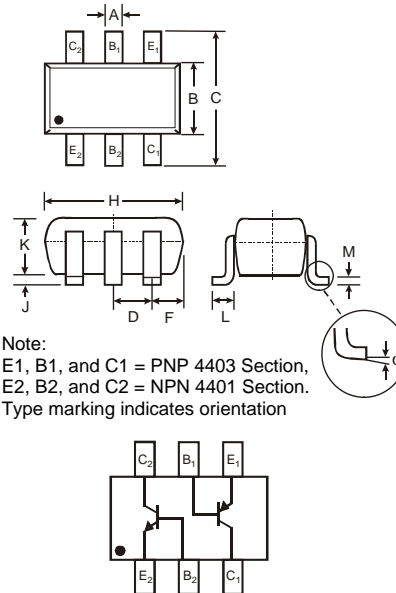


**Features**

- Complementary Pair
- One 4401-Type NPN,  
One 4403-Type PNP
- Epitaxial Planar Die Construction
- Ideal for Low Power Amplification and Switching
- Ultra-Small Surface Mount Package
- **Lead Free/RoHS Compliant (Note 3)**

**Mechanical Data**

- Case: SOT-363
- Case Material: Molded Plastic. UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020C
- Terminals: Solderable per MIL-STD-202, Method 208
- Lead Free Plating (Matte Tin Finish annealed over Alloy 42 leadframe).
- Terminal Connections: See Diagram
- Marking Information: See Page 5
- Ordering & Date Code Information: See Page 5
- Weight: 0.006 grams (approximate)



SOT-363		
Dim	Min	Max
A	0.10	0.30
B	1.15	1.35
C	2.00	2.20
D	0.65 Nominal	
F	0.30	0.40
H	1.80	2.20
J	—	0.10
K	0.90	1.00
L	0.25	0.40
M	0.10	0.25
$\alpha$	0°	8°
All Dimensions in mm		

**Maximum Ratings, Total Device** @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 1, 2)	P <sub>d</sub>	200	mW
Thermal Resistance, Junction to Ambient (Note 1)	R <sub>θJA</sub>	625	°C/W
Operating and Storage and Temperature Range	T <sub>j</sub> , T <sub>STG</sub>	-55 to +150	°C

**Maximum Ratings, NPN 4401 Section** @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic	Symbol	NPN4401	Unit
Collector-Base Voltage	V <sub>CBO</sub>	60	V
Collector-Emitter Voltage	V <sub>CEO</sub>	40	V
Emitter-Base Voltage	V <sub>EBO</sub>	6.0	V
Collector Current - Continuous (Note 1)	I <sub>C</sub>	600	mA

**Maximum Ratings, PNP 4403 Section** @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic	Symbol	PNP4403	Unit
Collector-Base Voltage	V <sub>CBO</sub>	-40	V
Collector-Emitter Voltage	V <sub>CEO</sub>	-40	V
Emitter-Base Voltage	V <sub>EBO</sub>	-5.0	V
Collector Current - Continuous (Note 1)	I <sub>C</sub>	-600	mA

- Notes:
1. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch; pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.
  2. Maximum combined dissipation.
  3. No purposefully added lead.

## Electrical Characteristics, NPN 4401 Section @<sub>T<sub>A</sub></sub> = 25°C unless otherwise specified

Characteristic	Symbol	Min	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 4)</b>					
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	60	—	V	$I_C = 100\mu A, I_E = 0$
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	40	—	V	$I_C = 1.0mA, I_B = 0$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6.0	—	V	$I_E = 100\mu A, I_C = 0$
Collector Cutoff Current	$I_{CEX}$	—	100	nA	$V_{CE} = 35V, V_{EB(OFF)} = 0.4V$
Base Cutoff Current	$I_{BL}$	—	100	nA	$V_{CE} = 35V, V_{EB(OFF)} = 0.4V$
<b>ON CHARACTERISTICS (Note 4)</b>					
DC Current Gain	$h_{FE}$	20	—	—	$I_C = 100\mu A, V_{CE} = 1.0V$ $I_C = 1.0mA, V_{CE} = 1.0V$ $I_C = 10mA, V_{CE} = 1.0V$ $I_C = 150mA, V_{CE} = 1.0V$ $I_C = 500mA, V_{CE} = 2.0V$
		40	—		
		80	—		
		100	300		
		40	—		
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	—	0.40 0.75	V	$I_C = 150mA, I_B = 15mA$ $I_C = 500mA, I_B = 50mA$
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	0.75	0.95 1.2	V	$I_C = 150mA, I_B = 15mA$ $I_C = 500mA, I_B = 50mA$
<b>SMALL SIGNAL CHARACTERISTICS</b>					
Output Capacitance	$C_{cb}$	—	6.5	pF	$V_{CB} = 5.0V, f = 1.0MHz, I_E = 0$
Input Capacitance	$C_{eb}$	—	30	pF	$V_{EB} = 0.5V, f = 1.0MHz, I_C = 0$
Input Impedance	$h_{ie}$	1.0	15	k $\Omega$	$V_{CE} = 10V, I_C = 1.0mA,$ $f = 1.0kHz$
Voltage Feedback Ratio	$h_{re}$	0.1	8.0	$\times 10^{-4}$	
Small Signal Current Gain	$h_{fe}$	40	500	—	
Output Admittance	$h_{oe}$	1.0	30	$\mu S$	
Current Gain-Bandwidth Product	$f_T$	250	—	MHz	
<b>SWITCHING CHARACTERISTICS</b>					
Delay Time	$t_d$	—	15	ns	$V_{CC} = 30V, I_C = 150mA,$
Rise Time	$t_r$	—	20	ns	$V_{BE(off)} = 2.0V, I_{B1} = 15mA$
Storage Time	$t_s$	—	225	ns	$V_{CC} = 30V, I_C = 150mA,$
Fall Time	$t_f$	—	30	ns	$I_{B1} = I_{B2} = 15mA$

## Electrical Characteristics, PNP 4403 Section @<sub>T<sub>A</sub></sub> = 25°C unless otherwise specified

Characteristic	Symbol	Min	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 4)</b>					
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-40	—	V	$I_C = -100\mu A, I_E = 0$
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-40	—	V	$I_C = -1.0mA, I_B = 0$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5.0	—	V	$I_E = -100\mu A, I_C = 0$
Collector Cutoff Current	$I_{CEX}$	—	-100	nA	$V_{CE} = -35V, V_{EB(OFF)} = -0.4V$
Base Cutoff Current	$I_{BL}$	—	-100	nA	$V_{CE} = -35V, V_{EB(OFF)} = -0.4V$
<b>ON CHARACTERISTICS (Note 4)</b>					
DC Current Gain	$h_{FE}$	30	—	—	$I_C = -100\mu A, V_{CE} = -1.0V$ $I_C = -1.0mA, V_{CE} = -1.0V$ $I_C = -10mA, V_{CE} = -1.0V$ $I_C = -150mA, V_{CE} = -2.0V$ $I_C = -500mA, V_{CE} = -2.0V$
		60	—		
		100	—		
		100	300		
		20	—		
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	—	-0.40 -0.75	V	$I_C = -150mA, I_B = -15mA$ $I_C = -500mA, I_B = -50mA$
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	-0.75	-0.95 -1.30	V	$I_C = -150mA, I_B = -15mA$ $I_C = -500mA, I_B = -50mA$
<b>SMALL SIGNAL CHARACTERISTICS</b>					
Output Capacitance	$C_{cb}$	—	8.5	pF	$V_{CB} = -10V, f = 1.0MHz, I_E = 0$
Input Capacitance	$C_{eb}$	—	30	pF	$V_{EB} = -0.5V, f = 1.0MHz, I_C = 0$
Input Impedance	$h_{ie}$	1.5	15	k $\Omega$	$V_{CE} = -10V, I_C = -1.0mA,$ $f = 1.0kHz$
Voltage Feedback Ratio	$h_{re}$	0.1	8.0	$\times 10^{-4}$	
Small Signal Current Gain	$h_{fe}$	60	500	—	
Output Admittance	$h_{oe}$	1.0	100	$\mu S$	
Current Gain-Bandwidth Product	$f_T$	200	—	MHz	
<b>SWITCHING CHARACTERISTICS</b>					
Delay Time	$t_d$	—	15	ns	$V_{CC} = -30V, I_C = -150mA,$
Rise Time	$t_r$	—	20	ns	$V_{BE(off)} = -2.0V, I_{B1} = -15mA$
Storage Time	$t_s$	—	225	ns	$V_{CC} = -30V, I_C = -150mA,$
Fall Time	$t_f$	—	30	ns	$I_{B1} = I_{B2} = -15mA$

Notes: 4. Short duration pulse test used to minimize self-heating effect.

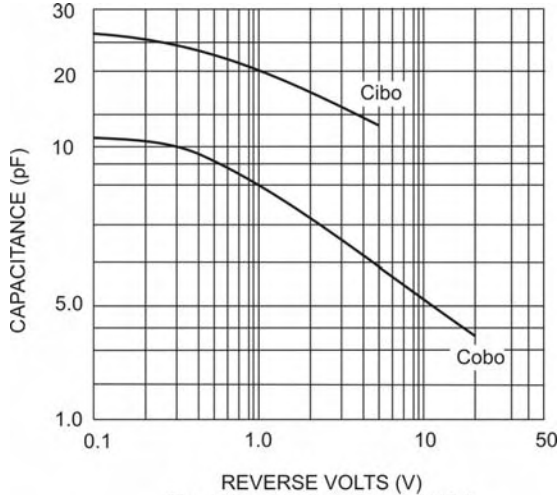


Fig. 1 Typical Capacitance (4401)

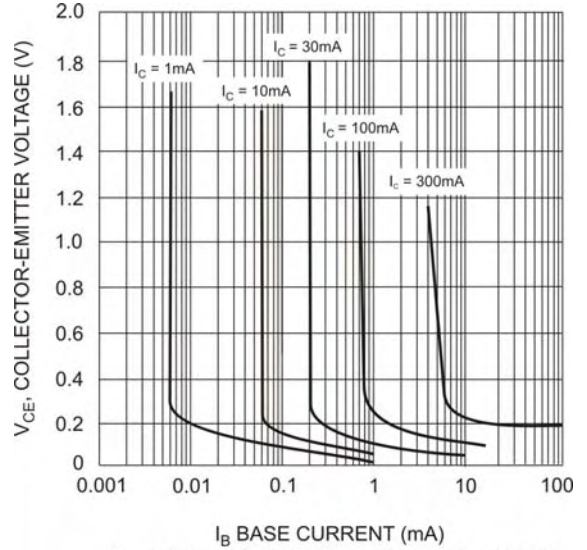


Fig. 2 Typical Collector Saturation Region (4401)

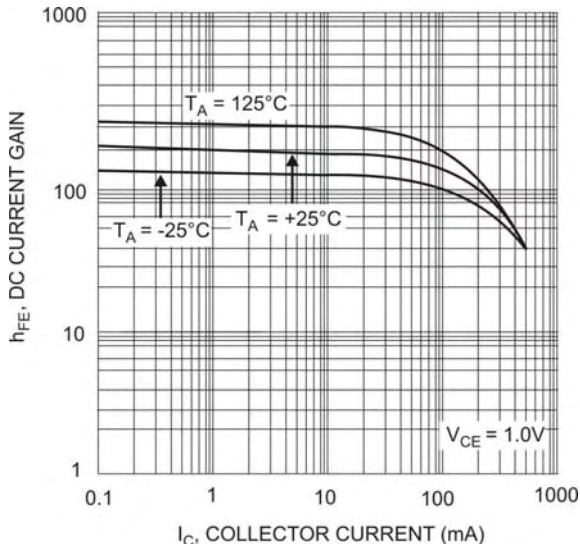


Fig. 3 Typical DC Current Gain vs Collector Current (4401)

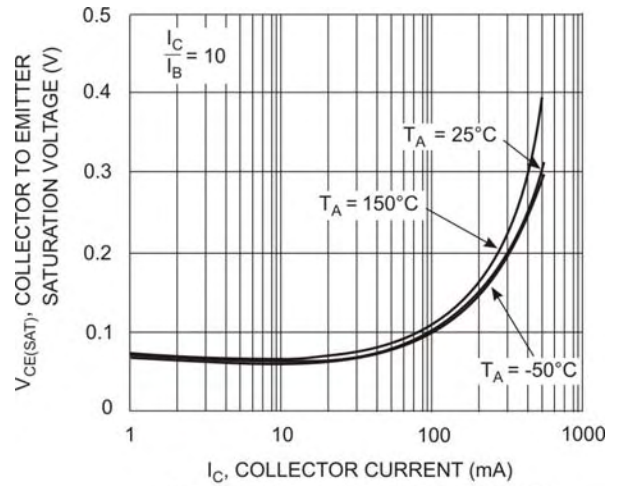


Fig. 4 Collector Emitter Saturation Voltage vs. Collector Current (4401)

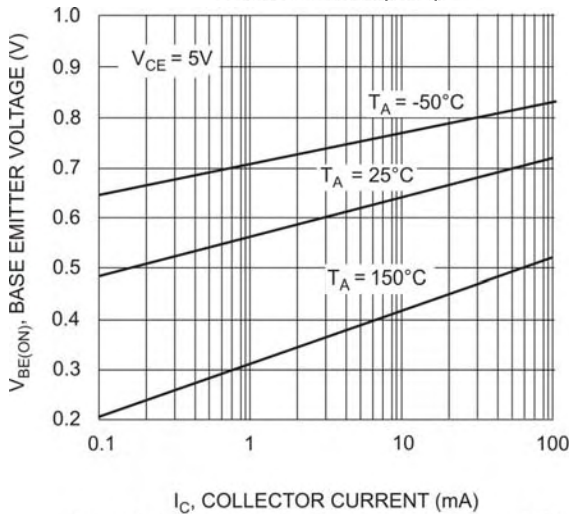


Fig. 5 Base Emitter Voltage vs. Collector Current (4401)

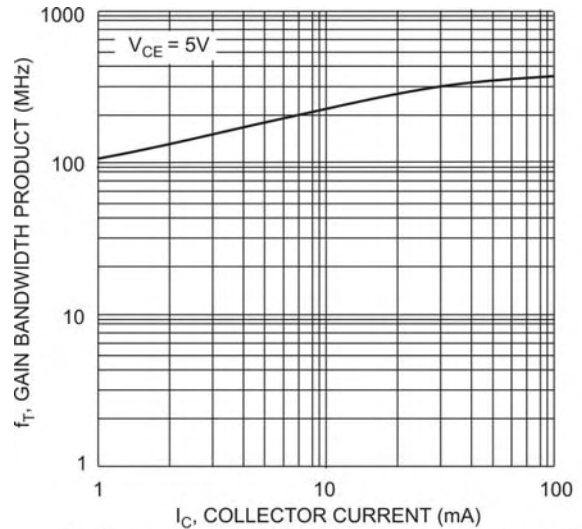


Fig. 6 Gain Bandwidth Product vs. Collector Current (4401)

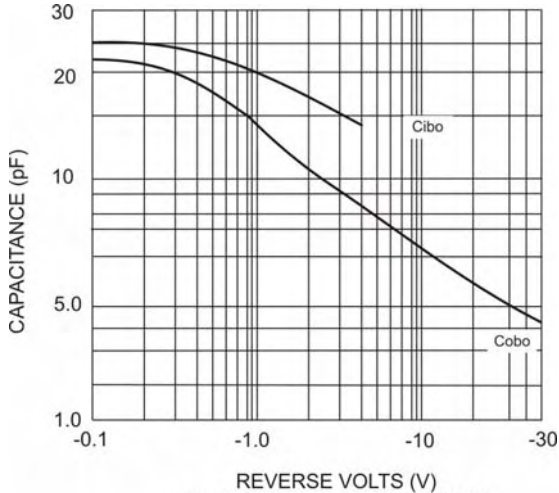


Fig. 7 Typical Capacitance (4403)

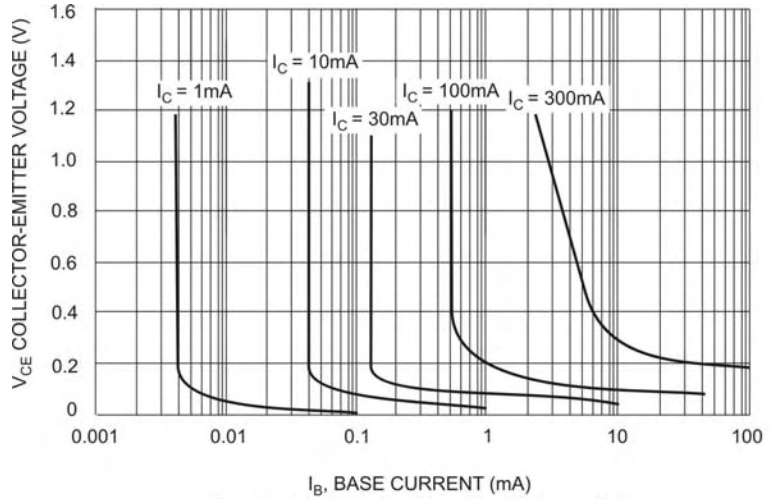


Fig. 8 Typical Collector Saturation Region (4403)

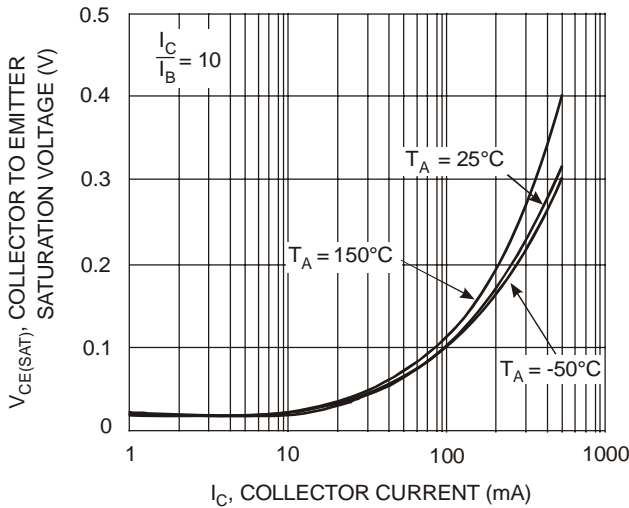


Fig. 9 Collector Emitter Saturation Voltage vs. Collector Current (4403)

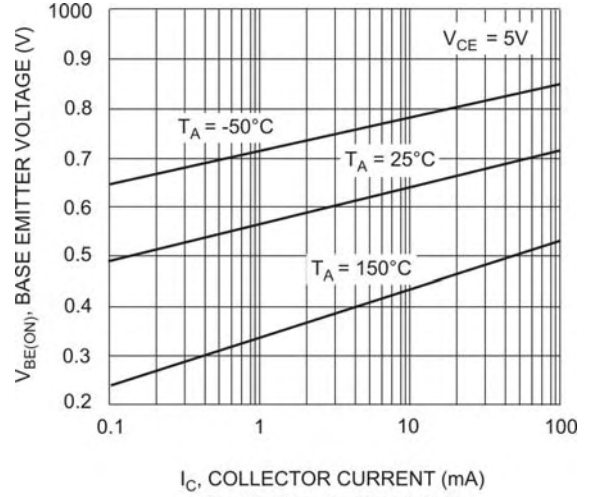


Fig. 10 Base-Emitter Voltage vs. Collector Current (4403)

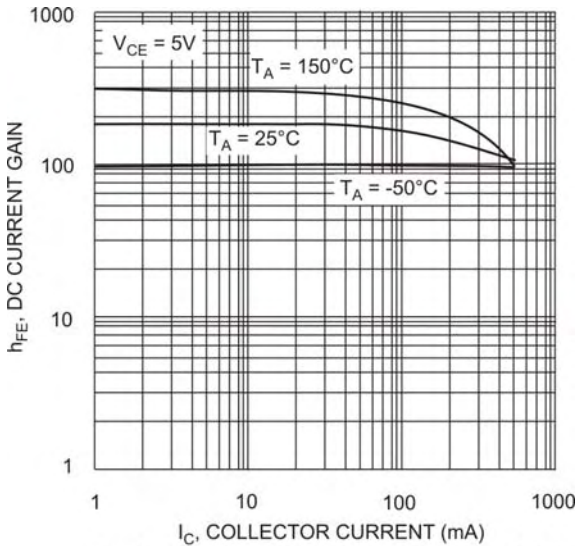


Fig. 11 DC Current Gain vs. Collector Current (4403)

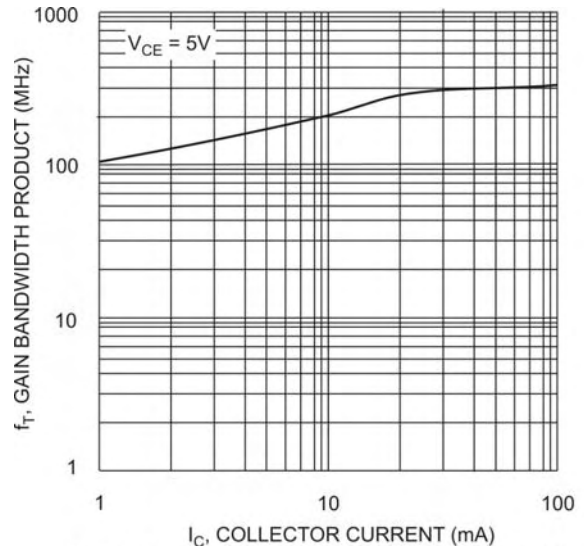
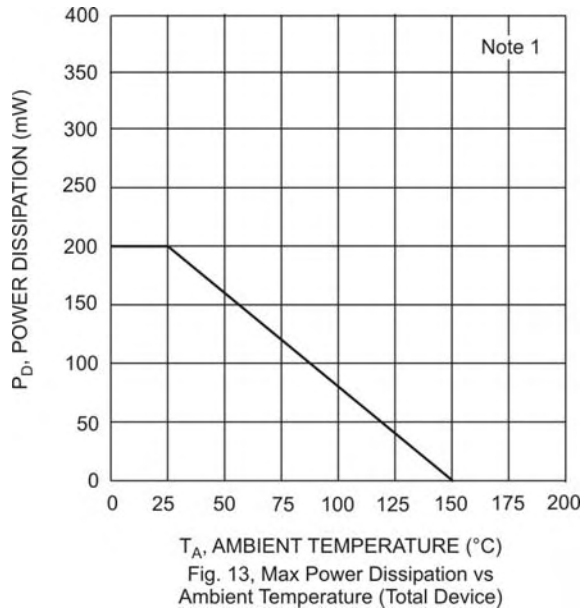


Fig. 12 Gain Bandwidth Product vs. Collector Current (4403)

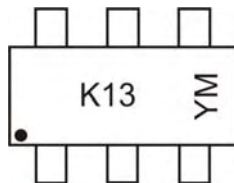


## Ordering Information (Note 5)

Device	Packaging	Shipping
MMDT4413-7-F	SOT-363	3000/Tape & Reel

Notes: 5. For Packaging Details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

## Marking Information



K13= Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year ex: N = 2002  
 M = Month ex: 9 = September

### Data Code Key

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Code	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	Z

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

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