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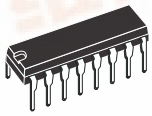
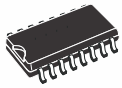
STP08C596

8-BIT CONSTANT CURRENT LED SINK DRIVER

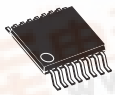
- 8 CONSTANT CURRENT OUTPUT CHANNELS
- ADJUSTABLE OUTPUT CURRENT THROUGH EXTERNAL RESISTOR
- SERIAL DATA IN/PARALLEL DATA OUT
- SERIAL OUT CHANGE STATE ON THE FAILING EDGES OF CLOCK
- OUTPUT CURRENT: 15-120 mA
- 25 MHz CLOCK FREQ.
- AVAILABLE IN HIGH THERMAL TSSOP EXPOSED PAD
- EFFICIENCY PACKAGE



DIP-16



SO-16



TSSOP16

DESCRIPTION

The STP08C596 is a monolithic, medium-voltage, low current power 8-bit shift register designed for LED panel display. The STP08C596 contains a 8-bit serial-in, parallel-out shift register that feeds a 8-bitD-type storage register. In the output stage, sixteen regulated current sources were designed to provide 15-120mA 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 STP08C596 output current, controlling in this way the light intensity of LEDs.

The STP08C596 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.

Table 1: Order Codes

Part Number	Temp. Range	Package	Comments
STP08C596B1	-40°C to 125°C	DIP-16	25 part per tube
STP08C596M	-40°C to 125°C	SO-16 (Tube)	50 parts per tube
STP08C596MTR	-40°C to 125°C	SO-16 (Tape & Reel)	1000 parts per reel
STP08C596TTR	-40°C to 125°C	TSSOP16 (Tape & Reel)	2500 parts per reel

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Table 2: Current Accuracy

Output Voltage	Current accuracy		Output Current
	Between bits	Between ICs	
≥ 0.7V	TYP. ± 3%	± 10%	15 to 120 mA

Figure 1: Pin Connection

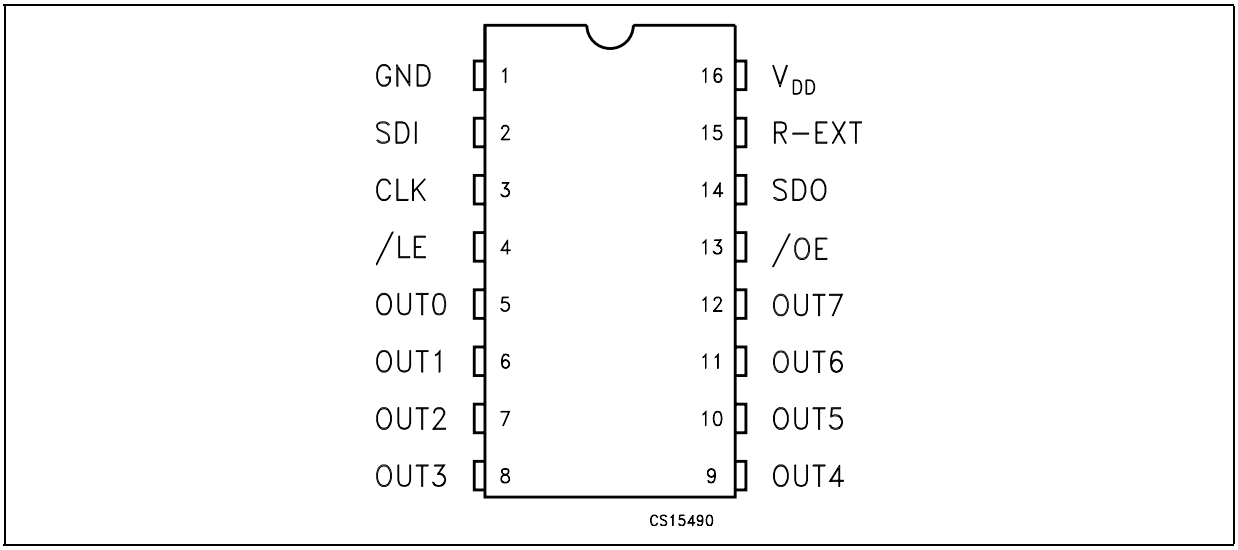


Table 3: Pin Description

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	$\overline{/OE}$	Output enable input terminal (active low)
14	SDO	Serial data out terminal
15	R-EXT	Constant Current programming
16	V_{DD}	5V Supply voltage terminal

Table 4: Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage	0 to 7	V
V_O	Output Voltage	-0.5 to 16	V
I_O	Output Current	120	mA
V_I	Input Voltage	-0.4 to V_{DD}+0.4	V
I_{GND}	GND Terminal Current	980	mA
f_{CLK}	Clock Frequency	25	MHz
T_{OPR}	Operating Temperature Range	-40 to +125	°C
T_{STG}	Storage Temperature Range	-55 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
$R_{thj\text{-}amb}$	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		4.5	5.0	5.5	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	MHz

Table 7: Electrical Characteristics (V_{DD}=5V, T = 25°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} = 16 V			10	µA
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 Ω	20.6	20.7	20.9	mA
I_{OL2}		V_O = 0.7V R_{EXT} = 360 Ω	50.6	51.0	51.5	mA
ΔI_{OL1}	Output Current Error between bit (All Output ON)	V_O = 0.7V R_{EXT} = 910 Ω			± 3	%
ΔI_{OL2}		V_O = 0.7V R_{EXT} = 360 Ω			± 3	%
$R_{SIN(up)}$	Pull-up Resistor		150	300	600	KΩ
$R_{SIN(down)}$	Pull-down Resistor		100	200	400	KΩ
$I_{DD(OFF1)}$	Supply Current (OFF)	R_{EXT} = OPEN OUT 0 to 7 = OFF		0.3	0.6	mA
$I_{DD(OFF2)}$		R_{EXT} = 470 Ω OUT 0 to 7 = OFF		5.5	7.7	
$I_{DD(OFF3)}$		R_{EXT} = 250 Ω OUT 0 to 7 = OFF		10.1	14.1	
$I_{DD(ON1)}$	Supply Current (ON)	R_{EXT} = 470 Ω OUT 0 to 7 = ON		5.5	7.7	
$I_{DD(ON2)}$		R_{EXT} = 250 Ω OUT 0 to 7 = ON		10.1	14.1	

Table 8: Switching Characteristics (V_{DD}=5V, T = 25°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} = 5 V	V_{IH} = V_{DD}		200	280	ns
t_{PLH2}	Propagation Delay Time, /LE-OUTn, /OE = L	V_{IL} = GND	C_L = 13pF		160	250	ns
t_{PLH3}	Propagation Delay Time, /OE-OUTn, /LE = H	I_O = 40mA	V_L = 3 V		145	200	ns
t_{PLH}	Propagation Delay Time, CLK-SDO	R_{EXT} = 470 Ω	R_L = 65 Ω		15	30	ns
t_{PHL1}	Propagation Delay Time, CLK-OUTn, /LE = H, /OE = L				15	30	ns
t_{PHL2}	Propagation Delay Time, /LE-OUTn, /OE = L				15	30	ns
t_{PHL3}	Propagation Delay Time, /OE-OUTn, /LE = H				45	60	ns
t_{PHL}	Propagation Delay Time, CLK-SDO				15	300	ns
t_r	Output Rise Time				160	200	ns
t_f	Output Fall Time				15	25	ns

EQUIVALENT CIRCUIT OF INPUTS AND OUTPUTS

Figure 2: /OE Terminal

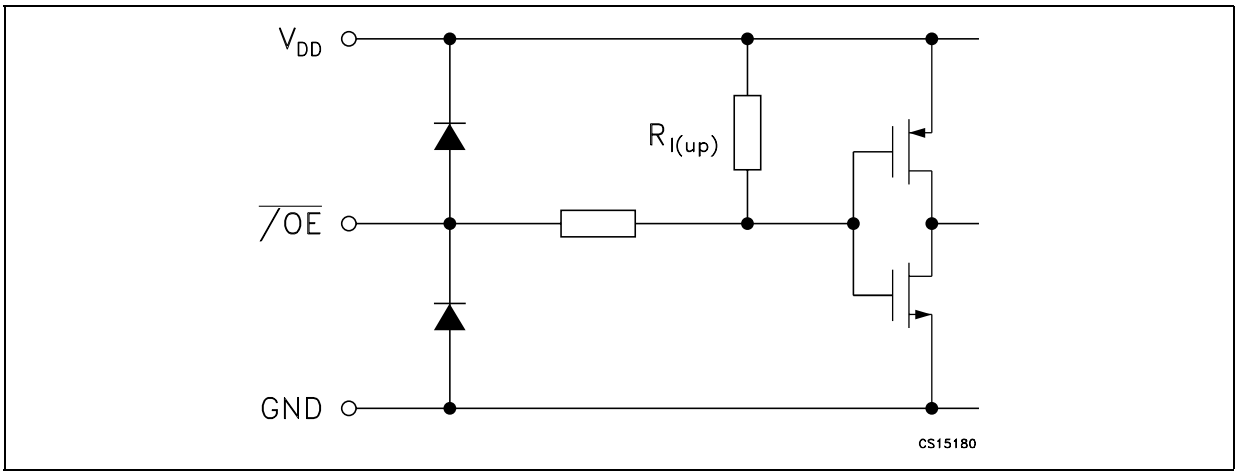


Figure 3: /LE Terminal

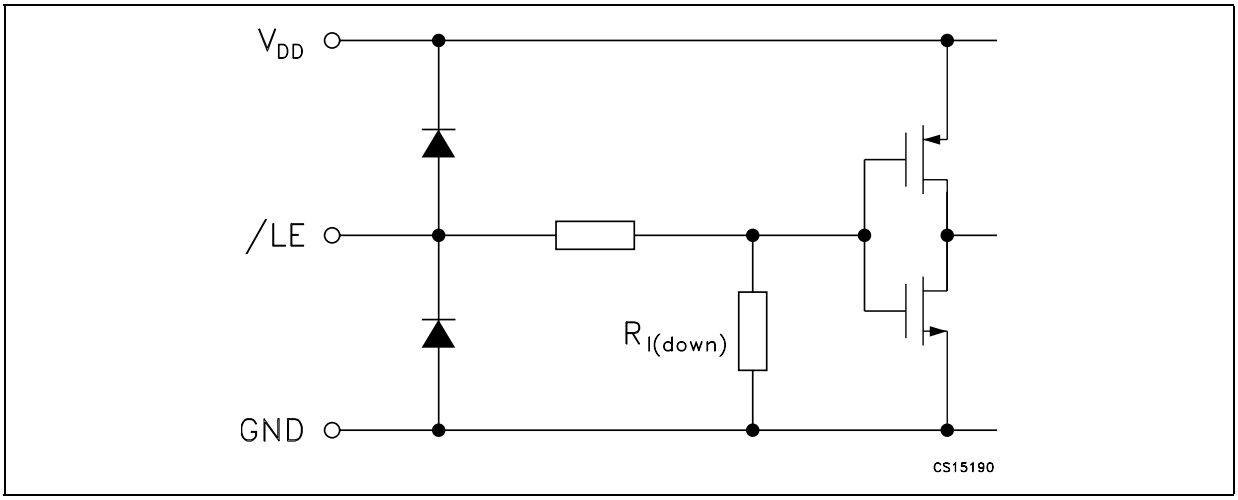


Figure 4: CLK, SDI Terminal

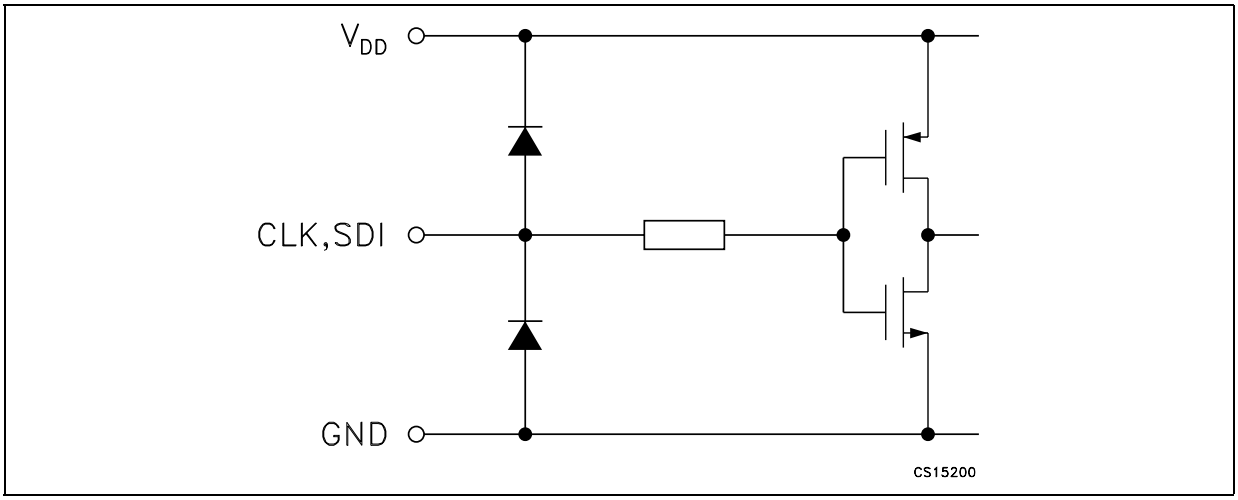


Figure 5: SDO Terminal

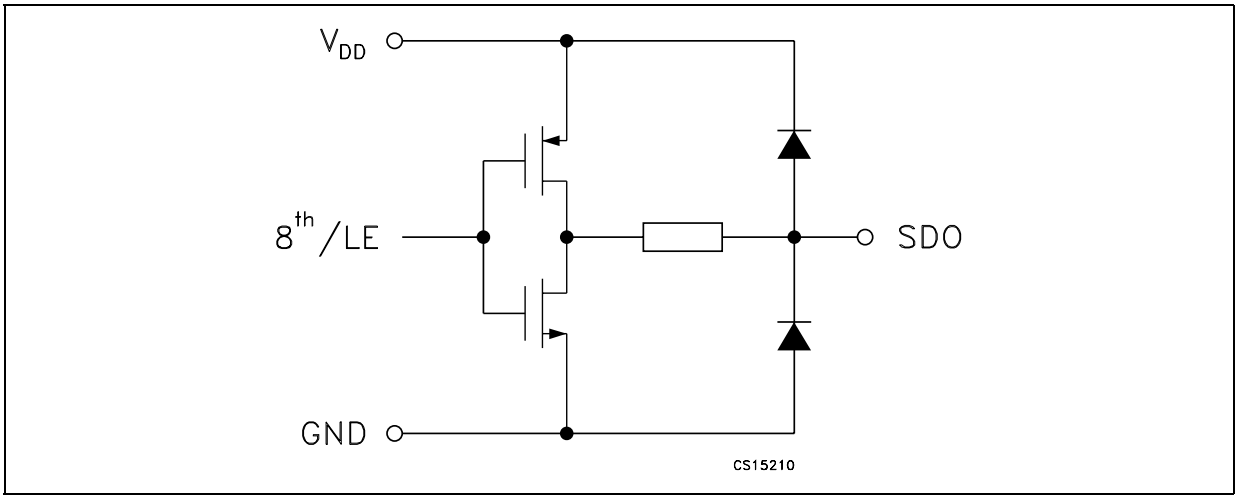


Figure 6: Block Diagram

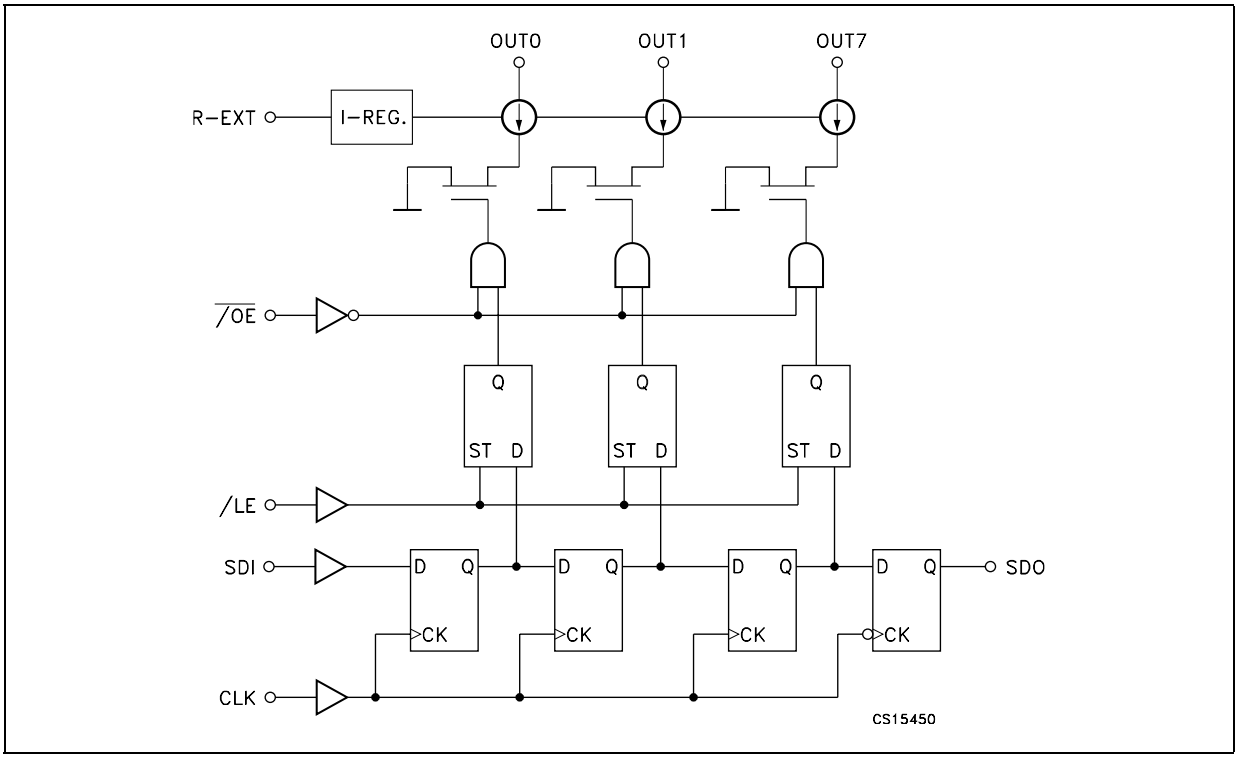


Figure 7: Timing Diagram

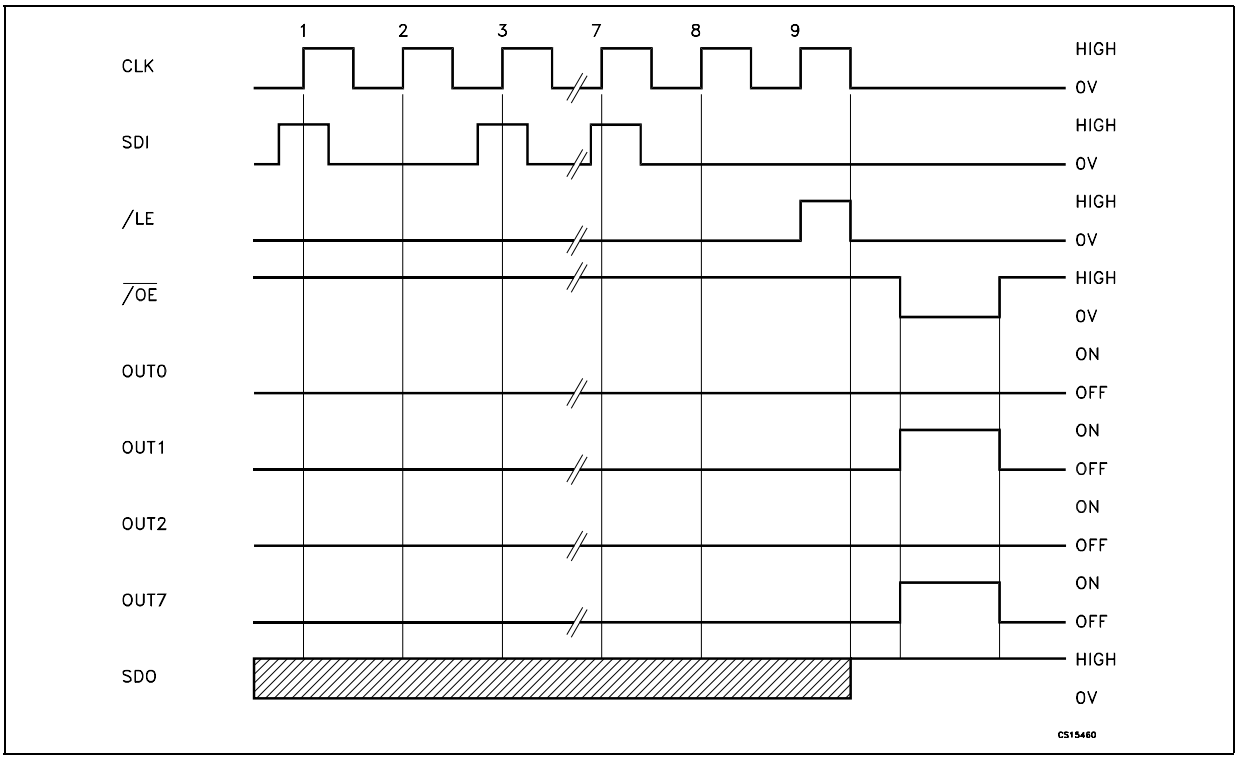


Figure 8: Clock, Serial-In, Serial-Out

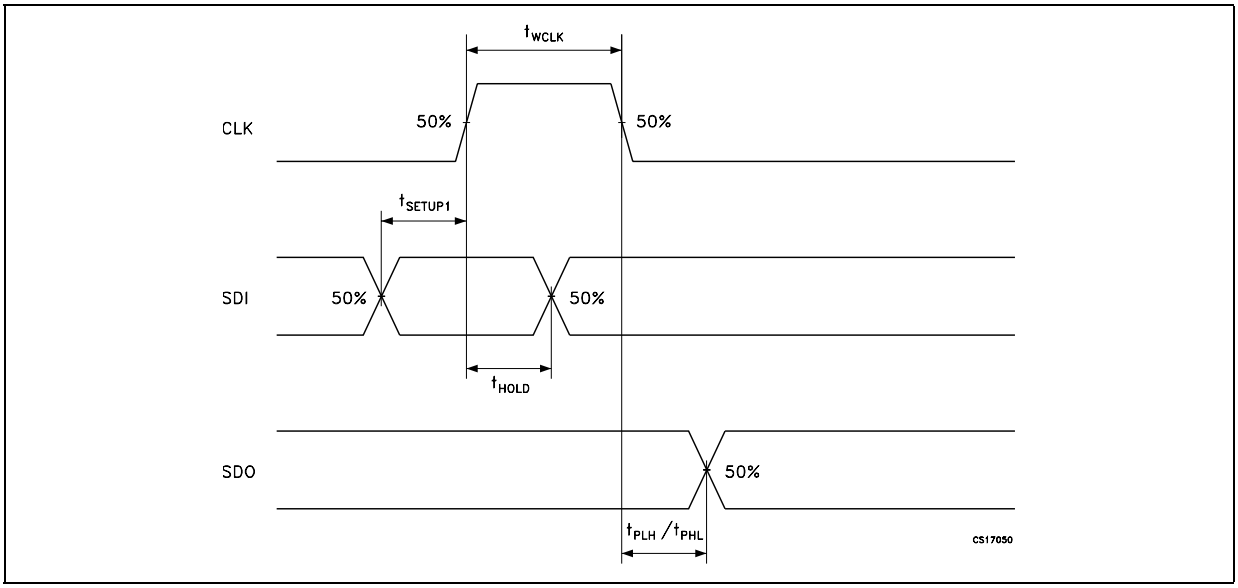


Figure 9: Clock, Serial-In, Latch, Enable, Outputs

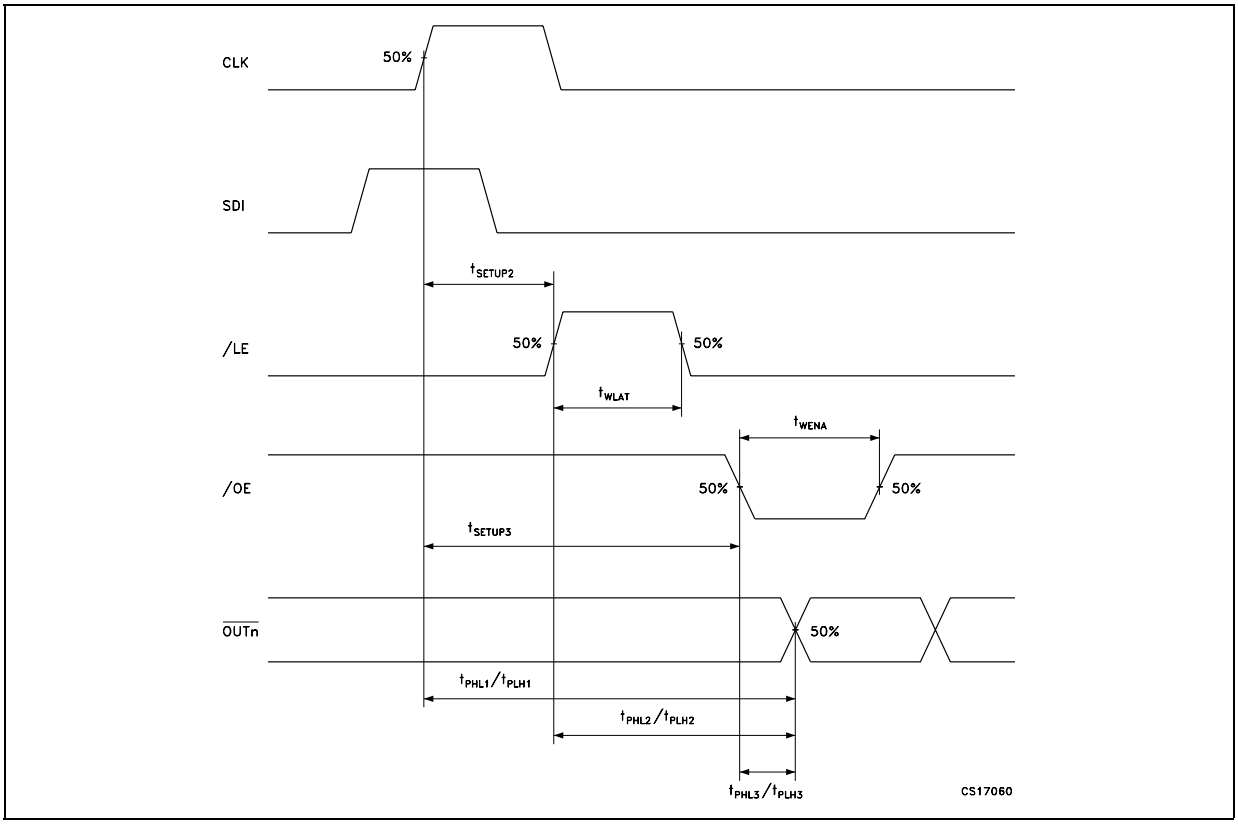
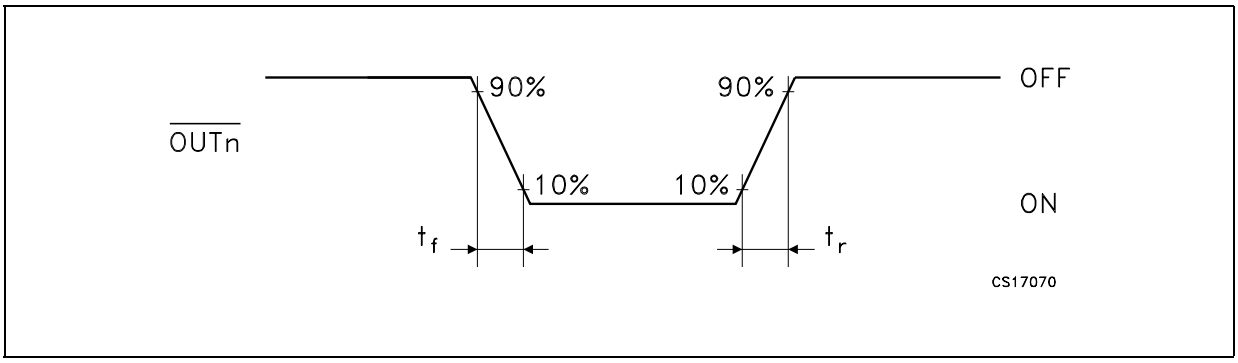


Figure 10: Outputs



TEST CIRCUIT

Figure 11: DC Characteristic

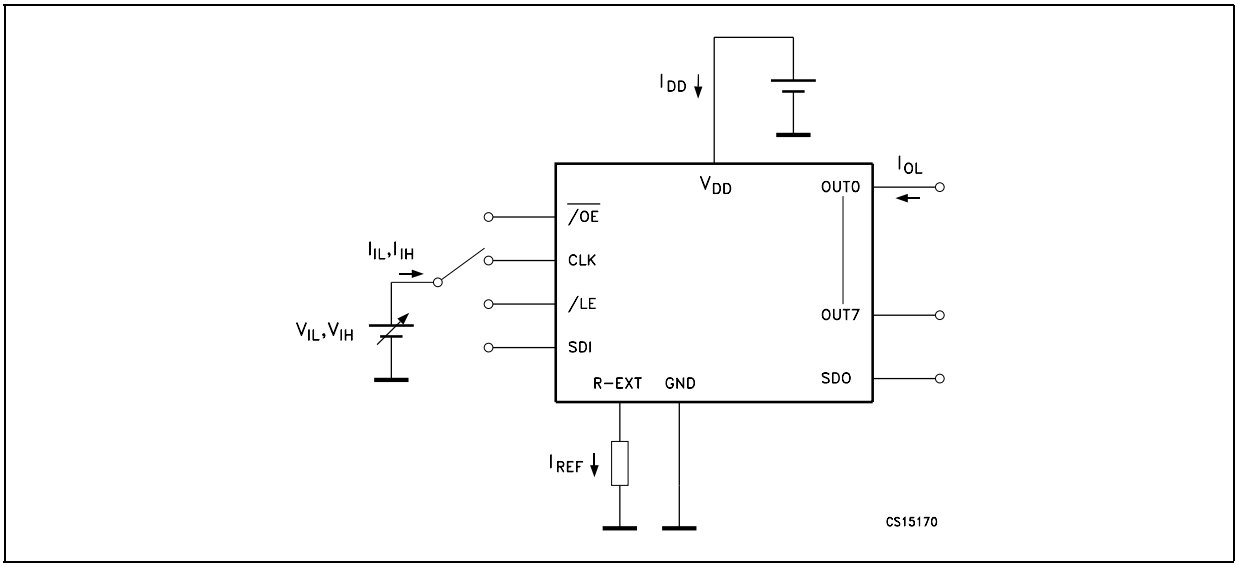


Figure 12: AC Characteristic

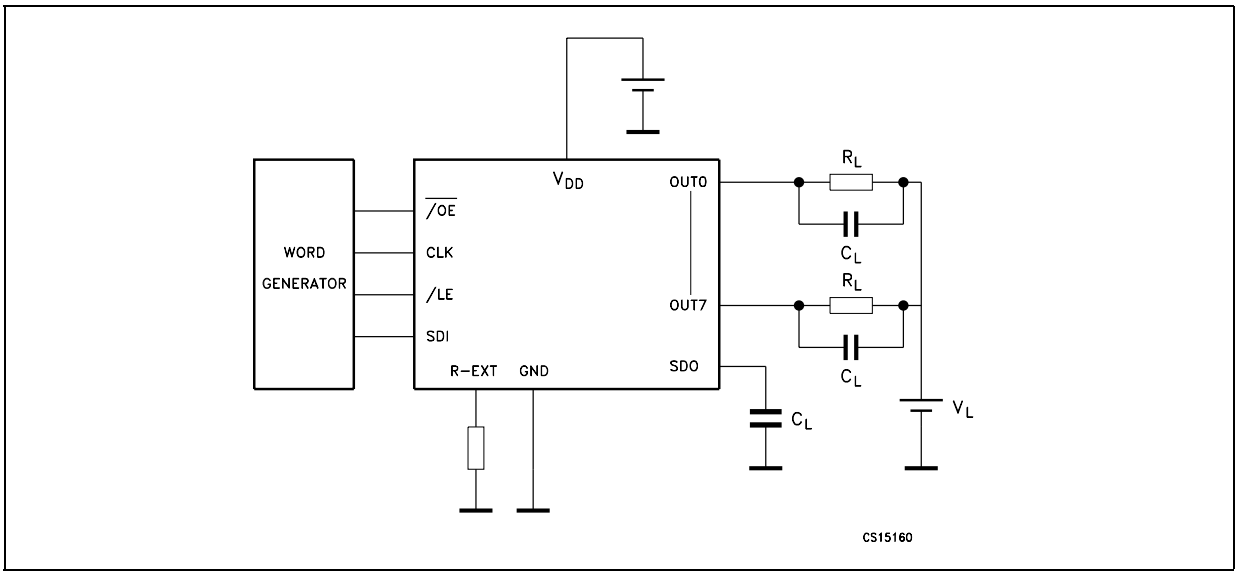


Figure 13: Output Current-R_{EXT} Resistor

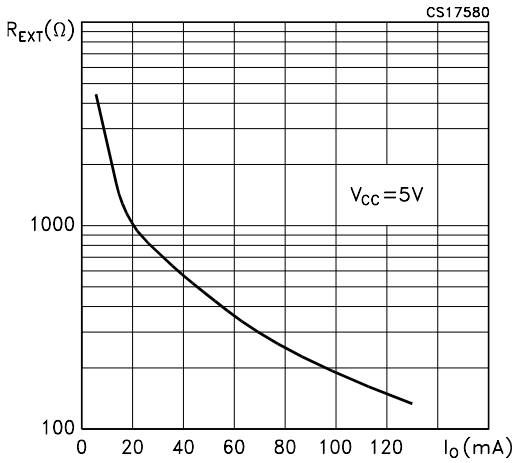
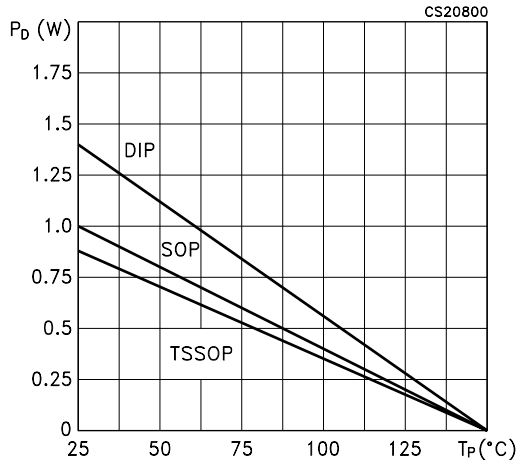
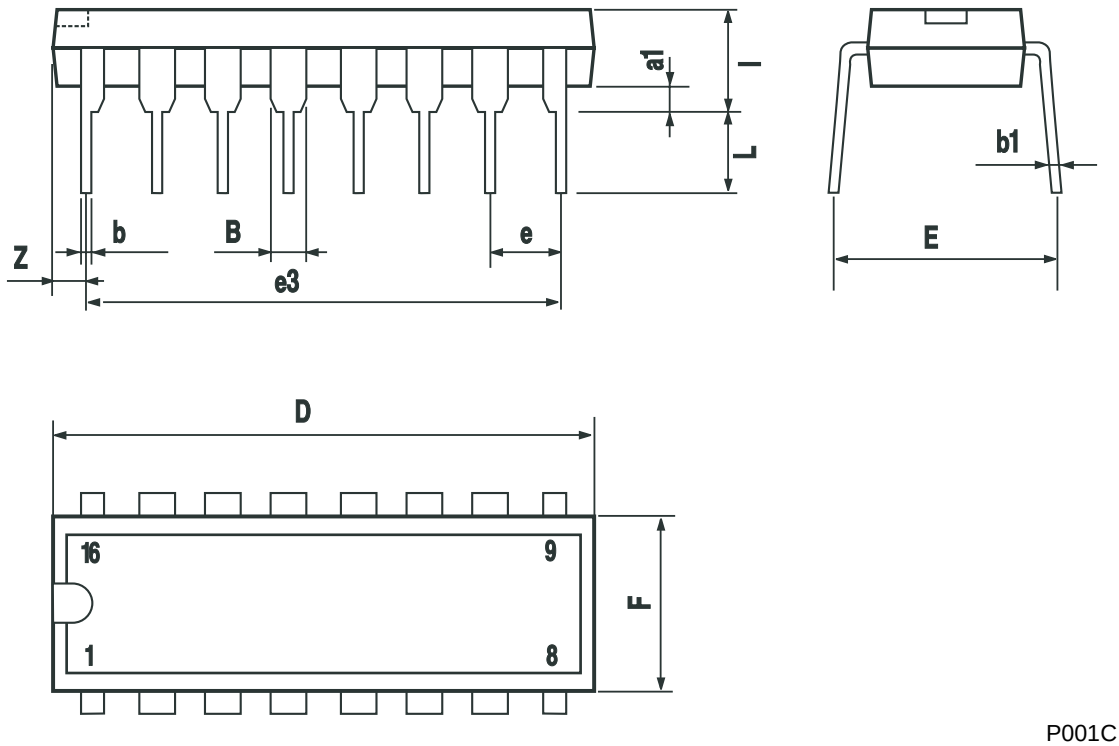


Figure 14: Power Dissipation vs Temperature Package



Plastic DIP-16 (0.25) MECHANICAL DATA

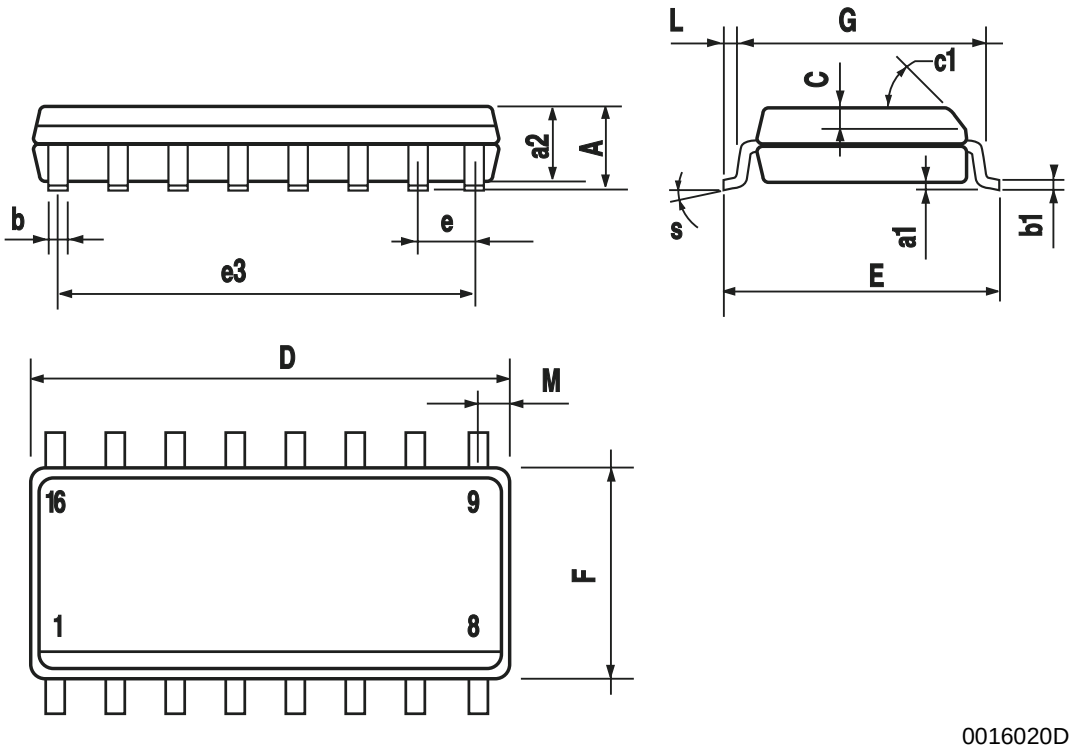
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



P001C

SO-16 MECHANICAL DATA

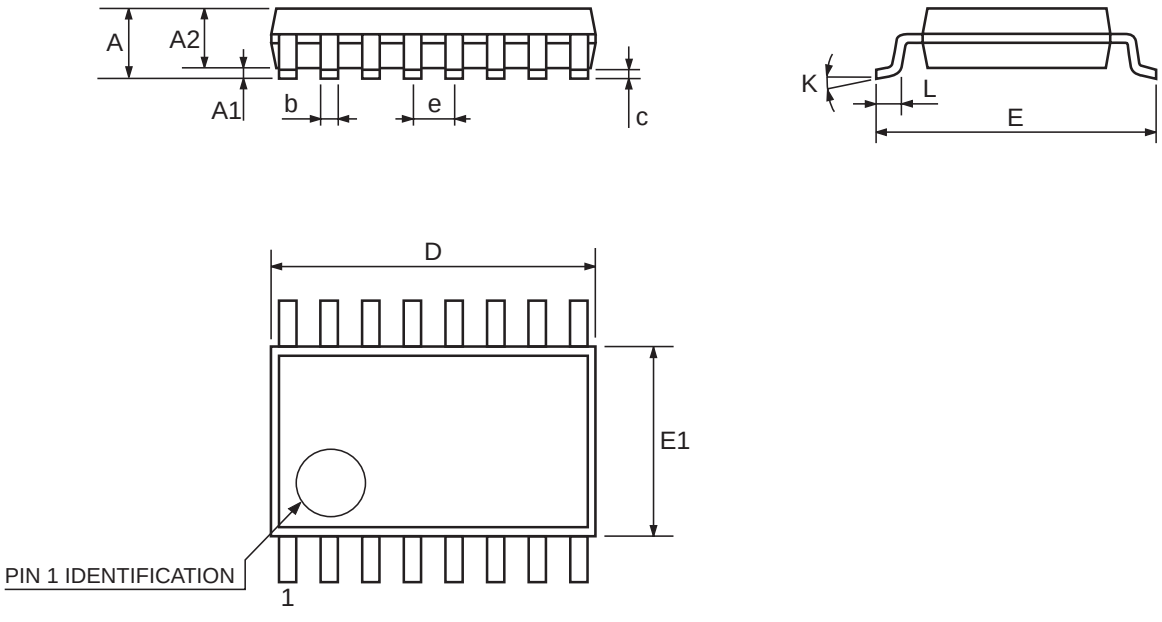
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.004		0.010
a2			1.64			0.063
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157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

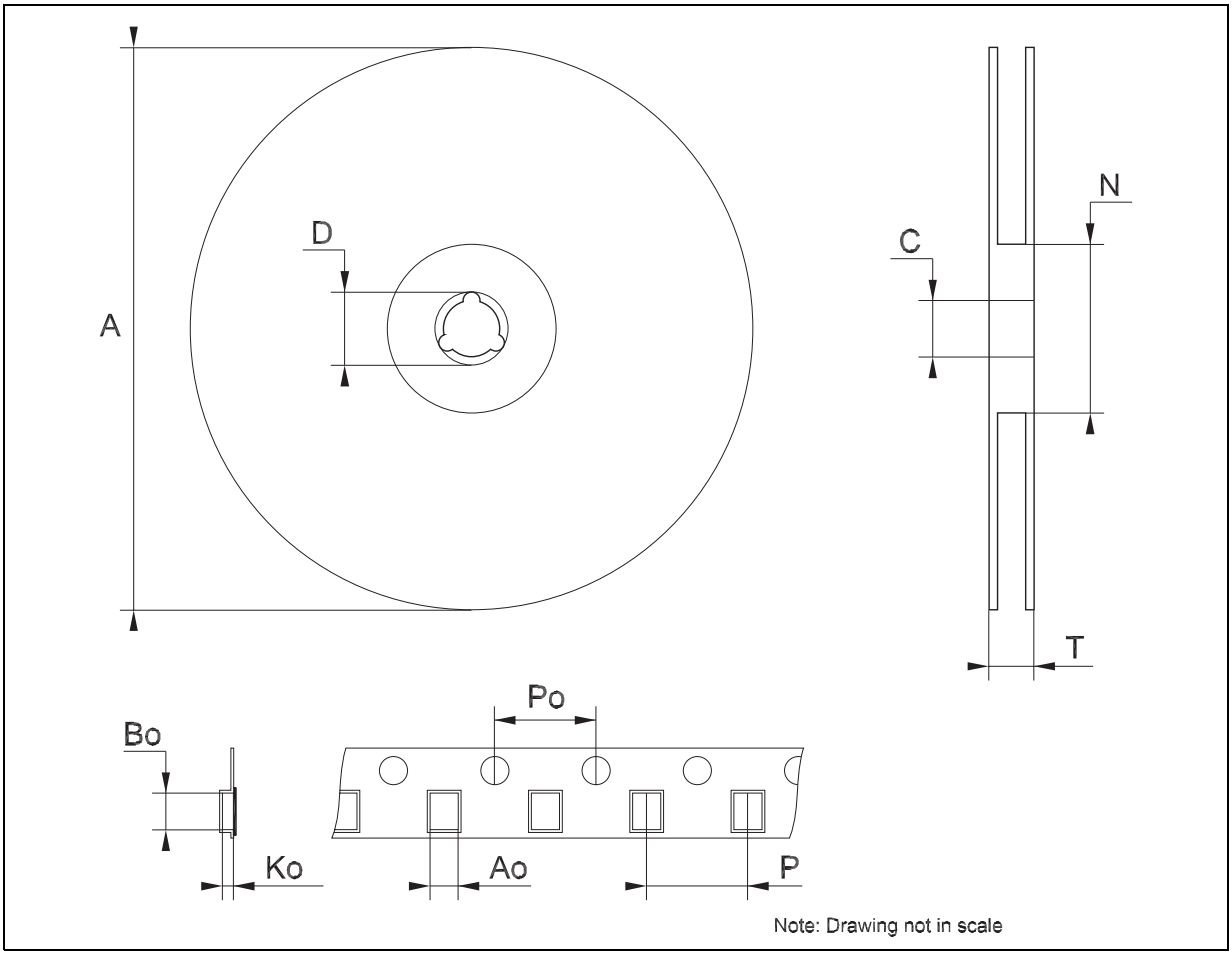
TSSOP16 MECHANICAL DATA

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



Tape & Reel SO-16 MECHANICAL DATA

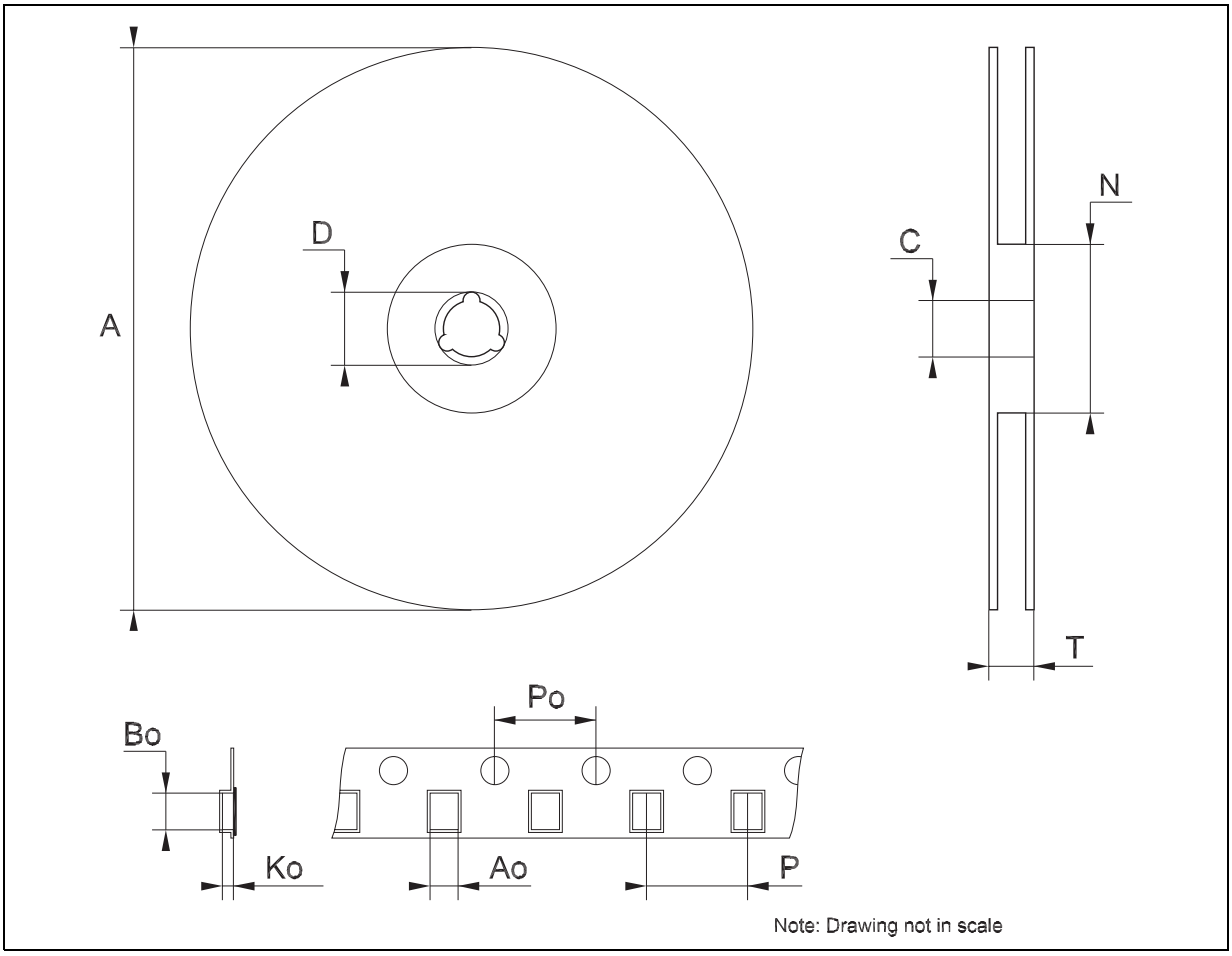
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	6.45		6.65	0.254		0.262
Bo	10.3		10.5	0.406		0.414
Ko	2.1		2.3	0.082		0.090
Po	3.9		4.1	0.153		0.161
P	7.9		8.1	0.311		0.319



Note: Drawing not in scale

Tape & 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



Note: Drawing not in scale

Table 9: Revision History

Date	Revision	Description of Changes
03-Aug-2004	6	Package TSSOP (Exposed Pad) removed. Table 8 - pag. 4 data changed. Figure 14 - pag. 10 changed.
23-Feb-2005	7	Mistake on Table 7 - I_{DDOFF} and I_{DDON} OUT 0 to 15 ==> OUT 0 to 7.

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