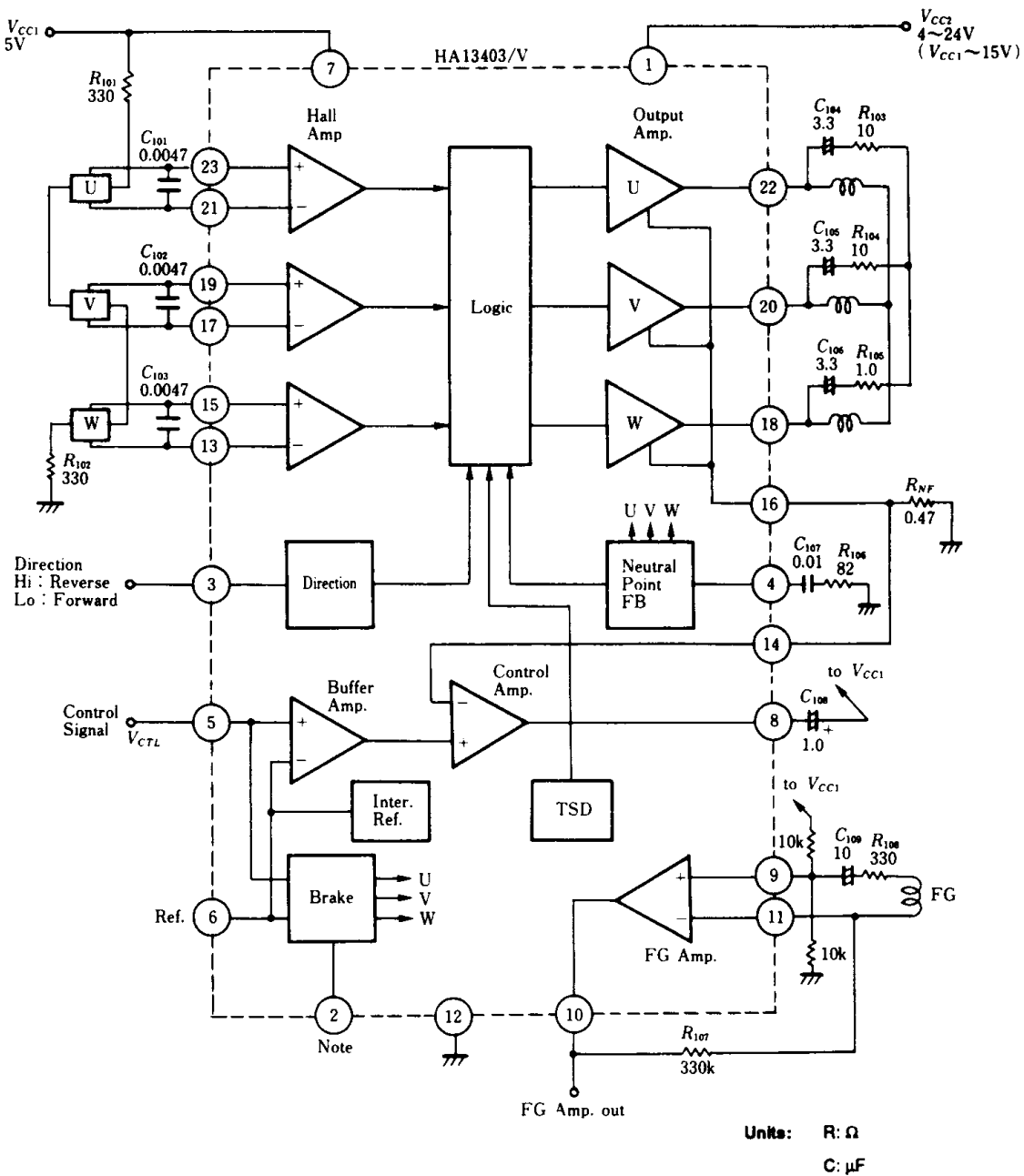


HA13403, HA13403V, HA13403MP

Block Diagram



Note: The brake circuit is disabled if pins 1 and 2 are shorted.



HA13403, HA13403V, HA13403MP

Absolute Maximum Ratings (Ta = 25°C)

| Parameter | Symbol | Rating | | Unit |
|------------------------------------|------------------|-----------------------|-----------------------|------|
| | | HA13403/V | HA13403MP | |
| Control block power supply voltage | V _{CC1} | 13 | 13 | V |
| Output block power supply voltage | V _{CC2} | 26 | 20 | V |
| Output current | I _O | 1.5 | 1.0 | A |
| Hall amplifier input voltage | V _H | 0 to V _{CC1} | 0 to V _{CC1} | V |
| Direction select input voltage | V _D | 0 to V _{CC1} | 0 to V _{CC1} | V |
| Control input voltage | V _{CTL} | 0 to V _{CC1} | 0 to V _{CC1} | V |
| Power dissipation | P _T | 10 | 1.0 | W |
| Junction temperature | T _j | 150 | 150 | °C |
| Operating temperature | T _{opr} | -20 to +70 | -20 to +70 | °C |
| Storage temperature | T _{stg} | -55 to +125 | -55 to +125 | °C |

The absolute maximum ratings are limiting values, to be applied individually, beyond which the device may be permanently damaged. Functional operation under any of these conditions is not guaranteed. Exposing a circuit to its absolute maximum rating for extended periods of time may affect the device's reliability.

Note:

1. Depends on derating. Thermal resistance is as follows:

Junction—TAB $\theta_{jc} \leq 5^\circ\text{C/W}$ (HA13403/V)

Junction—air $\theta_{ja} \leq 40^\circ\text{C/W}$ (HA13403/V)

Junction—air $\theta_{ja} \leq 80^\circ\text{C/W}$ (HA13403MP mounted on an aluminum baseplate)

Electrical Characteristics (V_{CC1} = 5 V, V_{CC2} = 15 V, Ta = 25°C)

| Parameter | Symbol | Min | Typ | Max | Unit | Test Conditions | Pin | | Notes | |
|--|-----------------------|------|------|------|------|--|--|--------|--------|---|
| | | | | | | | SP-23TA | MP-28 | | |
| Quiescent current | I _{CC1} | 6 | 8 | 7 | mA | V _{CTL} = V _{CC1} /2 | V _{CC1} = 5 V | 7 | 12 | |
| | | 9 | 12.4 | 20 | mA | | V _{CC1} = 12 V | | | |
| | I _{CC2} | 3.1 | 4.2 | 6.5 | mA | V _{CTL} = V _{CC1} | | 1 | 28 | |
| TSD operating temperature | T _{sd} | 125 | — | — | °C | | | | | |
| Hall amplifier input current | I _{BH} | — | 1.3 | 10 | μA | V _H = V _{CC1} | | 13, 15 | 15, 17 | |
| Hall amplifier common mode input voltage | V _H | 1.5 | — | 3.5 | V | | V _{CC1} = 5 V | 17, 19 | 20, 22 | |
| | | 2 | — | 9 | V | | V _{CC2} = 12 V | 21, 23 | 24, 27 | |
| Logic sensitivity | U _w | — | — | ±10 | mV | I _O = 50 mA | | | | 1 |
| Output TRS breakdown voltage | BV _{CER} | 26 | — | — | V | I _C = 50 mA | | 18 | 21 | 6 |
| Output amplifier leakage current | I _{CER} | — | — | 1.0 | mA | V _{CE} = 20 V | | 20 | 23 | |
| Output saturation voltage | V _{CE (Sat)} | — | 2.1 | 2.8 | V | V _{CTL} = V _{CC1} | I _O = 1 A | 22 | 26 | 2 |
| | | — | 3.3 | 4.7 | V | | I _O = 1.5 A | | | |
| | | — | 1.1 | 1.5 | V | | I _O = 0.3 A, V _{CC2} = 4 V | | | |
| | | — | — | 1.2 | V | V _{CTL} = V _{CC1} , I _O = 1 A | | | | 3 |
| Reference voltage | V _{REF} | 2.25 | 2.5 | 2.75 | V | | V _{CC1} = 5 V | 6 | 7 | |
| | | 5.4 | 6.0 | 6.6 | V | | V _{CC1} = 12 V | | | |
| Threshold voltage | V _{TH} | 0.08 | 0.14 | 0.27 | V | I _O = 20 mA | V _{CC1} = 5 V | 5 | 6 | 4 |
| | | 0.09 | 0.17 | 0.31 | V | | V _{CC1} = 12 V | | | |
| Control input current | I _{CTL} | — | 10 | 30 | μA | V _{CTL} = V _{CC1} | V _{CC1} = 5 V | | | |
| | | — | 80 | 240 | μA | | V _{CC1} = 12 V | | | |
| | | — | — | 15 | μA | V _{CTL} = V _{CC} | V _{CC1} = 12 V | | | |
| | | -15 | — | — | μA | V _{CTL} = 0 V | V _{CC1} = 12 V | | | |



HA13403, HA13403V, HA13403MP

| Parameter | Symbol | Min | Typ | Max | Unit | Test Conditions | Pin | | Notes |
|----------------------------------|-----------|-------|-------|-------|------|--------------------------|---------|-------|-------|
| | | | | | | | SP-23TA | MP-28 | |
| Control amplifier voltage gain | G_{CTL} | -8 | -6 | -4 | dB | $I_O = 50 \text{ mA}$ | 16 | 19 | |
| | | -9.7 | -7.7 | -5.7 | dB | $I_O = 200 \text{ mA}$ | | | |
| Forward mode voltage range | V_{D-F} | 0 | — | 1.5 | V | $V_{CC1} = 5 \text{ V}$ | 3 | 3 | |
| | | 0 | — | 2.2 | V | $V_{CC1} = 12 \text{ V}$ | | | |
| Reverse mode voltage range | V_{D-R} | 3.5 | — | 5 | V | $V_{CC1} = 5 \text{ V}$ | 3 | 3 | |
| | | 4.2 | — | 12 | V | $V_{CC1} = 12 \text{ V}$ | | | |
| Forward mode input current | V_{D-F} | -0.28 | -0.18 | -0.12 | mA | $V_D = 0 \text{ V}$ | 3 | 3 | |
| | | -0.40 | -0.25 | -0.16 | mA | $V_{CC1} = 12 \text{ V}$ | | | |
| Reverse mode input current | V_{D-R} | 0.12 | 0.18 | 0.28 | mA | $V_D = V_{CC1}$ | | | |
| | | 0.4 | 0.9 | 1.4 | mA | $V_{CC1} = 12 \text{ V}$ | | | |
| Brake mode voltage | V_{BRK} | 1.0 | — | 1.5 | V | $V_{CC1} = 5 \text{ V}$ | 5 | 6 | 5 |
| | | 1.0 | — | 5 | V | $V_{CC1} = 12 \text{ V}$ | | | |
| Brake release voltage | | — | — | 0.5 | V | | | | |
| FG amplifier output bias current | | -0.5 | -0.25 | -0.12 | mA | $V_{CC1} = 5 \text{ V}$ | 10 | 12 | |
| | | -0.8 | -0.4 | -0.2 | mA | $V_{CC1} = 12 \text{ V}$ | | | |
| FG amplifier output voltage | | 2.3 | 2.8 | 3.5 | V | | | | |

Notes:

1. Minimum input voltage necessary for 80% or more of $I_O = 50 \text{ mA}$ to flow at original phase.
2. Sum of the upper and lower saturation voltages.
3. Lower saturation voltage when brake circuit is in operation.
4. Difference in voltage from pin 6.
5. See figure 1.
6. Values in parentheses are for the HA13403MP.

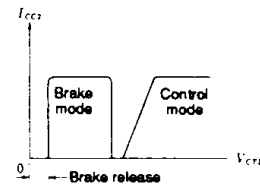


Figure 1

Timing Chart

