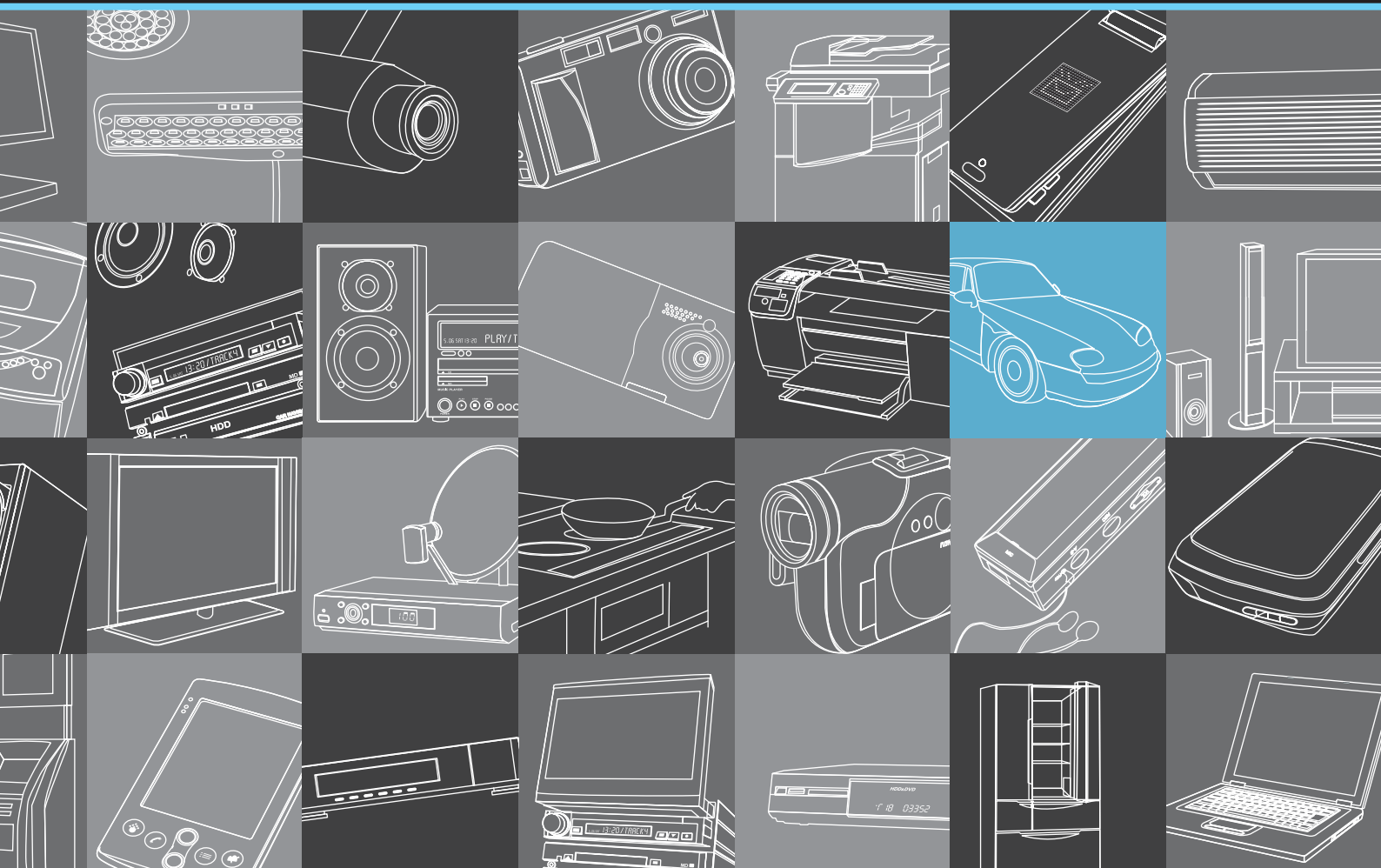




Automotive

- General Purpose ICs
- Video and Imaging ICs
- Audio ICs
- IT Equipment ICs
- Consumer Product ICs
- Automotive ICs
- Discrete Semiconductors
- Optoelectronics
- Modules

APPLICATION GUIDE 2009 1st



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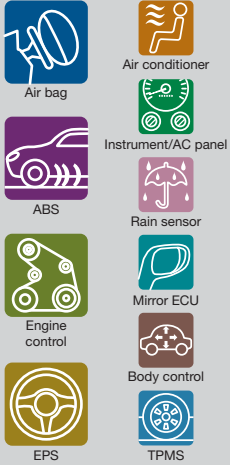
Enter the code above for additional details

ROHM offers comprehensive support with a complete array of products optimized for the automotive market



General Purpose Products

High Reliability Type



IC Low offset and high voltage resistance with low dark current

Voltage tracker ICs

- New** BD3925FP (TO252-5 Package)
- New** BD3925HFP (HRP5 Package)

ROHM BD3925FP/HFP voltage tracker ICs feature a voltage resistance of 50V and an output current of 500mA. Circuit current is limited to 45μA, making them ideal for battery driven sets such as automotive systems. In addition, high precision is ensured due to an output offset voltage of ±15mV.

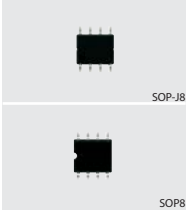


IC Zero defect serial EEPROMs

High Reliability Serial EEPROMs

- BR25H□□0 series**
(SPI BUS compatible,)
6kV ESD resistance
- BR93H□□ series**
(Microwave BUS compatible,)
8kV ESD resistance

A double-cell structure and double reset functionality, combined with gold pads and gold wires, are utilized for unprecedented reliability.



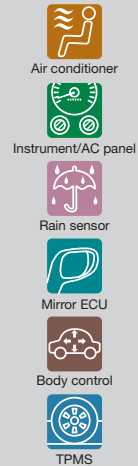
PM High reliability modules utilizing in-house components

Custom Power Modules

Power modules can be customized for any application.



General-purpose devices

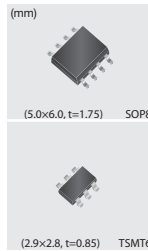


Tr A wide range of lineup from general-purpose switches to various types of drivers

MOSFET

- RSS090N03 (V_{DSS}=30V, I_D=9A, SOP8)
- RSS085N05 (V_{DSS}=45V, I_D=8.5A, SOP8)
- RSS065N06 (V_{DSS}=60V, I_D=6.5A, SOP8)
- RSS075P03 (V_{DSS}=-30V, I_D=-7.5A, SOP8)
- RSS060P05 (V_{DSS}=-45V, I_D=-6A, SOP8)
- SP8K3 (V_{DSS}=30V, I_D=7A, SOP8: Dual)
- SP8J1 (V_{DSS}=-30V, I_D=-5A, SOP8: Dual)
- SP8M3 (V_{DSS}=30V/-30V, I_D=5A/-4.5A, SOP8: Dual)
- RSQ045N03 (V_{DSS}=30V, I_D=4.5A, TSMT6)
- RSQ035P03 (V_{DSS}=-30V, I_D=-3.5A, TSMT6)

These ICs feature low ON resistance and a high level of resistance to electrostatic breakdown.

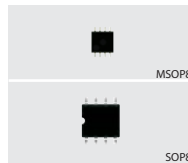


IC Best suited for downsizing and energy saving of systems

Watchdog timer reset ICs

- BD37A□□FVM series (INH logic: H Active)**
- BD87A□□FVM series (INH logic: L Active)**
- BD99A41F (INH logic: H Active)**

The watchdog timer reset ICs are available in a wealth of lineup for selections of ON or OFF logic of watchdog timer reset function and detection voltages to reset power supply voltage.

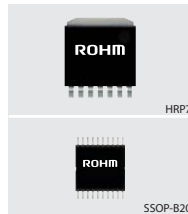


IC Enhancing system reliability by built-in watchdog timer and reset circuit

Regulators with watchdog timer reset ICs

- BD3004HFP (Variable reset detection voltage type)**
- BD3005HFP (WDT ON/OFF function type)**
- New** **BD3010AFV (Variable reset detection voltage type +WDT ON/OFF function type)**

The regulators with watchdog timer reset ICs have built-in 5V regulator and watchdog timer reset function, and warrant high withstand voltage up to 50V to contributing to enhancing system reliability.

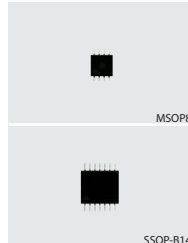


IC Operational amplifiers / comparators selectable according to applications and environment

Automotive grade operational amplifiers / comparators

- <Ground sense operational amplifiers>
- New** **BA2904HFVM-C (with two circuits)**
- ☆ **BA2902HFV-C (with four circuits)**
- <Ground sense comparators>
- New** **BA2903HFVM-C (with two circuits)**
- ☆ **BA2901HFV-C (with four circuits)**

The ROHM's automotive-grade operational amplifiers and comparators provide a maximum operating temperature of 125°C and electrostatic breakdown voltage of 5kV. Further, adopting automotive-compatible process makes the amplifiers and comparators safe for use under harsh conditions.



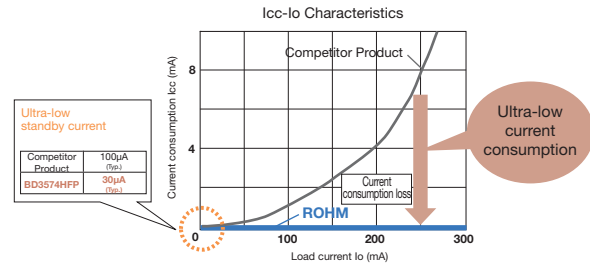
IC High performance high reliability regulators

High Voltage Resistance LDO Regulators

- New** **BD357□FP**
- New** **BD357□HFP**

Low current consumption prolongs battery life

The BD357□FP and BD357□HFP series regulators provide a voltage resistance of 50V and 500mA output while utilizing only 30μA, making them ideal for battery driven sets.

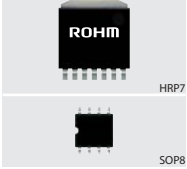


IC Provide high efficiency power from battery voltage

Flexible Step-down Switching Regulators with Built-in MOSFET

- BD9001F (48V/2A type)**
- BD9778F (35V/2A type)**
- BD9778HFP (35V/2A type)**
- BD9781HFP (35V/4A type)**

A high efficiency power MOSFET is built in, facilitating design while contributing to reduced system power consumption.



IC LDO regulator and reset IC in a single package

LDO + Reset IC

- BD3951F**

A 150mA LDO regulator and reset circuit are integrated into a single package.



IC Reduce set standby current consumption for longer battery life

Low Dark Current Switching Regulator

- ☆ **BD9081FV**

The BD9081FV switching regulator features a current consumption of just 110μA when OFF and low current operation during light loads. A wide input voltage range is offered, from 4.5V to 35V, making it ideal for battery driven automotive systems.



ROHM provides a complete lineup of products designed specifically for the needs of current and next-generation automotive systems, including the body, interface, security, AV, and sensor blocks.

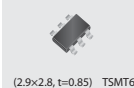
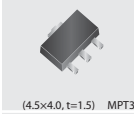
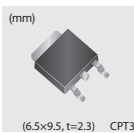
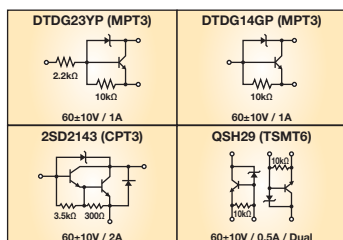


Body Control

Tr Industry-leading transistors

Solenoid Motor Drive Transistors

DTDG14GP ($V_{CC}=60\pm 10V$, $I_o=1A$, $R_1=$ None/ $R_2=10k\Omega$, MPT3)
DTDG23YP ($V_{CC}=60\pm 10V$, $I_o=1A$, $R_1=2.2k\Omega$ / $R_2=10k\Omega$, MPT3)
2SD2143 ($V_{CE0}=60\pm 10V$, $I_c=2A$, Darlington, CPT3)
QSH29 ($V_{CC}=60\pm 10V$, $I_o=0.5A$, $R_1=$ None/ $R_2=10k\Omega$, TSMT6: Dual)



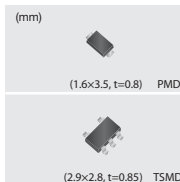
- Built-in protection clamp diode
- Space saving
- Fewer parts required

Di Market-tested reliability

Rectifier Diodes

RR264M-400 (400V, 0.7A, PMDU)
RR274EA-400 (400V, 0.5A, TSM5)

- 25% greater ESD resistance
- Resistant to both current and static voltage surges



Tc Broad lineup in a range of capacitances and package sizes

Tantalum Capacitors

<Open structure type>TCFGseries

P case (2012size) 22 μ F max.
A case (3216size) 68 μ F max.
B case (3528size) \star 330 μ F max.
C case (6032size) \star 220 μ F max.
D case (7343size) \star 330 μ F max.

These tantalum capacitors feature an internal open structure that shuts down current flow during abnormal current or temperature conditions, reducing the risk of combustion.



\star Under development



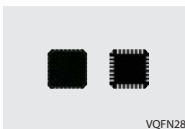
Camera Module / Network

IC DC/DC converter with built-in output FET

Switching Regulator with Reset Function

New BD3973KN

The BD3973KN switching regulator integrates a 2ch high voltage resistance power MOSFET that enables arbitrary setting of the operating frequency via external resistance for greater compatibility.



Di Mounting area reduced by half*

Bi-directional Zener Diodes

*Compared to conventional diodes

RSB16V ($V_z=14.4$ to $17.6V$)
RSB18V ($V_z=16.2$ to $19.8V$)
RSB27V ($V_z=26.2$ to $32.0V$)

Positive/negative surge protection on a single chip. Optimized for CAN/LIN bus lines.

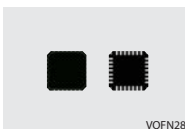


IC Integrated power startup sequence and multiple protection circuits

System Power Supplies for CCD/CMOS Camera Modules

New BD8671KN (for CCD image sensors)
New BD8674KN (for CMOS image sensors)

The BD8671KN features 3 outputs for CCD sensors while the BD8674KN provides dual outputs for CMOS sensors.



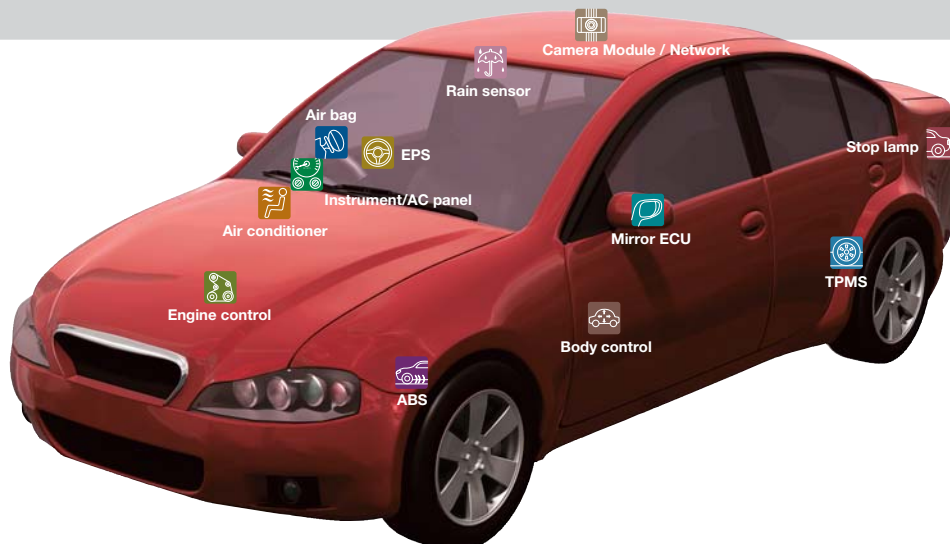
Tc Optimized for noise removal in signal lines

Tantalum Capacitors

Conductive Polymer Type: TCTO Series

M case (1608 size) 15 μ F max.
P case (2012 size) 47 μ F max.
AL case (3216 size, low profile type) 100 μ F max.

ROHM tantalum capacitors utilize a conductive polymer material at the cathode for significantly reduced ESR and combustibility. The TCTO series is offered in a low profile (1.2mm) package with a maximum capacitance of 100 μ F as well as compact types (1608, 2012 size) that contribute to end-product miniaturization.



Instrument/AC Panel

IC Compact, multi-channel 12-lamp driver

LED Driver IC for Indicators

BD8105FV

The BD8105FV is a 12ch LED driver IC rated at 35V and 50mA (DC). Cascade compatibility ensures driving of additional LEDs.



SSOP-B20W

S For detecting the rotation of various controllers

Compact Surface Mount Photointerrupter

RPI-0226V

A unique boss (bottom protrusion) design ensures greater mounting precision.



(4.4x2.7, t=2.95)

LED Expressive automotive lighting

Chip LEDs

<Ultra-high Bright Chip LEDs for Automotive>

SML-Z series (3.5x2.8mm, t=1.9mm)

A high heat resistant resin enables operation at 85°C and 50mA. Optimized for in-vehicle applications.

Wide operating temperature range: -40°C to +110°C.



<High Bright Chip LEDs>

SML-512(A) series (1.6x0.8mm, t=0.55mm)

SML-212(A) series (2.0x1.25mm, t=0.8mm)

Designed to meet the strict requirements of automotive applications.



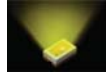
<Chip LEDs with Reflector>

SML-012(A) series (3.0x2.0mm, t=1.3mm)

SML-M10 series (2.0x1.25mm, t=0.8mm)

SML-T10 series (1.6x0.8mm, t=0.55mm)

1.5 times the brightness as conventional products in the industry's smallest size. A broad palette is offered, including colors matched to automotive OEM specs.



<Chip LEDs for LCD Backlights>

SMLK15 series (4.5x2.0mm, t=0.6mm)

SMLC14 series (3.8x1.0mm, t=0.6mm)

High brightness, high heat radiation type.



Mirror ECU

IC Reversible 50V motor driver

1ch/1.25A Output H-bridge Driver

BD6941FM

Conventionally, a Darlington configuration utilizing bipolar transistors is used to configure an H-bridge circuit. ROHM, however, uses DMOSFETs with low ON-resistance for greater efficiency and voltage resistance with reduced loss and heat generation.



HSOP-M36

Rain Sensor

Di Guaranteed surge protection in a compact form factor

Zener Diodes

KDZ series

1W rated power in a compact size (2616).



(1.6x3.5, t=0.8) PMDU

Air Conditioner

IC Reversible 50V motor driver

1ch/1.25A Output H-bridge Driver

BD6941FM

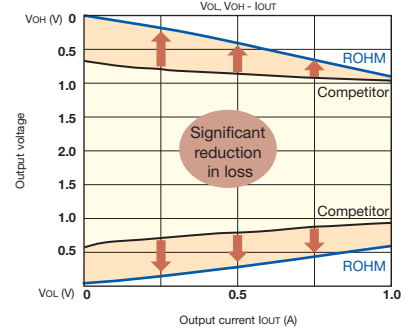
Low current consumption and heat generation with a built-in low ON-resistance DMOSFET

Conventionally, a Darlington configuration utilizing bipolar transistors is used to configure an H-bridge circuit. ROHM, however, uses DMOSFETs with low ON-resistance for greater efficiency and voltage resistance with reduced loss and heat generation.



HSOP-M36

Reduced heat generation with low ON-resistance DMOSFET

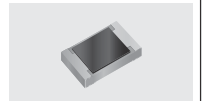


R Guaranteed 3kV ESD resistance

Anti-surge Chip Resistors

ESR series (1608-3225 size)

Twice the rated power as conventional products allow for greater miniaturization.



R Ideal for current detection

Ultra-low Ohmic Chip Resistors for Current Detection

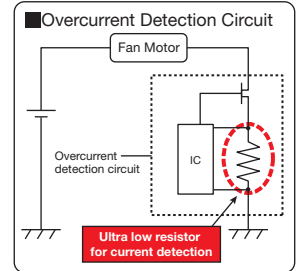
PMR series (1608-6432 size)

A metallic resistive element is utilized for greater rated power. Available in a wide range of resistances (1mΩ to 10mΩ).



UCR series (1005-3216 size)

Resistance range: 11mΩ to 910mΩ



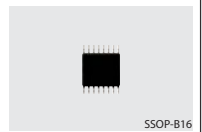
TPMS

IC Adjustable radio transmission range via supply voltage

1ch Pre-driver with Adjustable Drive Current for LF Antennas

BD6934FV

The BD6934FV 1ch half-bridge driver IC allows for a wide drive range for LF antennas due to the adjustable radio transmission range via supply voltage.



SSOP-B16

Stop Lamp

LED High reliability lighting

Chip LEDs

☆PLCC4 package

ROHM high reliability LEDs are ideal for stop and side lamps.



IC Product Specifications

General-purpose Devices

Voltage Trackers

Part No.	Offset Voltage (mV)	Output Current (A)	Maximum Voltage (V)	Circuit Current (μA)	Operating Temperature (°C)
New BD3925FP	±15 (Ta=-40~+125°C, Vcc=6-36V, Io=5-200mA)	0.5	50	45	-40 to +125
New BD3925HFP	±15 (Ta=-40~+125°C, Vcc=6-36V, Io=5-200mA)	0.5	50	45	-40 to +125

High-reliability Serial EEPROMs

Part No.	Density (bit)	Supply Voltage Range (V)	Operating Temperature Range (°C)	Lifetime (times) (Ta=25°C)	Data Retention (yrs) (Ta=25°C)
BR25H□□0 series	1K to 32K	2.5 to 5.5	-40 to +125	10 ⁶	40
BR93H□□ series	2K to 16K	2.7 to 5.5	-40 to +125	10 ⁶	40

High Voltage LDO Regulators

Part No.	Output Voltage (V)	Output Voltage Precision (±%)	Output Current (A)	Maximum Voltage (V)	Circuit Current (μA)	Operating Temperature (°C)
New BD3570FP	3.3	±2 (Ta=-40 to +125°C)	0.5	50	30	-40 to +125
New BD3570HFP	3.3	±2 (Ta=-40 to +125°C)	0.5	50	30	-40 to +125
New BD3571FP	5.0	±2 (Ta=-40 to +125°C)	0.5	50	30	-40 to +125
New BD3571HFP	5.0	±2 (Ta=-40 to +125°C)	0.5	50	30	-40 to +125
New BD3572FP	Variable	±2 (Ta=-40 to +125°C)	0.5	50	30	-40 to +125
New BD3572HFP	Variable	±2 (Ta=-40 to +125°C)	0.5	50	30	-40 to +125
New BD3573FP	3.3	±2 (Ta=-40 to +125°C)	0.5	50	30	-40 to +125
New BD3573HFP	3.3	±2 (Ta=-40 to +125°C)	0.5	50	30	-40 to +125
New BD3574FP	5.0	±2 (Ta=-40 to +125°C)	0.5	50	30	-40 to +125
New BD3574HFP	5.0	±2 (Ta=-40 to +125°C)	0.5	50	30	-40 to +125
New BD3575FP	Variable	±2 (Ta=-40 to +125°C)	0.5	50	30	-40 to +125
New BD3575HFP	Variable	±2 (Ta=-40 to +125°C)	0.5	50	30	-40 to +125

Voltage Detector ICs with Watchdog Timer

Part No.	Output Voltage (V)	Output Voltage Precision (%)	Output Current (mA)	Reset Active Voltage Range (V)	WDT Active Voltage Range (V)	Circuit Current (μA)	Operating Temperature (°C)
BD37A19FVM	1.9	±1.5 (Ta=25°C)	0.7	1.0 to 10	2.5 to 10	5	-40 to +105
BD37A41FVM	4.1	±1.5 (Ta=25°C)	0.7	1.0 to 10	2.5 to 10	5	-40 to +105
BD87A28FVM	2.8	±1.5 (Ta=25°C)	0.7	1.0 to 10	2.5 to 10	5	-40 to +105
BD87A29FVM	2.9	±1.5 (Ta=25°C)	0.7	1.0 to 10	2.5 to 10	5	-40 to +105
BD87A34FVM	3.4	±1.5 (Ta=25°C)	0.7	1.0 to 10	2.5 to 10	5	-40 to +105
BD87A41FVM	4.1	±1.5 (Ta=25°C)	0.7	1.0 to 10	2.5 to 10	5	-40 to +105
BD99A41F	4.1	±1.5 (Ta=25°C)	0.7	1.0 to 10	2.5 to 10	5	-40 to +105

Regulators with Voltage Detector and Watchdog Timer

Part No.	LDO			Reset		Function
	Output Voltage (V)	Output Voltage Precision (%)	Output Current (mA)	Saturation Voltage (V)	Detection Voltage (V)	
BD3004HFP	5	±2 (Ta=-40 to +125°C)	0.5	0.78 (Io=200mA)	Variable (at Vs open: 4.1V)	±2 Adjustable Voltage Detector+WDT
BD3005HFP	5	±2 (Ta=-40 to +125°C)	0.5	0.78 (Io=200mA)	4.5	±2 4.5V Voltage Detector +WDT(Active switch)
New BD3010AFV	5	±2 (Ta=-40 to +125°C)	0.2	0.25 (Io=150mA)	Variable (at RADJ open: 4.25V)	±3 Adjustable Voltage Detector+WDT

Flexible Step-down Switching Regulators with Built-in Power MOSFET

Part No.	Supply Voltage (V)	Output Current (A)	Output Voltage (V)	Reference Voltage Accuracy (%)	Operating Temperature (°C)	Oscillation Circuit
BD9001F	7 to 48	2.0	1 to VIN	±2	-40 to +95	Self-oscillation
BD9778F	7 to 35	2.0	1 to VIN	±2	-40 to +125	Self-oscillation
BD9778HFP	7 to 35	2.0	1 to VIN	±2	-40 to +125	Self-oscillation
BD9781HFP	7 to 35	4.0	1 to VIN	±2	-40 to +125	Self-oscillation/ External synchronization

Automotive Grade Operational Amplifiers/Comparators

Operational Amplifiers: Ground Sense

Part No.	Number of Circuits	Supply Voltage (V)	Circuit Current (mA)	Input Offset Voltage (mV)	Slew Rate (V/μs)	Gain Bandwidth (MHz)
New BA2904HFV-C	2	3 to 32	0.7	2	0.2	0.5
☆BA2902HFV-C	4	3 to 32	0.7	2	0.2	0.5

Comparators: Ground Sense

Part No.	Number of Circuits	Supply Voltage (V)	Circuit Current (mA)	Input Offset Voltage (mV)	Input Bias Current (nA)	Output Current (mA)	Input Voltage Range (V)
New BA2903HFV-C	2	2 to 36	0.6	2	50	16	VEE to VCC-1.5
☆BA2901HFV-C	4	2 to 36	0.8	2	50	16	VEE to VCC-1.5

Regulator with Voltage Detector IC

Part No.	LDO			Reset		Supply Voltage Detector
	Output Voltage (V)	Output Voltage Precision (%)	Output Current (mA)	Saturation Voltage (V)	Detection Voltage (V)	
BD3951F	5	±2 (Ta=-40 to +125°C)	0.15	0.31 (Io=100mA)	Variable (at RADJ open: 4.7V)	±2 Variable

Low Dark Current Switching Regulator

Part No.	Input Voltage (V)	Output Voltage Precision (%)	Output Current (A)	Maximum Voltage (V)	Operating Temperature (°C)
☆BD9081FV	4.5 to 35	±2.0	0.6	36	-40 to +125

Camera Module/Network

Switching Regulator with Built-in Reset Function

Part No.	Reference Voltage (V)	Output Current (A)		Power MOS ON-resistance (Ω)		Reset Detection Voltage (V)	Maximum Voltage (V)
		Vo1	Vo2	Vo1	Vo2		
New BD3973KN	1.250	0.5	0.2	2	4	2.7	36

System Power Supply for CCD · CMOS Camera Modules

For CCD image sensor

Part No.	Input Voltage (V)	Output Voltage (V)		Oscillating Frequency
New BD8671KN	4.5 to 9	3.3 [150mA]	12 [20mA] -5 [5mA]	500kHz to 1.2MHz

For CMOS image sensor

Part No.	Input Voltage (V)	Output Voltage (V)		Oscillating Frequency
New BD8674KN	4.5 to 9	3.3 [250mA]	5 [30mA]	500kHz to 1.2MHz

Instrument/AC Panel

LED Driver IC for Indicators

Part No.	Power Supply (V)	Output Current (mA)	Number of Inputs	Number of Outputs	Output Type	Maximum Voltage (V)
BD8105FV	4.5 to 5.5	50	5	12	Open Drain	35

Air Conditioner

1ch 1.25A Output H-bridge Driver

Part No.	Maximum Voltage (V)	Circuit Current (Standby) (μA)	Circuit Current (Operating mode) (mA)	ON Threshold Voltage (Upper+Lower)(V)	Operating Temperature (°C)
New BD6941FM	50	0	3	0.84	-40 to +125

Mirror ECU

1ch 1.25A Output H-bridge Driver

Part No.	Maximum Voltage (V)	Circuit Current (Standby) (μA)	Circuit Current (Operating mode) (mA)	ON Threshold Voltage (Upper+Lower)(V)	Operating Temperature (°C)
New BD6941FM	50	0	3	0.84	-40 to +125

TPMS

LF Antenna 1ch Pre-driver with Adjustable Drive Current

Part No.	Power Supply (V)	Circuit Current (Standby) (μA)	Circuit Current (Operating mode) (mA)	Vcc=3.5V	ON Duty (%)	Vcc=4.5V	Vcc=7V	Operating Temperature (°C)
New BD6934FV	3.5 to 8.0	0	3.5	9.2	15	49		-40 to +85

Discrete Product Specifications

General-purpose Devices

MOSFETs

Part No.	Package	Polarity	Voss (V)	Io (A)	Pd(W) (Ta=25°C)	Rθs(on) Typ. (m°C)			Qg (nC)	Driving Voltage (V)
						Vos=4V	Vos=4.5V	Vos=10V		
RSS090N03	SOP8	Nch	30	9	2	17	15	11	11	4
RSS085N05	SOP8	Nch	45	8.5	2	18	16	13	15.3	4
RSS065N06	SOP8	Nch	60	6.5	2	31	28	24	11	4
RSS075P03	SOP8	Pch	-30	-7.5	2	25	22	15	30	4
RSS060P05	SOP8	Pch	-45	-6	2	38	35	26	23	4
SP8K3	SOP8	Nch+Nch	30	7	2	25	23	17	8.4	4
SP8J1	SOP8	Pch+Pch	-30	-5	2	45	40	30	16	4
SP8M3	SOP8	Nch	30	5	2	58	52	36	3.9	4
		Pch	-30	-4.5		65	57	40	8.5	4
RSQ045N03	TSMT6	Nch	30	4.5	1.25	40	36	27	6.8	4
RSQ035P03	TSMT6	Pch	-30	-3.5	1.25	70	65	45	9.2	4

Body Control

Transistors for Solenoid Motors

Part No.	Package	Polarity	Vcc (V)	Io (A)	Pd(mW) (Ta=25°C)	GI	R1/R2 (kΩ)
DTDG14GP	MPT3	NPN	60±10	1	500	300 or more	none/10
DTDG23YP	MPT3	NPN	60±10	1	500	300 or more	2.2/10
2SD2143	CPT3	NPN	60±10	2	1000	1k to 10k	3.5/0.3
QSH29	TSMT6	NPN+NPN	60±10	0.5	500	500 or more	none/10

Rectifier Diodes

Part No.	Package	VrM (V)	Io (A)	I _{FSM} (A)
RR264M-400	PMDU	400	0.7	25
RR274EA-400	TSMD5	400	0.5	8

Camera Module/Network

Bi-directional Zener Diodes

Part No.	Package	P (mW)	Vz(V) max.	Iz(mA)
RSB16V	UMD2	200	14.4 to 17.6	1
RSB18V	UMD2	200	16.2 to 19.8	1
RSB27V	UMD2	200	26.2 to 32.0	1

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