

**LA5587**

General-Purpose Compact DC Motor Speed Controller

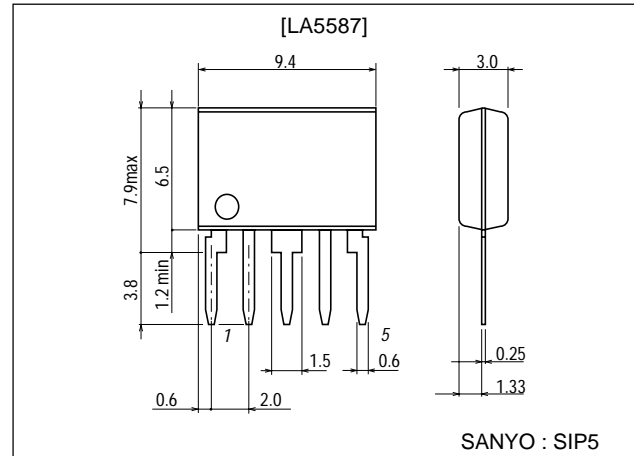
Features

- On-chip stable voltage reference meeting the requirements for various motors.
- Wide operating voltage range (3.8 to 16V).
- Minimum number of external parts required and small-sized package.
- Facilitates speed control.
- On-chip kickback absorber.
- On-chip protector against inverted connection to power supply.

Package Dimensions

unit:mm

3042C-SIP5



Specifications

Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC \text{ max}}$		18	V
Motor current	$I_m \text{ max}$	Switch ON or lock mode	1.4	A
Allowable power dissipation	$P_d \text{ max}$		1.2	W
Operating temperature	T_{opr}		-20 to +80	$^\circ\text{C}$
Storage temperature	T_{stg}		-40 to +150	$^\circ\text{C}$

Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Recommended operating voltage	$V_{CC \text{ op}}$		3.8 to 16	V
Recommended operating temperature	T_{opr}		-20 to +80	$^\circ\text{C}$

Operating Characteristics at $T_a = 25^\circ\text{C}$, See Test Circuit.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Reference voltage	V_{ref}	$V_{CC}=12\text{V}$, $I_m=10\text{mA}$	1.08	1.21	1.27	V
Quiescent current drain	I_d	$V_{CC}=12\text{V}$, $I_m=0\text{mA}$		1.0	1.6	mA
Shunt ratio	K	$V_{CC}=12\text{V}$, $I_m=50\text{--}150\text{mA}$	18	20	22	
Residual voltage	$V(\text{sat})$	$V_{CC}=4.2\text{V}$, $R_T=4.4\Omega$		0.94		V

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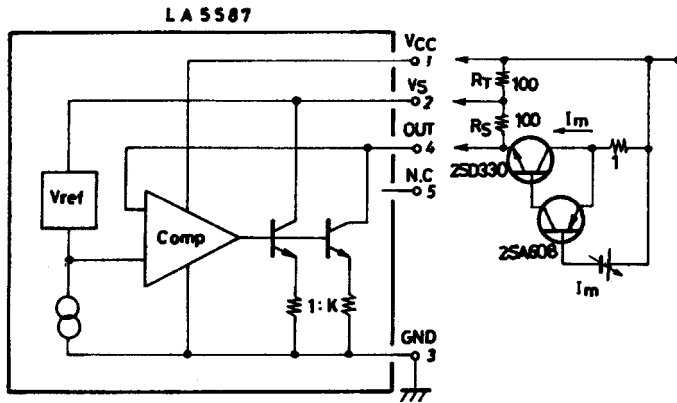
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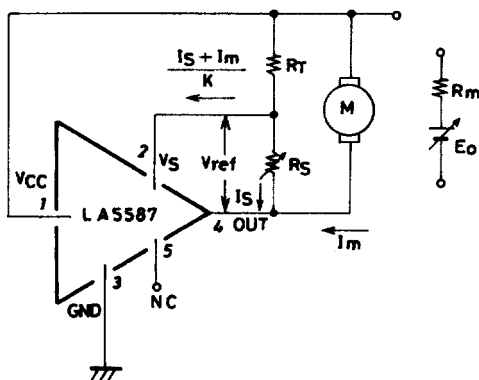
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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Voltage characteristic of reference voltage	$\frac{\Delta V_{ref}}{V_{ref}} / \Delta V_{CC}$	$V_{CC}=6.3$ to $16V$, $I_m=100mA$		0.06		%/V
Voltage characteristic of shunt ratio	$\frac{\Delta K}{K} / \Delta V_{CC}$	$V_{CC}=6.3$ to $16V$, $I_m=50-150mA$		0.1		%/V
Current characteristic of reference voltage	$\frac{\Delta V_{ref}}{V_{ref}} / \Delta I_m$	$V_{CC}=12V$, $I_m=30$ to $200mA$		-0.01		%/mA
Current characteristic of shunt ratio	$\frac{\Delta K}{K} / \Delta I_m$	$V_{CC}=12V$, $I_m=50-100$ to $150-200mA$		0.02		%/mA
Voltage characteristic of reference voltage	$\frac{\Delta I_s}{I_s} / \Delta V_{CC}$	$V_{CC}=6$ to $16V$, $I_m=0mA$		0.1		%/V
Temperature characteristic of reference voltage	$\frac{\Delta V_{ref}}{V_{ref}} / \Delta T_a$	$V_{CC}=12V$, $I_m=10mA$, $T_a=-20$ to $+80^\circ C$		-0.01		%/°C
Temperature characteristic of reference voltage	$\frac{\Delta K}{K} / \Delta T_a$	$V_{CC}=12V$, $I_m=50-150mA$, $T_a=-20$ to $+80^\circ C$		-0.01		%/°C

Equivalent Circuit Block Diagram and Test Circuit



Sample Application Circuit



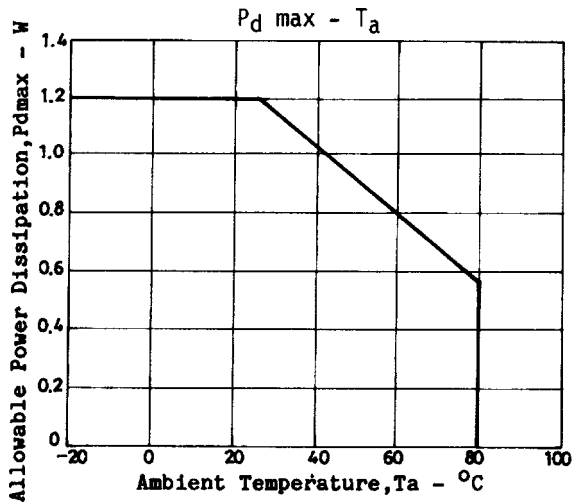
$$\text{From } I_m \cdot R_m + E_O = R_T \left(I_S + \frac{I_S + I_m}{K} \right) + V_{ref},$$

$$E_O = V_{ref} + R_T \left(1 + \frac{1}{K} \right) I_S + \left(\frac{R_T}{K} - R_m \right) I_m$$

Assuming $K \cdot R_m = R_T$,
The number of revolutions is determined by

$$E_O = V_{ref} + R_T \left(1 + \frac{1}{K} \right) I_S$$

Unless $R_T (\text{max}) < K \cdot R_m (\text{min})$ in the Sample Application Circuit, the operation becomes unstable.



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