



General Purpose ICs

- Operational Amplifiers & Comparators
- Memory: EEPROMs
- LDO Voltage Regulators
- Voltage Detectors
- Power Management Switch ICS

March 09, 2012

Finn Lange - Europe Product Marketing

General Purpose ICs

ROHM
SEMICONDUCTOR

Portfolio of General Purpose ICs

<http://www.rohm.com/eu/gpic>

ROHM Semiconductor
making Technology for you!

ROHM Semiconductor General Purpose ICs Campaign

Portfolio of General Purpose ICs

ROHM Semiconductor is a global analog and digital design and manufacturing company utilizing the latest in semiconductor technology. In addition to the wide variety of SoC and ASSP solutions a full lineup of Standard ICs is available.

Operational Amplifiers / Comparators

Universal standard Operational Amplifiers and Comparators have been developed for commercial and extended industrial use. These series correspond to a variety of operating voltage ranges, operating temperature ranges and packages to use in many fields. Besides these bipolar portfolio ROHM also offers CMOS types, which correspond to a low voltage and very low power consumption.

- Wide compatibility from 1.8V to 36V
- Wide operating temperature range: -40°C to +125°C
- Extensive package line-up
- High reliability with up to 4kV ESD resistance

View Op Amp and comparator range

EEPROM & FeRAM

ROHM's series of serial EEPROMs represent the highest level of reliability on the market. A double cell structure provides a fail-safe method of data.

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General Purpose IC Portfolio
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Low Dropout Linear Regulator
Give Part Number to view or download datasheet

Part Number	Type	Channel	Output Current [A]	Power Supply [V]	Operating Temperature [°C]	Output Voltage Range [V]	Output Voltage precision	Enable Switch	Packages
BAxxBC(W)	Secondary	1	1.0	3.0 to 16	-40 to +105	1.5 to 12	±2.0%		
BAxxCC(W)	Standard	1	1.0	4.0 to 25	-40 to +125	3.0 to 15	±2.0%	optional	TO252, TO220
BAxxDD(W)	Standard	1	2.0	3.0 to 25	-40 to +125	3.0 to 15	±1.0%	optional	TO252, TO220
BAxxCS(W)	Secondary	1	1.5	3.0 to 16	-40 to +105	1.5 to 12	±1.0%	optional	TO252, TO220, HRP5
BA3J01	Secondary	2	0.5 / 0.5	4.1 to 16	-25 to +105	1.5 / 1.8 and 3.3	±2.0%	optional	TO220
BHxxMA3W	CMOS	1	0.3	2.5 to 5.5	-40 to +85	1.5 to 3.3	±1.0%	no	HRP5
BHxxNB1W	CMOS	1	0.15	2.5 to 5.5	-40 to +85	2.5 to 3.3	±1.0%	yes	HVSOFE
BHxxPB1W	CMOS	1	0.15	1.7 to 5.5	-40 to +85	1.2 to 3.3	±1.0%	yes	HVSOFS
BHxxSA3W	CMOS	1	0.15	2.5 to 5.5	-40 to +85	1.5 to 3.3	±1.0%, ±25 mV	yes	HVSOFS
BHxxSA3W	CMOS	1	0.15	2.2 to 5.5	-40 to +85	1.8 to 3.0	±1.0%, ±25 mV	yes	VCSF60N1
BD00GA3W	Secondary	1	0.2	4.5 to 14	-25 to +85	1.5 to 13	±1.0%	yes	VCSF60N1
BD00GC3W	Secondary	1	0.5	4.5 to 14	-25 to +85	1.5 to 13	±1.0%	yes	HTSO8P
BD00HA3W	Secondary	1	1.0	4.5 to 14	-25 to +85	1.5 to 13	±1.0%	yes	HTSO8P
BD00HA3W	Secondary	1	0.3	4.5 to 8.0	-25 to +85	1.5 to 7.0	±1.0%	yes	HTSO8P
BD00HC3W	Secondary	1	0.5	4.5 to 8.0	-25 to +85	1.5 to 7.0	±1.0%	yes	HTSO8P
BD00HC3W	Secondary	1	1.0	4.5 to 8.0	-25 to +85	1.5 to 7.0	±1.0%	yes	HTSO8P
BD00HA3W	Secondary	1	1.5	4.5 to 8.0	-25 to +85	1.5 to 7.0	±1.0%	yes	HTSO8P
BD00HC3W	Secondary	1	0.5	2.4 to 5.5	-25 to +85	0.8 to 4.5	±1.0%	yes	HTSO8P
BD00IC3W	Secondary	1	1.0	2.4 to 5.5	-25 to +85	0.8 to 4.5	±1.0%	yes	HTSO8P
BD00KA3W	Secondary	1	0.5	2.3 to 5.5	-40 to +105	1.0 to 4.0	±1.0%	yes	HTSO8P
BD7020UM	CMOS	2	0.3 / 0.3	2.5 to 5.5	-40 to +85	1.0 to 4.0	±1.0%	optional	SO8P, TO252
BUxxTA2W	CMOS	1	0.2	2.5 to 5.5	-40 to +85	1.5 to 3.3	±1.0%	yes	VSON008x2030
BUxxTD2W	CMOS	1	0.2	1.7 to 5.5	-40 to +85	1.0 to 3.4	±1.0%, ±25 mV	yes	SSON004x1216, HVSOFS
BUxxTD2W	CMOS	1	0.2	1.7 to 5.5	-40 to +85	1.0 to 3.4	±1.0%, ±25 mV	yes	SSON004x1010
BU6K5x	CMOS	3	0.2 / 0.2 / 0.2	2.5 to 5.5	-40 to +85	1.5 to 3.3	±1.0%, ±25 mV	yes	SSOPS
								yes	VSON008x2030

For the complete lineup please visit www.rohm.com
for
General Purpose LDOs
Special Automotive LDOs

Operational Amplifiers & Comparators



GENERAL PURPOSE ICs

Operational Amplifiers & Comparators

Standard Line-up

OpAmp	Package	Comparator	Package
LM2902 (4 channel)	SO14, TSSOP14	LM2901 (4 channel)	SO14, TSSOP14
LM2904 (2 channel)	SO8, TSSOP8, MiniSO8	LM2903 (2 channel)	SO8, TSSOP8
LM324 (4 channel)	SO14, TSSOP14	LM339 (4 channel)	SO14, TSSOP14
LM358 (2 channel)	SO8, TSSOP8, MiniSO8	LM393 (2 channel)	SO8, TSSOP8, MiniSO8

Other series available for: low noise, high voltage&speed, ultra low power, low voltage

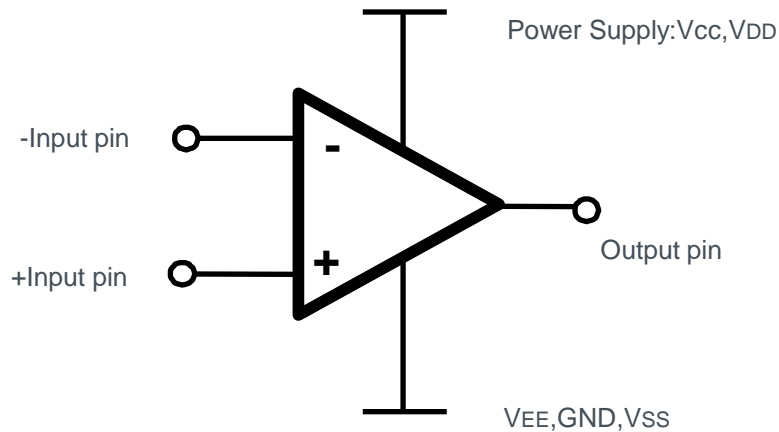
ROHM's General Purpose ICs are designed to be used in all electronic devices for consumer, industrial and automotive applications.

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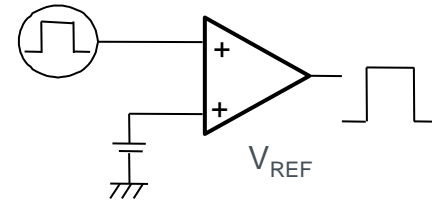
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OpAmps & Comparators: Function

- OpAmp & Comparator symbol



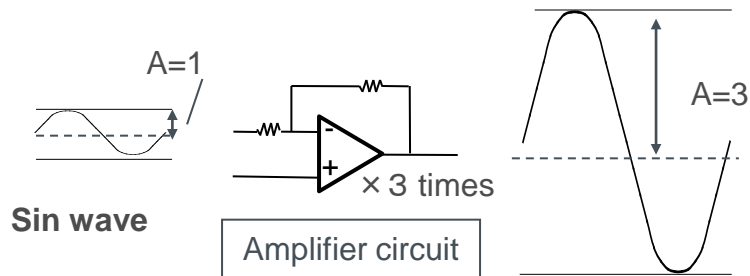
- Comparator how to use?



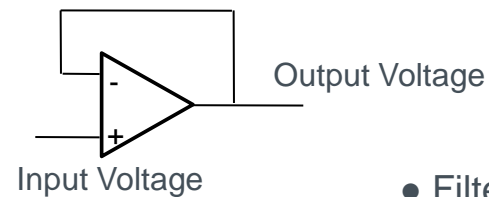
Input signal is compared with V_{REF} in which High level or Low level.

- OpAmp how to use?

- Amplifier circuit



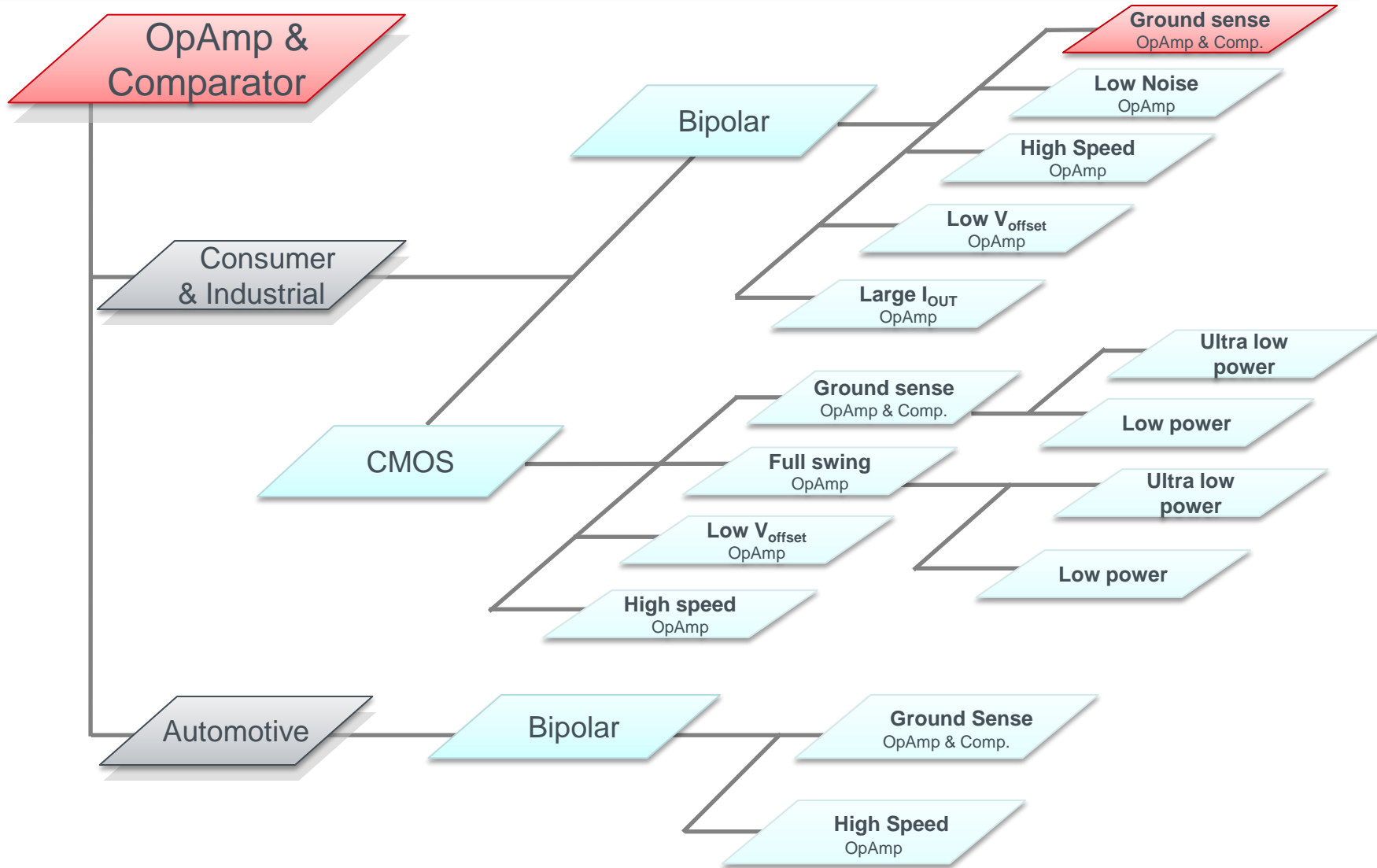
- Buffer circuit



Output V is kept same level of Input V ($\times 1$)

- Filter circuit
- Pulse generate circuit
- Oscillation circuit

OP Amp & Comparators Line up Tree



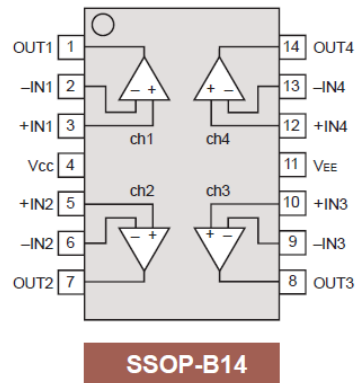
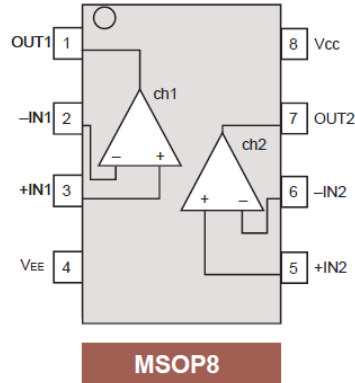
OpAmps & Comparators: Line-up LM-Series

Part Number	Function	Channels	Circuit Current [mA]	Power Supply [V]	Operating Temperature [°C]	Input offset voltage [mV]	Input bias current [nA]	Slew Rate [V/μs] / Re-sponse Time [μs]	Package
LM2901	Comparator	4	0.8	2.0 to 36.0	-40 to +85	2	25	1.3	SOP14, TSSOP14
LM2902	OpAmp	4	0.7	3.0 to 32.0	-40 to +125	3	20	0.5	SOP14, TSSOP14
LM2903	Comparator	2	0.4	2.0 to 32.0	-40 to +85	2	25	1.5	SOP8, TSSOP8
LM2904	OpAmp	2	0.7	3.0 to 32.0	-40 to +125	3	20	0.3	SOP8, TSSOP8, MiniSO8
LM324	OpAmp	4	0.7	3.0 to 32.0	0 to +70	3	20	0.5	SOP14, TSSOP14
LM339	Comparator	4	0.8	2.0 to 36.0	0 to +70	2	25	1.3	SOP14, TSSOP14
LM358	OpAmp	2	0.7	3.0 to 32.0	0 to +70	3	20	0.3	SOP8, TSSOP8, MiniSO8
LM393	Comparator	2	0.4	2.0 to 36.0	0 to +70	1	25	1.3	SOP8, TSSOP8, MiniSO8

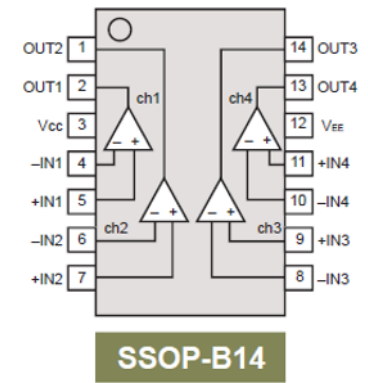
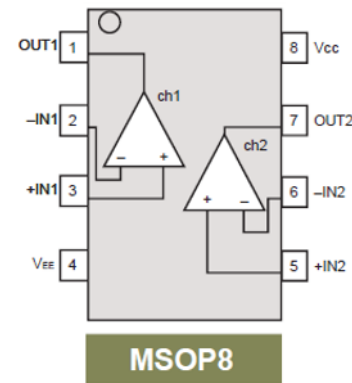
Automotive OpAmp & Comparator Line-up

Function	Type	Supply Voltage	Channels	ESD	Response time / Gain band width	Operating Temperature	Package
OpAmp	BA2904HFVM-C	3 to 32V	2	5 kV	1.3 μ s	-40 to +125 $^{\circ}$ C	MSOP8
OpAmp	BA2902HFV-C	3 to 32V	4	5 kV	1.3 μ s	-40 to +125 $^{\circ}$ C	SSOP-B14
Comparator	BA2903HFVM-C	2 to 36V	2	5 kV	0.5 MHz	-40 to +125 $^{\circ}$ C	MSOP8
Comparator	BA2901HFV-C	2 to 36V	4	5 kV	0.5 MHz	-40 to +125 $^{\circ}$ C	SSOP-B14

● Pin assignment



● Pin assignment



**AEC-Q100
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EEPROM



GENERAL PURPOSE ICs

■ EEPROMs

Features

- I²C (BR24 Series), SPI (BR25 and BR35 Series) and Microwire (BR93 Series)
- High reliable double cell structure
- Double reset method for twice the safety
- Wide range of memory capacities: 1k to 1Mbit
- Worldwide standard packages (JEDEC): SO8, TSSOP8 & others

ROHM's General Purpose ICs are designed to be used in all electronic devices for consumer, industrial and automotive applications.

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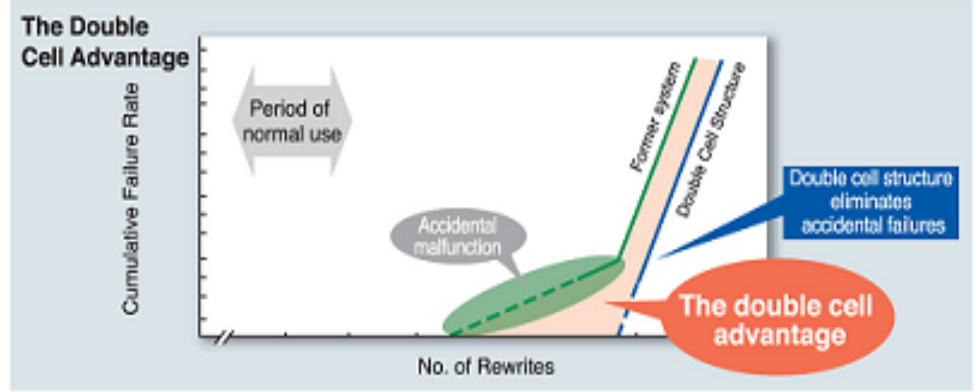
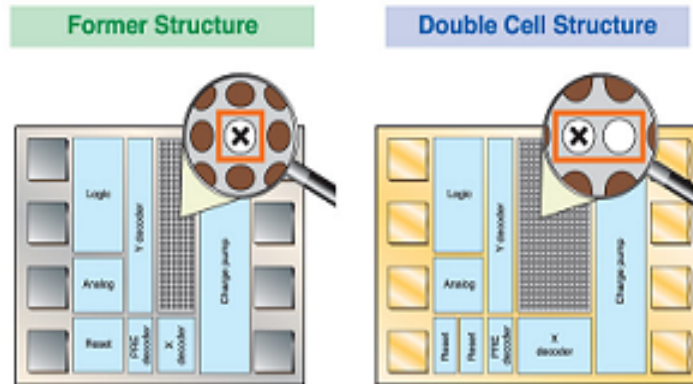
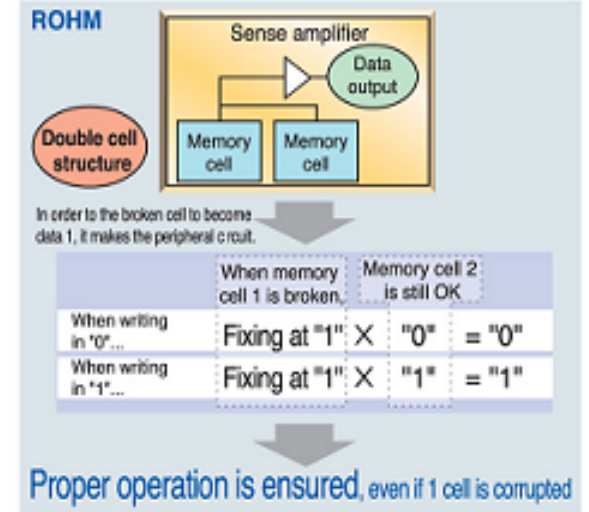
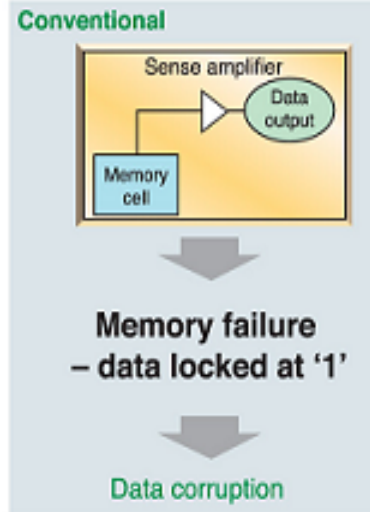
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EEPROM: Reliability

High reliability double cell structure eliminates accidental failures



Rewriting is performed by passing electrons through a tunnel oxide film. This, however, causes deterioration of the film, eventually leading to memory failure, where the memory cell data is fixed at '1' and cannot be rewritten. ROHM's novel double cell structure prevents this by allotting two cells for each memory bit, connected in an OR configuration, that will enable the second cell to operate upon failure of the first.



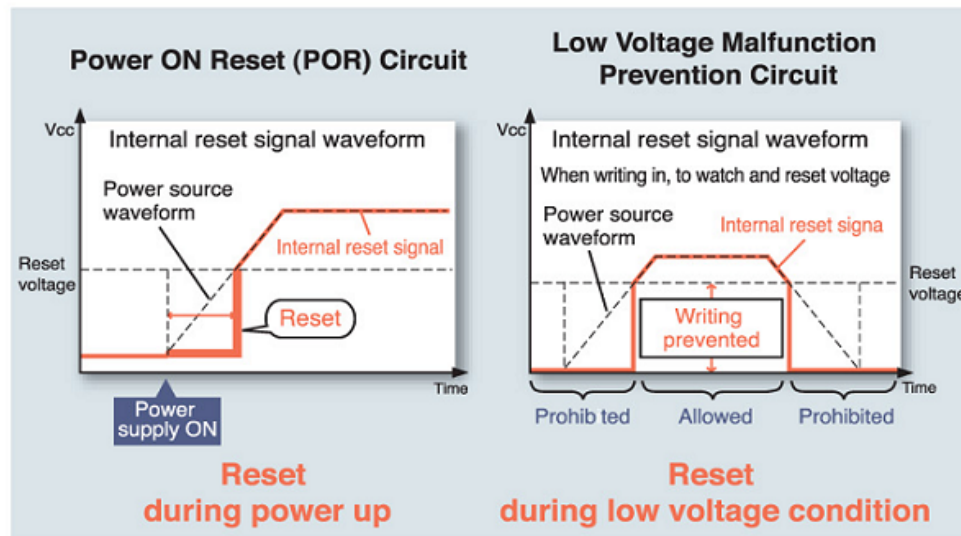
EEPROM: Protection

Writing errors prevented

with double protection circuit



All LSIs become unstable during power ON and OFF. EEPROMs, however, are even more susceptible to failure, making it all but impossible to recover from even one malfunction. In response to this, ROHM integrates a double protection circuit consisting of a Power ON Reset (POR) block that resets during startup and a Low Voltage Write Error Protection Circuit (LVCC) that prevents write operations and resets during low voltage conditions.



EEPROM Line-up: I2C BUS

Density	Type	Power supply	max. Frequency	DIP-T8	SOP8	SOP-J8 (JEDEC)	SSOP-B8	TSSOP-B8 (JEDEC)	TSSOP-B8J (JEDEC)	MSOP8	VSON 008 X2030
				blank	F	FJ	FV	FVT	FVJ	FVM	NUX
1Mbit	BR24G1M-3A	1.7 to 5.5V	1MHz	☆ Q3/2012	☆ Q3/2012	☆ Q3/2012					
512Kbit	BR24G512-3A	1.7 to 5.5V	1MHz	☆ Q3/2012	☆ Q3/2012	☆ Q3/2012	☆ Q3/2012	☆ Q3/2012			
256Kbit	BR24G256-3A BR24G256-3	1.7 to 5.5V	1MHz 400kHz	●	●	●	●	●			
128Kbit	BR24G128-3A BR24G128-3	1.7 to 5.5V	1MHz 400kHz	●	●	●	●	●	●	●	●
64Kbit	BR24G64-3A BR24G64-3	1.7 to 5.5V	1MHz 400kHz	☆ ●	☆ ●	☆ ●	☆ ●	☆ ●	☆ ●	☆ ●	☆ ●
32Kbit	BR24G64-3A BR24G32-3	1.7 to 5.5V	1MHz 400kHz	☆ ●	☆ ●	☆ ●	☆ ●	☆ ●	☆ ●	☆ ●	☆ ●
16Kbit	BR24G16-3	1.7 to 5.5V	400kHz	●	●	●	●	●	●	●	●
8Kbit	BR24G08-3	1.7 to 5.5V	400kHz	●	●	●	●	●	●	●	●
4Kbit	BR24G04-3	1.7 to 5.5V	400kHz	●	●	●	●	●	●	●	●
2Kbit	BR24G02-3	1.7 to 5.5V	400kHz	●	●	●	●	●	●	●	●
1Kbit	BR24G01-3	1.7 to 5.5V	400kHz	●	●	●	●	●	●	●	●

☆: Under development

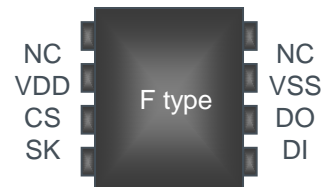
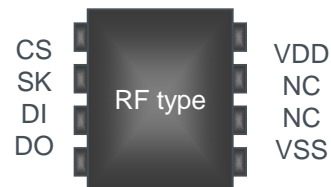
EEPROM Line-up: SPI BUS (+85°C)

Density	Type	Power supply	max. Frequency	DIP-T8	SOP8	SOP-J8 (JEDEC)	SSOP-B8	TSSOP-B8 (JEDEC)	TSSOP-B8J (JEDEC)	MSOP8	VSON 008 X2030
				blank	F	FJ	FV	FVT	FVJ	FVM	NUX
1Mbit	BR25G1M-3	1.7 to 5.5V	20MHz		□ 2014	□ 2014					
512Kbit	BR25G512-3	1.7 to 5.5V	20MHz		□ 2014	□ 2014					
256Kbit	BR25S256-W	1.7 to 5.5V	20MHz		●	●					
128Kbit	BR25S128-W	1.7 to 5.5V	20MHz		●	●	●	●			
64Kbit	BR25S640-W BR25L640-W	1.7 to 5.5V	20MHz 5MHz		●/●	●/●	●/-	●/-	●/-	●/-	
32Kbit	BR25S320-W BR25L320-W	1.7 to 5.5V	20MHz 5MHz		●/●	●/●	●/-	●/-	●/-	●/-	●/-
16Kbit	BR25L160-W	1.8 to 5.5V	5MHz		●	●	●	●			
8Kbit	BR25L080-W	1.8 to 5.5V	5MHz		●	●	●	●			
4Kbit	BR25L040-W	1.8 to 5.5V	5MHz		●	●	●	●	●	●	
2Kbit	BR25L020-W	1.8 to 5.5V	5MHz		●	●	●	●	●	●	
1Kbit	BR25L010-W	1.8 to 5.5V	5MHz		●	●	●	●	●	●	

☆: Under development
□: Under Planning

EEPROM Line-up: Microwire BUS (+85°C)

Density	Type	Power source Voltage	DIP-T8	SOP8 F / RF	SOP-J8 FJ / RFJ (JEDEC)	SSOP-B8 FV / RFV	TSSOP- B8 FVT/RFVT (JEDEC)	TSSOP- B8J RFVJ (JEDEC)	MSOP8 RFVM	VSON008 X2030
16Kbit	BR93L86-W	1.8 to 5.5V		● / ●	● / ●	- / ●	- / ●	●	●	
8Kbit	BR93L76-W	1.8 to 5.5V		● / ●	● / ●	- / ●	- / ●	●	●	
4Kbit	BR93L66-W	1.8 to 5.5V		● / ●	● / ●	● / ●	● / ●	●	●	
2Kbit	BR93L56-W	1.8 to 5.5V		● / ●	● / ●	● / ●	● / ●	●	●	
1Kbit	BR93L46-W	1.8 to 5.5V		● / ●	● / ●	● / ●	● / ●	●	●	



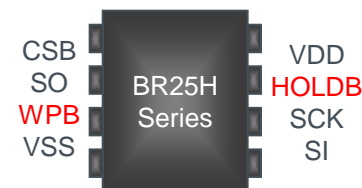
The difference between RF and F type is only pin rotation.

Automotive EEPROM Line-up: SPI BUS (+125°C)

Density	Type	Power source Voltage	SOP8	SOP-J8 (JEDEC)	TSSOP-B8 (JEDEC)	MSOP8
128Kbit	BR25H128-2C	2.5 to 5.5V	☆	☆		
64Kbit	BR25H640-2C	2.5 to 5.5V	☆	☆	☆	
32Kbit	BR25H320-WC(2C)	2.5 to 5.5V	●	●	☆	☆
16Kbit	BR25H160-WC(2C)	2.5 to 5.5V	●	●	●	☆
8Kbit	BR25H080-WC(2C)	2.5 to 5.5V	●	●	●	☆
4Kbit	BR25H040-WC(2C)	2.5 to 5.5V	●	●	☆	☆
2Kbit	BR25H020-WC(2C)	2.5 to 5.5V	●	●	☆	☆
1Kbit	BR25H010-WC(2C)	2.5 to 5.5V	●	●	☆	☆
128Kbit	BR35H128-WC	2.5 to 5.5V	●	●		
64Kbit	BR35H640-WC	2.5 to 5.5V	●	●	●	
32Kbit	BR35H320-WC	2.5 to 5.5V	●	●	●	●
16Kbit	BR35H160-WC	2.5 to 5.5V	●	●	●	●

☆ : Under development

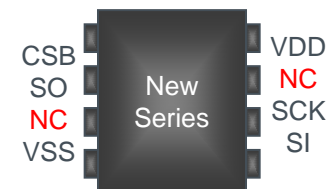
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WPB and HOLDB pins are used as a pull up normally .



BR35H Series is reduced 2 PINs for BR25H Series which is full compatible with SPI EEPROM.



Automotive EEPROM Line-up: Microwire BUS (+125°C)

**AEC-Q100
qualified!**

Density	Type	Power source Voltage	SOP8	SOP-J8 (JEDEC)	TSSOP-B8 (JEDEC)	MSOP8
16Kbit	BR93H86-WC(2C)	2.7 (2.5) to 5.5V	●	●	☆	☆
8Kbit	BR93H76-WC(2C)	2.7 (2.5) to 5.5V	●	●	☆	☆
4Kbit	BR93H66-WC(2C)	2.7 (2.5) to 5.5V	●	●	☆	☆
2Kbit	BR93H56-WC(2C)	2.7 (2.5) to 5.5V	●	●	☆	☆
1Kbit	BR93H46-2C	2.5 to 5.5V	●	●	☆	☆

☆ : Under development

LDO Regulator Overview

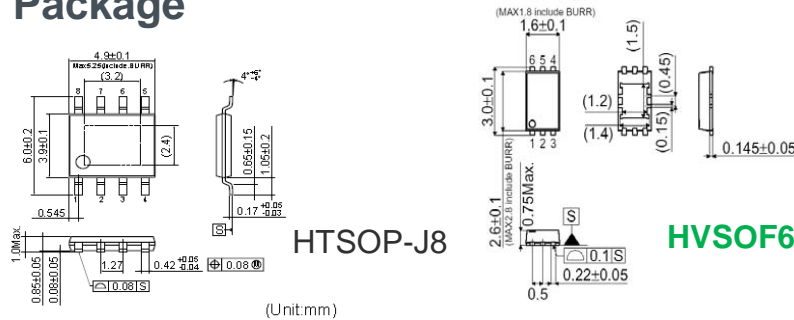
Series	Type	V_{IN}	V_{OUT}	I_{OUT}	Packages
BD357□	Automotive	max. 50V	2.8-12V	0.5A	TO252, HRP
BA□□CC0	Standard	max. 35V	3.0-15V	1.0A	TO220FP, TO220CP, TO252
BD□□C0A	Standard	max. 35V	3.0-15V	1.0A	TO252
BA□□DD0	Standard	max. 35V	1.5-16V	2.0A	TO220FP, TO220CP, HRP
BD□□D0A	Standard	max. 35V	3.0-15V	2.0A	HRP
BA□□JC5	Secondary	max. 18V	1.5-12V	1.5A	TO220FP
BA□□BC0	Secondary	max. 18V	1.5-12V	1.0A	TO220FP, TO220CP, TO252
BD00GC0	Secondary	max. 15V	1.5-13V	1.0A	HTSOP
BD00GA5	Secondary	max. 15V	1.5-13V	0.5A	HTSOP
BD00GA3	Secondary	max. 15V	1.5-13V	0.3A	HTSOP
BD00HC5	Secondary	max. 10V	1.5-7.0V	1.5A	HTSOP
BD00HC0	Secondary	max. 10V	0.8-7.0V	1.0A	HTSOP
BD00HA5	Secondary	max. 10V	1.5-7.0V	0.5A	HTSOP
BD00HA3	Secondary	max. 10V	1.5-7.0V	0.3A	HTSOP
BD00IC0	Secondary	max. 7.0V	0.8-4.5V	1.0A	HTSOP
BD00IA5	Secondary	max. 7.0V	0.8-4.5V	0.5A	HTSOP
BD□□KA5	Secondary	max. 7.0V	1.0-4.0V	0.5A	TO252, SOP
BH□□□□	CMOS	max. 8.5V	1.0-3.4V	0.3A	HVSO8, SSON, SSOP, VSON, VCSP

New LDO: BDxxI/H/G – Target Specification

Features

- Power supply voltage : 7/10/15V in line-up
- Output current: 0.3/0.5/1.0/1.5A
- Fixed output: 1/1.2/1.5/1.8/2.5/3.0/3.3/5.0/6.0V, **Possible 50mV step**
- High accuracy voltage output $\pm 1\%$
- Enable pin
- Supporting Small Ceramic capacitor down to 1 μ F
- Rich protections:
 - Soft start, Thermal shutdown, OCP (Over Current Protection), Pin to Pin short matrix protection
- Small SMD package : HTSOP-J8, **HVSO6**

Package



Part numbering

BD 00 G C0 WEFJ

VOUT

00: ADJ
XX: Fixed

VIN ABX max

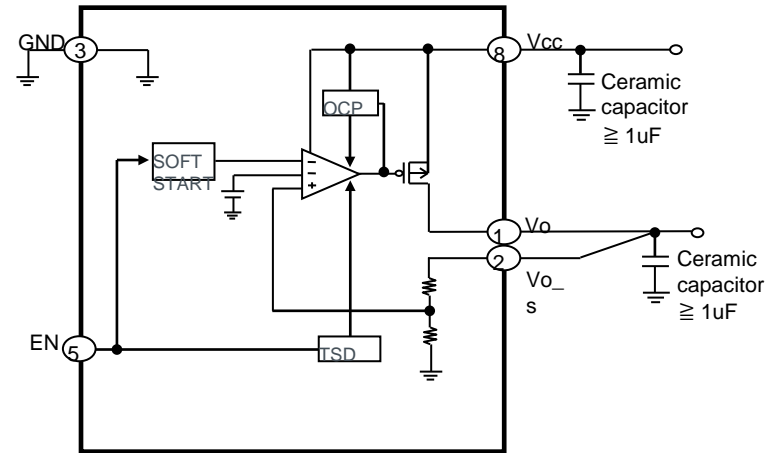
G: 15V
H: 10V
I: 7V

I_{OUT}

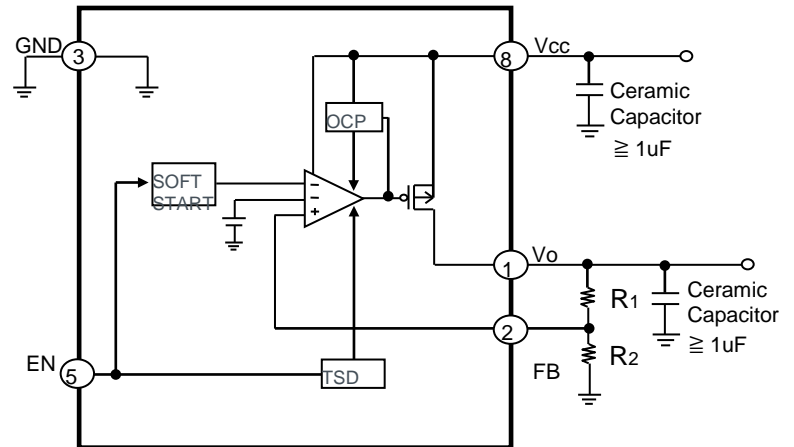
C5: 1.5A
C0: 1A
A5: 0.5A
A3: 0.3A

Application circuit

Fixed output voltage



Variable output voltage



New LDO: BA1117FP – Target Specification

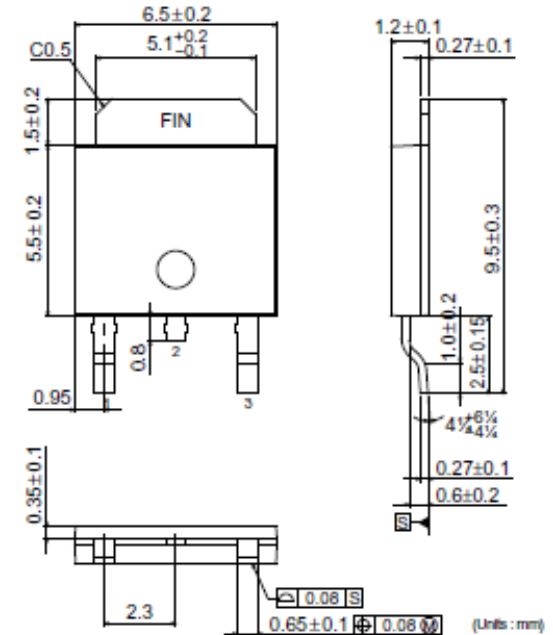
Operating Condition

Parameter	Symbol	Min	Max	Unit
Operating Input Voltage	V _{in}	V _{out} + V _{drop}	15	V
Output Current	I _o	1	-	A

Electrical Characteristics

Parameter	Symbol	Limit			Unit	Condition
		Min	Typ	Max		
Line Regulation	Reg.I	-	0.035	0.2	%	V _{IN} -V _{OUT} =1.5V to 13.75V, I _{OUT} =10mA
Load Regulation	Reg.L	-	0.2	0.5	%	V _{IN} -V _{OUT} =3V, I _{OUT} =10mA to 1A
Dropout Voltage	V _{DR}	-	1	1.1	V	I _{OUT} =100mA
		-	1.05	1.15	V	I _{OUT} =500mA
		-	1.1	1.2	V	I _{OUT} =800mA
		-	1.2	1.4	V	I _{OUT} =1000mA
Current Limit	I _{limit}	1	-	-	A	V _{IN} -V _{OUT} =5V
Minimum Load Current	I _l	-	1.7	5	mA	V _{IN} =15V
Ripple Rejection	RR	60	75	-	dB	V _{IN} -V _{OUT} =3V, I _{OUT} =40mA, V _{ripp} e=1V _{pp} , f=120Hz
Adjust Pin Current	I _{adj}	-	60	120	uA	V _{IN} ≤ 15V
Adjust Pin Current Change	dI _{adj}	-	0.2	5	uA	V _{IN} -V _{OUT} =1.4V to 10V, I _{OUT} =10mA to 1A
Thermal Regulation	TR	-	0.01	0.1	%/W	T _a =25°C, 30ms pluse
Temperature Stability	TS	-	0.5	-	%	I _{OUT} =10mA
Long Term Stability	LS	-	0.3	-	%	1000hrs, T _a =125°C
RMS Output Noise	N	-	0.03	-	%	f=10Hz to 100kHz, T _a =25°C

TO252-3



Pin No.	Pin Name	Function
1	ADJ/Gnd	ADJ/Gnd
2/FIN	V _{OUT}	Output
3	V _{IN}	Input

New LDO: BA1117FP – Line-up & Schedule

Line Up

Output Voltage[V]	ADJ	1.5	1.8	1.9	2.0	2.5	2.85	3.3	5.0
BA1117FP-xxx(TO252-3)	○	○	○	○	○	○	○	○	○
BA1117xx-xxx(SOT-223)	○	○	○	○	○	○	○	○	○

Schedule

	Package	Vout	Development Plan						
			2012/1Q	2012/2Q	2012/3Q	2012/4Q	2013/1Q	2013/2Q	
BA1117 Serie	TO252-3	ADJ	MP: 2012/09 start						
		1.5		MP: 2012/12 start					
		1.8							
		1.9							
		2.0							
		2.5							
		2.85					MP: 2013/01 start		
		3.3							
		5.0							
	SOT223	ADJ				MP: 2013/02 start			
		1.5							
		1.8							
		1.9							
		2.0							
		2.5							
2.85									
3.3									
5.0									

CMOS LDO: Single Channel

	Product	I _{out}	V _{in}	V _{out}	Package	Feature
CMOS LDO Regulators	BH□□PB1W Series (with enable pin)	150 mA	1.7-5.5	Fixed: 1.2 to 3.3 V (± 1%)	HVSOF5	Automatic Power Saving
	BH□□NB1W Series (with enable pin)		2.5-5.5	Fixed: 2.5 to 3.3 V (± 1%)	HVSOF5	High 80dB ripple rejection
	BH□□RB1W Series (with enable pin)			Fixed: 1.5 to 3.3 V (± 1%)	VCSP	Stable 2mV load regulation
	BU□□TA2W Series (with enable pin)	200 mA	1.7-5.5	Fixed: 1.5 to 3.4 V (± 1%)	SSON004, HVSOF5	High speed load response
	BU□□TD2W Series (with enable pin)			Fixed: 1.0 to 3.4 V (± 1%)	SSON004	High speed start-up
	BU□□TD3W Series (with enable pin)		2.2-5.5		Fixed: 1.8 to 3.0 V (± 1%)	SSOP5 (SOT23-5)
	BH□□SA3W Series (with enable pin)			VCSP		High speed load response
	BH□□MA3W Series (with enable pin)	300 mA	2.5-5.5	Fixed: 1.5 to 3.3 V (± 1%)	HVSOF6	Low noise & soft start

CMOS LDO: Multi Channel & DCDC integrated

	Product	Iout	Vin	Vout	Package	Feature
2ch CMOS LDO	BD7003 (with enable pin)	300 mA	2.5-5.5	Fix: 1.5,1.8,2.6,2.8,2.9 & 2.6,2.7,2.8,2.9,3.3 (± 1.8%)	VSON008	9 output voltage patterns
3ch CMOS LDO	BU665□ Series (with enable pin)	200 mA	2.5-5.5	Fixed: 2.8,3.3 & 1.8,2.8 & 1.5,1.8 (± 1%)	VSON008	High speed load response
DC/DC Converter + 3-6ch CMOS LDO	BH6173 (with enable pin)	500 mA, 3x300 mA	2.2-5.2	DC/DC: Variable 0.8-2.4 V LDO: 2xVariable 1.0-3.3 & 1xVariable 1.2-3.3 V	VCSP50	I ² C Interface
	BH6172 (with enable pin)	500 mA, 3x150 & 2x300 mA	2.2-5.5	DC/DC: Variable 0.8-2.4 V LDO: 2xVariable 1.0-3.3 & 3xVariable 1.2-3.3 V	VCSP85	I ² C / parallel Interface
	BH6174 (with enable pin)	2x600 mA, 5x300 mA	2.6-5.5	DC/DC: Variable 0.8-2.4 V LDO: 2xVariable 1.0-3.3 & 3xVariable 1.2-3.3 V	VCSP50	I ² C / parallel Interface, APS
	BH6178 (with enable pin)	400,650 mA, 5x50 mA	2.7-4.5	DC/DC: Fixed 1.8 & 2.4 V LDO: 2xFixed 1.2 & 2x fixed 1.8 & 1xFixed 2.7 V	VCSP50	I ² C / parallel Interface, APS
	BH6176 (with enable pin)	500 mA, 3x150 & 3x300 mA	2.2-5.2	DC/DC: Variable 0.8-2.35 V LDO: 2xVariable 1.0-3.3 & 4xVariable 1.2-3.3 V	VCSP85	I ² C / parallel Interface
	BH6179 (with enable pin)	600 mA, 3x150 & 3x300 mA	2.2-5.5	DC/DC: Variable 0.8-2.35 V LDO: 2xVariable 1.0-3.3 & 4xVariable 1.2-3.3	VCSP85	I ² C / parallel Interface

Voltage Detectors

ESD Resistance
8kV
Now available

High temperature operating
125°C
Now Available

IC

Pb Free
RoHS

High Reliability
Voltage Detector IC
Series

Ver.2.1

General Purpose
LSIs

SELECT SELECTION CATALOG

Voltage Detectors – Line up

Detection Voltage[V]	Standard				With Adjustable Delay Time				With Fixed Delay Time				Bipolar Open Collector
	Open Drain		CMOS		Open Drain		CMOS		Open Drain		CMOS		
	Delay time (ms)												
	50	100	200	400	50	100	200	400	50	100	200	400	
6.0	BD48□□G BD48□□FVE ★BD48K□□G ★BD48L□□G ★BD48E□□G-M	BD49□□G BD49□□FVE ★BD49K□□G ★BD49L□□G ★BD49E□□G-M	BD52□□G BD52□□FVE	BD53□□G BD53□□FVE	BD45□□5G BD45□□1G BD45□□2G ★BD45K□□2G ★BD45L□□2G ★BD45E□□2G	BD46□□5G BD46□□1G BD46□□2G ★BD46K□□2G ★BD46L□□2G ★BD46E□□2G	BD47□□G	BD42□□G BD42□□FVE BD42□□F	BD43□□G BD43□□FVE BD43□□F	BD44□□G BD44□□FVE BD44□□F	BD44□□G BD44□□FVE BD44□□F	BD44□□G BD44□□FVE BD44□□F	
5.9													
5.8													
∞													
4.9	BD48□□G BD48□□FVE ★BD48K□□G ★BD48L□□G ★BD48E□□G-M	BD49□□G BD49□□FVE ★BD49K□□G ★BD49L□□G ★BD49E□□G-M	BD52□□G BD52□□FVE	BD53□□G BD53□□FVE	BD45□□5G BD45□□1G BD45□□2G ★BD45K□□2G ★BD45L□□2G ★BD45E□□2G	BD46□□5G BD46□□1G BD46□□2G ★BD46K□□2G ★BD46L□□2G ★BD46E□□2G	BD47□□G	BD42□□G BD42□□FVE BD42□□F	BD43□□G BD43□□FVE BD43□□F	BD44□□G BD44□□FVE BD44□□F	BD44□□G BD44□□FVE BD44□□F	BD44□□G BD44□□FVE BD44□□F	
4.8													
4.7													
4.6													
4.6	BD48□□G BD48□□FVE BD48□□F	BD49□□G BD49□□FVE BD49□□F	BD52□□G BD52□□FVE	BD53□□G BD53□□FVE	BD45□□5G BD45□□1G BD45□□2G ★BD45K□□2G ★BD45L□□2G ★BD45E□□2G	BD46□□5G BD46□□1G BD46□□2G ★BD46K□□2G ★BD46L□□2G ★BD46E□□2G	BD47□□G	BD42□□G BD42□□FVE BD42□□F	BD43□□G BD43□□FVE BD43□□F	BD44□□G BD44□□FVE BD44□□F	BD44□□G BD44□□FVE BD44□□F		
∞													
2.5													
2.4													
2.3	BD48□□G BD48□□FVE BD48□□F	BD49□□G BD49□□FVE BD49□□F	BD52□□G BD52□□FVE	BD53□□G BD53□□FVE	BD45□□5G BD45□□1G BD45□□2G ★BD45K□□2G ★BD45L□□2G ★BD45E□□2G	BD46□□5G BD46□□1G BD46□□2G ★BD46K□□2G ★BD46L□□2G ★BD46E□□2G	BD47□□G	BD42□□G BD42□□FVE BD42□□F	BD43□□G BD43□□FVE BD43□□F	BD44□□G BD44□□FVE BD44□□F	BD44□□G BD44□□FVE BD44□□F		
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2.0													
1.9	BD48□□G BD48□□FVE BD48□□F	BD49□□G BD49□□FVE BD49□□F	BD52□□G BD52□□FVE	BD53□□G BD53□□FVE	BD45□□5G BD45□□1G BD45□□2G ★BD45K□□2G ★BD45L□□2G ★BD45E□□2G	BD46□□5G BD46□□1G BD46□□2G ★BD46K□□2G ★BD46L□□2G ★BD46E□□2G	BD47□□G	BD42□□G BD42□□FVE BD42□□F	BD43□□G BD43□□FVE BD43□□F	BD44□□G BD44□□FVE BD44□□F	BD44□□G BD44□□FVE BD44□□F		
∞													
1.0													
0.9													

★: Under Development

Package Line-up

G : SSOP5(SOT23-5)

SSOP3(SOT23-3)

FVE : VSOF5

F : SOP4(SC82)

NEW



–M: High reliability grade (105°C)
AECQ100 qualified

Voltage Detectors – Details

Standard CMOS Voltage Detector IC

BD48□□Series Open Drain Output
BD49□□Series CMOS Push Pull Output

Total 152 types

Detection Voltage: 2.3 - 6.0 V
Circuit Current (on/off): 0.60 / 0.85 μ A
Output Current (1.2/2.4V): 1 / 4 mA

Free Delay Time Setting CMOS Voltage Detector IC

BD52□□Series Open Drain Output
BD53□□Series CMOS Push Pull Output

Total 152 types

Detection Voltage: 2.3 - 6.0 V
Circuit Current (on/off): 0.85 / 0.85 μ A
Output Current (1.2/2.4V): 1.2 / 5 mA

Counter Timer Built-in CMOS Voltage Detector IC

BD45□□Series Open Drain Output
BD46□□Series CMOS Push Pull Output

Total 156 types

Detection Voltage: 2.3 - 4.8 V
Circuit Current (on/off): 0.80 / 0.85 μ A
Output Current (1.2/2.4V): 1.2 / 5 mA

Low Voltage Standard CMOS Voltage Detector IC

BU48□□Series Open Drain Output
BU49□□Series CMOS Push Pull Output

Total 240 types

Detection Voltage: 0.9 - 4.8 V
Circuit Current (on/off): 0.40 / 0.55 μ A
Output Current (1.2/2.4V): 3.3 / 6.5 mA

Low Voltage Free Delay Time Setting CMOS Voltage Detector IC

BU42□□Series Open Drain Output
BU43□□Series CMOS Push Pull Output

Total 240 types

Detection Voltage: 0.9 - 4.8 V
Circuit Current (on/off): 0.40 / 0.55 μ A
Output Current (1.2/2.4V): 3.3 / 6.5 mA

PIN No.	Symbol	Function
1	V _{OUT}	Reset Output
2	V _{DD}	Power Supply Voltage
3	GND	Ground
4	N.C.	Unconnected Terminal
5	N.C.	Unconnected Terminal

SSOP5

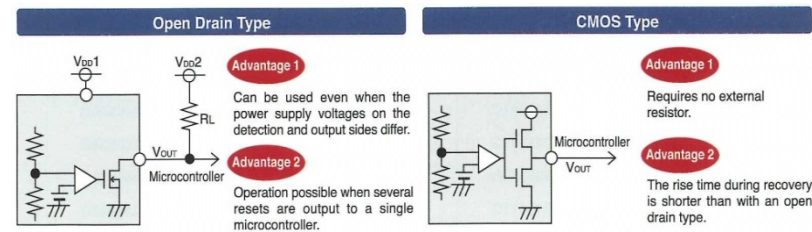
PIN No.	Symbol	Function
1	V _{OUT}	Reset Output
2	SUB	Substrate*
3	N.C.	Unconnected Terminal
4	V _{DD}	Power Supply Voltage
5	GND	Ground

VSO5F5

*Please connect the substrate to V_{DD}.

PIN No.	Symbol	Function
1	V _{OUT}	Reset Output
2	V _{DD}	Power Supply Voltage
3	N.C.	Unconnected Terminal
4	GND	Ground

SOP4



New Voltage Detectors - Schedule

	Package	2012											
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
BD48KxxG	SSOP3			DS				CS		MP			
BD48LxxG				DS				CS		MP			
BD49KxxG				DS				CS		MP			
BD49LxxG				DS				CS		MP			
BD45KxxxG						DS				CS		MP	
BD45LxxxG						DS				CS		MP	
BD46KxxxG						DS				CS		MP	
BD46LxxxG						DS				CS		MP	
BD48ExxG - M	SSOP5	DS				CS		MP					
BD49ExxG - M		DS				CS		MP					

Tentative schedule

Power Management Switch ICs

For load switches
New
NMOS Drivers

For PCs and Digital Consumer Electronics

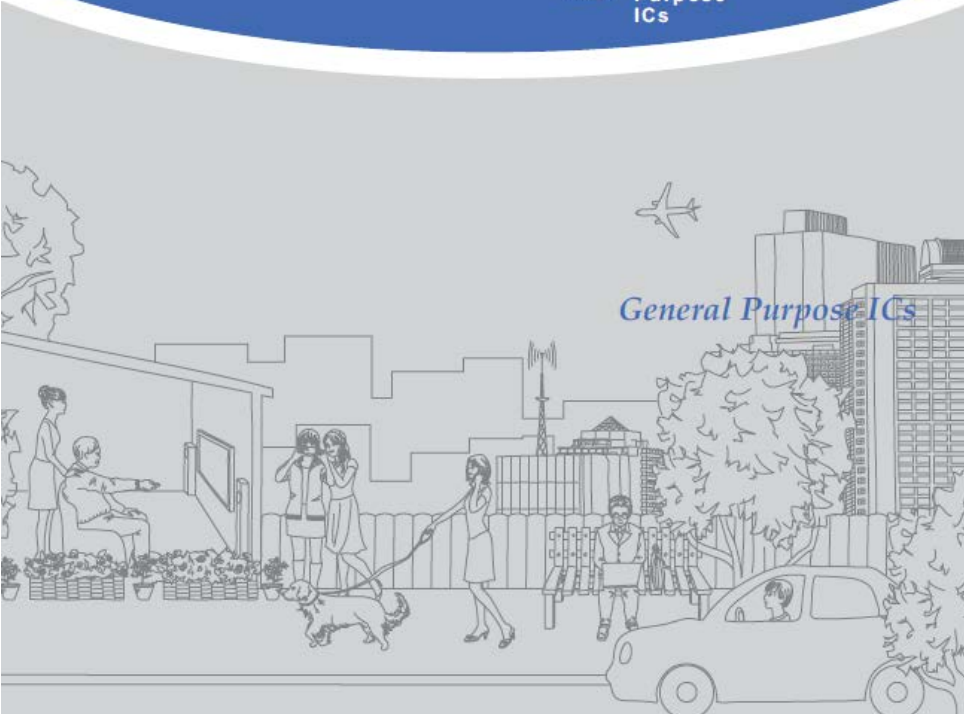
Power Management Switch IC Series

Ver.3.0





SELECT SELECTION CATALOG

General Purpose ICs

General Purpose ICs



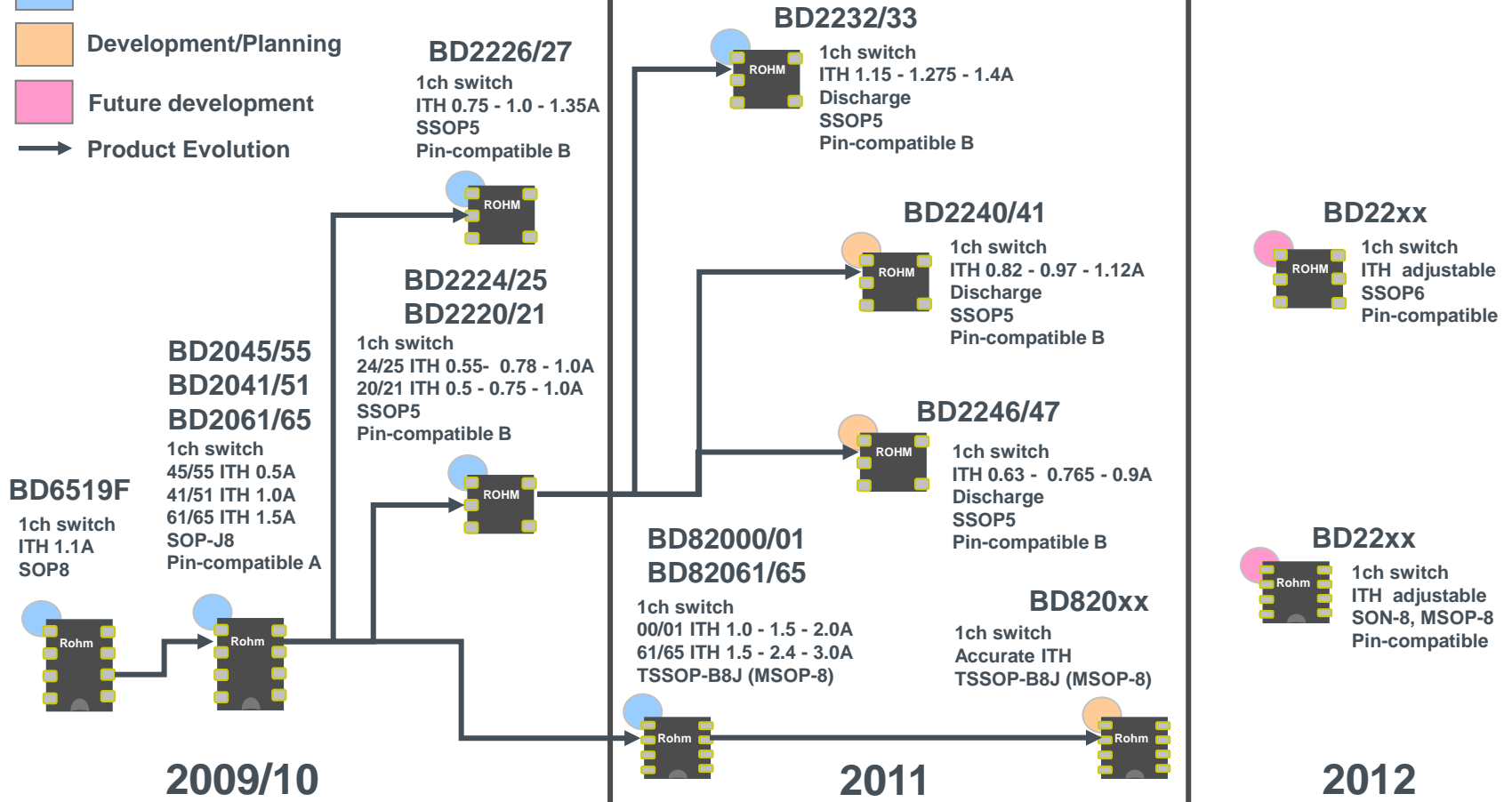
Power Management Switch ICs: Roadmap

-  Product in production
-  Development/Planning
-  Future development
-  Product Evolution

Smaller Package SSOP5 (SOT23-5)

Accurate I_{TH} Expand Line-up for I_{TH}

Adjustable I_{TH}

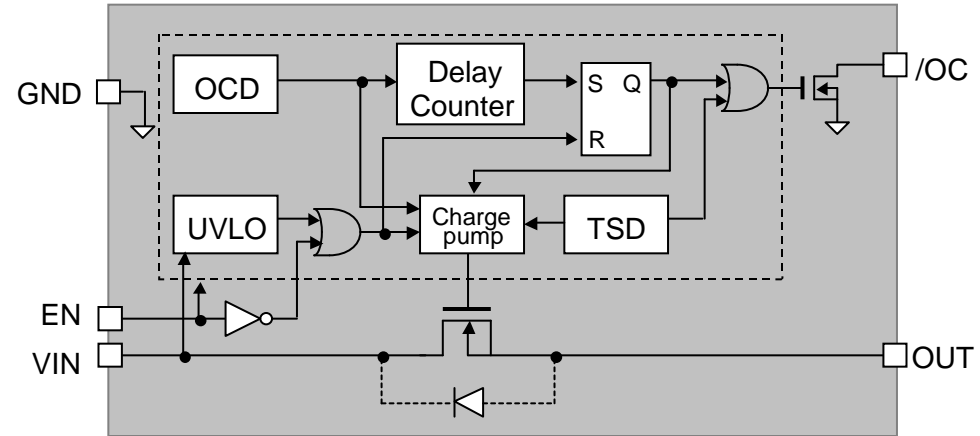


Power Management Switch ICs: 1ch (SOT23-5)

Function

- Single channel Power High-Side Switch
- Power supply voltage 2.7 – 5.5V
- Rich protections
 - Over-Current Detection
 - Thermal Shutdown
 - UVLO (Under Voltage Lock Out)
 - Reverse current protection
- Error flag output with delay filter
- Selectable Latch/Recovery for reboot
- Soft--Start
- Small SSOP5 Package

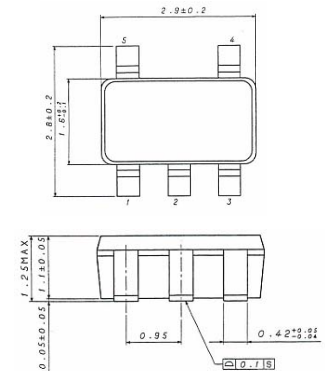
Block diagram



Line-up

Part No.	EN Logic	Current Threshold (Min-Typ-Max) A	ON-Resistance	Over-Current Protection	Flag Delay Filter	Reverse-Current Protection	Output Discharge	Package
BD6538G	H	0.5 - 0.75 - 1.0	150mΩ	Latch	15ms	---	---	SSOP5
BD2224/25G	H / L	0.55 - 0.75 - 1.0	150mΩ	Recovery	15ms	---	---	SSOP5
BD2220/21G	H / L	0.5 - 0.75 - 1.0	160mΩ	Latch	15ms	Yes	---	SSOP5
BD2226/27G	H / L	0.75 - 1.0 - 1.35	150mΩ	Recovery	15ms	---	---	SSOP5
BD2246/47G	H / L	0.63 - 0.77 - 0.9	110mΩ	Recovery	15ms	Yes	Yes	SSOP5
BD2240/41G	H / L	0.82 - 0.97 - 1.12	110mΩ	Recovery	15ms	Yes	Yes	SSOP5
BD2232/33G	H / L	1.15 - 1.28 - 1.40	100mΩ	Recovery	15ms	---	Yes	SSOP5

Package



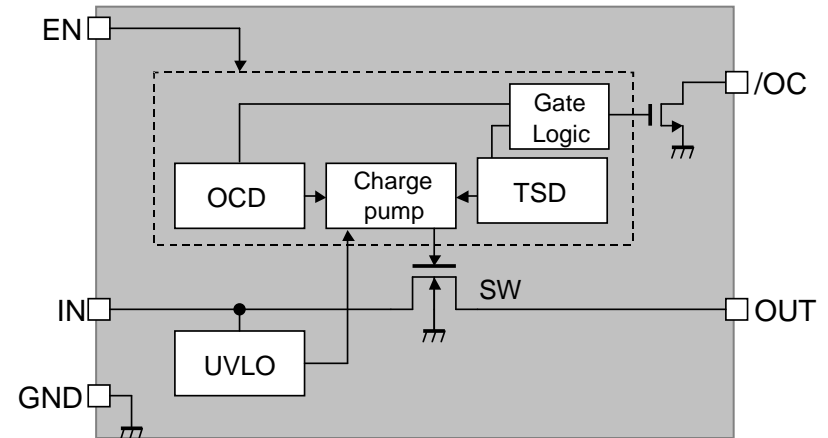
SSOP5
2.9 x 2.8 x 1.25 mm

Power Management Switch ICs: 1ch (SO8, TSSOP8)

Function

- 1ch Low ON-Resistance (70mΩ) High-Side Switch
- Error Protection Circuit, Error Flag Output
 - Over-Current Detection Circuit
 - Thermal Shutdown Circuit
 - Built-in Flag Delay Filter
- Slow-Start
- Under Voltage Lock Out
- Cancel the parasitic diode of power transistor
Prevent the reverse current from OUT to IN

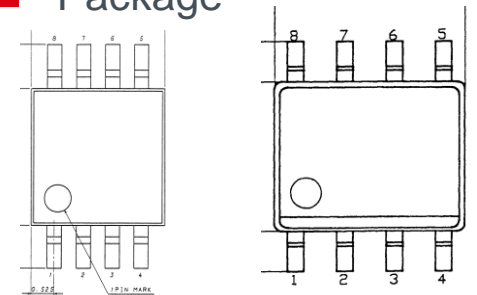
Block diagram



Line-up

Part No.	EN Logic Type	Current Threshold (Min-Typ-Max) A	ON-Resistance	Flag Delay Filter	Reverse-Current Protection	Package
BD2055/45AFJ	H / L	0.3-0.5-0.8	80mΩ	1.3ms	Yes	SOP-J8
BD2051/41AFJ	H / L	0.7-1.0-1.6	80mΩ	1.3ms	Yes	SOP-J8
BD6519FJ	L	1.2	100mΩ	2.5ms	Yes	SOP-J8
BD2065/61AFJ	H / L	1.1-1.5-2.3	80mΩ	2.5ms	Yes	SOP-J8
BD82001/00FVJ	H / L	1.0-1.5-2.0	70mΩ	15ms	---	TSSOP-B8J
BD82065/61FVJ	H / L	1.5-2.4-3.0	70mΩ	15ms	Yes	TSSOP-B8J

Package



TSSOP-B8J (MSOP-8)
3.0 * 4.9 * 1.1 mm

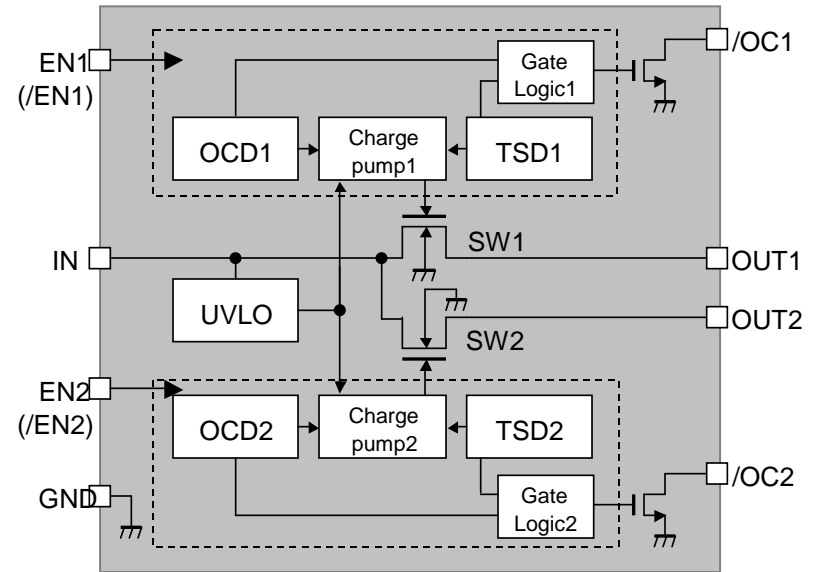
SOP-J8
4.9 * 6.0 * 1.4 mm

Power Management Switch ICs: 2ch (SO8)

Function

- 2ch Low ON-Resistance (80mΩ) High-Side Switch
- Error Protection Circuit, Error Flag Output
 - Over-Current Detection Circuit
 - Thermal Shutdown Circuit
 - Built-in Delay Flag Filter
 - Slow-Start
 - Under Voltage Lock Out
- Cancel the parasitic diode of power transistor
Prevent the reverse current from OUT1 (OUT2) to IN

Block diagram



Line-up

Part No.	EN Logic Type	Current Threshold (Min-Typ-Max) A	ON-Resistance	Flag Delay Filter	Reverse-Current Protection	Package
BD2056/46AFJ	H / L	0.3 - 0.5 - 0.9	100mΩ	1.3ms	Yes	SOP-J8
BD2052/42AFJ	H / L	0.7 - 1.0 - 1.8	100mΩ	1.3ms	Yes	SOP-J8
BD6512/13F	H / L	1.25 - 1.65 - 2.2	100mΩ	—	---	SOP8
BD6516/17F	H / L	1.2-1.65-2.5	110mΩ	1.0ms	Yes	SOP8
BD2066/62FJ	H / L	1.5-2.4-3.0	80mΩ	15ms	Yes	SOP-J8

Package

