BL8506

High-precision Low Voltage Detector

上海贝岭股份有限公司
SHANGHAI BELLING CO.,LTD.

Outline:

BL8506 is a series of high precision voltage detector with ultra low current consumption (500nA typ. at Vdd=3.0V). It can work at very low voltage, which makes it perfect for system reset.

BL8506 is composed of high precision voltage reference, comparator, output driver and resistor array. Internally preset detect voltage has a low temperature drift and requires no external trimming.

Two type of output, CMOS and N-channel open-drain are available.

BL8506 is available in SOT-89-3,SOT-23-3 TO92, SOT23-5 packages which is Pb free.

Features

- High-precision detection Voltage $\pm 2\%$
- Detection Voltage 0.9V~6.0V (in 0.1V steps)
- Precise hysteresis 4% typ.
- Operating Voltage range 0.7V~10V
- Ultra-low current consumption 500nA typ. (at V_{DD} 3.0V)
- Two Output forms CMOS and N-channel open-drain

Application

- Power monitor for portable equipment such as PDA,DSC,Mobile phone,Notebook,MP3
- CPU and Logic Circuit Reset
- Battery Checker
- Battery Back-up Circuit
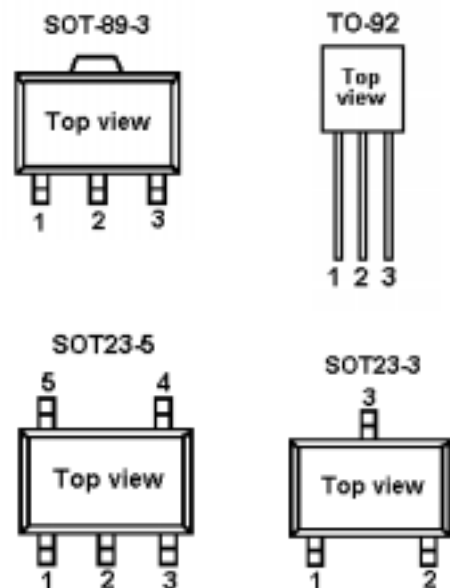- Power Failure Detector

Selection Guide

BL8506-*XX* *X* *XX*

Package Type
RM   SOT-23-3
RN   SOT-23-5
SM   SOT-89-3
T   TO-92
   Default   Pb Free

Output Type
N   Nch Open-drain
C   CMOS

Detector Voltage
09……0.9V
30……3.0V
  ……
50……5.0V
60……6.0V

Pin Assignment

SOT-89-3 — Top view — 1 2 3

TO-92 — Top view — 1 2 3

SOT23-5 — Top view — 5 4 / 1 2 3

SOT23-3 — Top view — 3 / 1 2

Pin Description:

PIN Number				PIN Name	Function
SOT-89-3	TO-92	SOT-23-3	SOT-23-5		
1	3	1	1	V_{OUT}	Voltage detection output Pin
2	1	3	2	V_{DD}	Voltage input Pin
3	2	2	3	V_{SS}	GND Pin
			4	NC	No connection
			5	NC	No connection

Product Classification:

Product Name	Detector Voltage	Output Type	Package
BL8506-XXNRM	XX V	Nch Open-Drain	SOT-23-3
BL8506-XXNRN	XX V	Nch Open-Drain	SOT-23-5
BL8506-XXNSM	XX V	Nch Open-Drain	SOT-89-3
BL8506-XXNT	XX V	Nch Open-Drain	TO-92
BL8506-XXCRM	XX V	CMOS	SOT-23-3
BL8506-XXCRN	XX V	CMOS	SOT-23-5
BL8506-XXCSM	XX V	CMOS	SOT-89-3
BL8506-XXCT	XX V	CMOS	TO-92

Product Mark Information:

Product NO.	Mark
BL8506-09CSM	BL8506-09C
BL8506-20CT	BL8506-20C
BL8506-27CSM	BL8506-27C
BL8506-30CT	BL8506-30C
……	……
BL8506-09NRM	N609
BL8506-21NRN	N621
BL8506-27CRM	C627
BL8506-30CRM	C630
……	……

SOT-89-3 TO-92	SOT-23-5 SOT-23-3
Example BL8506-30NSM ↓ BL8506 N30XX	Example BL8506-30CRM ↓ C630
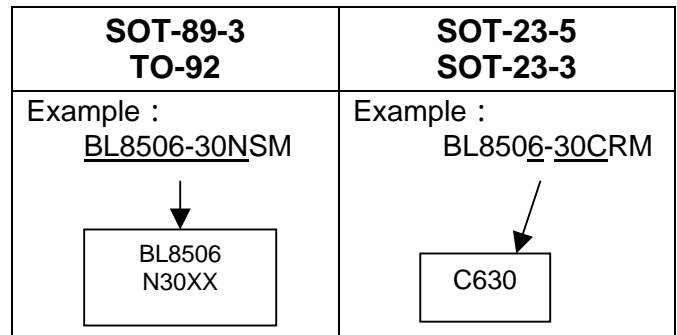
Block diagram:
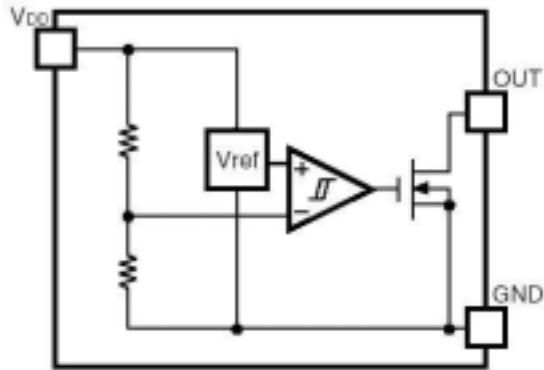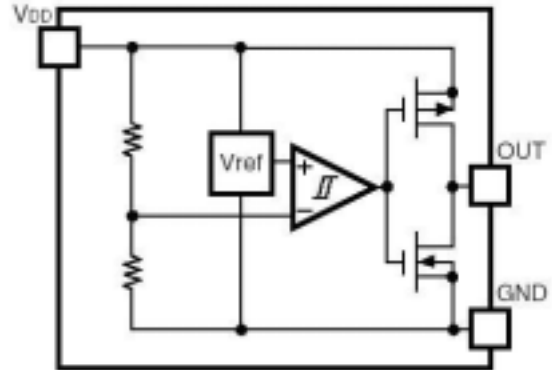
N channel open-drain   CMOS output

Absolute Maximum Ratings

Input Voltage range --0.3V~12V
Output Voltage range--0.3V~12V
Maximum Output current ---70mA
Maximum power dissipation ---150mW
Ambient temperature --- -40~+70°C
Storage temperature-- -40~125°C
Lead temperature and time --260°C,10S

Recommended Work Conditions

Item	Min	Recommended	Max	unit
Input Voltage range	0.7		10	V
Ambient temperature	-40	25	70	

Electrical Characteristics

● BL8506-09C/NXX 0.9V   (Topt 25 ,Unless otherwise specified.)

Symbol	Parameter	Conditions	Reference data			Unit
			Min.	Typ.	Max.	
-V_{DET}	Detector Threshold		0.882	0.9	0.918	V
V_{HYS}	Detector Threshold Hysteresis		0.018	0.036	0.054	V
I_{SS}	Current consumption	V_{DD}=2.9V		1	1.5	uA
V_{DDH}	Maximum operating voltage				10	V
V_{DDL}	Minimum Operating voltage			0.5		V
I_{OUT}	Output current	Nch V_{DS}=0.05V V_{DD}=0.7V V_{DS}=0.50V V_{DD}=0.8V	0.01 0.05	0.05 0.50		mA

		Pch VDS=-2.1V VDD=4.50V	1.0	2.0		mA
TPLH	Output Delay Time				20	uS

- BL8506-27C/NXX   2.7V   (Topt   25   ,Unless otherwise specified.)

Symbol	Parameter	Conditions	Reference data			Unit
			Min.	Typ.	Max.	
-VDET	Detector Threshold		2.646	2.7	2.754	V
VHYS	Detector Threshold Hysteresis		0.054	0.108	0.162	V
ISS	Current consumption	VDD=4.7V		0.5	1	uA
VDDH	Maximum operating voltage				10	V
VDDL	Minimum Operating voltage			0.5		V
IOUT	Output current	Nch VDS=0.05V VDD=0.70V	0.01	0.05		mA
		Pch VDS=-2.1V VDD=4.50V	1.0	2.0		mA
TPLH	Output Delay Time				20	uS

- BL8506-30C/NXX   3.0V   (Topt   25   ,Unless otherwise specified.)

Symbol	Parameter	Conditions	Reference data			Unit
			Min.	Typ.	Max.	
-VDET	Detector Threshold		2.94	3.0	3.06	V
VHYS	Detector Threshold Hysteresis		0.060	0.12	0.18	V
ISS	Current consumption	VDD=5.0V		0.5	1	uA
VDDH	Maximum operating voltage				10	V
VDDL	Minimum Operating voltage			0.5		V
IOUT	Output current	Nch VDS=0.05V VDD=0.7V	0.01	0.05		mA
		Pch VDS=-2.1V VDD=4.50V	1.0	2.0		mA
TPLH	Output Delay Time				20	uS

- BL8506-34C/NXX   3.4V   (Topt   25   ,Unless otherwise specified.)

Symbol	Parameter	Conditions	Reference data			Unit
			Min.	Typ.	Max.	
-VDET	Detector Threshold		3.332	3.4	3.468	V
VHYS	Detector Threshold		0.068	0.136	0.204	V

Symbol	Parameter	Conditions					Unit
	Hysteresis						
Iss	Current consumption	VDD=5.0V			0.5	1	uA
VDDH	Maximum operating voltage					10	V
VDDL	Minimum Operating voltage				0.5		V
IOUT	Output current	Nch VDS=0.05V VDD=0.7V	0.01		0.05		mA
		Pch VDS=-2.1V VDD=4.50V	1.0		2.0		mA
TPLH	Output Delay Time					20	uS

● BL8506-44C/NXX   4.4V   (Topt 25 ,Unless otherwise specified.)

Symbol	Parameter	Conditions	Reference data			Unit
			Min.	Typ.	Max.	
-VDET	Detector Threshold		4.312	4.4	4.488	V
VHYS	Detector Threshold Hysteresis		0.088	0.176	0.264	V
Iss	Current consumption	VDD=6.4V		0.5	1	uA
VDDH	Maximum operating voltage				10	V
VDDL	Minimum Operating voltage			0.5		V
IOUT	Output current	Nch VDS=0.05V VDD=0.7V	0.01	0.05		mA
		Pch VDS=-2.1V VDD=8.0V	1.5	3.0		mA
TPLH	Output Delay Time				20	uS

Electrical Characteristics By Detector Threshold

Part Number	Detector Threshold			Detector Threshold Hysteresis			Supply Current1			Supply Current2		
	-Vdet[V]			Vhys[V]			Iss1[uA]			Iss2[uA]		
	Min.	Typ.	Max.	Min.	Typ.	Max.	Condition	Typ.	Max.	Condition	Typ.	Max.
BL8506-09XXX	0.882	0.900	0.918	0.018	0.036	0.054						
BL8506-10XXX	0.980	1.000	1.020	0.020	0.040	0.060						
BL8506-11XXX	1.078	1.100	1.122	0.022	0.044	0.066						
BL8506-12XXX	1.176	1.200	1.224	0.024	0.048	0.072						
BL8506-13XXX	1.274	1.300	1.326	0.026	0.052	0.078						
BL8506-14XXX	1.372	1.400	1.428	0.028	0.056	0.084					1.0	1.5
BL8506-15XXX	1.470	1.500	1.530	0.030	0.060	0.090						
BL8506-16XXX	1.568	1.600	1.632	0.032	0.064	0.096						
BL8506-17XXX	1.666	1.700	1.734	0.034	0.068	0.102						
BL8506-18XXX	1.764	1.800	1.836	0.036	0.072	0.108						
BL8506-19XXX	1.862	1.900	1.938	0.038	0.076	0.114						
BL8506-20XXX	1.960	2.000	2.040	0.040	0.080	0.120						
BL8506-21XXX	2.058	2.100	2.142	0.042	0.084	0.126						
BL8506-22XXX	2.156	2.200	2.244	0.044	0.088	0.132						
BL8506-23XXX	2.254	2.300	2.346	0.046	0.092	0.138						
BL8506-24XXX	2.352	2.400	2.448	0.048	0.096	0.144						
BL8506-25XXX	2.450	2.500	2.550	0.050	0.100	0.150						
BL8506-26XXX	2.548	2.600	2.652	0.052	0.104	0.156						
BL8506-27XXX	2.646	2.700	2.754	0.054	0.108	0.162						
BL8506-28XXX	2.744	2.800	2.856	0.056	0.112	0.168						
BL8506-29XXX	2.842	2.900	2.958	0.058	0.116	0.174						
BL8506-30XXX	2.940	3.000	3.060	0.060	0.120	0.180						
BL8506-31XXX	3.038	3.100	3.162	0.062	0.124	0.186						
BL8506-32XXX	3.136	3.200	3.264	0.064	0.128	0.192						
BL8506-33XXX	3.234	3.300	3.366	0.066	0.132	0.198						
BL8506-34XXX	3.332	3.400	3.468	0.068	0.136	0.204	Vdd= (-Vdet) +0.1V	0.5	1.0	Vdd= (-Vdet) +2V		
BL8506-35XXX	3.430	3.500	3.570	0.070	0.140	0.210						
BL8506-36XXX	3.528	3.600	3.672	0.072	0.144	0.216						
BL8506-37XXX	3.626	3.700	3.774	0.074	0.148	0.222						
BL8506-38XXX	3.724	3.800	3.876	0.076	0.152	0.228						
BL8506-39XXX	3.822	3.900	3.978	0.078	0.156	0.234						
BL8506-40XXX	3.920	4.000	4.080	0.080	0.160	0.240					0.5	1.0
BL8506-41XXX	4.018	4.100	4.182	0.082	0.164	0.246						
BL8506-42XXX	4.116	4.200	4.284	0.084	0.168	0.252						
BL8506-43XXX	4.214	4.300	4.386	0.086	0.172	0.258						
BL8506-44XXX	4.312	4.400	4.488	0.088	0.176	0.264						
BL8506-45XXX	4.410	4.500	4.590	0.090	0.180	0.270						
BL8506-46XXX	4.508	4.600	4.692	0.092	0.184	0.276						
BL8506-47XXX	4.606	4.700	4.794	0.094	0.188	0.282						
BL8506-48XXX	4.704	4.800	4.896	0.096	0.192	0.288						
BL8506-49XXX	4.802	4.900	4.998	0.098	0.196	0.294						
BL8506-50XXX	4.900	5.000	5.100	0.100	0.200	0.300						
BL8506-51XXX	4.998	5.100	5.202	0.102	0.204	0.306						
BL8506-52XXX	5.096	5.200	5.304	0.104	0.208	0.312						
BL8506-53XXX	5.194	5.300	5.406	0.106	0.212	0.318						
BL8506-54XXX	5.292	5.400	5.508	0.108	0.216	0.324						
BL8506-55XXX	5.390	5.500	5.610	0.110	0.220	0.330						
BL8506-56XXX	5.488	5.600	5.712	0.112	0.224	0.336						
BL8506-57XXX	5.586	5.700	5.814	0.114	0.228	0.342						
BL8506-58XXX	5.684	5.800	5.916	0.116	0.232	0.348						
BL8506-59XXX	5.782	5.900	6.018	0.118	0.236	0.354						
BL8506-60XXX	5.880	6.000	6.120	0.120	0.240	0.360						

Output Current1			Output Current2				Output Delay Time	Minimum Operating Voltage		Detector Threshold Temperature Coefficient	
Iout1[mA]			Iout2[mA]				T_{PLH}[us]	V_{DDL}[V]		$\Delta\text{-}V_{DET}/\Delta T$ppm/°C	
Condition	Min.	Typ.	Condition		Min.	Typ.	Max.	Typ.	Max.	Condition	Typ.
				Vdd=0.85V	0.1	0.5					
				Vdd=1.0V	0.2	1.0					
NCH, V_{DS}=0.05V, V_{DD}=0.7V	0.01	0.05	NCH, V_{DS}=0.5V	V_{DD}=1.5V	1.0	2.0	20	0.5	0.7	-40°C≤ Topt ≤85°C	±100

Function description:
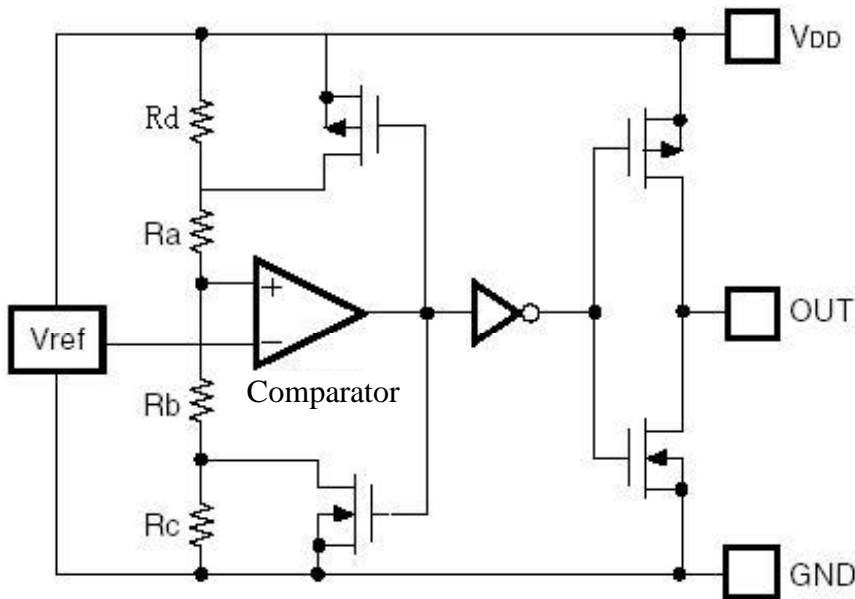
High precision low temperature co-efficiency reference voltage is applied to the negative input of a comparator. Input voltage, divided by resistor array of Ra Rb and Rc, is applied to the positive input of the comparator. Output of the comparator controls a pair of NMOS and PMOS switches, generating the hysteresis. Output of the comparator passes a series of buffer to drive the output CMOS pair.

+ V_{DET} - V_{DET} V_{HYS} can be calculated as follows:

- $V_{DET} = V_{REF}*(1+Ra/(Rb+Rc))$

+ $V_{DET} = V_{REF}*(1+(Ra+Rd)/Rb) = V_{REF}*(1+(Ra+Rc)/Rb)$

$V_{HYS} = + V_{DET} - (- V_{DET}) = V_{REF}*(Ra+Rb+Rc)(1/Rb - 1/(Rb+Rc))$
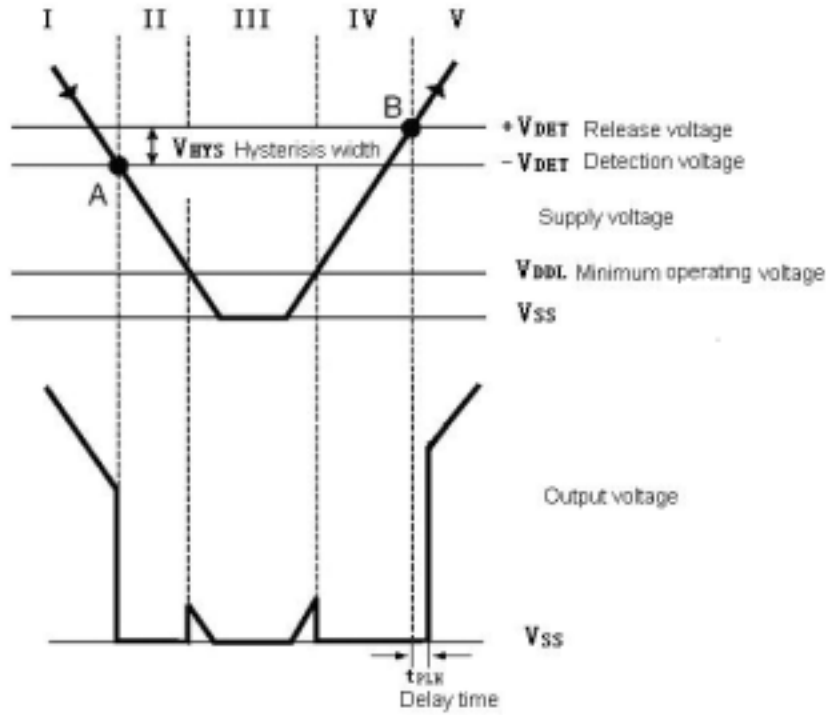
No.	Operation status	Output status
I	V_{DD}>-V_{DET}	Output voltage is equal to the supply voltage
II	V_{DD} drops below - V_{DET}	Output voltage equals to GND level
III	V_{DD} drops further below V_{DDL}	Output voltage is undefined
IV	V_{DD} rises above V_{DDL}	Output voltage equals to GND level
V	V_{DD} rises above + V_{DET}	Output voltage equals to supply voltage V_{HYS}=(+ V_{DET})-(- V_{DET})

Test circuits

1 Supply current test circuit
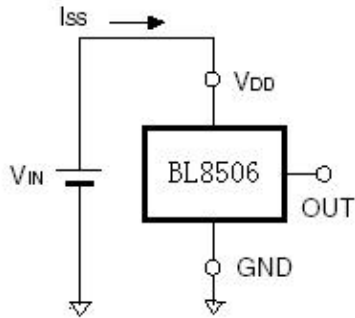
2 Detector threshold test circuit
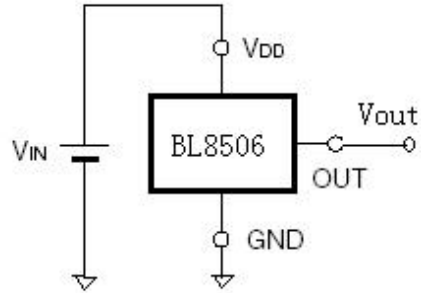
3 NCH Drive Output Current Test Circuit
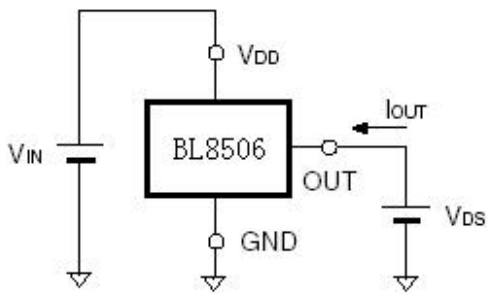
4 PCH Drive Output Current Test Circuit
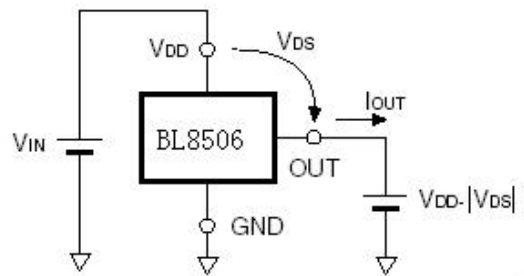
Typical Performance Characteristics
1) Output voltage VS. Input voltage

Detector threshold= 0.9V
-40℃
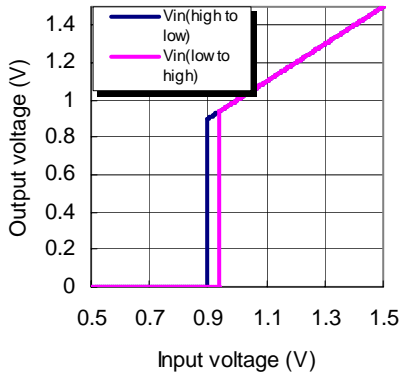
Detector threshold= 0.9V
25℃
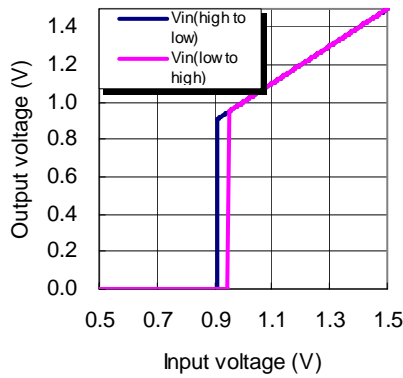
Detector threshold= 0.9V
70℃
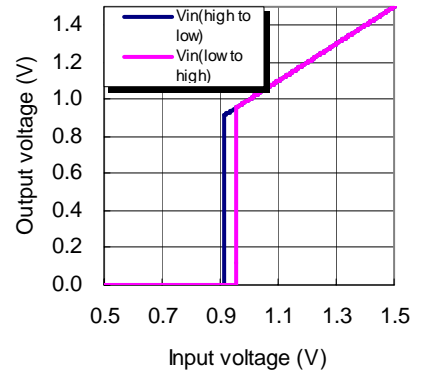
Detector threshold=2.7V   -40℃
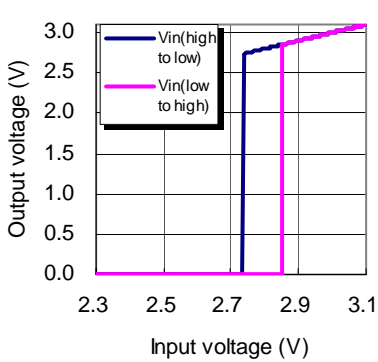
Detector threshold=2.7V   25℃
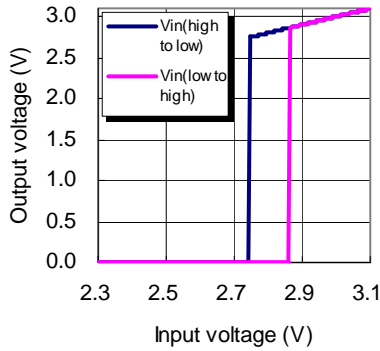
Detector threshold=2.7V   70℃
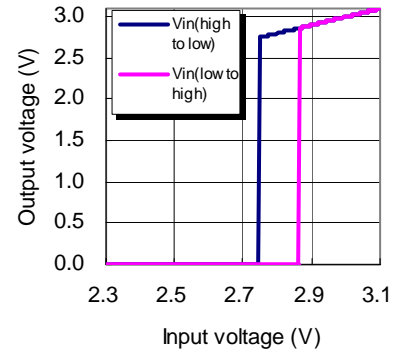
Detector threshold=3.0V   -40℃
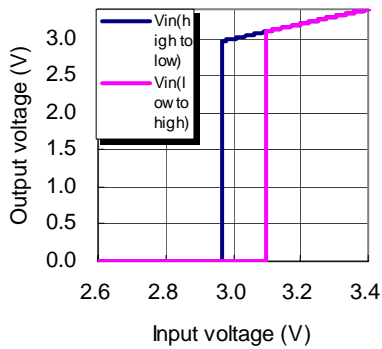
Detector threshold=3.0V   25℃
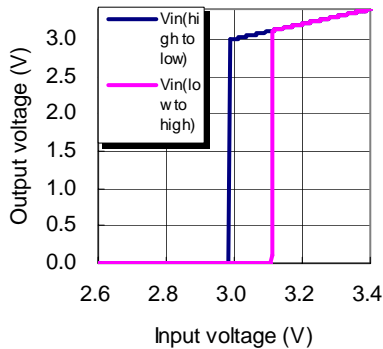
Detector threshold=3.0V   70℃
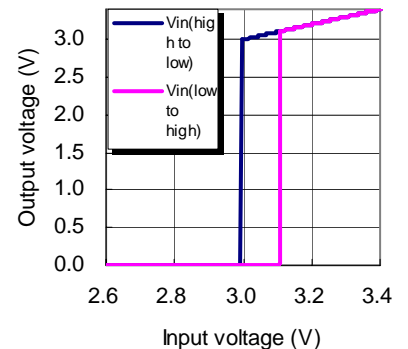
Detector threshold=4.4V   -40℃
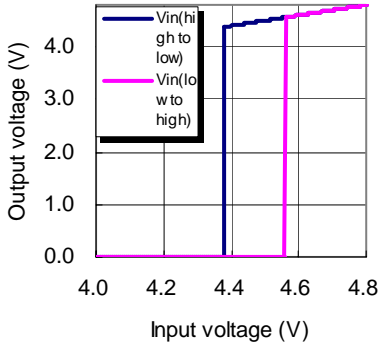
Detector threshold=4.4V   25℃
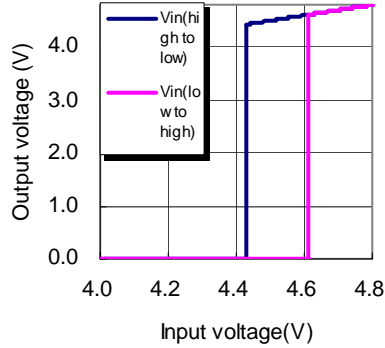
Detector threshold=4.4V   70℃
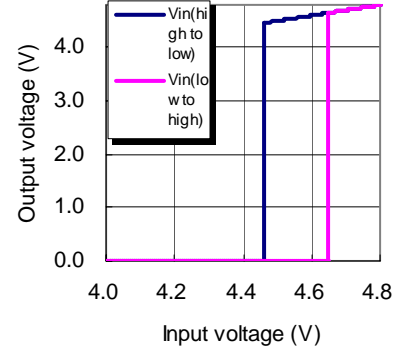
2) Supply current VS. Input voltage

Detector threshold= 0.9V
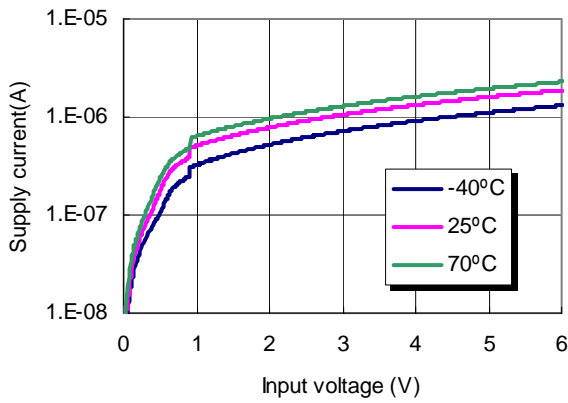
Detector threshold=2.7V
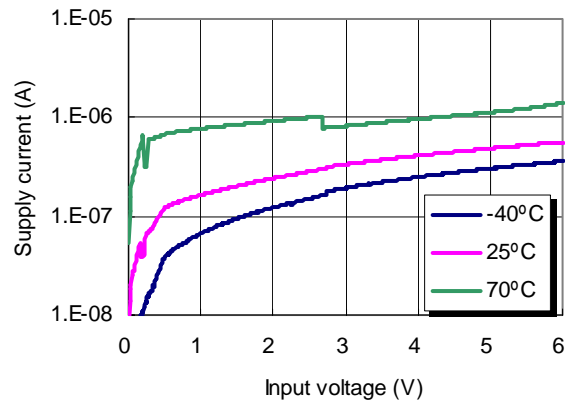
Detector threshold=3.0V
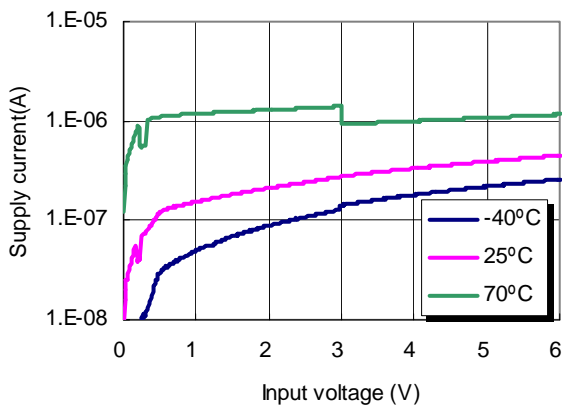
Detector threshold=4.4V
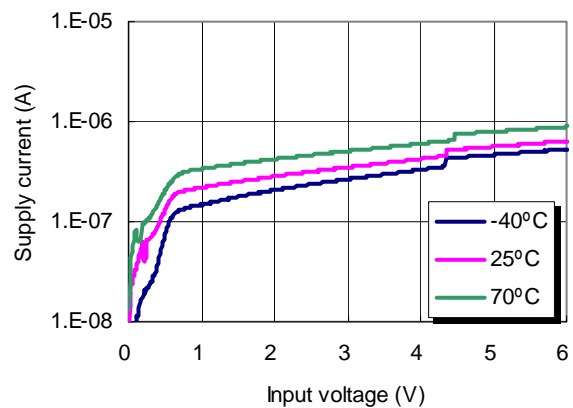
3) Detector Threshold Hysteresis VS. Temperature

Detector threshold= 0.9V
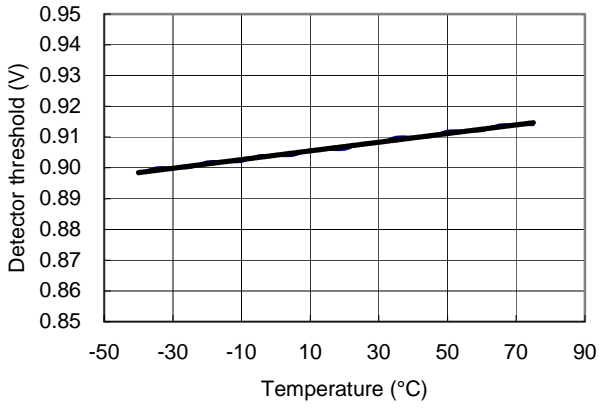
Detector threshold=2.7V
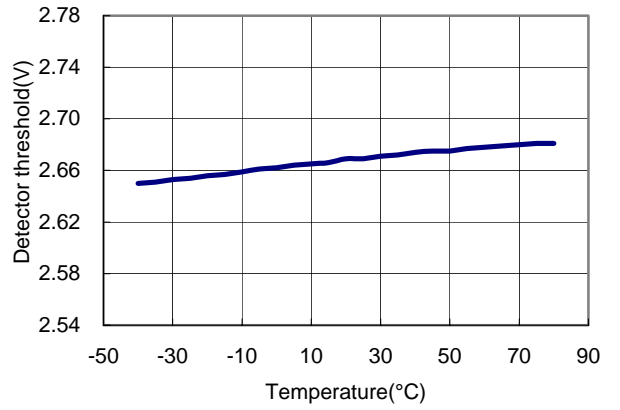
Detector threshold=3.0V
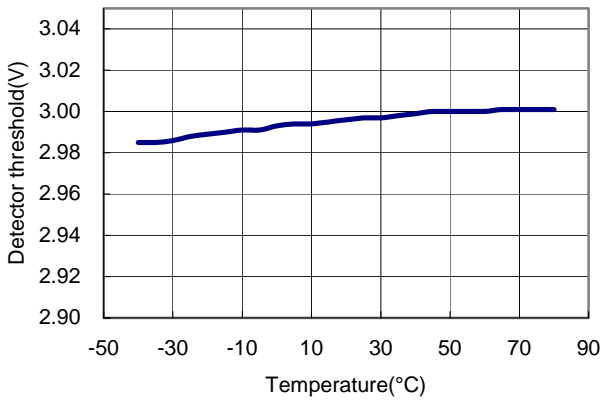
Detector threshold=4.4V
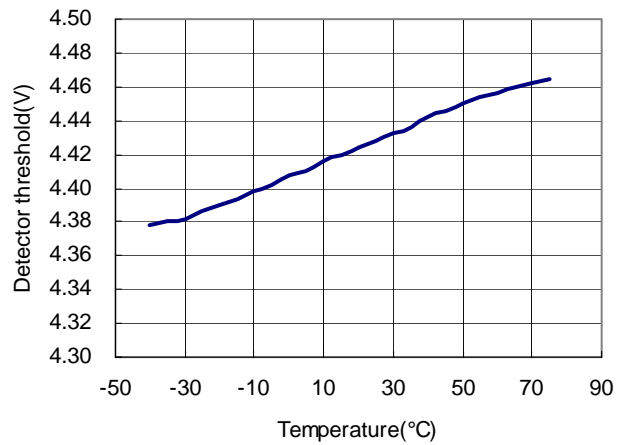
4 Nch Driver Output Current VS. V_{DS}

BL8506-09CXX
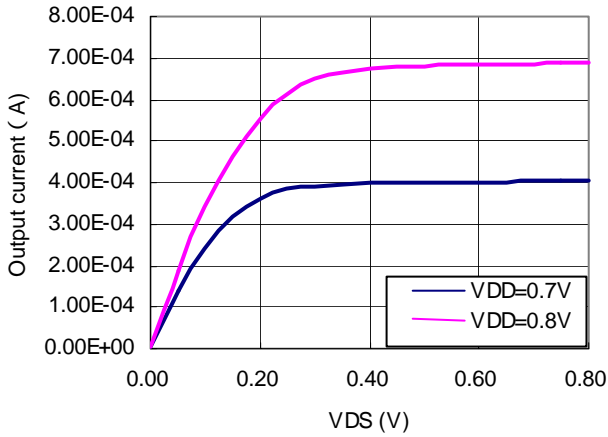
BL8506-27CXX
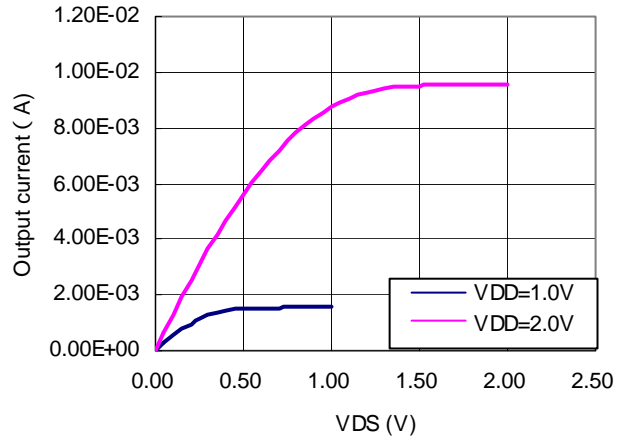
BL8506-30CXX
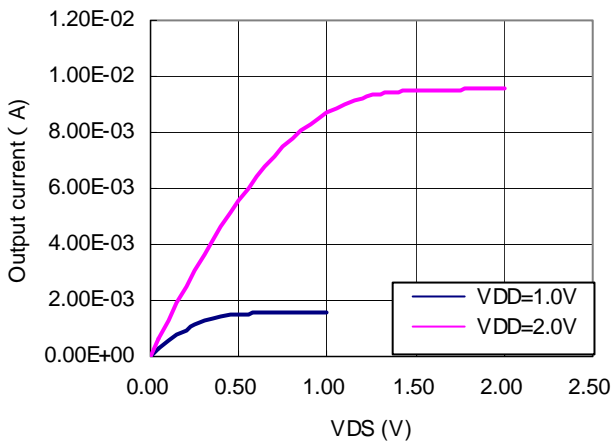
BL8506-44CXX
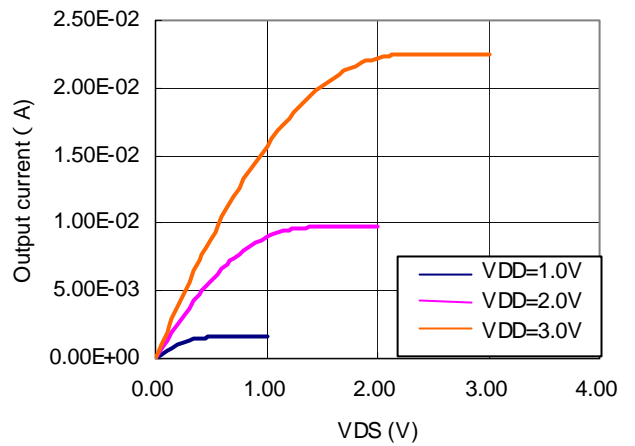
5 NCH Driver Output Current vs. Input Voltage
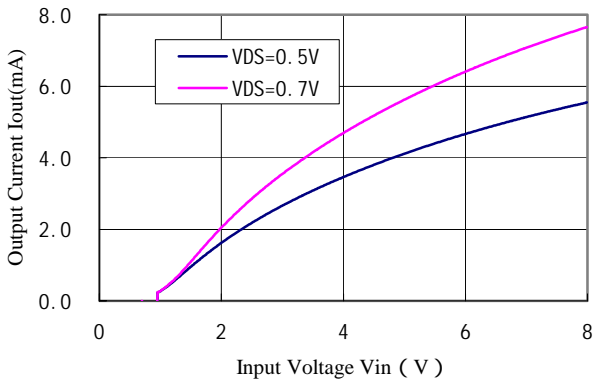
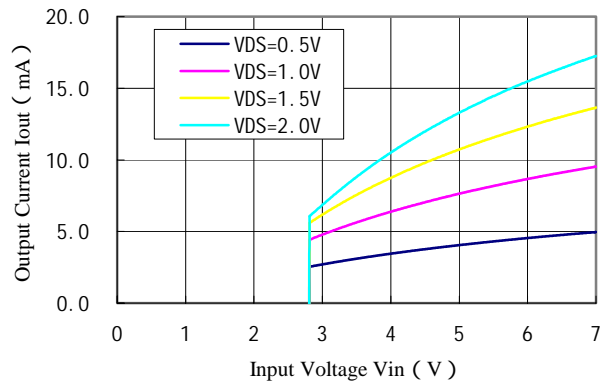Detector threshold=2.7V
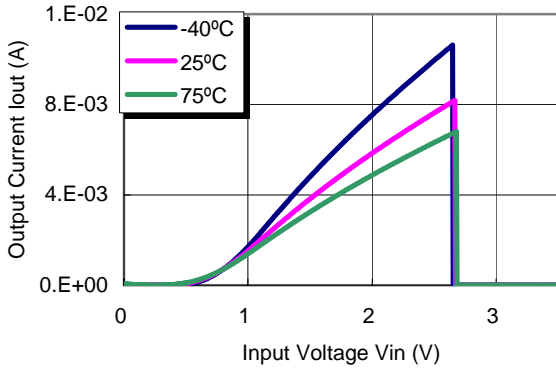
Detector threshold=3.0V
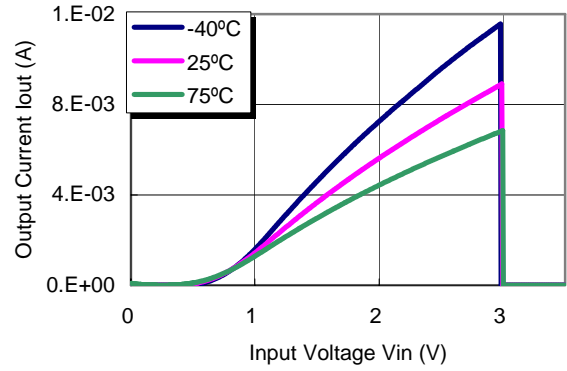
6 PCH Driver Output Current vs. Input Current
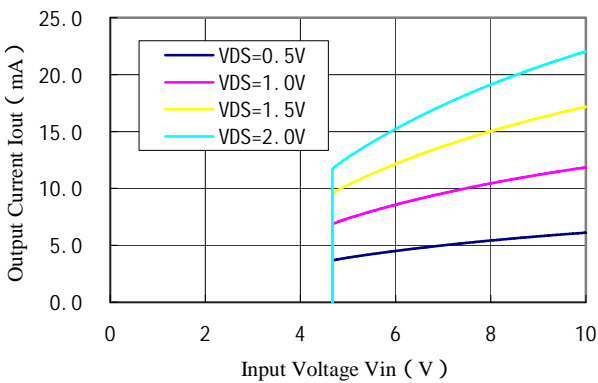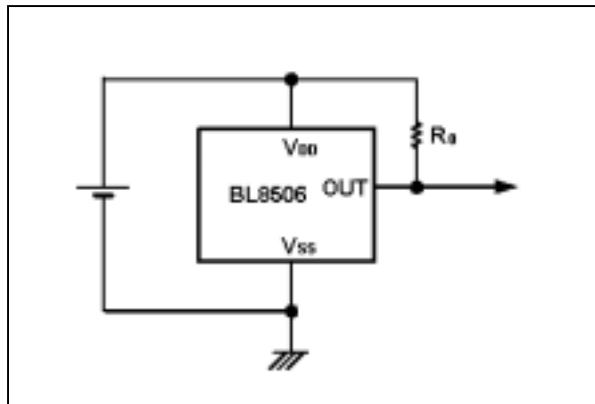
Detector threshold=0.9V

Detector threshold=2.7V

Detector threshold=4.4V

Typical applications

Note
1. R_0 is unnecessary for CMOS output products.
2. The value of R_0 need to be selected in different application, Typical value is 470k