NCV7001

Quad Variable Reluctance Sensor Interface IC

The NCV7001 is a four−channel variable reluctance sensor interface IC. Microprocessor control functions include two polarity 5.0 V programmable resets, two programmable watchdog inputs, and an enable function (OLE). Two watchdog inputs allow control from two independent microprocessors.

Open sensor detection capability is provided. During test mode (NTEST = Low), a high on the OLE pin should provide a high on the output. A low under these conditions indicates an open load.

This part has been designed to operate in an automotive environment.

Features

- Four Channel Capability
- Differential Inputs
- Open Sensor Detect
- 5.0 V Supply Operation with RESET and Watchdog Features
- On−Chip Input Voltage Clamping
- NCV Prefix for Automotive and Other Applications Requiring Site and Change Control

Typical Applications

- Antilock Braking Systems (ABS)
- Traction Control Systems (TCS)
- Vehicle Dynamics Control (VDC)

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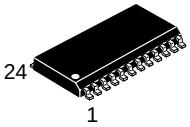
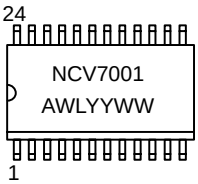


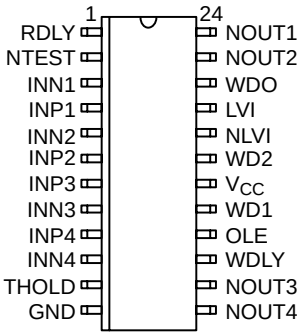
SO−24L
DW SUFFIX
CASE 751E

MARKING DIAGRAM



A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week

PIN CONNECTIONS



ORDERING INFORMATION

Device	Package	Shipping
NCV7001DW	SO−24L	30 Units/Rail
NCV7001DWR2	SO−24L	1000 Tape & Reel

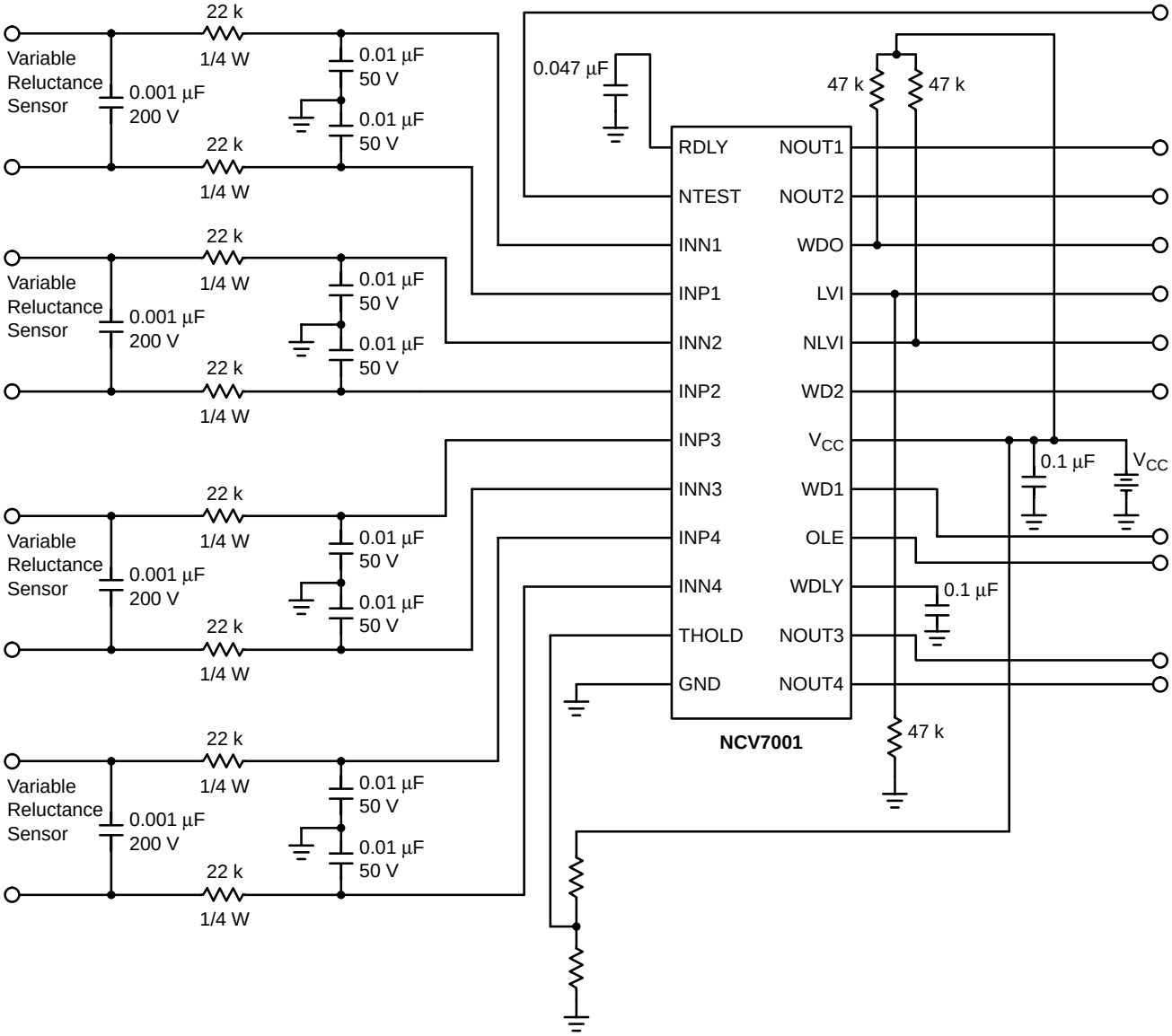


Figure 1. Application Diagram

MAXIMUM RATINGS*

Rating	Value	Unit
DC Supply Voltage (V_{CC})	−0.3 to 7.0	V
Input Clamp Current	−10, 10	mA
ESD Capability (Human Body Model)	2.0	kV
Storage Temperature	−55 to 150	°C
Operating Junction Temperature	−40 to 150	°C
Package Thermal Resistance: Junction−to−Case, $R_{\theta JC}$ Junction−to−Ambient, $R_{\theta JA}$	 16 80	 °C/W °C/W
Lead Temperature Soldering: Reflow: (SMD styles only) (Notes 1, 2)	240 peak	°C

*The maximum package power dissipation must be observed.

1. 60 second maximum above 183°C.
2. −5°C/+0°C allowable conditions.

ELECTRICAL CHARACTERISTICS ($4.5\ V \le V_{CC} \le 5.5\ V$, $-40°C \le T_J \le 125°C$; unless otherwise noted.)

Characteristic	Test Conditions	Min	Typ	Max	Unit
General Characteristics					
Quiescent Current	–	–	–	24	mA
Input					
Positive Input Threshold	Rseries = 22 k between INPX & INNX Thold Pin = 0 V	30	45	60	mV
Negative Input Threshold	Rseries = 22 k between INPX & INNX Thold Pin = 0 V	−60	−45	−30	mV
Positive Input Threshold	Rseries = 22 k between INPX & INNX Thold Pin = 2.0 V	84	126	168	mV
Negative Input Threshold	Rseries = 22 k between INPX & INNX Thold Pin = 2.0 V	−168	−126	−84	mV
Positive Input Threshold	Rseries = 22 k between INPX & INNX ±90 mV at $V_{CC} = V_{THOLD} = 4.5\ V$	110	140	200	mV
Negative Input Threshold	Rseries = 22 k between INPX & INNX ±90 mV at $V_{CC} = V_{THOLD} = 4.5\ V$	−200	−140	−110	mV
Input Resistance	–	225	400	800	kΩ
Input Bias/Single Ended	Thold = 0 V	0.46 V_{CC}	0.5 V_{CC}	0.54 V_{CC}	V
Input Clamp Current	For Correct Reset & Watchdog During Power Up	−6.0	–	6.0	mA
Input Clamp Voltage	(−10 mA) (+10 mA)	−0.5 V_{CC} − 0.6	0 V_{CC}	0.5 V_{CC} + 0.6	V V
Open Sensor Threshold	22 k in Series with INNX and INPX	12	–	120	kΩ
Output (NOUTX)					
Output Low Voltage	$I_{OUT} = 1.0\ mA$	–	0.2	0.4	V
Output High Voltage	$I_{OUT} = -100\ \mu A$	V_{CC} − 0.7	–	–	V
Output During Test / Normal Sensor ($V_{CC} - V_{OUT}$)	OLE = 1.0, $I_{OUT} = -100\ \mu A$	–	–	0.7	V
Output During Test / Open Sensor ($V_{CC} - V_{OUT}$)	OLE = 1.0, $I_{OUT} = -1.0\ mA$	–	–	0.4	V
Output ($V_{CC} - V_{OUT}$)	OLE (= Low), $I_{OUT} = -100\ \mu A$,	–	–	0.7	V
Output ($V_{CC} - V_{OUT}$)	OLE (= 1.0)/Normal Sensor, NO Signal from Sensor, $I_{OUT} = -100\ \mu A$	–	–	0.4	V
Logic					
Watchdog Output Low Voltage	$I_{WDO} = 1.0\ mA$	–	0.2	0.4	V
Watchdog Output High Leakage	$V_{WDO} = V_{CC}$	–	–	10	μA
Watchdog Input Voltage High	–	–	1.5	2.0	V
Watchdog Input Voltage Low	–	0.8	1.4	–	V
Watchdog Input Pullup Current	WD1 = WD2 = 2.0 V	−30	–	−450	μA
Watchdog Input Pullup Current	WD1 = WD2 = 0.8 V	−50	–	−600	μA
Thold Pin Input Current	$0.3\ V < V_{THOLD} < V_{CC}$	–	5.0	40	μA
Test Input Low Threshold	–	0.3 V_{CC}	–	–	V
Test Input High Threshold	–	–	–	0.7 V_{CC}	V
Test Input Current	$V_{IN} = 0.7\ V_{CC}$, TEST = 1	−25	–	220	μA
OLE Input Low Threshold	–	0.8	1.4	–	V
OLE Input High Threshold	–	–	1.5	2.0	V
OLE Input Current	OLE = 1.0, $V_{IN} = 2.0\ V$	−30	–	−450	μA
OLE Input Current	OLE = Low, $V_{IN} = 0.8\ V$	−50	–	−600	μA

ELECTRICAL CHARACTERISTICS (continued) (4.5 V ≤ V_{CC} ≤ 5.5 V, −40°C ≤ T_J ≤ 125°C; unless otherwise noted.)

Characteristic	Test Conditions	Min	Typ	Max	Unit
Low Voltage Reset					
Timeout Delay	V_{CC} − Increasing 0 to 5.0 V	30	50	70	ms
Reset Delay	V_{CC} − Decreasing 5.0 to 4.25 V	−	−	1.0	ms
NLVI Rise and Fall Time	10 k Pullup & CL = 30 pF	−	−	50	μs
LVI Rise and Fall Time	57 k Pulldown & CL = 30 pF	−	−	50	μs
Threshold High V_{CC} Going Up	−	−	4.66	4.75	V
Threshold Low V_{CC} Going Low	−	4.5	4.59	−	V
Threshold Hysteresis	LVTH − LVTL	30	70	−	mV
NLVI Output Low	25°C ≤ T ≤ 125°C, V_{CC} = 1.0 V, I_{NLVI} = 1.0 mA −40°C ≤ T ≤ 125°C, V_{CC} = 1.2 V, I_{NLVI} = 1.0 mA	− −	150 150	300 300	mV mV
NLVI Output Low	V_{CC} = 4.5 V @ −40°C, I_{NLVI} = 2.5 mA	−	150	300	mV
NLVI Output Leakage	V_{NLI} = V_{CC}	−10	−	10	μA
LVI Output High	V_{CC} = 1.0 V, I_{LV} = −36 μA	0.8	0.9	−	V
LVI Output High	V_{CC} = 4.5 V, I_{LV} = −250 μA	3.6	4.3	−	V
LVI Output Leakage	4.75 < V_{CC} 5.25 V, V_{LVC} = 0 V	−7.5	−	7.5	μA
Timing Specs					
Watchdog Short Time Detect	(Watchdog Running at 300 Hz)	4.56	6.075	7.59	ms
Watchdog Long Time Detect	(Watchdog Running at 33 Hz)	13.7	18.25	22.8	ms
Watchdog Skew Time Detect	(Difference between WD1 & WD2)	0.7	−	2.1	ms
Watchdog Timeout Delay Time	−	30	50	70	ms
Output Rise Time	CL = 30 pF	−	0.5	2.0	μs
Output Fall Time	CL = 30 pF	−	0.05	2.0	μs
Delay Input to Output	−	−	1.0	20	μs
OLE Delay to N_{OUT}	−	−	1.0	20	μs

PIN DESCRIPTION

Pin No.	Symbol	Description
1	RDLY	Determines the low voltage reset delay and watchdog enable and disable delay.
2	NTEST	Low = test, high = normal operation.
3	INN1	Minus input to channel 1 comparator.
4	INP1	Plus input to channel 1 comparator.
5	INN2	Minus input to channel 2 comparator.
6	INP2	Plus input to channel 2 comparator.
7	INP3	Plus input to channel 3 comparator.
8	INN3	Minus input to channel 3 comparator.
9	INP4	Plus input to channel 4 comparator.
10	INN4	Minus input to channel 4 comparator.
11	THOLD	Variable threshold adjustment.
12	GND	Ground.
13	NOUT4	Inverted output of comparator 4.
14	NOUT3	Inverted output of comparator 3.
15	WDLY	Determines watchdog timing.
16	OLE	Disables outputs. High = normal operation. Low = forces all outputs and comparators high.
17	WD1	Watchdog input.
18	V_{CC}	5.0 V input to IC.
19	WD2	Watchdog input.
20	NLVI	Reset output (in reset when low).
21	LVI	Reset output (in reset when high).
22	WDO	Watchdog output (low for valid watchdog signal).
23	NOUT2	Inverted output of comparator 2.
24	NOUT1	Inverted output of comparator 1.

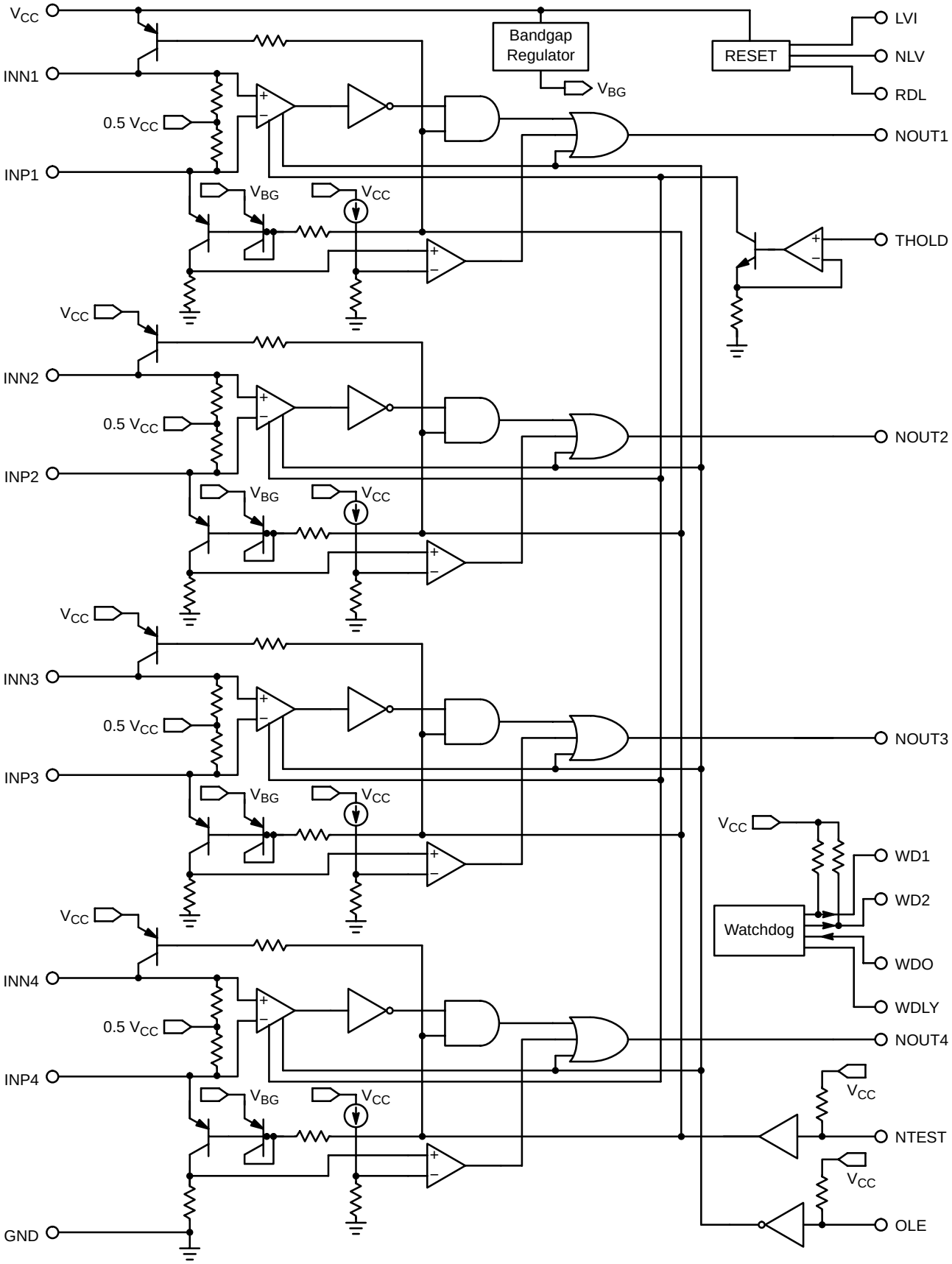
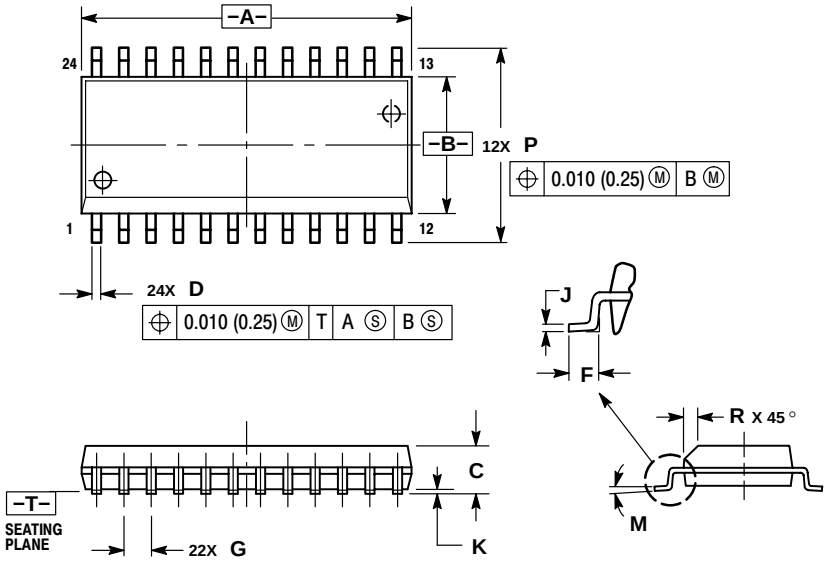


Figure 2. Block Diagram

PACKAGE DIMENSIONS

SO−24L
DW SUFFIX
CASE 751E−04
ISSUE E



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF D DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	15.25	15.54	0.601	0.612
B	7.40	7.60	0.292	0.299
C	2.35	2.65	0.093	0.104
D	0.35	0.49	0.014	0.019
F	0.41	0.90	0.016	0.035
G	1.27 BSC		0.050 BSC	
J	0.23	0.32	0.009	0.013
K	0.13	0.29	0.005	0.011
M	0°	8°	0°	8°
P	10.05	10.55	0.395	0.415
R	0.25	0.75	0.010	0.029

PUBLICATION ORDERING INFORMATION

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