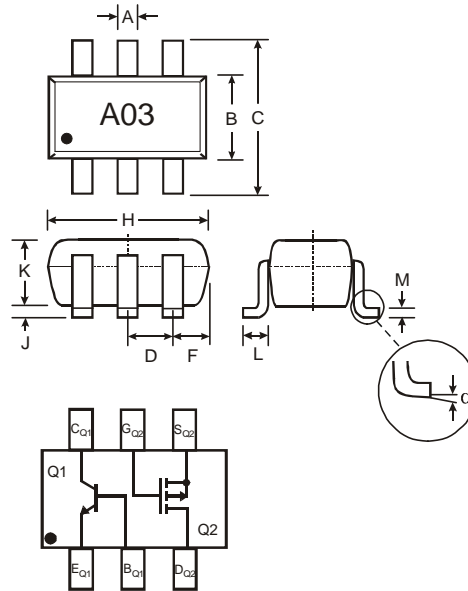


Features

- Combines MMBT4401 type transistor with BSS84 type MOSFET
- Small Surface Mount Package
- PNP/N-Channel Complement Available: CTA2P1N
- **Lead Free/RoHS Compliant (Note 2)**
- **"Green" Device (Note 3 and 4)**

Mechanical Data

- Case: SOT-363
- Case Material: Molded Plastic. UL Flammability Classification 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: A03, See Page 6
- Ordering Information: See Page 6
- 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 |
| α | 0° | 8° |
| All Dimensions in mm | | |

Maximum Ratings, Total Device @T_A = 25°C unless otherwise specified

| Characteristic | Symbol | Value | Unit |
|--------------------------------------------------|-----------------------------------|-------------|------|
| Power Dissipation (Note 1) | P _d | 150 | mW |
| Thermal Resistance, Junction to Ambient (Note 1) | R _{θJA} | 833 | °C/W |
| Operating and Storage Temperature Range | T _j , T _{STG} | -55 to +150 | °C |

Maximum Ratings, Q1, MMBT4401 NPN Transistor Element @T_A = 25°C unless otherwise specified

| Characteristic | Symbol | Value | Unit |
|--------------------------------|------------------|-------|------|
| Collector-Base Voltage | V _{CB0} | 60 | V |
| Collector-Emitter Voltage | V _{CE0} | 40 | V |
| Emitter-Base Voltage | V _{EBO} | 6.0 | V |
| Collector Current - Continuous | I _c | 600 | mA |

Maximum Ratings, Q2, BSS84 P-Channel MOSFET Element @T_A = 25°C unless otherwise specified

| Characteristic | Symbol | Value | Unit |
|--------------------------------------------|------------------|-------|------|
| Drain-Source Voltage | V _{DSS} | -50 | V |
| Drain-Gate Voltage R _{GS} ≤ 1.0MΩ | V _{DGR} | -50 | V |
| Gate-Source Voltage Continuous | V _{GSS} | ±20 | V |
| Drain Current Continuous | I _D | -130 | 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. No purposefully added lead.
 3. Diodes Inc.'s "Green" policy can be found on our website at http://www.diodes.com/products/lead_free/index.php.
 4. Product manufactured with Date Code UO (week 40, 2007) and newer are built with Green Molding Compound. Product manufactured prior to Date Code UO are built with Non-Green Molding Compound and may contain Halogens or Sb2O3 Fire Retardants.

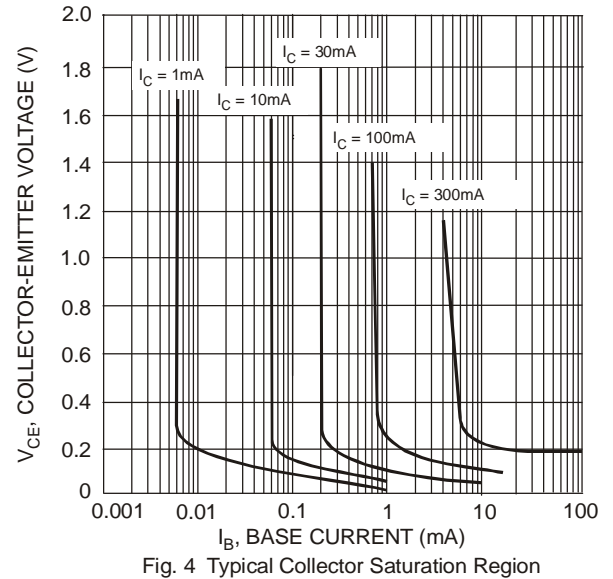
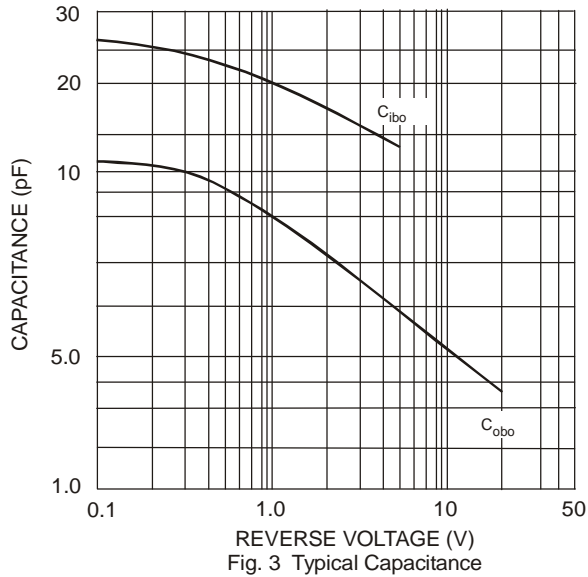
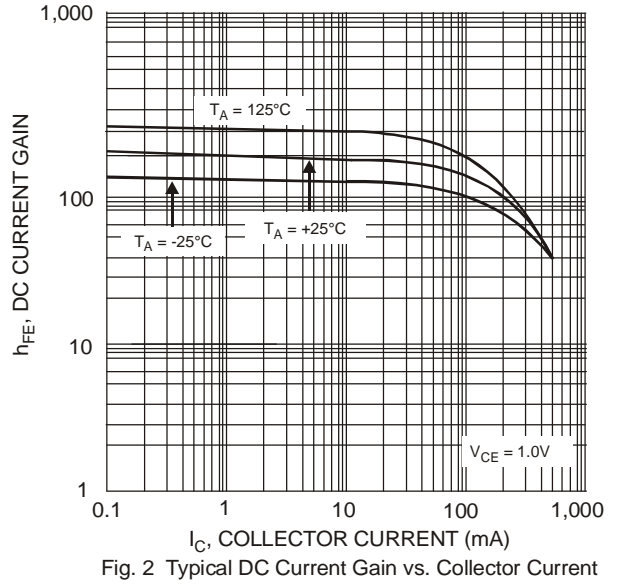
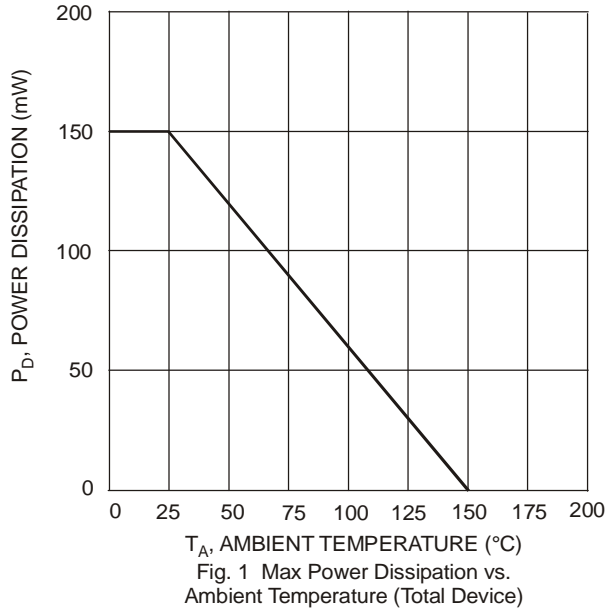
Electrical Characteristics, Q1, MMBT4401 NPN Transistor Element @T_A = 25°C unless otherwise specified

| Characteristic | Symbol | Min | Max | Unit | Test Condition |
|--------------------------------------|----------------------|-----------------------------|-------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OFF CHARACTERISTICS (Note 5) | | | | | |
| Collector-Base Breakdown Voltage | V _{(BR)CBO} | 60 | — | V | I _C = 100μA, 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 = 100μA, 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 |
| ON CHARACTERISTICS (Note 5) | | | | | |
| DC Current Gain | h _{FE} | 20 40 80 100 40 | — — — 300 — | — | I _C = 100μA, 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 |
| 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 |
| SMALL SIGNAL CHARACTERISTICS | | | | | |
| 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 | kΩ | V _{CE} = 10V, I _C = 1.0mA, f = 1.0kHz |
| Voltage Feedback Ratio | h _{re} | 0.1 | 8.0 | x 10 ⁻⁴ | |
| Small Signal Current Gain | h _{fe} | 40 | 500 | — | |
| Output Admittance | h _{oe} | 1.0 | 30 | μS | |
| Current Gain-Bandwidth Product | f _T | 250 | — | MHz | V _{CE} = 10V, I _C = 20mA, f = 100MHz |
| SWITCHING CHARACTERISTICS | | | | | |
| 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, Q2, BSS84 P-Channel MOSFET Element @T_A = 25°C unless otherwise specified

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|-------------------------------------|---------------------|------|-----|--------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OFF CHARACTERISTICS (Note 5) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | -50 | — | — | V | V _{GS} = 0V, I _D = -250μA |
| Zero Gate Voltage Drain Current | I _{DSS} | — | — | -15 -60 -100 | μA μA nA | V _{DS} = -50V, V _{GS} = 0V, T _J = 25°C V _{DS} = -50V, V _{GS} = 0V, T _J = 125°C V _{DS} = -25V, V _{GS} = 0V, T _J = 25°C |
| Gate-Body Leakage | I _{GSS} | — | — | ±10 | nA | V _{GS} = ±20V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 5) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | -0.8 | — | -2.0 | V | V _{DS} = V _{GS} , I _D = -1mA |
| Static Drain-Source On-Resistance | R _{DS(ON)} | — | — | 10 | Ω | V _{GS} = -5V, I _D = 0.100A |
| Forward Transconductance | g _{FS} | .05 | — | — | S | V _{DS} = -25V, I _D = 0.1A |
| DYNAMIC CHARACTERISTICS | | | | | | |
| Input Capacitance | C _{iSS} | — | — | 45 | pF | V _{DS} = -25V, V _{GS} = 0V f = 1.0MHz |
| Output Capacitance | C _{oss} | — | — | 25 | pF | |
| Reverse Transfer Capacitance | C _{rss} | — | — | 12 | pF | |
| SWITCHING CHARACTERISTICS | | | | | | |
| Turn-On Delay Time | t _{D(ON)} | — | 10 | — | ns | V _{DD} = -30V, I _D = -0.27A, |
| Turn-Off Delay Time | t _{D(OFF)} | — | 18 | — | ns | R _{GEN} = 50Ω, V _{GS} = -10V |

Notes: 5. Short duration pulse test used to minimize self-heating effect.



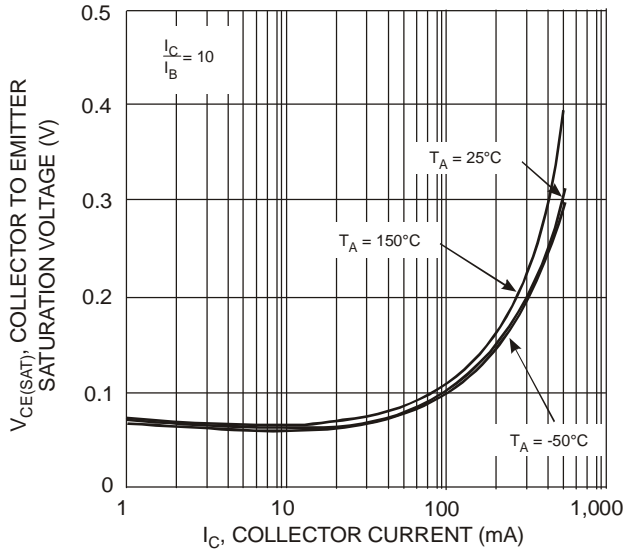


Fig. 5 Collector Emitter Saturation Voltage vs. Collector Current

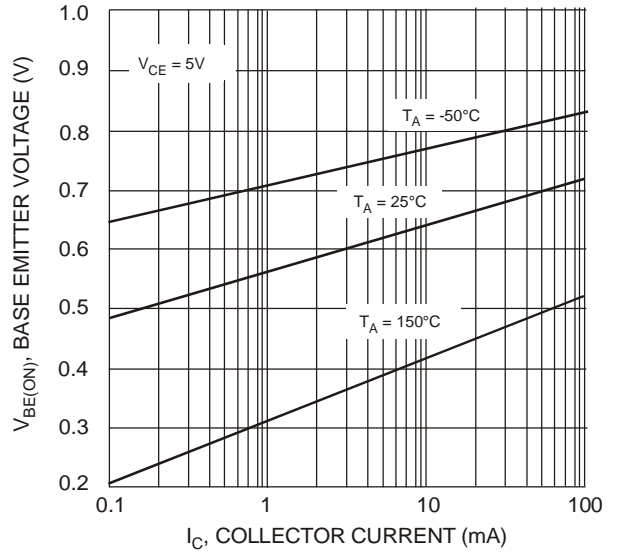


Fig. 6 Base Emitter Voltage vs. Collector Current

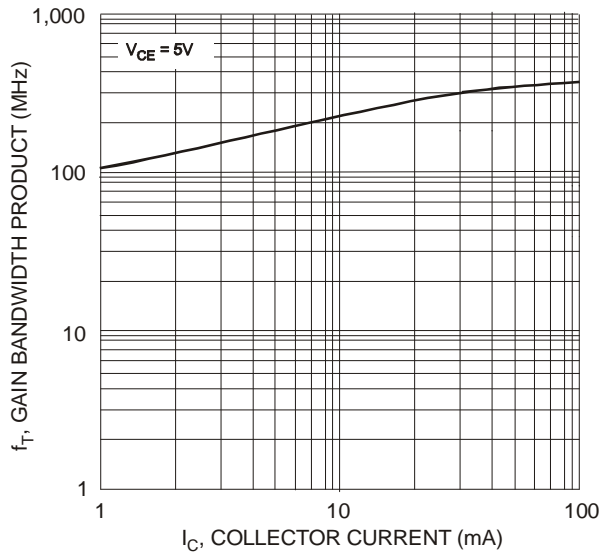


Fig. 7 Gain Bandwidth Product vs. Collector Current

NEW PRODUCT

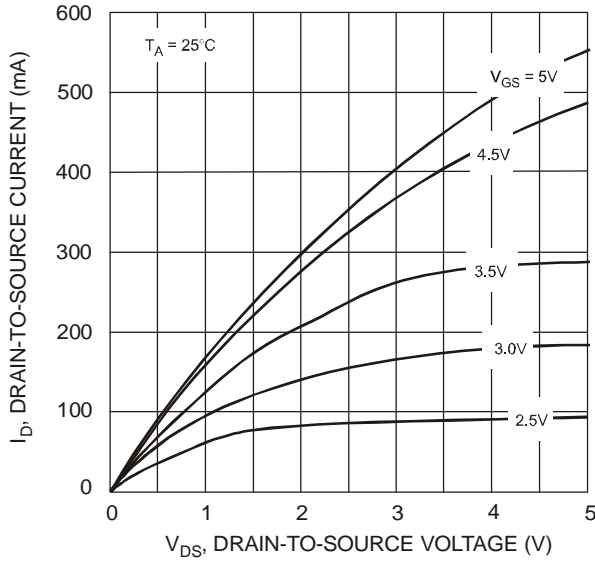


Fig. 8 Drain-Source Current vs. Drain-Source Voltage

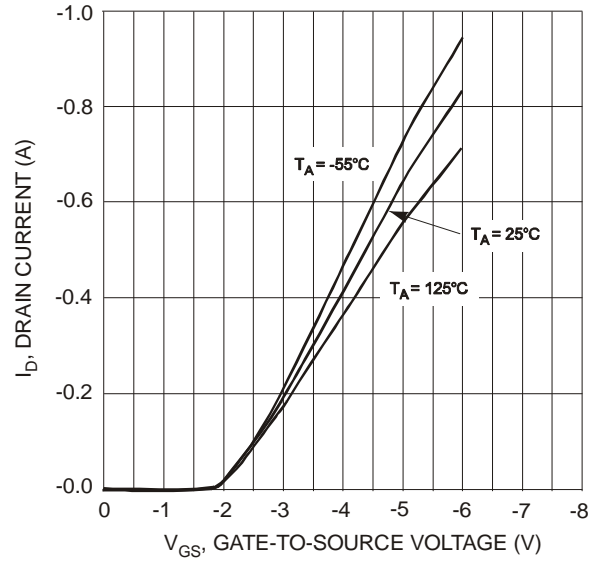


Fig. 9 Drain Current vs. Gate Source Voltage

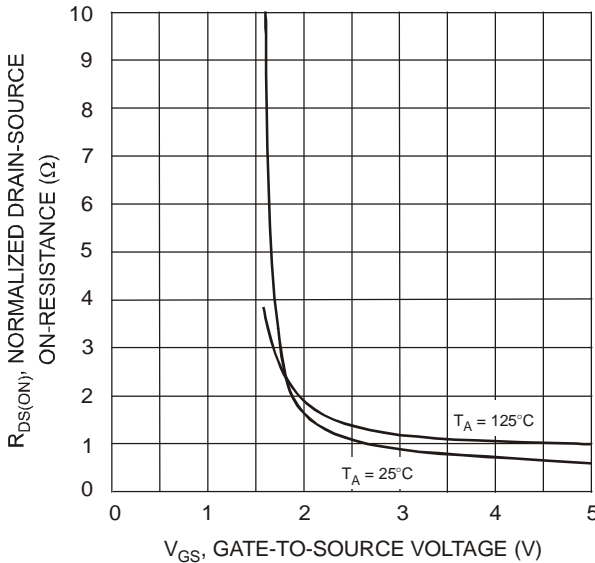


Fig. 10 On-Resistance vs. Gate-Source Voltage

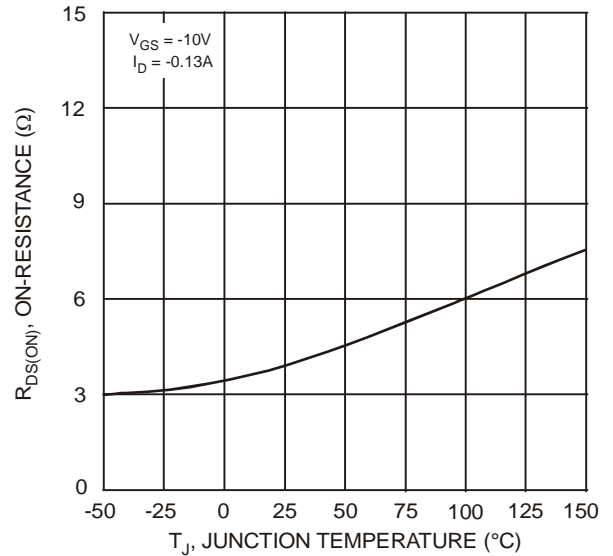


Fig. 11 On-Resistance vs. Junction Temperature

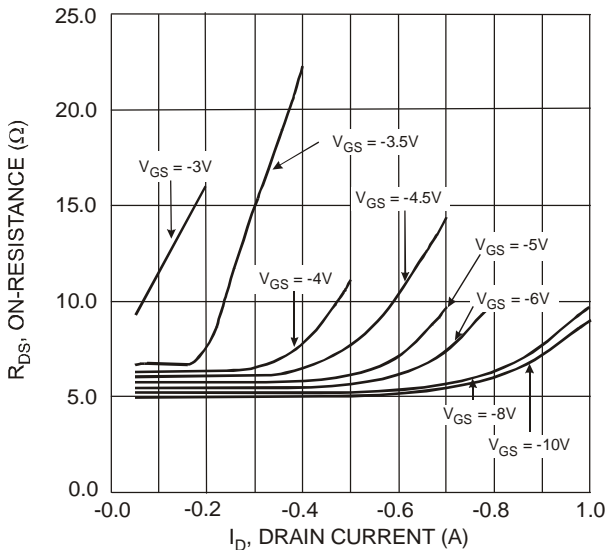


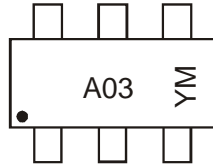
Fig. 12, On-Resistance vs. Drain Current

Ordering Information (Note 6)

| Device | Packaging | Shipping |
|-------------|-----------|------------------|
| CTA2N1P-7-F | SOT-363 | 3000/Tape & Reel |

Notes: 6. For packaging details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

Marking Information



A03 = Product Type Marking Code
 YM = Date Code Marking
 Y = Year ex: T = 2006
 M = Month ex: 9 = September

Date Code Key

| Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Code | 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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