

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

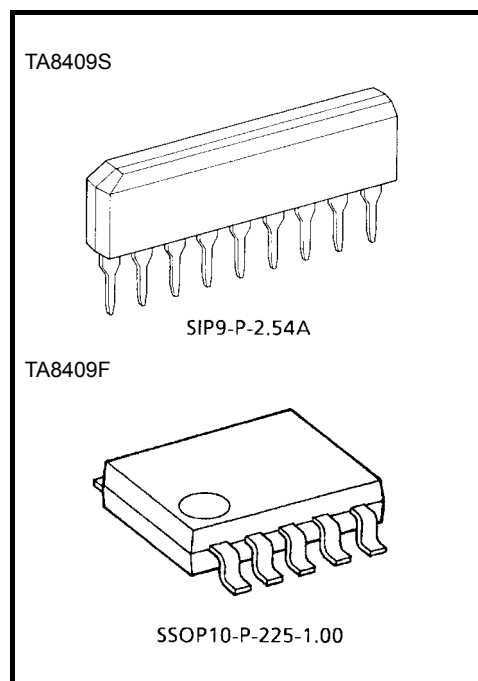
TA8409S, TA8409F

Bridge Driver

TA8409S and TA8409F are bridge driver with output voltage control.

Features

- Modes available (CW/CCW/STOP/BRAKE)
- Output current up to 0.4 A (AVE) and 1.0 A (PEAK)
- Wide range of operating voltage
 $V_{CC} \text{ (opr.)} = 4.5 \text{ to } 20 \text{ V}$
 $V_S \text{ (opr.)} = 0 \text{ to } 20 \text{ V}$
 $V_{ref} \text{ (opr.)} = 0 \text{ to } 20 \text{ V} \quad (V_{ref} \leq V_S)$
- Built-in thermal shutdown
- Standby mode available (STOP MODE)
- Hysteresis for all inputs.

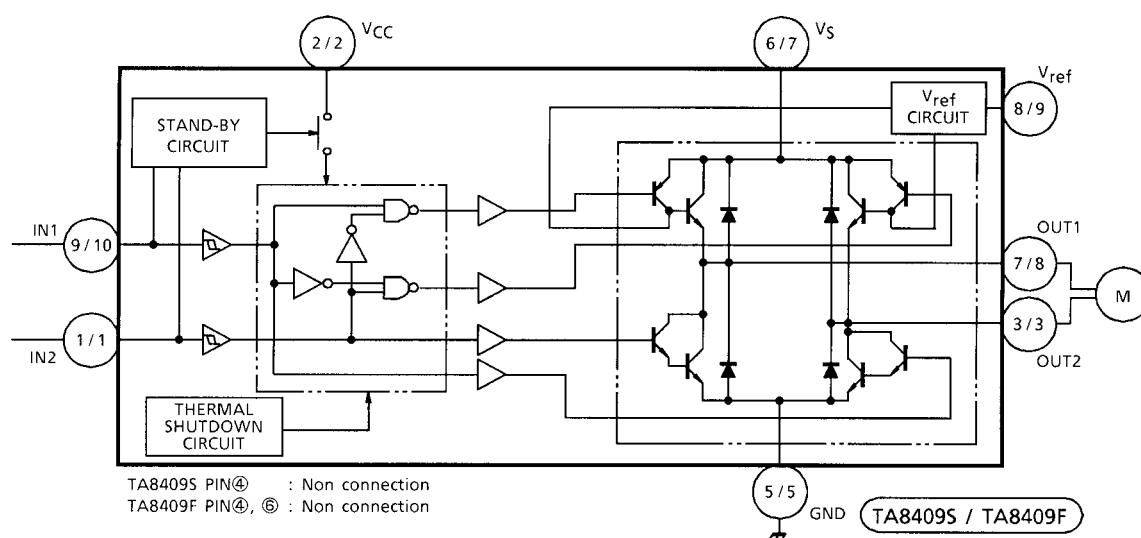


Weight

SIP9-P-2.54A: 0.92 g (typ.)

SSOP10-P-225-1.00: 0.09 g (typ.)

Block Diagram



Pin Function

TA8409S

| Pin No. | Symbol | Functional Description |
|---------|------------------|--|
| 1 | IN2 | Input terminal |
| 2 | V _{CC} | Supply voltage terminal for logic |
| 3 | OUT2 | Output terminal |
| 4 | NC | Non connection |
| 5 | GND | GND terminal |
| 6 | V _S | Supply voltage terminal for motor driver |
| 7 | OUT1 | Output terminal |
| 8 | V _{ref} | Reference voltage terminal for control circuit |
| 9 | IN1 | Input terminal |

TA8409F

| Pin No. | Symbol | Functional Description |
|---------|------------------|---|
| 1 | IN2 | Input terminal |
| 2 | V _{CC} | Supply voltage terminal for logic |
| 3 | OUT2 | Output terminal |
| 4 | NC | Non connection |
| 5 | GND | GND terminal |
| 6 | NC | Non connection |
| 7 | V _S | Supply voltage terminal for motor driver |
| 8 | OUT1 | Output terminal |
| 9 | V _{ref} | Reference voltage terminal for control circuit. |
| 10 | IN1 | Input terminal |

Function

| Input | | Output | | Mode |
|-------|------|--------|------|--------|
| IN 1 | IN 2 | OUT1 | OUT2 | MB |
| 0 | 0 | ∞ | ∞ | STOP |
| 1 | 0 | H | L | CW/CCW |
| 0 | 1 | L | H | CCW/CW |
| 1 | 1 | L | L | BRAKE |

∞: High impedance

Note: Inputs are all high active type.

Maximum Ratings (Ta = 25°C)

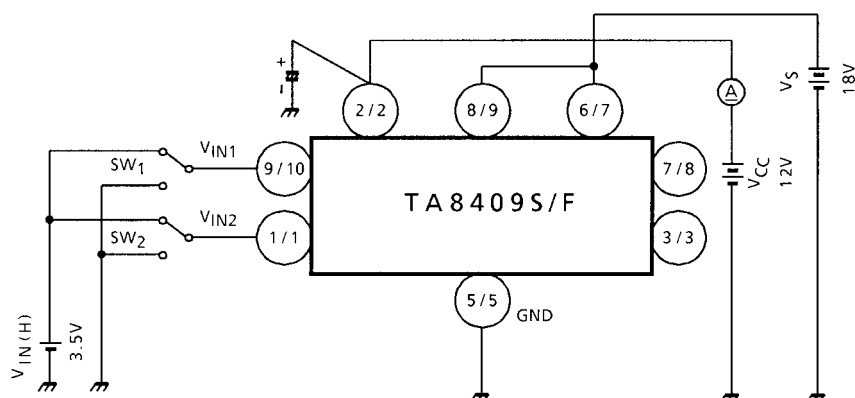
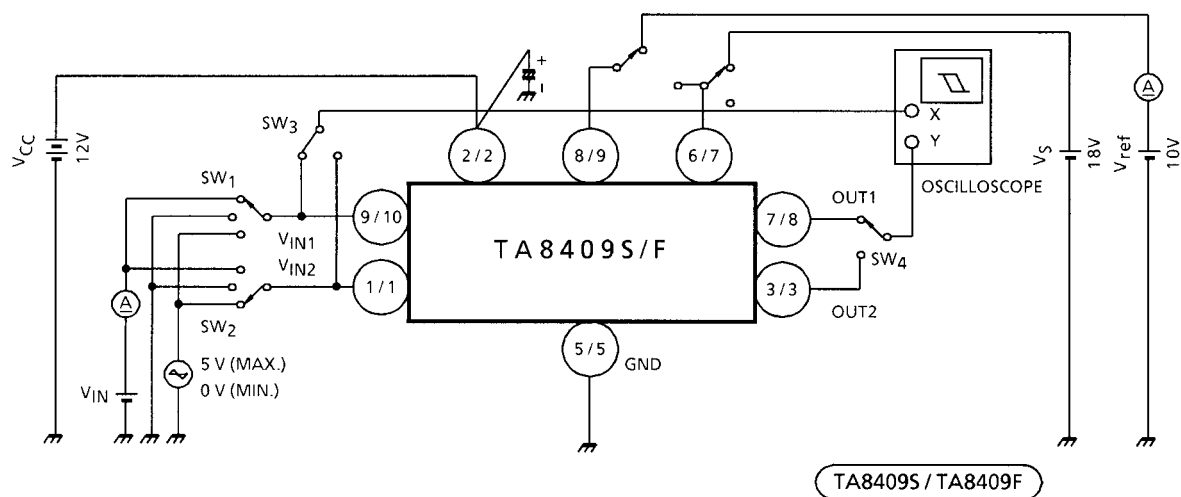
| Characteristics | | Symbol | Rating | Unit |
|-----------------------|---------|-----------------------|--------------|------|
| Supply voltage | | V _{CC} | 25 | V |
| Motor drive voltage | | V _S | 25 | V |
| Reference voltage | | V _{ref} | 25 | V |
| Output current | PEAK | I _O (PEAK) | 1.0 | A |
| | AVE. | I _O (AVE.) | 0.4 | |
| Power dissipation | TA8409F | P _D | 0.735 (Note) | W |
| | TA8409S | | 0.95 | |
| Operating temperature | | T _{opr} | -30 to 75 | °C |
| Storage temperature | | T _{stg} | -55 to 150 | °C |

Note: This rating is obtained by mounting on 50 × 50 × 1.6 mm PCB that occupied above 30% of copper area.

Electrical Characteristics (Ta = 25°C, V_{CC} = 12 V, V_S = 18 V)

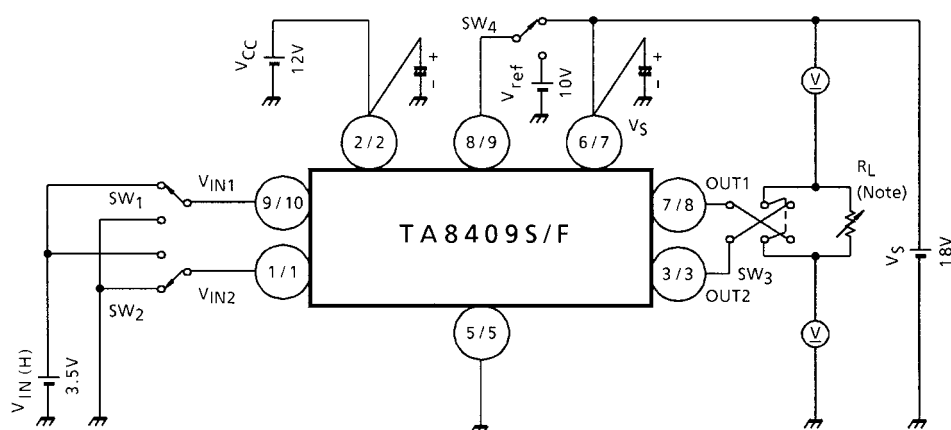
| Characteristics | | Symbol | Test Circuit | Test Condition | Min | Typ. | Max | Unit |
|-----------------------------------|------------|-----------------------|--------------|---|------|------|------|------|
| Supply current | | I _{CC1} | 1 | Output OFF, CW/CCW mode | — | 10.0 | 15.0 | mA |
| | | I _{CC2} | 1 | Output OFF, STOP mode | — | 0 | 50 | μA |
| | | I _{CC3} | 1 | Output OFF, BREAK mode | — | 6.5 | 10.0 | mA |
| Input operating voltage | 1 (High) | V _{IN1} | 2 | T _j = 25°C IN1, 2 | 3.5 | — | 5.5 | V |
| | 2 (Low) | V _{IN2} | 2 | T _j = 25°C IN1, 2 | GND | — | 0.8 | |
| Input current | | I _{IN} | 2 | Sink mode, V _{IN} = 3.5 V | — | 3 | 10 | μA |
| Input hysteresis voltage | | ΔV _T | 2 | — | — | 0.7 | — | V |
| Saturation voltage | Upper side | V _{SAT U-1} | 3 | V _{ref} = V _S , V _{OUT} -V _S measure I _O = 0.2 A, CW/CCW mode | — | 0.9 | 1.2 | V |
| | Lower side | V _{SAT L-1} | 3 | V _{ref} = V _S , V _{OUT} -GND measure I _O = 0.2 A, CW/CCW mode | — | 0.8 | 1.2 | |
| | Upper side | V _{SAT U-2} | 3 | V _{ref} = V _S , V _{OUT} -V _S measure I _O = 0.4 A, CW/CCW mode | — | 1.0 | 1.35 | |
| | Lower side | V _{SAT L-2} | 3 | V _{ref} = V _S , V _{OUT} -GND measure I _O = 0.4 A, CW/CCW mode | — | 0.9 | 1.35 | |
| Output voltage | | V _{SAT U-1'} | 3 | V _{ref} = 10 V, V _{OUT} -GND measure I _O = 0.2 A | 10.4 | 11.2 | 12.2 | V |
| | | V _{SAT U-2'} | 3 | V _{ref} = 10 V, V _{OUT} -GND measure I _O = 0.4 A | — | 10.9 | — | |
| Output transistor leakage current | Upper side | I _{LU} | 4 | V _L = 25 V | — | — | 50 | μA |
| | Lower side | I _{LL} | 4 | V _L = 25 V | — | — | 50 | |
| Diode forward voltage | Upper side | V _{F U-1} | 5 | I _F = 0.4 A | — | 1.5 | — | V |
| | Lower side | V _{F L-1} | 5 | I _F = 0.4 A | — | 0.9 | — | |
| Reference current | | I _{ref} | 2 | V _{ref} = 10 V, source mode | — | 20 | 40 | μA |

lcc1, lcc2, lcc3

 $V_{IN1}, V_{IN2}, I_{IN}, \Delta V_T, I_{ref}$ 

Test Circuit 3

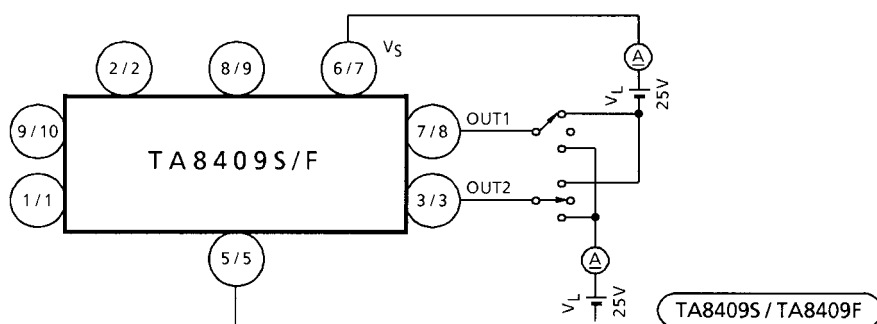
$V_{SAT\ U-1, 2}$, $V_{SAT\ L-1, 2}$, $V_{SAT\ U-1', 2'}$



Note: Calibrate I_{OUT} to 0.2/0.4 A by R_L .

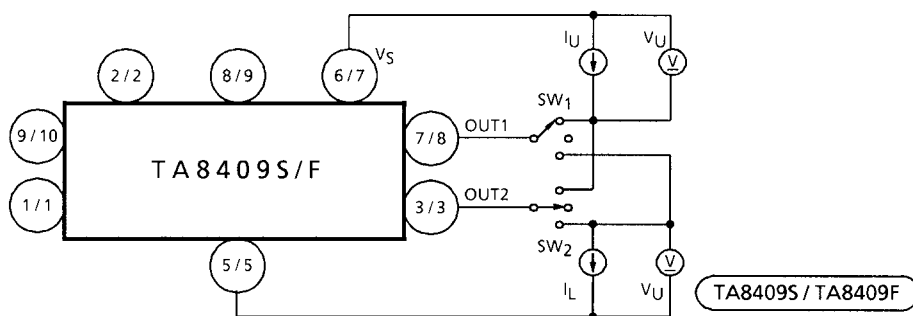
Test Circuit 4

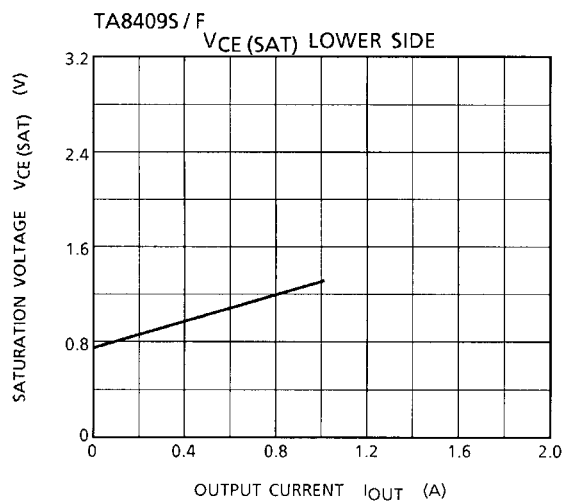
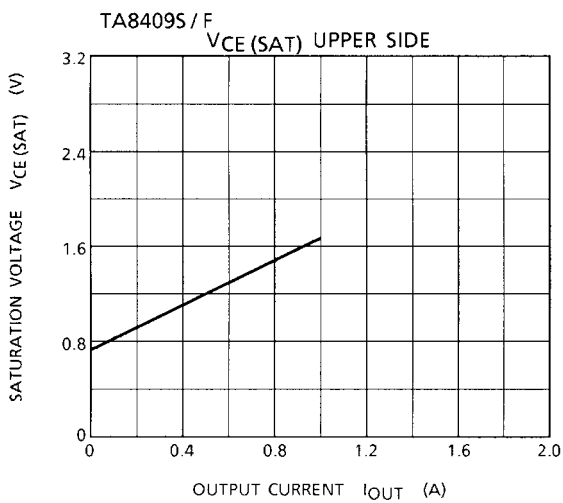
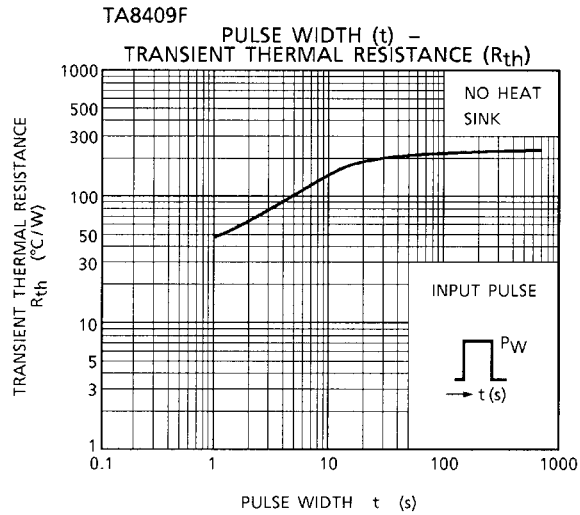
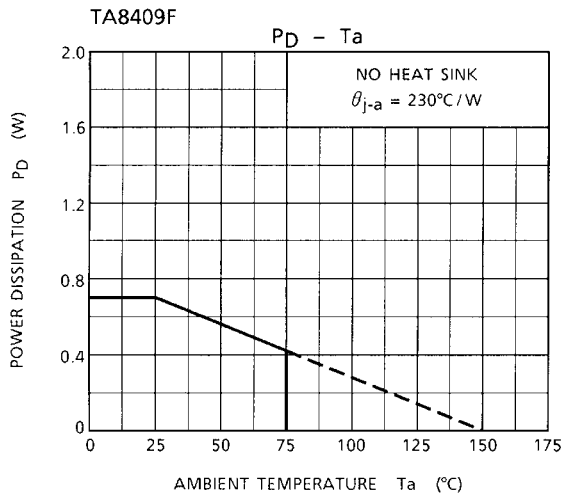
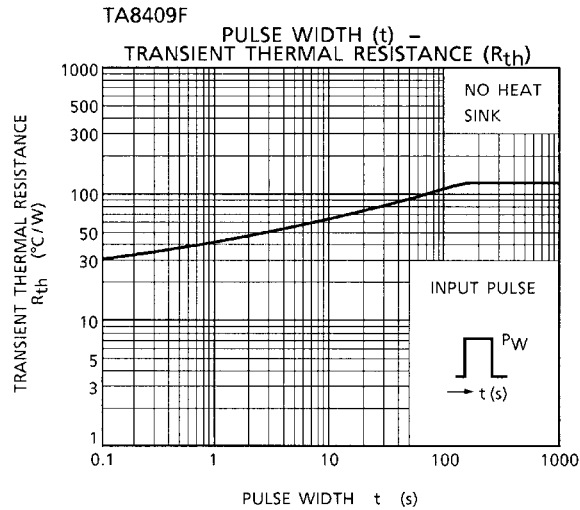
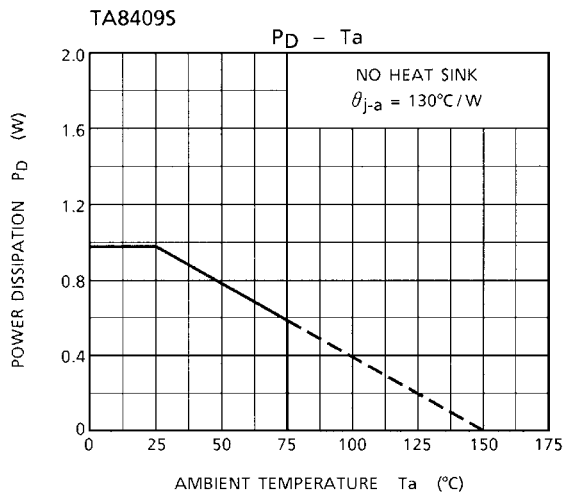
$I_{L\ U, L}$



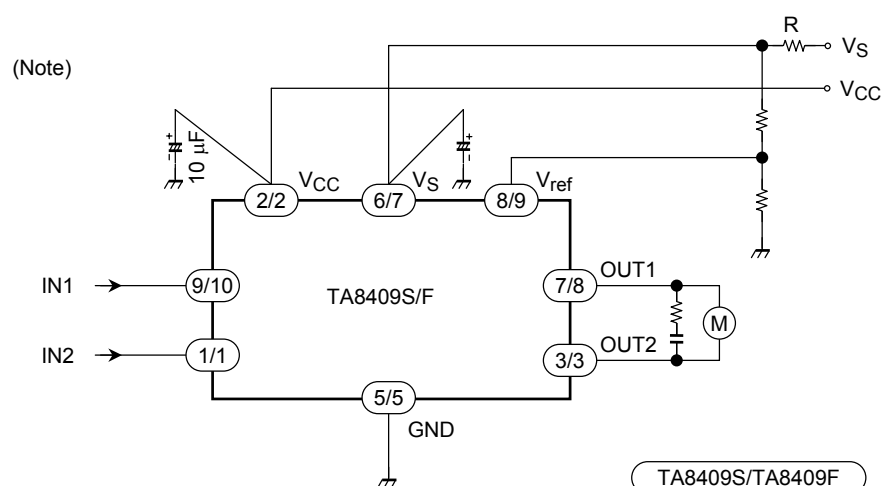
Test Circuit 5

$V_{F\ U-1, 2}$, $V_{F\ L-1, 2}$





Application Circuit



Note 1: Attach a bypass capacitor to the VS pin as required.

Note 2: Utmost care is necessary in the design of the output line, VS, VCC and GND line since IC may be destroyed due to short-circuit between outputs, to supply fault, or to ground. Also note in mind that mounting the IC in the reverse orientation may also cause a breakdown.

Note 3: Switching the inputs may allow a pass-through current to flow. Keep the IC device in the STOP mode (for at least 100 µs) during the switching. Alternatively, insert a current limiting resistor R.

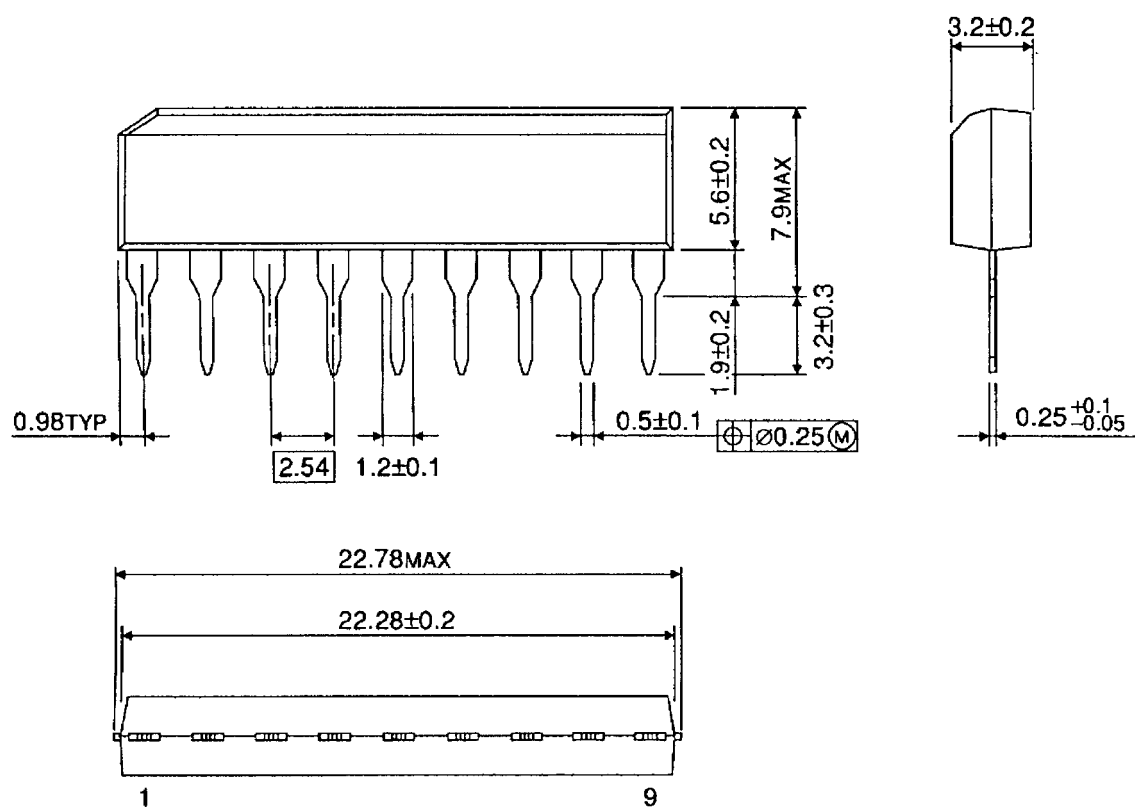
Note 4: Use a current limiting resistor R or fuse for overcurrent protection.

Note 5: When turning on the power for the IC device, apply VS after VCC (or VCC and VS simultaneously).
When shutting off the power, drop VS before VCC (or VS and VCC simultaneously).
When turning on the power (VCC), keep both the inputs (IN1 and IN2) on a low level.

Package Dimensions

SIP9-P-2.54A

Unit : mm

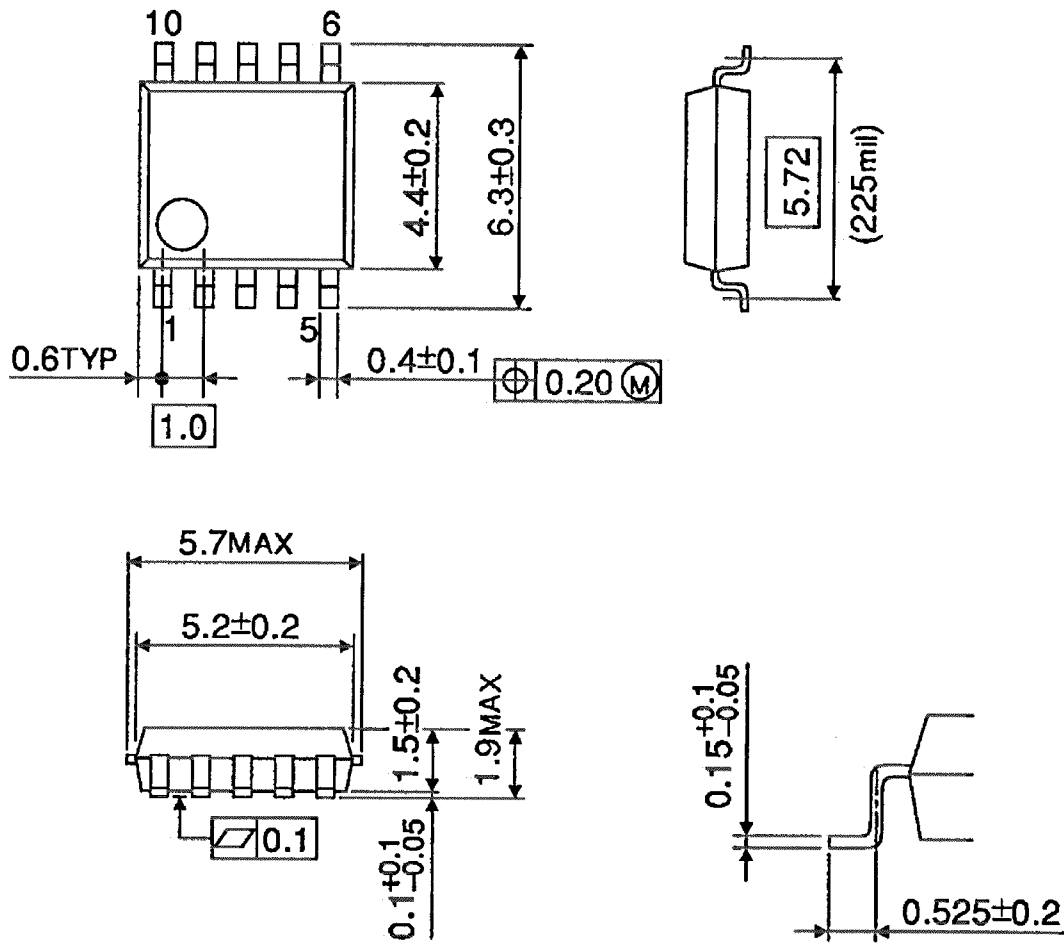


Weight: 0.92 g (typ.)

Package Dimensions

SSOP10-P-225-1.00

Unit : mm



Weight: 0.09 g (typ.)

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