# MCA1911N, P series MCA2011N, P series (SILICON)

**6.8 Volts** **8.6 Volts**

# MCA2111N, P series

**9.5 Volts**

# MCA2211N, P series

**11 Volts**

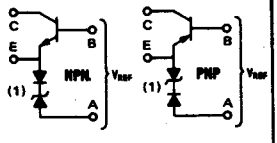
## REFERENCE AMPLIFIERS

. . . designed for use in regulated power supplies as a combination voltage reference element and error voltage amplifier, providing temperature compensation for excellent reference voltage stability.

- Available With Either PNP or NPN Polarity for Versatility of Circuit Design
- Specified With a Variety of Reference Voltage Stability Factors Allowing for a Wide Selection of the Most Economical Device to Meet Circuit Requirements
- Available for Operation in Three Different Test Temperature Ranges: 0 to +75°C, -55 to +100°C, -55 to +150°C
- Guaranteed Maximum Impedance
- "In-Line" Leads – Ideal for Automatic Insertion

## REFERENCE AMPLIFIERS

DS 6039 R1



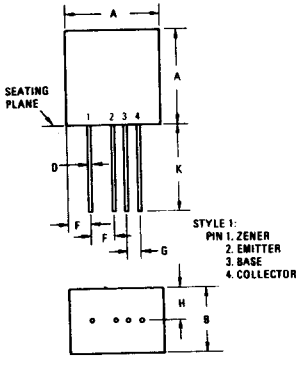

(1) MCA1911 Series uses only zener diode and transistor.

### MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Zener Current | $I_Z$ | 20 | mA |
| Collector Current | $I_C$ | 20 | mA |
| Collector-Emitter Voltage | $V_{CEO}$ | 30 | Volts |
| Operating and Storage Junction Temperature Range | $T_J$, $T_{stg}$ | -65 to +175 | °C |

### ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C unless otherwise noted)

| Characteristic | Symbol | Value | | Unit |
|---|---|---|---|---|
| Nominal Reference Voltage ($I_Z$ = 5.0 mA, $V_{CE}$ = 3.0 V, $I_C$ = 250 μA) | $V_{REF}$ | 6.8 - 11 (Nom) (Table 1) | | Volts |
| Maximum Reference Voltage Change with Temperature ($I_Z$ = 5.0 mA, $V_{CE}$ = 3.0 V, $I_C$ = 250 μA) | $\Delta V_{REF}$ | (Table 1) | | Volts |
| | | Min | Max | |
| Zener Impedance ($I_{ZT}$ = 5.0 mA, $I_{ac}$ = 10% $I_Z$) MCA1911N, P; MCA2011N,P; MCA2111N,P; Series<br>MCA2211N,P Series | $Z_{ZT}$ | –<br>– | 40<br>120 | ohms |
| Collector-Emitter Breakdown Voltage ($I_C$ = 250 μA) | $BV_{CEO}$ | 30 | – | Volts |
| Collector-Cutoff Current ($V_{CB}$ = 45 V)<br>($V_{CB}$ = 45 V, $T_A$ = 150°C) | $I_{CBO}$ | –<br>– | 0.05<br>10 | μA |
| DC Current Gain ($I_C$ = 250 μA, $V_{CE}$ = 3.0 V) | $h_{FE}$ | 50 | 300 | – |
| Small-Signal Transconductance ($V_{CE}$ = 3.0 V, $I_C$ = 250 μA, f = 1.0 kHz) | $g_{fe}$ | 6500 | – | μmhos |




| DIM | MILLIMETERS MIN | MILLIMETERS MAX | INCHES MIN | INCHES MAX |
|---|---|---|---|---|
| A | 9.65 | 10.41 | 0.380 | 0.410 |
| B | 7.62 | 8.13 | 0.300 | 0.320 |
| D | 0.46 | 0.56 | 0.018 | 0.022 |
| F | 2.29 | 2.79 | 0.090 | 0.110 |
| G | 1.02 | 1.52 | 0.040 | 0.060 |
| H | 3.68 | 4.19 | 0.145 | 0.165 |
| K | 9.53 | – | 0.375 | – |

CASE 212-(2)
(Formerly Case 181)

**TABLE 1 – ELECTRICAL CHARACTERISTICS** ($T_A$ = 25°C unless otherwise specified)

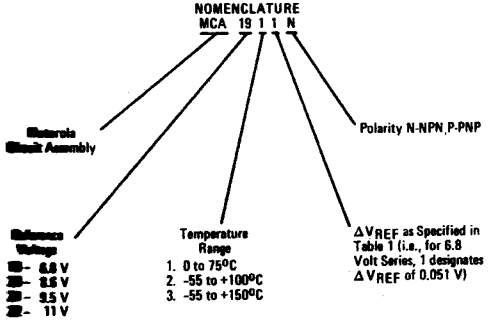
| Type Number (Note 1) | Max Voltage Change (Note 2) $\Delta V_{REF}$ (Volts) | @ Test Temperature (°C) | Reference Voltage $V_{REF}$ (Volts) |
|---|---|---|---|
| 6.8 Volt Series ($I_{ZT}$ = 5 mA) | | | |
| MCA1911N | 0.051 | 0, +25, +75 | 6.8 ± 10% |
| MCA1912N | 0.025 | | |
| MCA1913N | 0.010 | | |
| MCA1914N | 0.005 | | |
| MCA1921N | 0.105 | -55, 0, +25, +75, +100 | 6.8 ± 5% |
| MCA1922N | 0.052 | | |
| MCA1923N | 0.020 | | |
| MCA1924N | 0.010 | | |
| MCA1931N | 0.139 | -55, 0, +25, +75, +100, +150 | 6.8 ± 5% |
| MCA1932N | 0.069 | | |
| MCA1933N | 0.026 | | |
| MCA1934N | 0.013 | | |
| 9.5 Volt Series ($I_{ZT}$ = 5 mA) | | | |
| MCA2111N | 0.071 | 0, +25, +75 | 9.5 ± 10% |
| MCA2112N | 0.035 | | |
| MCA2113N | 0.014 | | |
| MCA2114N | 0.007 | | |
| MCA2121N | 0.147 | -55, 0, +25, +75, +100 | 9.5 ± 5% |
| MCA2122N | 0.073 | | |
| MCA2123N | 0.028 | | |
| MCA2124N | 0.014 | | |
| MCA2131N | 0.194 | -55, 0, +25, +75, +100, +150 | 9.5 ± 5% |
| MCA2132N | 0.097 | | |
| MCA2133N | 0.038 | | |
| MCA2134N | 0.019 | | |

| Type Number (Note 1) | Max Voltage Change (Note 2) $\Delta V_{REF}$ (Volts) | @ Test Temperature (°C) | Reference Voltage $V_{REF}$ (Volts) |
|---|---|---|---|
| 8.6 Volt Series ($I_{ZT}$ = 5 mA) | | | |
| MCA2011N | 0.060 | 0, +25, +75 | 8.6 ± 10% |
| MCA2012N | 0.030 | | |
| MCA2013N | 0.012 | | |
| MCA2014N | 0.006 | | |
| MCA2021N | 0.124 | -55, 0, +25, +75, +100 | 8.6 ± 5% |
| MCA2022N | 0.062 | | |
| MCA2023N | 0.024 | | |
| MCA2024N | 0.012 | | |
| MCA2031N | 0.164 | -55, 0, +25, +75, +100, +150 | 8.6 ± 5% |
| MCA2032N | 0.082 | | |
| MCA2033N | 0.032 | | |
| MCA2034N | 0.016 | | |
| 11 Volt Series ($I_{ZT}$ = 5 mA) | | | |
| MCA2211N | 0.082 | 0, +25, +75 | 11 ± 10% |
| MCA2212N | 0.041 | | |
| MCA2213N | 0.016 | | |
| MCA2214N | 0.008 | | |
| MCA2221N | 0.170 | -55, 0, +25, +75, +100 | 11 ± 5% |
| MCA2222N | 0.085 | | |
| MCA2223N | 0.034 | | |
| MCA2224N | 0.017 | | |
| MCA2231N | 0.225 | -55, 0, +25, +75 +100, +150 | 11 ± 5% |
| MCA2232N | 0.112 | | |
| MCA2233N | 0.044 | | |
| MCA2234N | 0.022 | | |

**NOTES:**

1. Type numbers listed are NPN polarity. For PNP polarity devices substitute "P" suffix – e.g.: MCA1911N (NPN)
   MCA1911P (PNP)

2. $\Delta V_{REF}$ is the maximum voltage variation over the specified test temperature range, verified by tests at specified points within the range.




## TYPICAL APPLICATION IN REGULATED POWER SUPPLIES