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LA6588MC

Monolithic Linear IC 24V power supply, BTL output linear drive Single-phase Fan Motor IC

Overview

The LA6588MC is a Single-phase bipolar fan motor IC for 24V power supply. BTL output linear drive ensures highly-efficient, energy-saving, and silent drive while suppressing the ineffective current. Lock protection and lock signal circuit are incorporated, proving most suitable for consumer equipment power supply, OA equipment and car audio system, etc which require high reliability and low noise.

Functions

- Single-phase full-wave linear drive by BTL output (gain resistance 500 to 360k, 57dB)
 - : No switching noise, which is most favorable for use in equipment requiring silent operation, such as consumer equipment power supply, car audio system, etc.
- Operable at low voltage and over a wide operation voltage range (8 to 26.4V)
- Low saturation output (Upper + lower saturation voltages: $V_{OSat}(\text{total}) = 1.1V$ typ, $I_O = 200mA$)
 - : High coil efficiency and small current drain. Small heat generation from IC itself
- Lock protection and automatic return circuits incorporated
- Lock protection signal output (L during rotation, H at stop, open collector output)
- Output (Rotation detection output: Open collector output)
- Hall bias incorporated ($V_{HB} = 1.5V$)
- Heat protection circuit
 - : The heat protection circuit suppresses the drive current to prevent burn or damage of IC when the large current flows due to output short-circuit and the IC chip temperature exceeds 180°C.
- Small package with high heat capacity (MFP10SK) Pin-compatible silent series (5V/12V/24V products)

Specifications

Absolute Maximum Ratings at $T_a = 25^\circ C$

| Parameter | Symbol | Conditions | Ratings | Unit |
|--|-------------------------|---------------------------------|-------------|------|
| Supply voltage | $V_{CC} \text{ max}$ | | 28 | V |
| Output current | $I_{OUT} \text{ max}$ | | 0.8 | A |
| Output withstand voltage | $V_{OUT} \text{ max}$ | | 28 | V |
| Output withstand voltage of RD/FG output pin | $V_{RD/FG} \text{ max}$ | | 28 | V |
| RD/FG output current | $I_{RD/FG} \text{ max}$ | | 5 | mA |
| HB output current | $I_B \text{ max}$ | | 10 | mA |
| Allowable dissipation | $P_d \text{ max}$ | Mounted on a specified board. * | 800 | mW |
| Operating temperature | T_{opr} | | -30 to +90 | °C |
| Storage temperature | T_{stg} | | -55 to +150 | °C |

* Mounted on a specified board: 114.3×76.1×1.6 mm³, glass epoxy board.

Caution 1) Absolute maximum ratings represent the value which cannot be exceeded for any length of time.

Caution 2) Even when the device is used within the range of absolute maximum ratings, as a result of continuous usage under high temperature, high current, high voltage, or drastic temperature change, the reliability of the IC may be degraded. Please contact us for the further details.

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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Recommended Operating Conditions at Ta = -30 to +90°C

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|--|------------------|------------|---------|-----|----------------------|------|
| | | | min | typ | max | |
| Supply voltage | V _{CC} | | 8 | | 26.4 | V |
| Common-phase input voltage range of Hall input | V _{ICM} | | 0 | | V _{CC} -1.5 | V |

Electrical Characteristics at Ta = 25°C, V_{CC} = 24V, unless otherwise specified.

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|--|--------------------|---|---------|------|------|------|
| | | | min | typ | max | |
| Circuit Current | I _{CC1} | During drive (CT = L) | 4.5 | 7 | 9.5 | mA |
| | I _{CC2} | During lock protection (CT = H) | 2.5 | 4.5 | 6.5 | mA |
| Lock detection capacitor charge current | I _{CT1} | | 2.0 | 2.7 | 3.5 | μA |
| Capacitor discharge current | I _{CT2} | | 0.15 | 0.23 | 0.30 | μA |
| Capacitor charge and discharge current ratio | R _{CT} | RCD = I _{CT1} /I _{CT2} | 10 | 12 | 14 | |
| CT charge voltage | V _{CT1} | | 1.55 | 1.7 | 1.8 | V |
| CT discharge voltage | V _{CT2} | | 0.65 | 0.75 | 0.85 | V |
| OUT output L saturation voltage | V _{OL} | I _O = 200mA | | 0.2 | 0.3 | V |
| OUT output H saturation voltage | V _{OH} | I _O = 200mA | | 0.9 | 1.2 | V |
| Hall input sensitivity | V _{HN} | Zero peak value (including offset and hysteresis) | | 7 | | mV |
| RD/FG output pin L voltage | V _{RD/FG} | I _{RD/FG} = 5mA | | 0.2 | 0.3 | V |
| RD/FG output pin leak current | I _{RD/FG} | V _{RD/FG} = 15V | | 1 | 3 | μA |
| HB output voltage | V _{HB} | I _{HB} = 5mA | 1.3 | 1.5 | 1.7 | V |

Truth Table

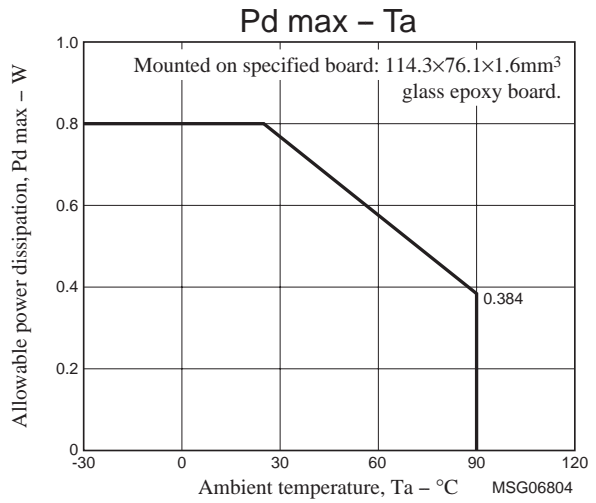
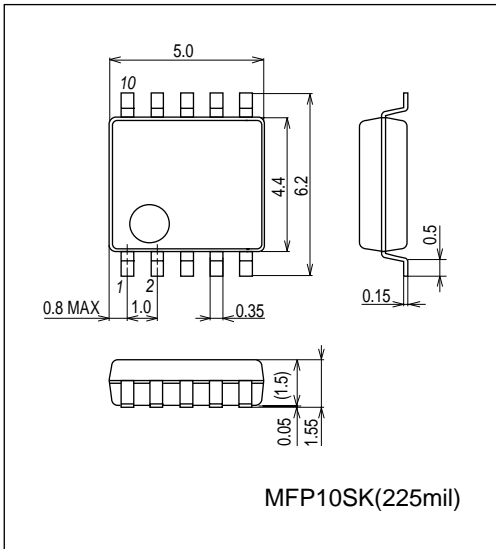
| IN ⁻ | IN ⁺ | CT | OUT1 | OUT2 | FG | RD | Mode |
|-----------------|-----------------|----|------|------|----|----|----------------------------|
| H | L | L | H | L | L | L | During rotation |
| L | H | | L | H | H | | |
| - | - | H | OFF | OFF | - | H | During overheat protection |

--Don't care.

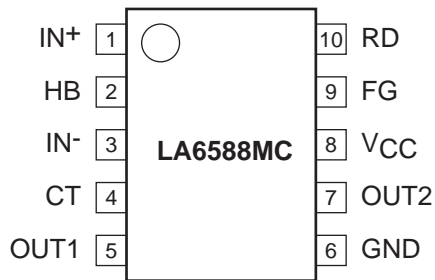
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Package Dimensions

unit : mm (typ)
3420

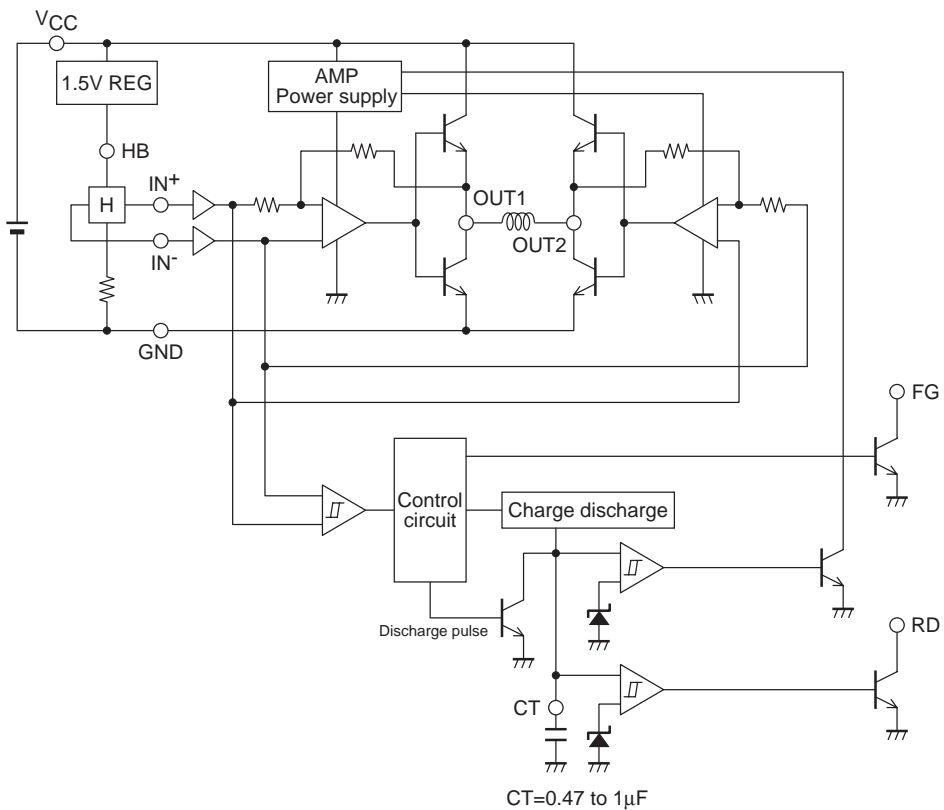


Pin Assignment

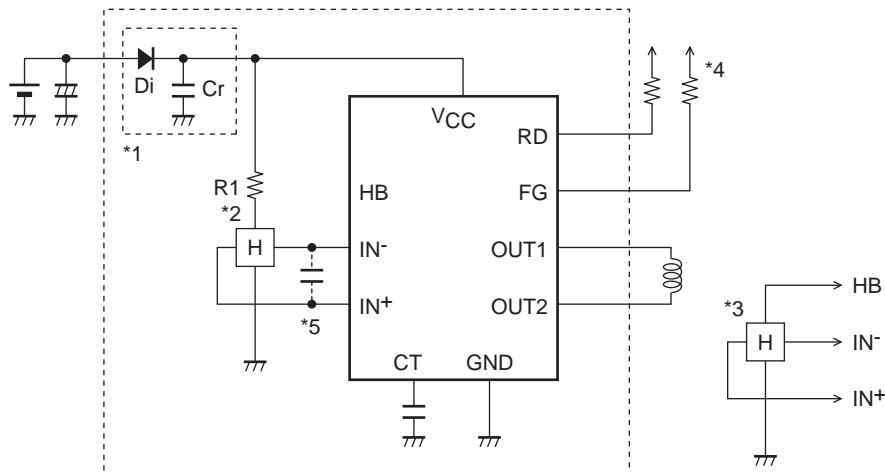


Top View

Block Diagram



Application Circuit Examples



- *1: When Di to prevent breakdown in case of reverse connection is used, it is necessary to insert a capacitor Cr to secure the regenerative current route. Similarly, Cr is necessary to enhance the reliability when there is no capacitor near the fan power line.
- *2: When taking Hall bias from V_{CC}, carry out bias to V_{CC} with resistor R1 as shown in the figure. Linear drive is achieved through voltage control of the coil by amplifying the Hall output. With large Hall element output, the start performance and efficiency are improved. Noise can be reduced further by adjusting the Hall element.
- *3: When the Hall bias is taken from the HB pin, constant-voltage bias is made with about 1.5V. Therefore, the Hall element can provide the output satisfactory in temperature characteristics.
- *4: Keep this open when not using.
- *5: When the wiring from the Hall output to IC Hall input is long, noise may be carried through the wiring. In this case, insert the capacitor as shown in the figure.

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