

LB1940T, LB1940U

Allowable Operating Range at Ta = 25°C

Parameter	Symbol	Conditions	Ratings			unit
			min	typ	max	
Function-guaranteed voltage range	VOPR1	V _{DD} system, V _S = 2.0V	1.9		6.5	V
	VOPR2	V _S system, V _{DD} = 5.0V	1.6		7.5	
Low level input threshold voltage	V _{IL}	ENA1, ENA2, IN1, IN2	-0.3		1.0	V
High level input threshold voltage	V _{IH}	ENA1, ENA2, IN1, IN2	2.0		6.0	V
VC input voltage	VC		0.19		1.0	V

Electrical Characteristics at Ta = 25°C, V_S = 3V, V_{DD} = 5V

Parameter	Symbol	Conditions	Ratings			unit
			min	typ	max	
Standby current dissipation	ISTB	V _S = V _{DD} = 6.5V		0.1	1.0	μA
Regulator output circuit						
VREF output voltage	VREF	I _{OL} = 0 to 1mA	0.85	0.9	0.95	V
SVDD output voltage	VSVD	I _{OL} = 10mA	4.70	4.85		V
H bridge output circuit						
OUT output saturation voltage (at saturation control)	V _{O(sat)1}	V _{DD} = 5.0V, V _S = 2.0V I _O = 200mA (PNP side)		0.20	0.30	V
	V _{O(sat)2}	V _{DD} = 5.0V, V _S = 2.0V I _O = 200mA (NPN side)		0.10	0.15	V
OUT output current (at constant current control)	I _{OUT1}	V _{DD} = 6.0V, V _C = 0.2V, V _S = 3.5V R _L = 5Ω (between OUT-OUT), R _{FB} = 2Ω	94	100	106	mA
	I _{OUT2}	$V_C = \frac{R_b}{R_a + R_b} V_{REF} \text{ (} R_a = 70k\Omega, R_b = 20k\Omega \text{) } *$ V _{DD} = 6.0V, V _S = 2.0V R _L = 5Ω (between OUT-OUT), R _{FB} = 1Ω	180	200	220	mA
V _S system operating current consumption	IS1	$V_C = \frac{R_b}{R_a + R_b} V_{REF} \text{ (} R_a = 70k\Omega, R_b = 20k\Omega \text{) } *$		1.5	3	mA
V _{DD} system operating current dissipation	I _{DD1}	$V_C = \frac{R_b}{R_a + R_b} V_{REF} \text{ (} R_a = 70k\Omega, R_b = 20k\Omega \text{) } *$ ENA1 = 2V		4	7	mA
VC input current	IVC	V _{DD} = 6.0V, V _S = 2.0V, V _C = 1.9V	0		-1	μA
Control input circuit						
Control pin maximum input current	I _{IH}	V _{IH} = 5.5V		80	100	μA
	I _{IL}	V _{IL} = GND	-1		0	

* For Ra and Rb, refer to Application Circuit Diagram.

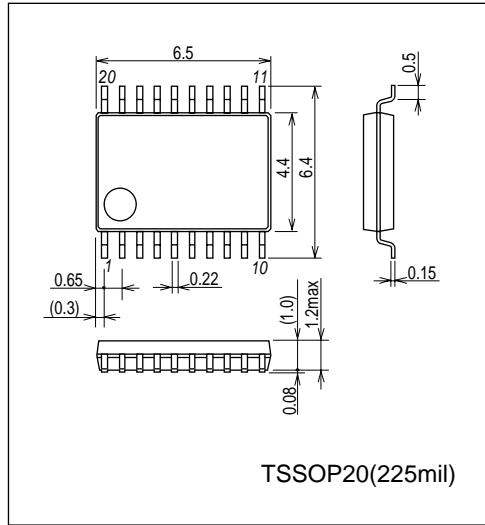
LB1940T, LB1940U

Package Dimensions

unit : mm (typ)

3246

[LB1940T]

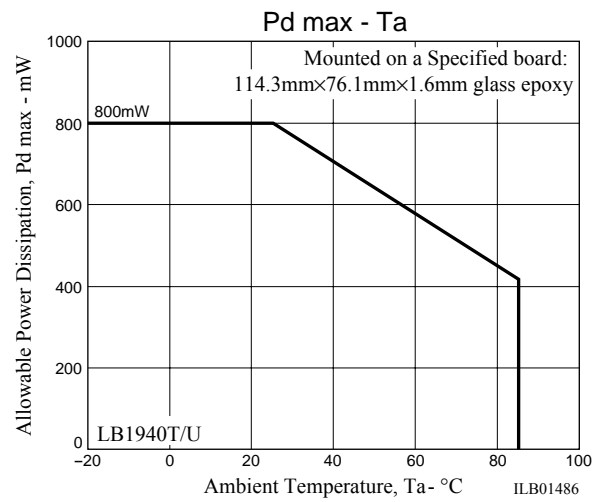
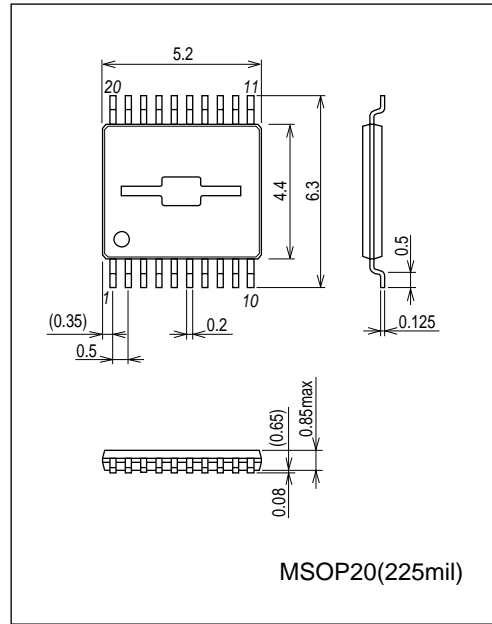


Package Dimensions

unit : mm (typ)

3262

[LB1940U]

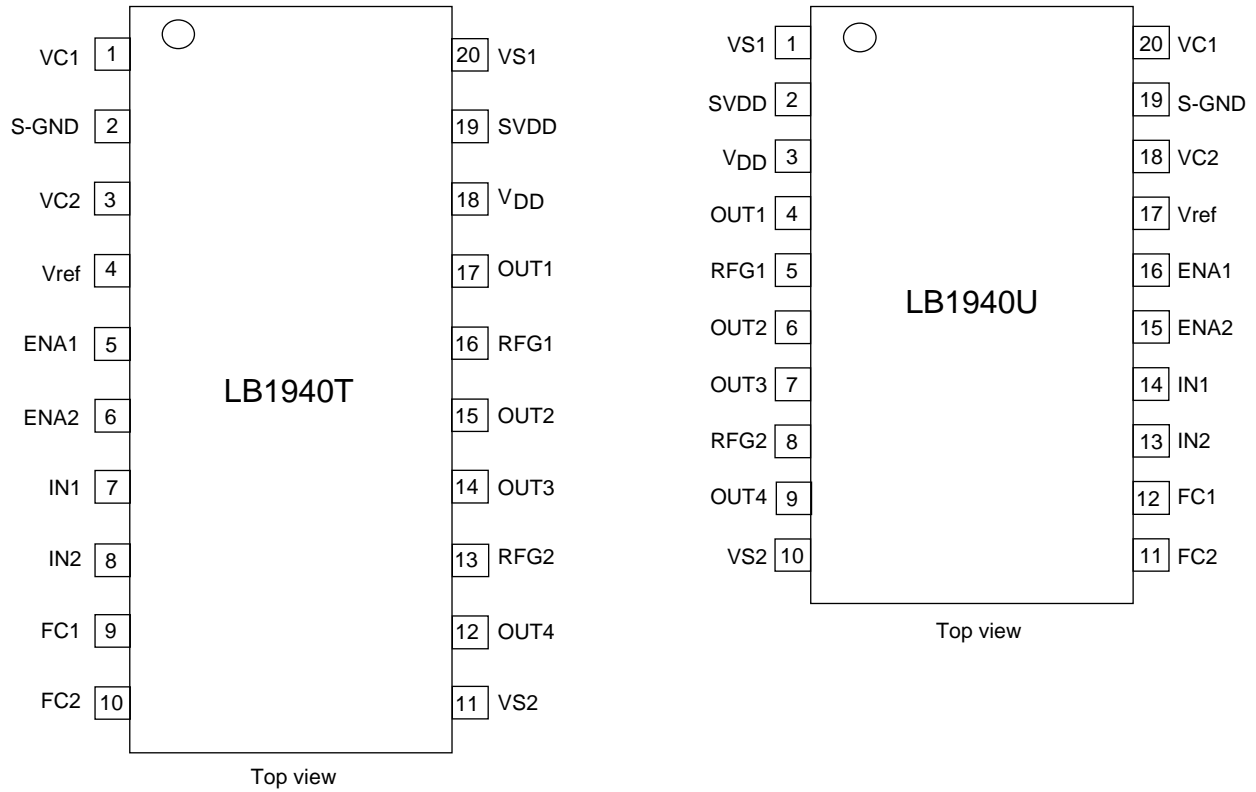


True Table

Input				Output					Mode
ENA		IN		OUT				SVDD	
1	2	1	2	1	2	3	4		
L	L								Standby (current dissipation zero)
H		H		L	H			on	Reverse rotation
		L		H	L			on	Forward rotation
	H		H			L	H	on	Reverse rotation
			L			H	L	on	Forward rotation
A blank means "don't care".				A blank means "off".					

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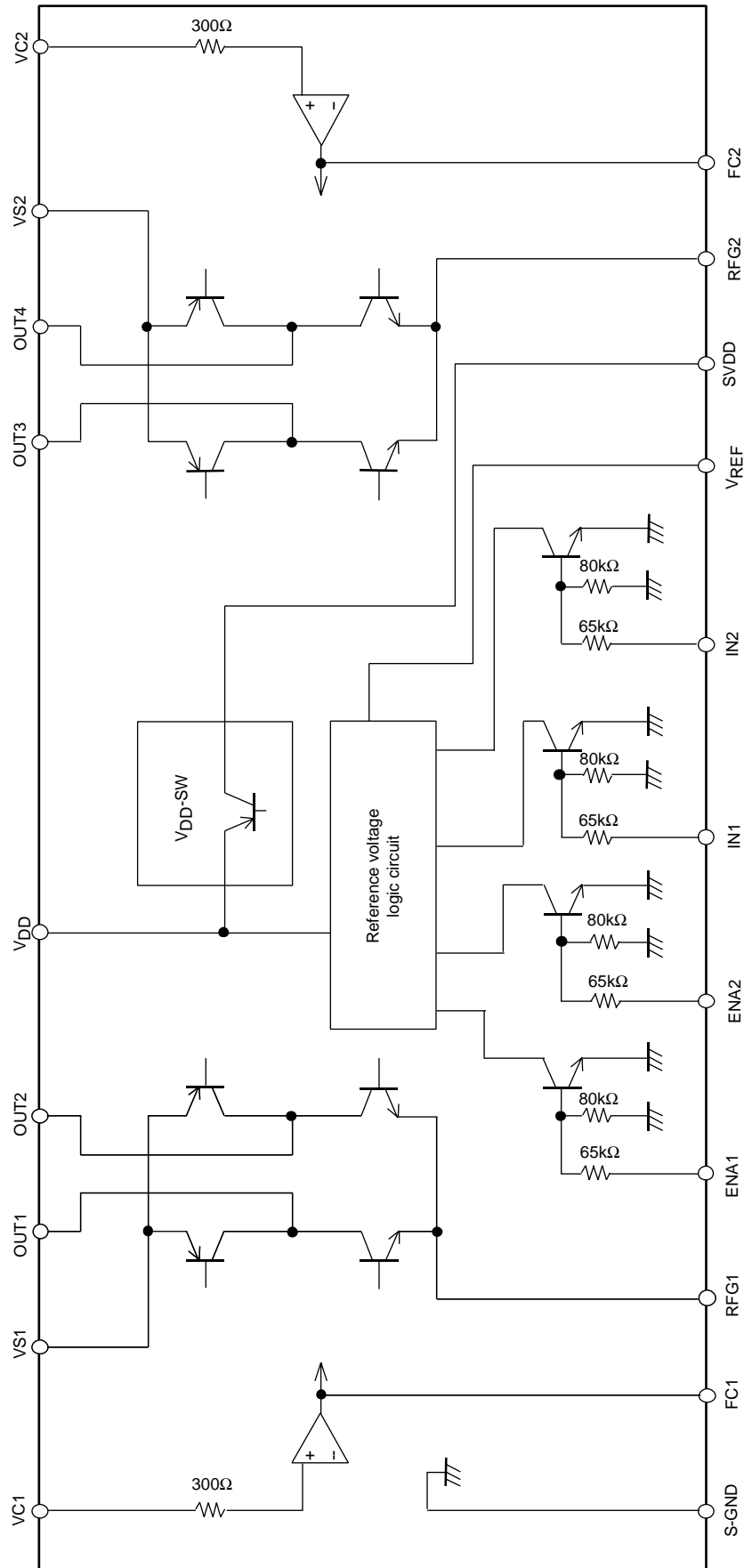
Pin Assignment



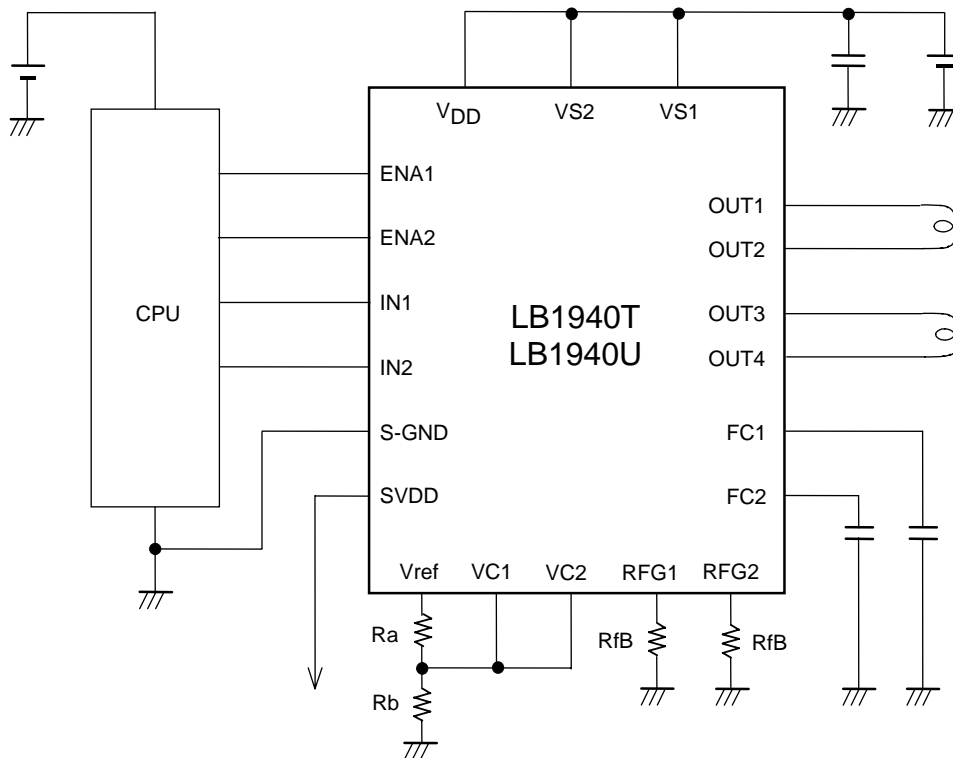
Pin Description

Pin No.		Pin Name	Description	Pin No.		Pin Name	Description
LB1940T	LB1940U			LB1940T	LB1940U		
1	20	VC1	Reference voltage input for 1ch control	11	10	VS2	Motor power supply (+)
2	19	S-GND	GND for control system	12	9	OUT4	Motor drive output 4
3	18	VC2	Reference voltage input for 2ch control	13	8	RFG2	Constant-current detection pin
4	17	Vref	Reference voltage output	14	7	OUT3	Motor drive output 3
5	16	ENA1	Signal input for 1ch control	15	6	OUT2	Motor drive output 2
6	15	ENA2	Signal input for 2ch control	16	5	RFG1	Constant-current detection pin 1
7	14	IN1	Signal input for 1ch control	17	4	OUT1	Motor drive output 1
8	13	IN2	Signal input for 2ch control	18	3	V _{DD}	Control system power supply (+)
9	12	FC1	C connection pin for 1ch phase compensation	19	2	SVDD	Control system power output
10	11	FC2	C connection pin for 2ch phase compensation	20	1	VS1	Motor power supply (+)

Block Diagram



Application Circuit Diagram



At constant-current control: The OUT current is controlled so that the RFG pin voltage is equal to the VC input pin voltage.

For example, $I_{OUT} = 200\text{mA}$ ($= 0.2\text{V}/1\Omega$) when $VC = 0.2\text{V}$ and $R_{FB} = 1\Omega$.

*: There is no priority relationship between respective input voltages (ENA, IN) and respective supply voltages (V_{DD} , VS). For example, operation with $V_{IN} = 5\text{V}$, $V_{DD} = 3\text{V}$, $VS = 2\text{V}$ is possible.

Note: The input voltage range to the reference voltage input pin VC for constant-current setting is from 0.19V to 1.0V.

Constant current setting

The composition of the constant-control circuit of this IC is as shown in the figure below.

The voltage entered in the VC pin is entered as a reference to the “+” side input of the constant-current control amplifier.

The “-” side of this constant-current control amplifier is connected to the RFG pin via the wire bonded resistor R_b ($= 0.1\Omega$).

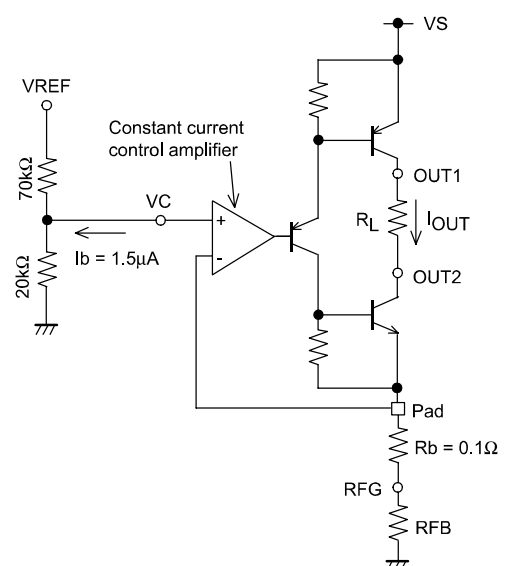
The constant-current control circuit consists of comparison of the voltage generated at the external current detection resistor with the above reference voltage.

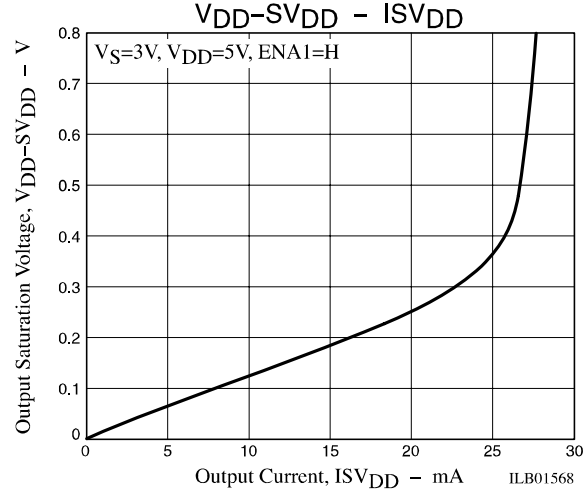
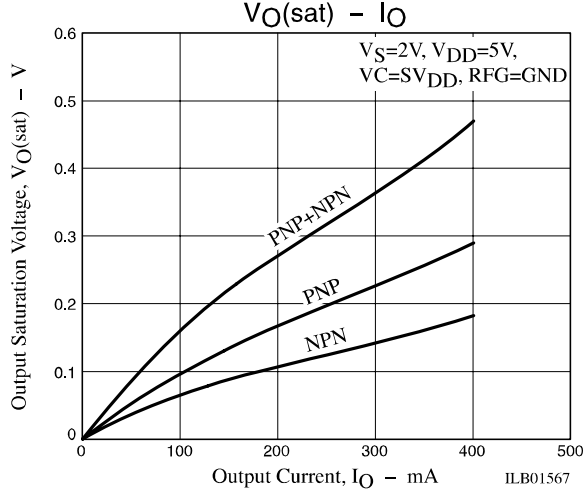
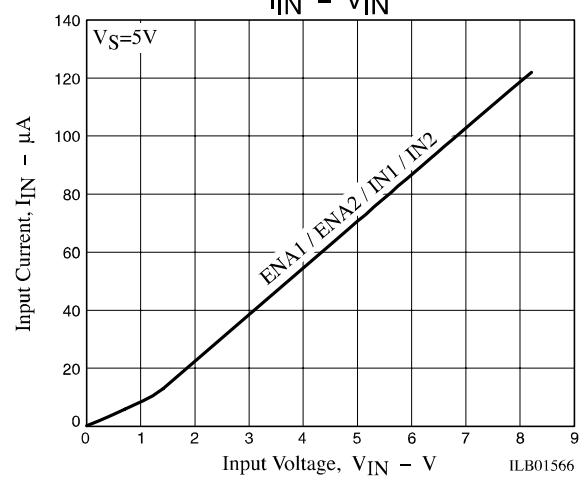
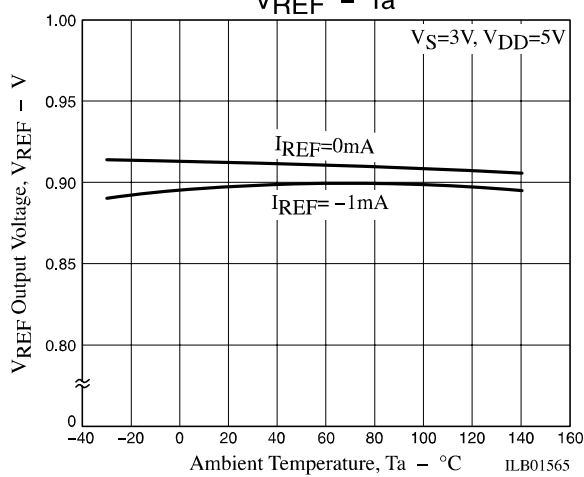
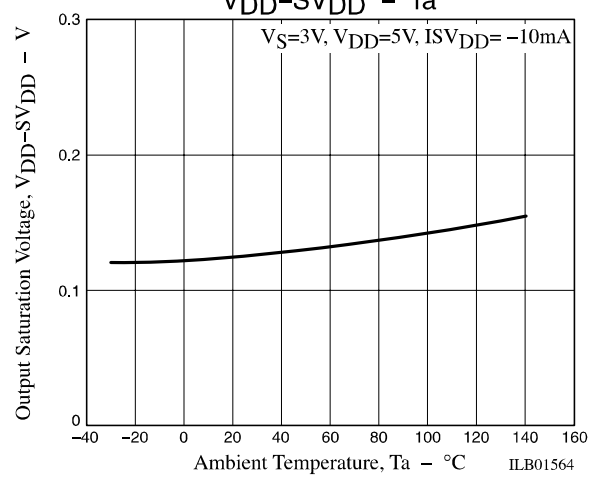
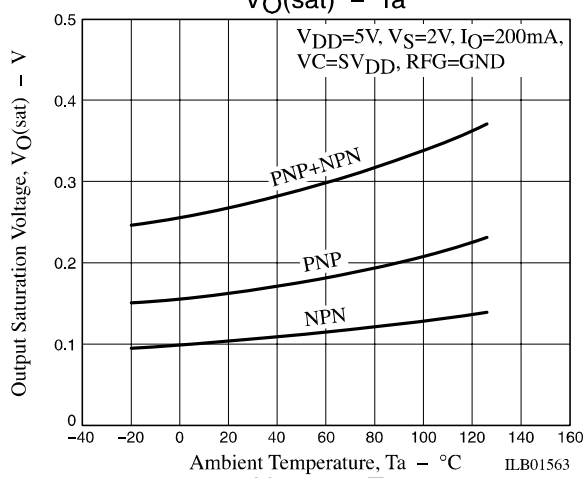
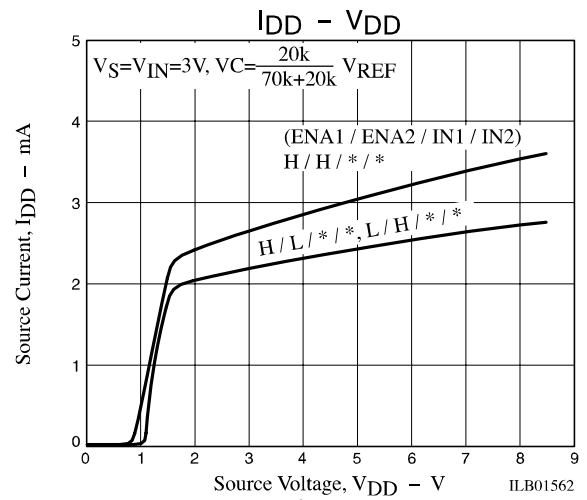
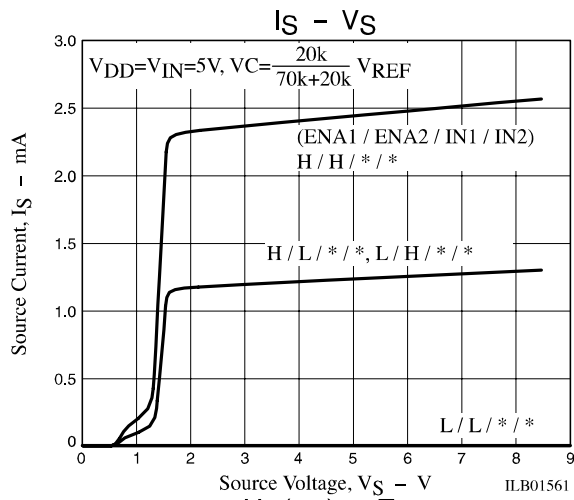
In addition, since the bias current I_b ($= 1.5\mu\text{A}$) flows out of the positive (+) input of the constant current control amplifier during the constant current control, if the voltage is input to the VC pin by dividing the V_{REF} voltage by 4.5 according to the dividing resistance ($70\text{k}\Omega$ and $20\text{k}\Omega$) as shown in the figure, the formula for calculating the VC voltage is as follows :

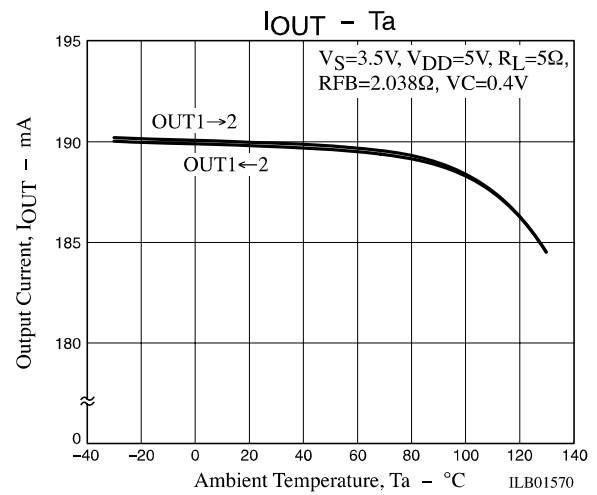
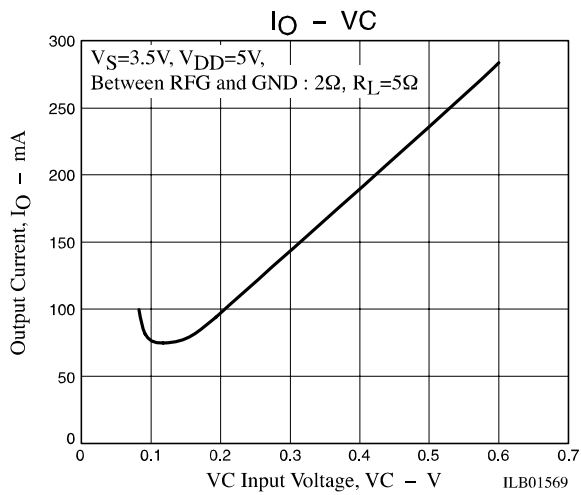
$$VC = V_{REF}/4.5 + I_b \times 20\text{k}\Omega = V_{REF}/4.5 + 0.03$$

Therefore, the theoretical equation to set the constant current I_{OUT} is as follows:

$$I_{OUT} = VC/(R_{FB} + R_b) = (V_{REF}/4.5 + 0.03)/(R_{FB} + R_b)$$







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