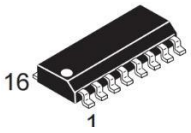
General Description

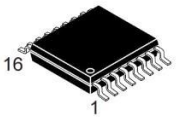
The CD4511B BCD-to-seven segment latch/ decoder/driver is constructed with complementary MOS (CMOS) enhancement mode devices and NPN bipolar out- put drivers in a single monolithic structure. The circuit pro- vides the functions of a 4-bit storage latch, an 8421 BCD-to- seven segment decoder, and an output drive capability. Lamp test (LT), blanking (BI), and latch enable (LE) inputs are used to test the display, to turn-off or pulse modulate the brightness of the display, and to store a BCD code, respectively. It can be used with seven-segment light emit- ting diodes (LED), incandescent, fluorescent, gas discharge, or liquid crystal readouts either directly or indirectly.

Applications include instrument (e.g., counter, DVM, etc.) display driver, computer/calculator display driver, cockpit display driver, and various clock, watch, and timer uses.

DIP-16



SOP-16



TSSOP-16

Features

- Low logic circuit power dissipation
- High current sourcing outputs (up to 25 mA)
- Latch storage of code
- Blanking input
- Lamp intensity modulation capabilityLamp test provision
- Time share (multiplexing) facility
- Equivalent to Motorola MC14511

Ordering Information

DEVICE	Package Type	Marking	Packing	Packing Qty
CD4511BE/CD4511BN	DIP-16	CD4511B	TURE	1000pcs/Box
CD4511BM/TR	SOP-16	CD4511B	REEL	2500pcs/Reel
CD4511BMT/TR	TSSOP-16	CD4511B	REEL	2500pcs/Reel

Connection Diagram

DIP-16/SOP-16/TSSOP-16

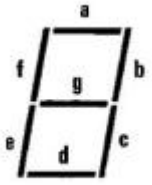
Truth Table

Inputs							Outputs							
LE	BI	LT	D	C	B	A	a	b	c	d	e	f	g	Display
X	X	0	X	X	X	X	1	1	1	1	1	1	1	B
X	0	1	X	X	X	X	0	0	0	0	0	0	0	
0	1	1	0	0	0	0	1	1	1	1	1	1	0	0
0	1	1	0	0	0	1	0	1	1	0	0	0	0	1
0	1	1	0	0	1	0	1	1	0	1	1	0	1	2
0	1	1	0	0	1	1	1	1	1	1	0	0	1	3
0	1	1	0	1	0	0	0	1	1	0	0	1	1	4
0	1	1	0	1	0	1	1	0	1	1	0	1	1	5
0	1	1	0	1	1	0	0	0	1	1	1	1	1	6
0	1	1	0	1	1	1	1	1	1	0	0	0	0	7
0	1	1	1	0	0	0	1	1	1	1	1	1	1	8
0	1	1	1	0	0	1	1	1	1	0	0	1	1	9
0	1	1	1	0	1	0	0	0	0	0	0	0	0	
0	1	1	1	0	1	1	0	0	0	0	0	0	0	
0	1	1	1	1	0	0	0	0	0	0	0	0	0	
0	1	1	1	1	0	1	0	0	0	0	0	0	0	1
1	1	1	1	0	0	0	0	0	0	0	0			
0	1	1	1	1	1	1	0	0	0	0	0	0	0	
1	1	1	X	X	X	X				*				*

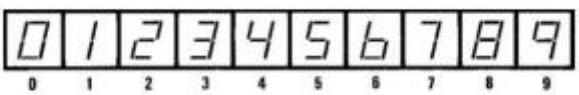
X-Don't Care

*Depends upon the BCD code applied during the 0 to 1 transition of LE.

Segment Identification



Display



Absolute Maximum Ratings

Condition		Min	Max	Units
DC Supply Voltage (Vpp)		—0.5	18	V
nput Voltage (Vin)		—0.5	Vbp+0.5	V
Storage Temperature Range (Ts)		-65	150	℃
PowerDissipation (PD)	Dual-In-Line		700	mW
	Small Outline		500	
Lead Temperature (T1)	(Soldering,10 seconds)		245	℃

Absolute Maximum Ratings indicate limits beyond which damage to the device may occur.Operating Ratings indicate conditions for which the device is intended to be functional,but specific performance is not ensured.

Recommended Operating Conditions

Condition	Min	Max	Units
DC Supply Voltage (VDD	5	15	V
Input Voltage (Vn)	0V to VDD		V
Operating Temperature Range (TA)	40	85	℃

DC Electrical Characteristics

Symbol	Parameter	Condition	—40℃	+25℃	+85℃	Units

			Min	Max	Min	Typ	Max	Min	Max	
IDD	Quiescent Supply Current	VDD=5V, VIN=VDD or VSS VDD=10V, VIN =VDD or VSS VDD=15V, VIN =VDD or VSS		5 10 20			5 10 20		150 300 600	mA mA mA
VOL	Output Voltage Logical "0" Level	VDD=5V VDD=10V VDD=15V		0.01 0.01 0.01		0 0 0	0.01 0.01 0.01		0.05 0.05 0.05	V
VOH	Output Voltage Logical "1" Level	VDD=5V VDD=10V VDD=15V	4.1 9.1 14.1		4.1 9.1 14.1	4.57 9.58 14.59		4.1 9.1 14.1		V
VIL	Low Level Input Voltage	VDD=5V, VOUT=3.8V or 0.5V VDD=10V, VOUT=8.8V or 1.0V VDD=15V, VOUT=13.8V or 1.5V		1.5 3.0 4.0		2 4 6	1.5 3.0 4.0		1.5 3.0 4.0	V
VIH	High Level Input Voltage	VDD=5V, VOUT=0.5V or 3.8V VDD=10V, VOUT=1.0V or 8.8V VDD=15V, VOUT=1.5V or 13.8V	3.5 7.0 11.0		3.5 7.0 11.0	3 6 9		3.5 7.0 11.0		V
VOH	Output (Source)Drive Voltage	VDD=5V, IOH=0 mA VDD=5V, IOH=5 mA VDD=5V, IOH=10 mA VDD=5V, IOH=15 mA VDD=5V, IOH=20 mA VDD=5V, IOH=25 mA	4.1 3.9 3.4		4.1 3.9 3.4	4.57 4.24 4.12 3.94 3.75 3.54		4.1 3.5 3.0		V
		VDD=10V, IOH=0 mA VDD=10V, IOH=5 mA VDD=10V, IOH=10 mA VDD=10V, IOH=15 mA VDD=10V, IOH=20 mA VDD=10V, IOH=25 mA	9.1 9.0 8.6		9.1 9.0 8.6	9.58 9.26 9.17 9.04 8.9 8.75		9.1 8.6 8.2		V
		VDD=15V, IOH=0 mA VDD=15V, IOH=5 mA VDD=15V, IOH=10 mA VDD=15V, IOH=15 mA VDD=15V, IOH=20 mA VDD=15V, IOH=25 mA	14.1 14.0 13.6		14.1 14.0 13.6	9.58 14.27 14.17 14.07 13.95 13.8		14.1 13.6 13.2		V
IOL	Low Level Output Current	VDD=5V, VOL=0.4V VDD=10V, VOL=0.5V VDD=15V, VOL=1.5V	0.64 1.6 4.2		0.51 1.3 3.4	0.88 2.25 8.8		0.36 0.9 2.4		mA
IIN	Input Current	VDD=15V, VIN=0V VDD=15V, VIN=5V		-0.10 0.10		-10-5 10-5	-0.10 0.10		—1.0 1.0	μA μA

Note1:Devices should not be connected with power on.

DC Electrical Characteristics

Symbol	Parameter	Conditions	-40℃		+25C			+85	C	Units
			Min	Max	Min	Typ	Max	Min	Max	

IDD	Quiescent Supply Current	VDD-5V VDD-10V VDD-15V		20 40 80			20 40 80		150 300 600	μA
VOL	Output Voltage Logical “0” Level	VDD-5V VDD-10V VDD-15V		0.01 0.01 0.01		0 0 0	0.01 0.01 0.01		0.05 0.05 0.05	V
VoH	Output Voltage Logical “1” Level	VDD-5V VDD-10V VDD-15V	4.1 9.1 14.1		4.1 9.1 14.1	4.57 9.58 14.59		4.1 9.1 14.1		V
VIL	Low Leve Input Voltage	VDD-5V, VOUT-3.8V or 0.5V VDD-10V, VOUT-8.8V or 1.0V VDD-15V, VOUT-13.8Vor 1.5V		1.5 3.0 4.0		4 6	1.5 3.0 4.0		1.5 3.0 4.0	V
VIH	High Leve Input Voltage	VDD-5V, VOUT-0.5V or 3.8V VD-10V, VOUT-1.0V or 8.8V VDD-15V, VOUT-1.5Vor 13.8V	3.5 7.0 11.0		3.5 7.0 11.0	3 6 9		3.5 7.0 11.0		V
VOH	Output (Source) Drive Voltage	VDD-5V, IOH-0mA VDD-5V, IOH-5mA VDD-5V, IOH-10 mA VDD-5V, IOH-15 mA VDD-5V, IOH-20 mA VDD-5V, IOH-25 mA	4.1 3.6 2.8		4.1 3.6 2.8	4.57 4.24 4.12 3.94 3.75 3.54		4.1 3.3 2.5		V
		VDD-10V, IOH-0mA VDD-10V, IOH-5mA VDD-10V, IOH-10 mA VDD-10V, IOH-15mA VDD-10V, IOH-20 mA VDD-10V, IOH-25mA	9.1 8.75 8.1		9.1 8.75 8.1	9.58 9.26 9.17 9.04 8.9 8.75		9.1 8.45 7.8		V
		VDD-15V, IOH-0 mA VDD-15V, IOH-5 mA VDD-15V, IOH-10 mA VDD-15V, IOH-15 mA VDD-15V, IOH-20 mA VDD-15V, IOH-25 mA	14.1 13.75 13.1		14.1 13.75 13.1	14.59 14.27 14.18 14.07 13.95 13.8		14.1 13.45 12.8		V
IOL	Low Leve Output Current	VDD-5V, VOL-0.4V VDD-10V, VOL-0.5V VDD-15V, VOL-1.5V	0.52 1.3 3.6		0.44 1.1 3.0	0.88 2.25 8.8		0.36 0.9 2.4		mA
IIN	Input Current	VDD—15V, VIN—0V VDD-15V, VIN-15V		—0.30 0.30		-10-5 10-5	-0.30 0.30		-10 1.0	μA

AC Electrical Characteristics*

TA=25° C and CL=50 pF, typical temperature coeficient for all values of Vbd-0.3%1C

Symbol	Parameter	Conditions	CD4511B			Units
			Min	Typ	Max	

CiN	Input Capacitance	VIN=0		5.0	7.5	pF
tr	Output Rise Time (Figure 1a)	VDD=5V VDD=10V VDD=15V		40 30 25	80 60 50	ns
tf	Output Fall Time (Figure 1a)	VDD=5V VDD=10V VDD=15V		125 75 65	250 150 130	ns
tPLH	Turn-Off Delay Time (Data) (Figure 1a)	VDD=5V VDD=10V VDD=15V		640 250 175	1280 500 350	ns
tPHL	Turn-On Delay Time (Data) (Figure 1a)	VDD=5V VDD=10V VDD=15V		720 290 195	1440 580 400	ns
tPLH	Turn-Off Delay Time (Blank) (Figure 1a)	VDD=5V VDD=10V VDD=15V		320 130 100	640 260 200	ns
tPHL	Turn-On Delay Time (Blank) (Figure 1a)	VDD=5V VDD=10V VDD=15V		485 200 160	970 400 320	ns
tPLH	Turn-Off Delay Time (Lamp Test) (Figure 1a)	VDD=5V VDD=10V VDD=15V		313 125 90	625 250 180	ns
tPHL	Turn-On Delay Time (Lamp Test) (Figure 1a)	VDD=5V VDD=10V VDD=15V		313 125 90	625 250 180	ns
tSETUP	Setup Time (Figure 1b)	VDD=5V VDD=10V VDD=15V	180 76 40	90 38 20		ns
tHOLD	Hold Time (Figure 1b)	VDD=5V VDD=10V VDD=15V	0 0 0	-90 -38 -20		ns
PWLE	Minimum Latch Enable Pulse Width (Figure 1c)	VDD=5V VDD=10V VDD=15V	520 220 130	260 110 65		ns

*AC Parameters are guaranteed by DC correlated testing.

Switching Time Waveforms

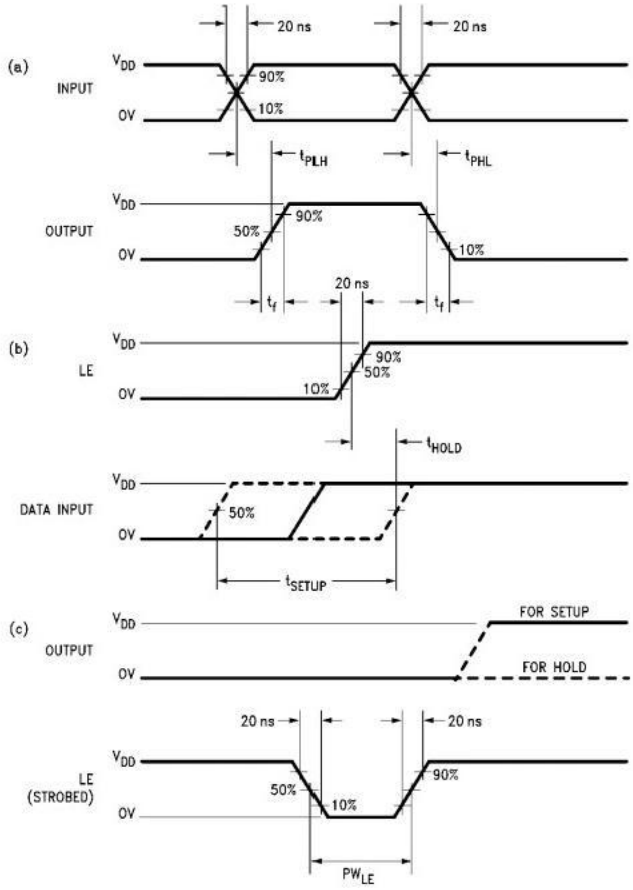
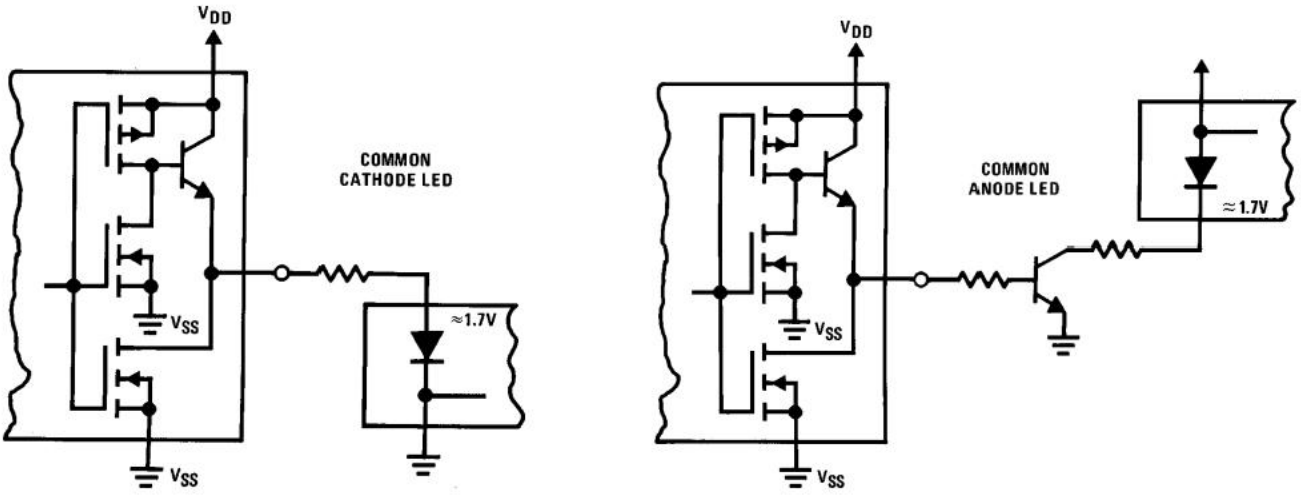


FIGURE 1

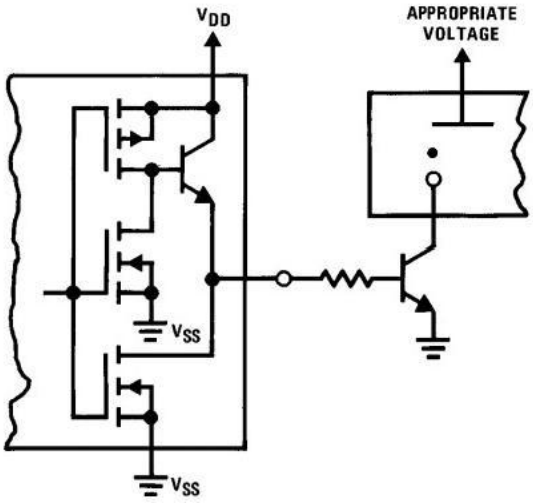
Typical Applications

Light Emitting Diode (LED)Readout

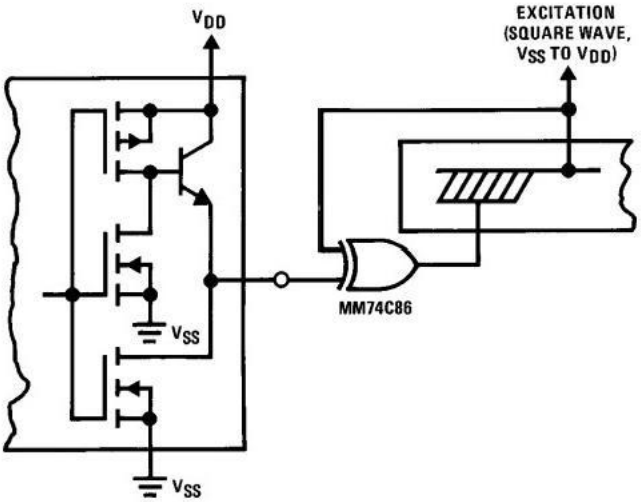


Typical Applications(Continued)

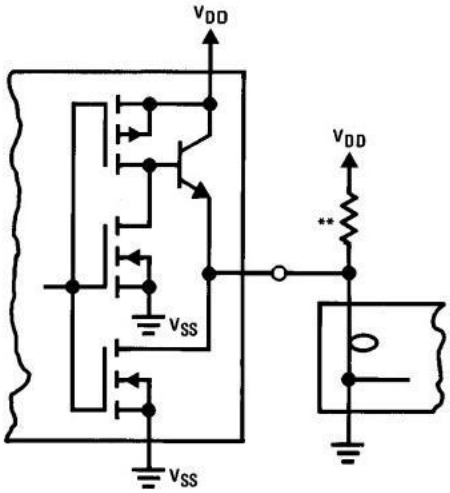
Gas Discharge Readout



Liquid Crystal (LC)Readout

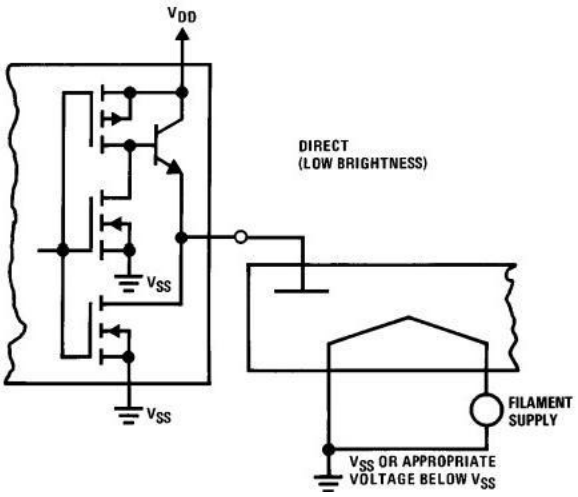


lncandescent Readout



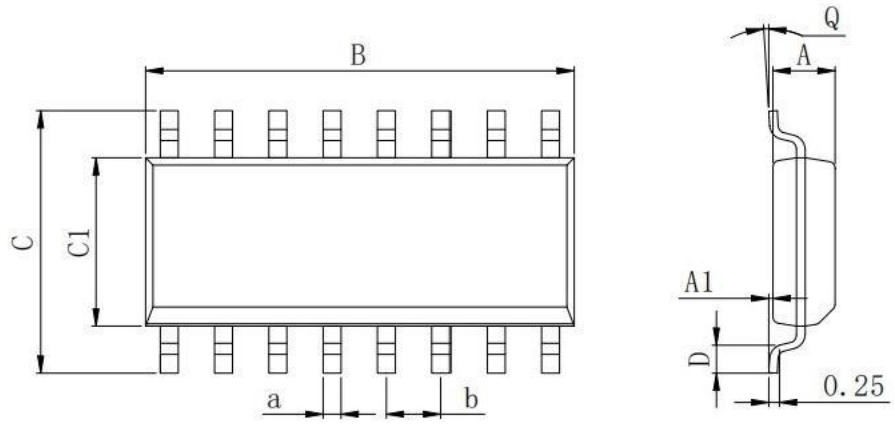
**A filament pre-warm resistor is recommended to reduce filament thermal shock and increase the effective cold resistance of the filament.

Fluorescent Readout



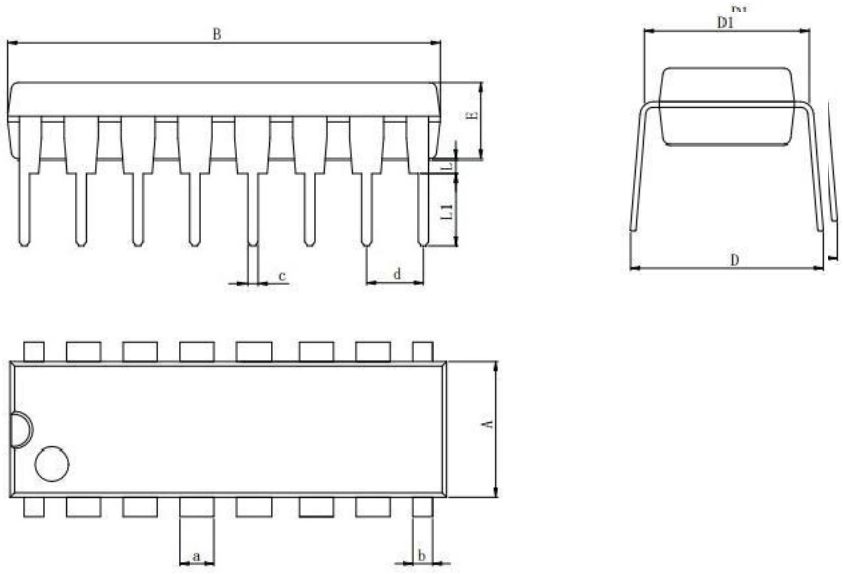
Physical Dimensions

SOP-16



Dimensions In Millimeters(SOP-16)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	9.80	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	10.0	6.20	4.00	0.80	8°	0.45	

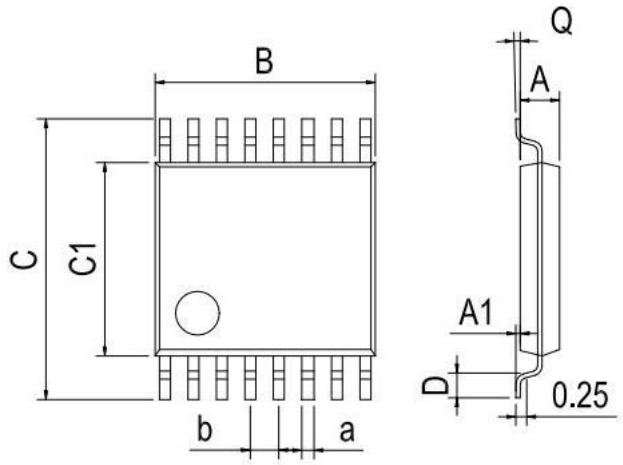
DIP-16



Dimensions In Millimeters(DIP-16)											
Symbol:	A	B	D	D1	E	L	L1	a	b	C	d
Min:	6.10	18.94	8.10	7.42	3.10	0.50	3.00	1.50	0.85	0.40	2.54 BSC
Max	6.68	19.56	10.9	7.82	3.55	0.70	3.60	1.55	0.90	0.50	

Physical Dimensions

TSSOP-16



Dimensions In Millimeters(TSSOP-16)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.85	0.05	4.90	6.20	4.30	0.40	0°	0.20	0.65 BSC
Max:	0.95	0.20	5.10	6.60	4.50	0.80	8°	0.25	