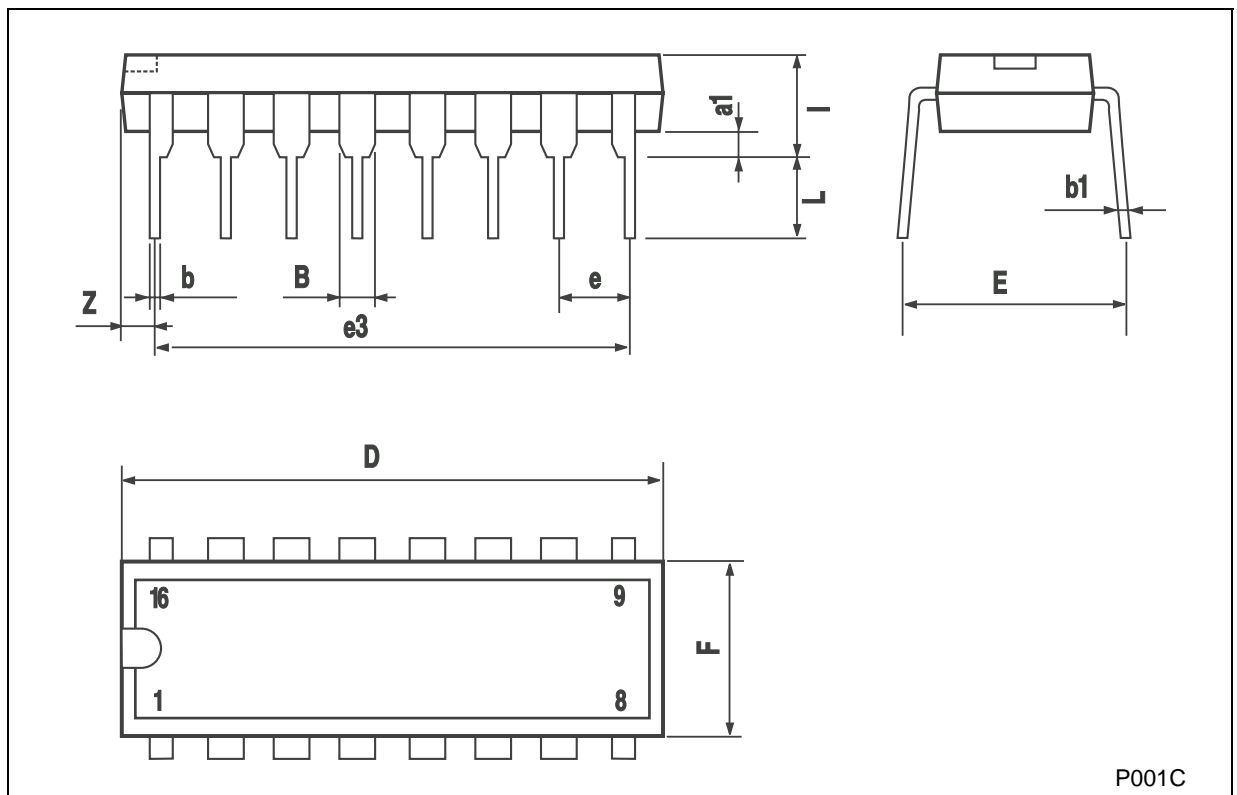




**Figure 13: Output Current- $R_{EXT}$  Resistor****Figure 14: Power Dissipation vs Temperature Package**

### Plastic DIP-16 (0.25) MECHANICAL DATA

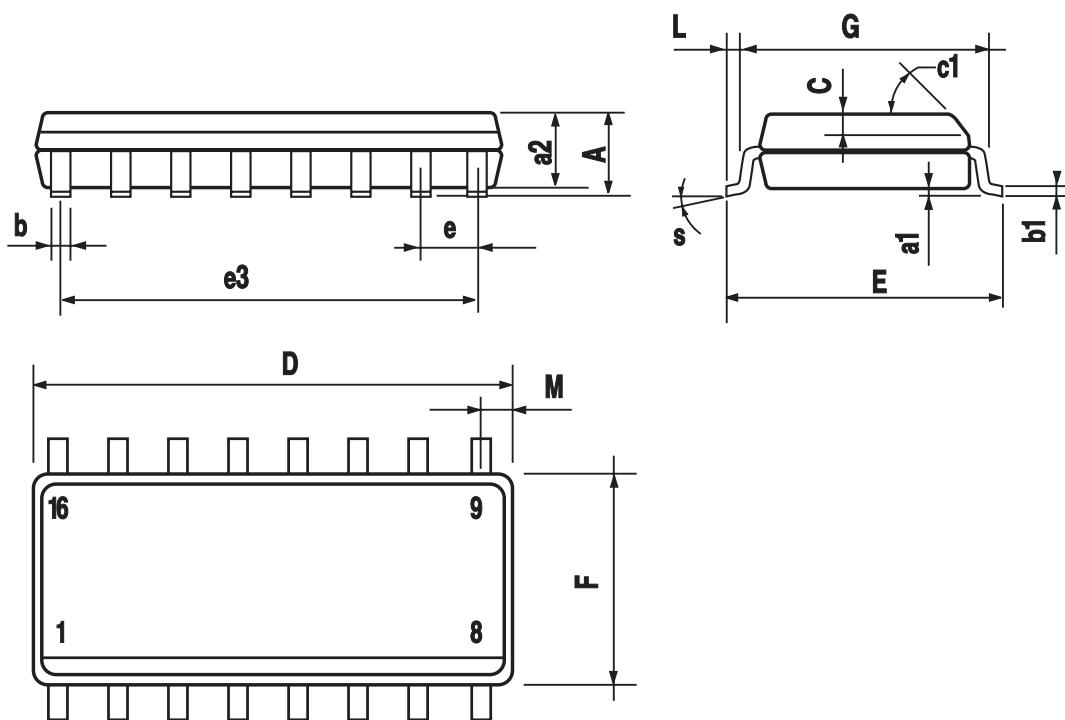
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



P001C

## SO-16 MECHANICAL DATA

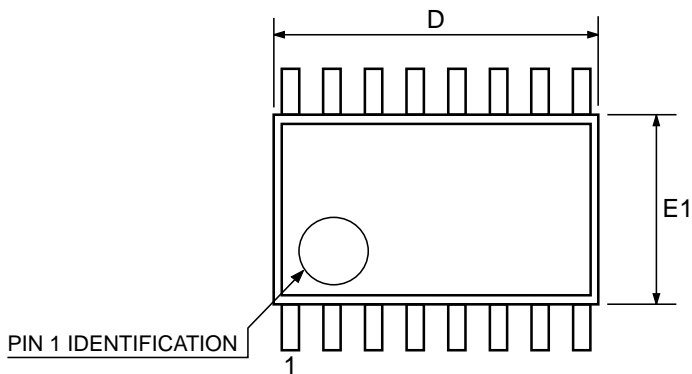
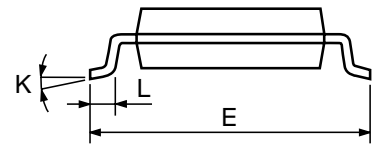
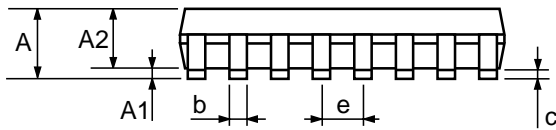
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.004		0.010
a2			1.64			0.063
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)					



0016020D

## TSSOP16 MECHANICAL DATA

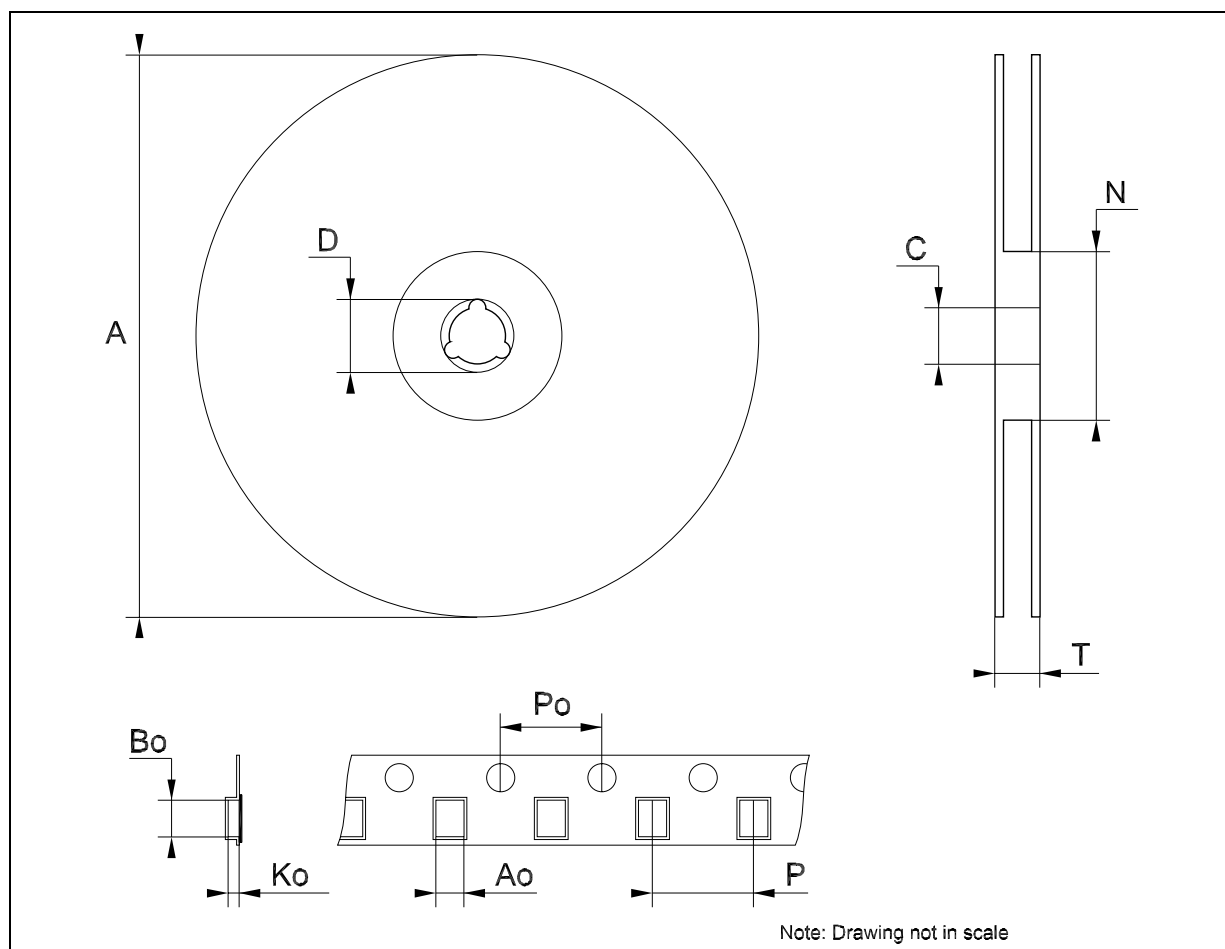
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0079
D	4.9	5	5.1	0.193	0.197	0.201
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030



0080338D

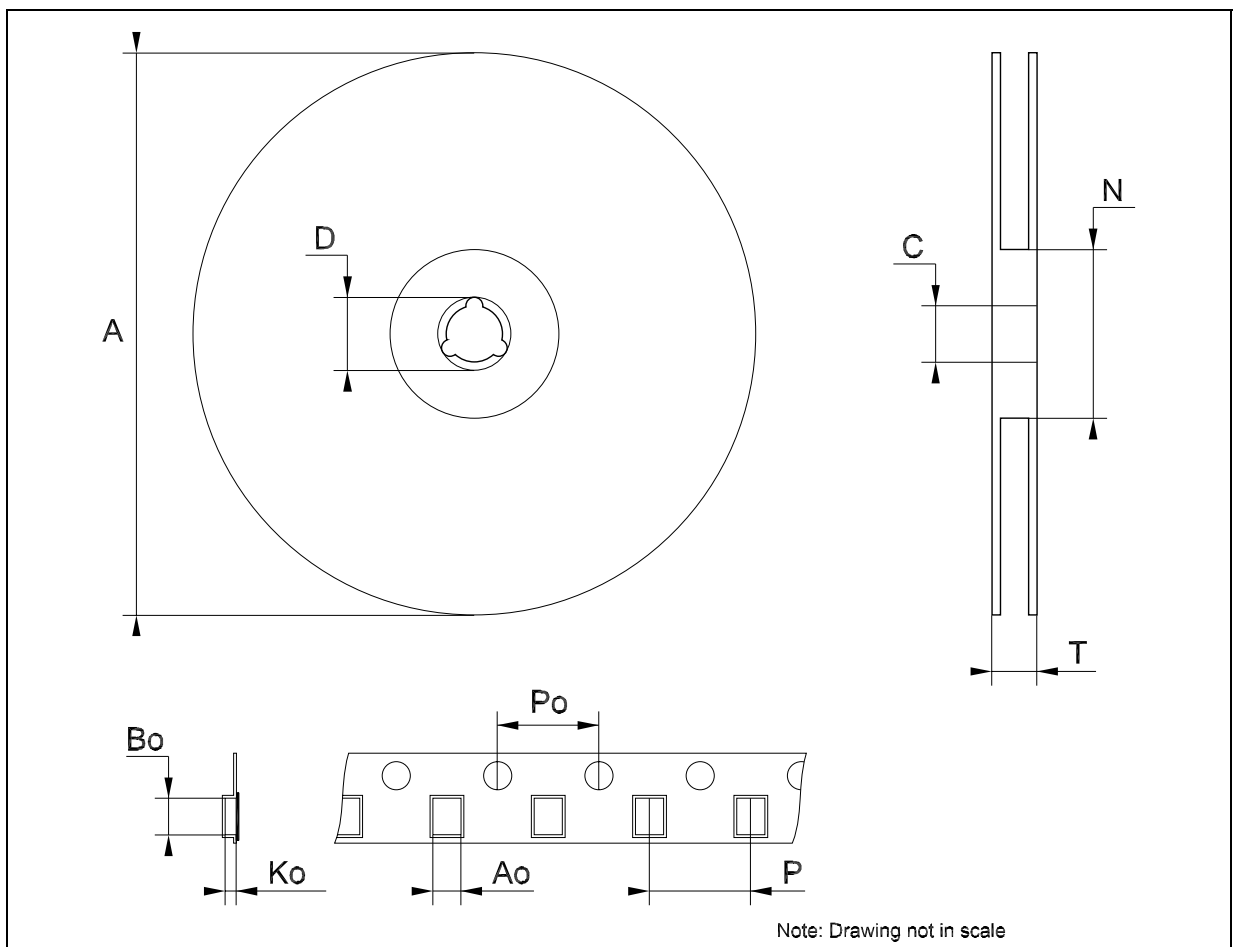
## Tape &amp; Reel SO-16 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	6.45		6.65	0.254		0.262
Bo	10.3		10.5	0.406		0.414
Ko	2.1		2.3	0.082		0.090
Po	3.9		4.1	0.153		0.161
P	7.9		8.1	0.311		0.319



## Tape &amp; Reel TSSOP16 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	6.7		6.9	0.264		0.272
Bo	5.3		5.5	0.209		0.217
Ko	1.6		1.8	0.063		0.071
Po	3.9		4.1	0.153		0.161
P	7.9		8.1	0.311		0.319



**Table 9: Revision History**

Date	Revision	Description of Changes
03-Aug-2004	7	Package TSSOP (Exposed Pad) removed. Table 8 - pag. 4 data changed. Figure 14 - pag. 10 changed.

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