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LA6586FA

Monolithic Linear IC

BTL Driver Single-Phase Full-Wave Fan Motor Driver

Overview

The LA6586FA is Single-phase bipolar fan motor is put into silent driving by means of BTL output linear drive, offering high efficiency and power saving by suppressing the reactive current. Lock protection and rotation signal (FG, RD) circuits are built in, ensuring optimum application to small fans for notebook PC, consumer equipment power supply, car audio system, CPU cooler, etc. that require high reliability and low noise.

Functions

- Single-phase full-wave linear drive by BTL output (gain resistance $1k\Omega$ - $360k\Omega$, 51dB)
- Low-voltage operation possible, with wide operating voltage range (2.2 to 14.0V)
- Low saturation output (Upper + lower saturation voltage : V_{sat} (total)= $1.2V_{typ}$, $I_O=200mA$)
- Built-in lock protection and automatic reset circuits
- Built-in FG&RD outputs
- Thermal protection circuit
- Built-in Hall bias ($V_{HB}=1.3V$)
- Extra-small package (Micro10)

Specifications

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

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|-----------------|-------------------------------|-------------|------------|
| Output voltage | V_{CC} max | | 15 | V |
| Allowable power dissipation | P_d max | Mounted on a specified board* | 400 | mW |
| Output current | I_{OUT} max | | 0.6 | A |
| Output withstand voltage | V_{OUT} max | | 15 | V |
| RD/FG output pin output withstand voltage | $V_{RD/FG}$ max | | 15 | V |
| RD/FG output current | $I_{RD/FG}$ max | | 10 | mA |
| HB output current | I_B max | | 10 | mA |
| Operating temperature | T_{opr} | | -30 to +90 | $^\circ C$ |
| Storage temperature | T_{stg} | | -55 to +150 | $^\circ C$ |

*Mounted on a specified board : 20mm×10mm×0.8mm, paper phenol

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 Range at Ta = 25 °C

| Parameter | Symbol | Conditions | Ratings | Unit |
|--|------------------|------------|---------------------------|------|
| Supply voltage | V _{CC} | | 2.2 to 14.0 | V |
| Common-phase input voltage range of Hall input | V _{ICM} | | 0 to V _{CC} -1.5 | V |

Electrical Characteristics at Ta = 25 °C, V_{CC} = 12 V

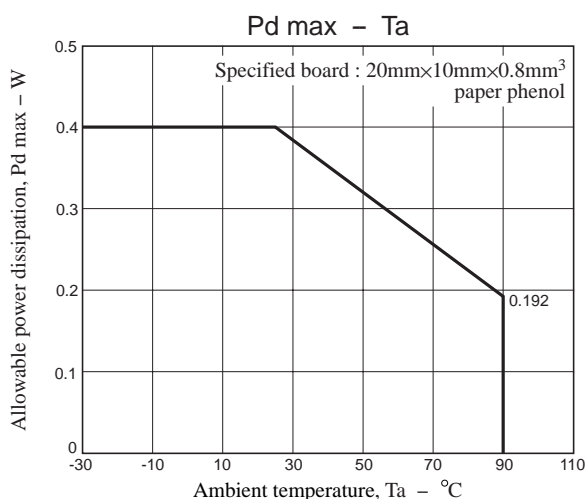
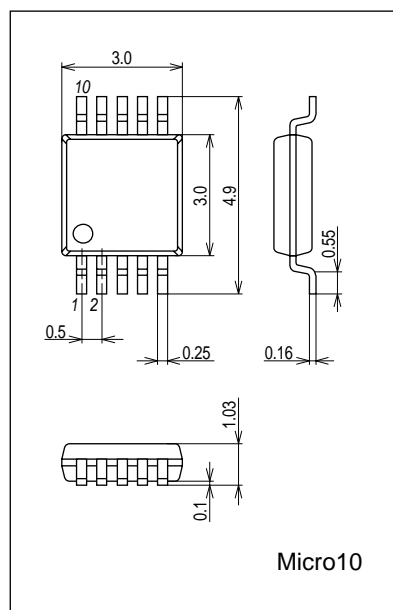
| Parameter | Symbol | Conditions | Ratings | | | Unit |
|--|-------------------|--|---------|------|------|------|
| | | | min | typ | max | |
| Circuit current | I _{CC1} | During drive (CT = L) | 3 | 6 | 9 | mA |
| | I _{CC2} | During lock protection (CT = H) | 2.5 | 5 | 7.5 | mA |
| Lock detection capacitor charge current | I _{CT1} | | 0.9 | 1.2 | 1.5 | μA |
| Capacitor discharge current | I _{CT2} | | 0.10 | 0.18 | 0.25 | μA |
| Capacitor charge and discharge current ratio | R _{CT} | R _{CT} = I _{CT1} /I _{CT2} | 5 | 6.5 | 8 | - |
| CT charge voltage | V _{CT1} | | 1.3 | 1.5 | 1.7 | V |
| CT discharge voltage | V _{CT2} | | 0.3 | 0.5 | 0.7 | V |
| OUT output L saturation voltage | V _{OL} | I _O = 200 mA | | 0.25 | 0.45 | V |
| OUT output H saturation voltage | V _{OH} | I _O = 200 mA | | 0.95 | 1.2 | V |
| Input offset voltage | V _{OFST} | | | 3 | 6 | mV |
| Hall input sensitivity | V _{HN} | Zero peak value (including offset and hysteresis) | | 7 | 15 | mV |
| Hall bias output L voltage | V _{HB} | I _{HB} = 5 mA | 1.3 | 1.5 | 1.7 | V |
| RD/FG input pin L voltage | V _{FG} | I _{RD/FG} = 5 mA | | 0.15 | 0.3 | V |
| RD/FG input pin leak current | I _{FGL} | V _{RD/FG} = 15 V | | 1 | 30 | μA |
| Overheat protection circuit | T _{SD} | (*1) Designed target value | 150 | 180 | 210 | °C |

(*1) The standard is a design target and the measurement with a single unit is not made.

Package Dimensions

unit : mm

3428

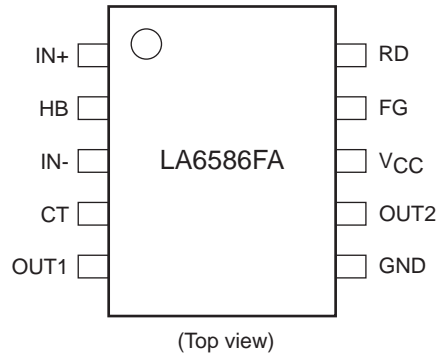


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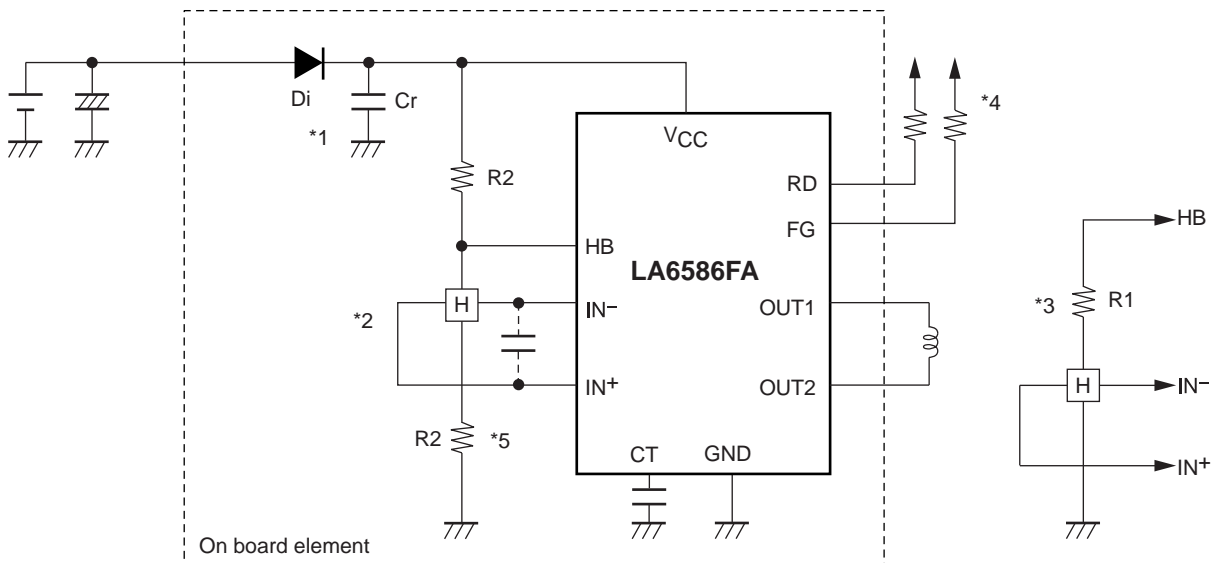
Truth Table

| 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 |

Pin Assignment

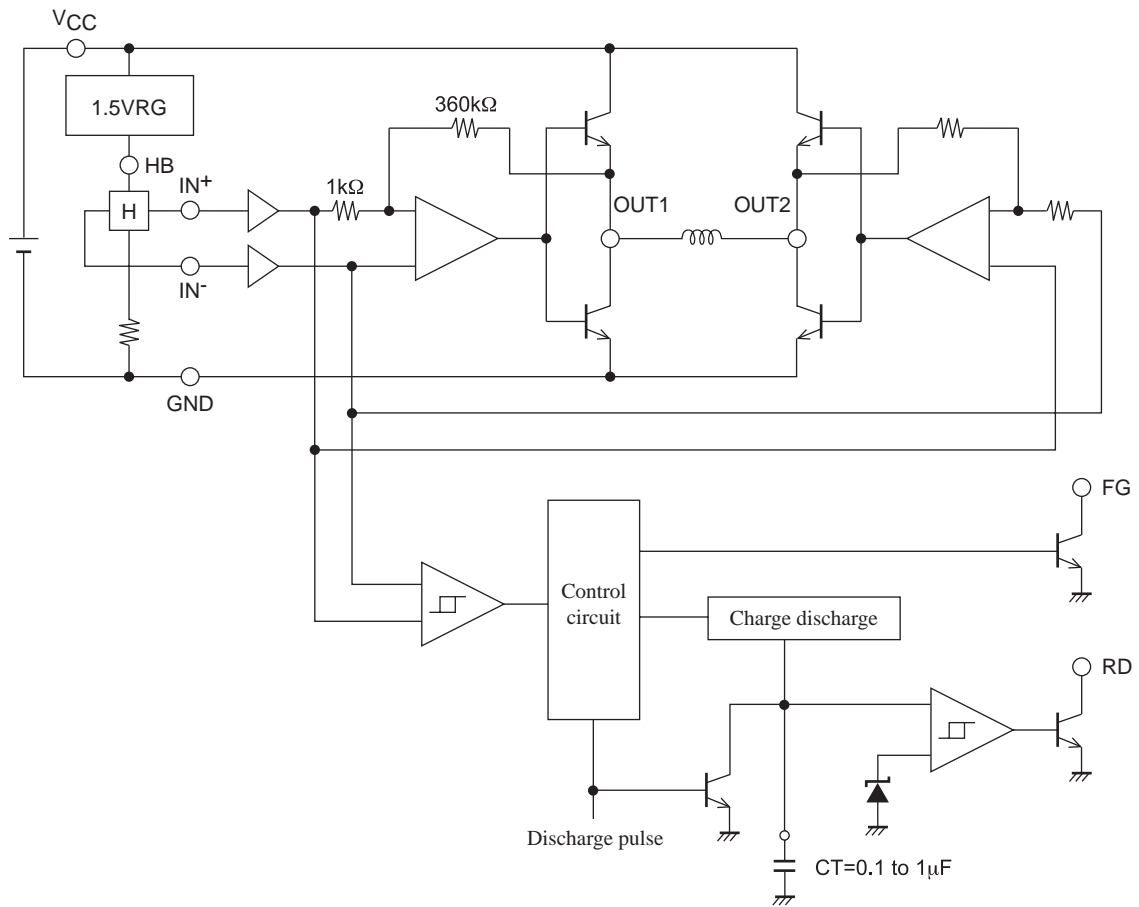


Sample Application Circuit



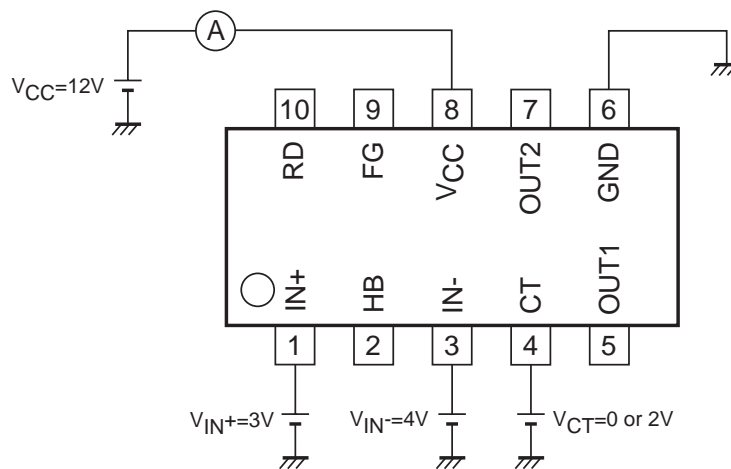
- *1 To enhance the reliability, it is necessary to insert a capacitor Cr to secure the regenerative current route.
- *2 To obtain Hall bias from VCC, carry out $1/2 \times V_{CC}$ bias as shown in the figure. Linear driving is made through voltage control of the coil by amplifying the Hall output. When the Hall element output is large, the startup performance and efficiency are improved. Adjustment of the Hall element can reduce the noise further.
- *3 To obtain Hall bias from the HB pin, carry out constant-voltage bias at about 1.5 V. which enables the Hall element to generate the stable Hall output satisfactory in temperature characteristics. The Hall output amplitude is adjusted with R1. (In the case of $V_{CC} = 12\text{ V}$, *2 proves advantageous in terms of heat generation in IC.)
- *4 Keep this open when not used.
- *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.

Internal Equivalent Circuit



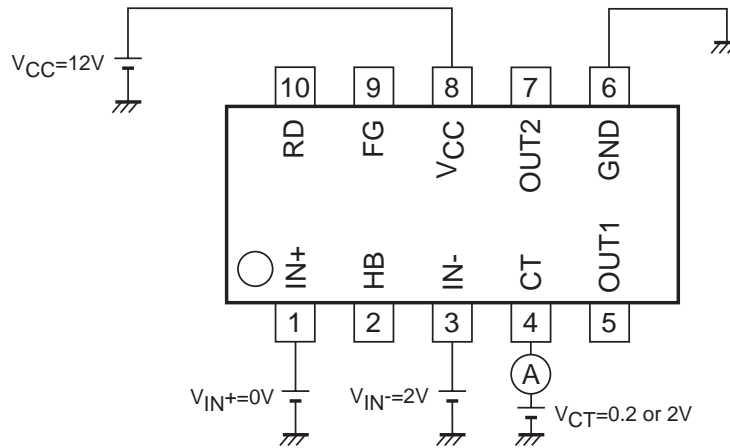
Test Circuit Diagram

Input current (I_{CC})

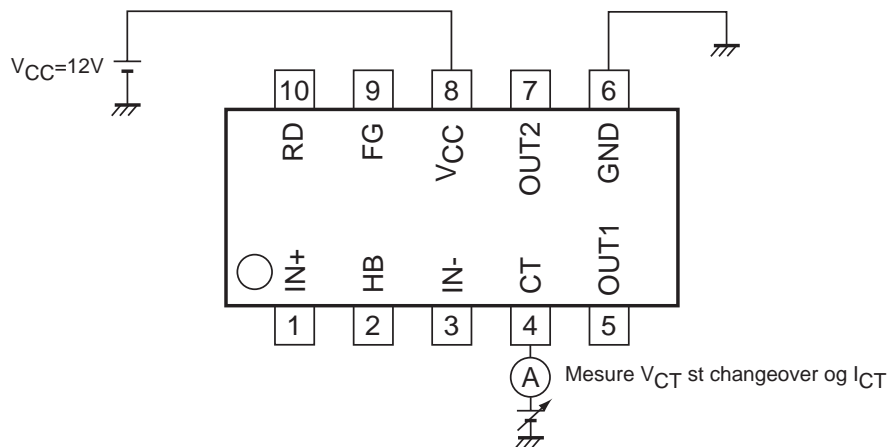


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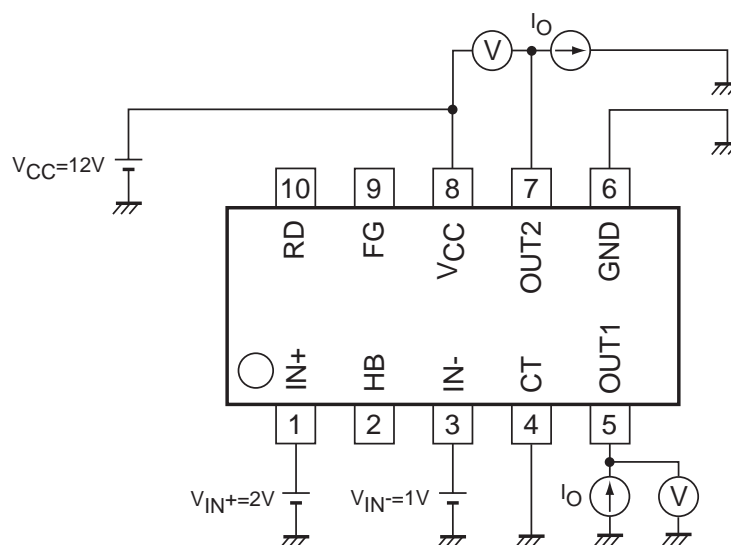
CT pin charge/discharge current (I_{CT})



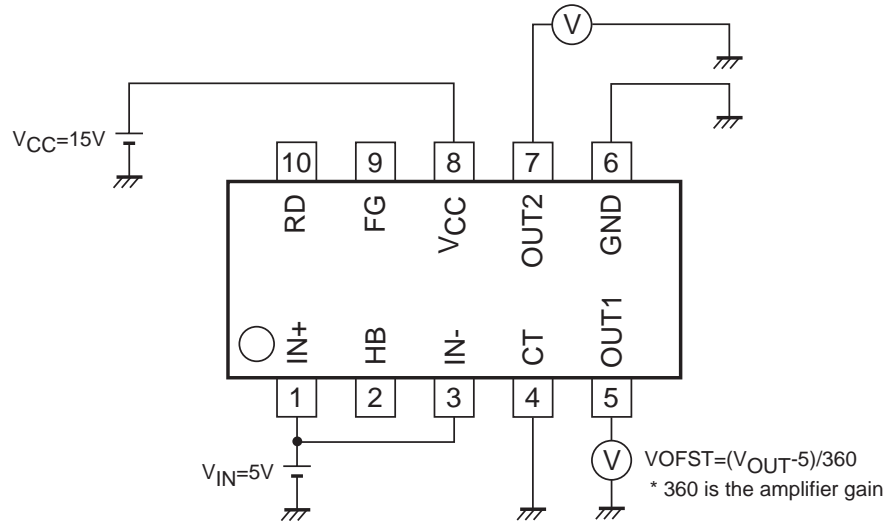
CT pin charge/discharge voltage (V_{CT})



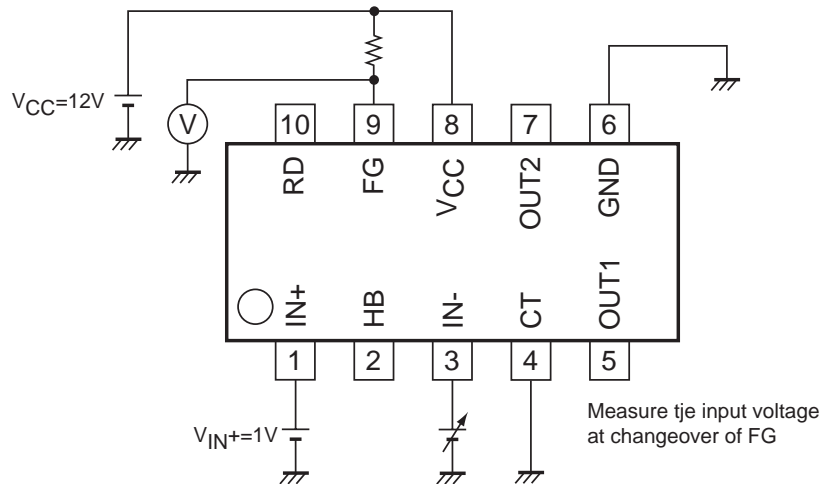
OUT output saturation voltage (V_{OL} , V_{OH})



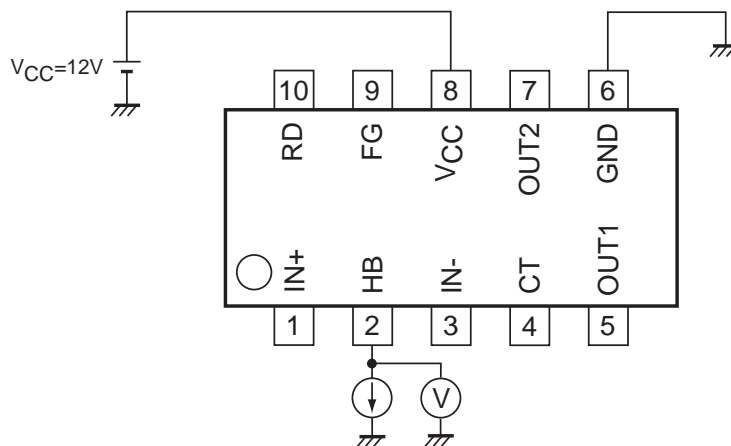
Input offset voltage (VOFST)



Hall input sensitivity (VHN)

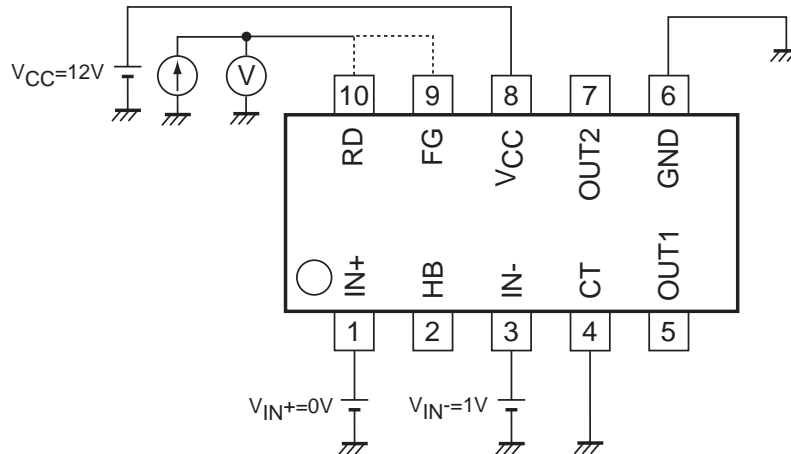


Hall bias output voltage (VHB)

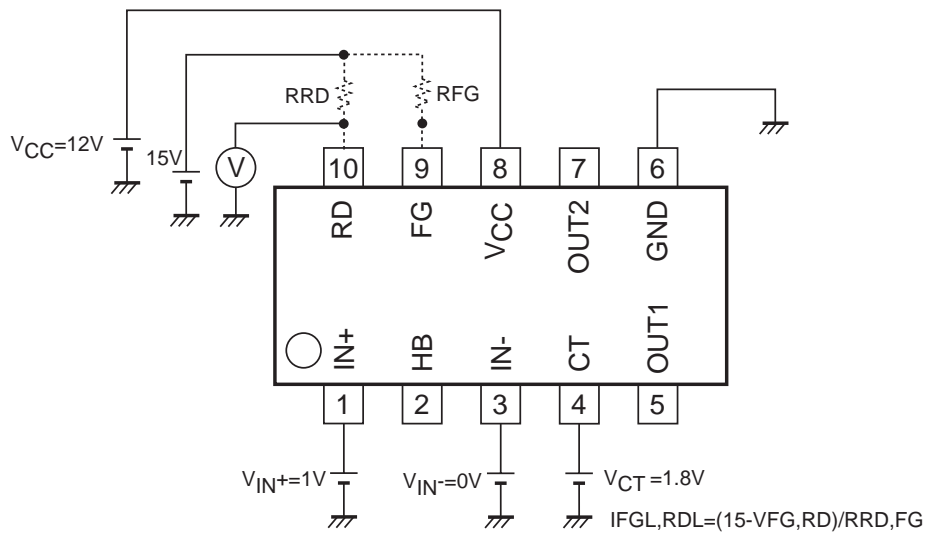


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FG, RD input pin L voltage (VFG, RD)



FG, RD input pin leakage current (IFGL, RDL)



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