To our customers,

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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M61018GP

MOTOR DRIVER FOR CAMERA

Description

M61018GP is a semiconductor integrated circuit built-in motor driver for compact camera
All power transistors which have been used as external parts so far are built in by using minute bi-polar process ,so it contributes to reduction of the part cost and the miniaturization of the system .

Features

- Built-in DC/DC converter (Presser type,TYP 5.0V)
- Built-in Regulator circuit for Auto Focus (Depressor type,TYP 4.1V)
- Built-in IRED drive circuit (TYP Io=1A)
- Built-in DC motor driver circuit of 1.5CH

Application

Motor driver for compact camera etc.

Recommend Operating Condition

Rated supply voltage·······································3.0V

Supply voltage range·······································1.8 to 3.5V

Pin Configuration

Outline   32P6B

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Block Diagram

CT VBMON VWL2 VWL1 SML4 SML3 SML2 SML1 VB2 VB1 NC NC

(26) (14) (32) (1) (8) (10) (11) (12) (4) (13) (9) (29)

VCH (25) DC/DC Circuit Oscillator Battery Check Circuit Film widing

VDD (27)

VB

(31) Regulator Circuit VDD

Control Logic

DC motor drive OUT1 (7)

OUT2 (5) Lensdrive

OUT3 (3) VB Shutter drive

VAF (30)

VREF (15)

BF4CONT

Buffer driver BF4 Buffer driver BF3 Buffer driver BF2 Buffer driver BF1

Shutter drive SH (16)

SRICONT (17)

(20) BF4 (19) BF3 (21) BF2 (23) BF1 (28) (18) (22) (24) (2) (6)

VB LED VB LED VB Red-eye VB IRED SGND PGND5 PGND4 PGND3 PGND2 PGND1

Absolute Maximum Ratings

(Ta=25°C, unless otherwise noted)

Parameter	Symbol	Ratings	Unit	Remark
Supply voltage	VB	4.0	V	note1
Supply voltage	VDD	6.0	V	note1
Power dissipation	Pd	550	mW	Ta=25°C
Thermal derating	Kθ	4.4	mW/ °C	Ta≥25°C
Pin input voltage	VIF	6.0	V	3,4,11,12,13,14,17pin
Another pin	VI/O	0 to VDD+0.3	V	note2
Operating temperature	Topr	- 20 to 60	°C	
Storage temperature	Tstg	- 40 to 150	°C	

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Thermal Derating (Maximum Rating)
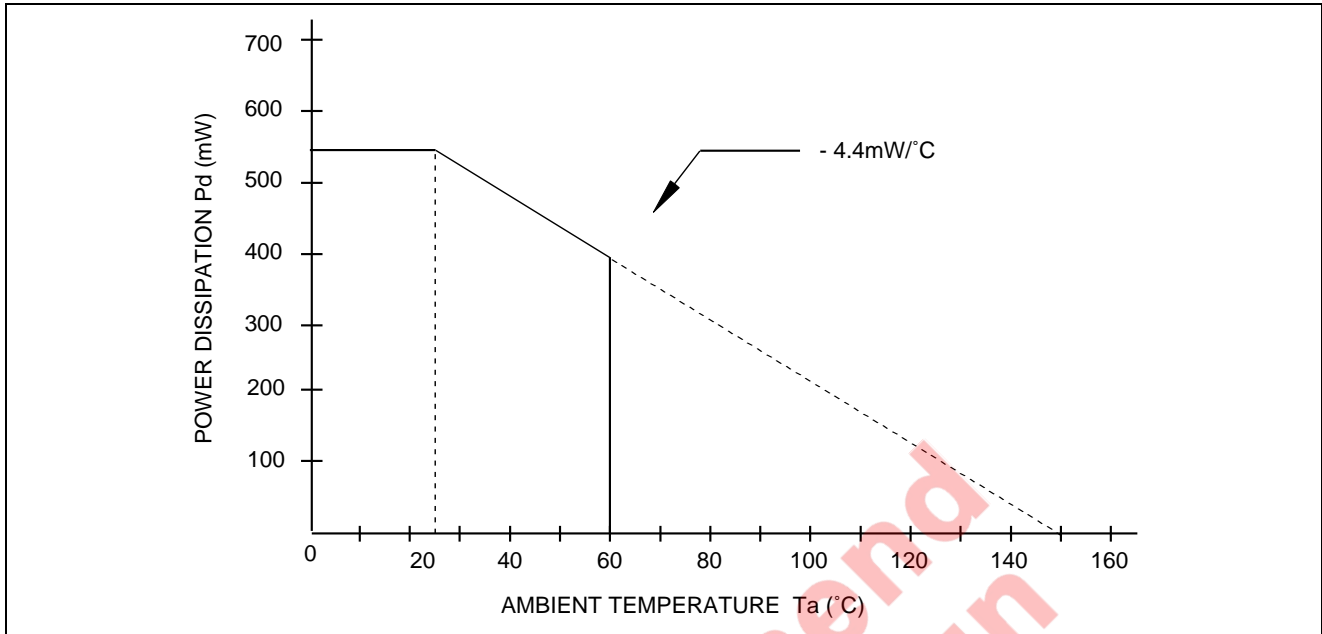
Electrical Charactteristics

(Ta=25°C,VB=3.0V,unless otherwise noted)

Classification	Parameter	Symbol	Test condition	Limits			Unit	Note
				min	typ	max		
	Operating supply voltage range	VB		1.8	3.0	3.5	V	
Consuming current	While STAND BY consuming current	IB1	VWL1:H,VWL2:H	—	—	5.0	μA	
	While STAND BY consuming current	IDD1	VWL1:H,VWL2:H	—	—	5.0	μA	
	Usual consuming current	IDD2	Consuming current When driver don't operate (Operating only DC/DC converter)	—	5.0	10.0	mA	
DC/DC converter	Operating start voltage	Vstart	VB voltage	—	—	1.8	V	*1
	Operating stop voltage	Vstop	VB voltage	—	—	1.0	V	*1
	Oscillation frequency	fosc	C=330pF	35K	50K	65K	Hz	*1
	DUTY	duty		66	78	90	%	*1
	Output voltage	ΔVout	VDD voltage	4.5	5.0	5.5	V	*1
	Input stability	ΔVout1	VB=2.0 to 3.3V Iout=50mA	—	—	100	mV	*1
	Load stability	ΔVout2	VB=2.85V Iout=0 to 100mA	—	—	100	mV	*1
	Maximum output current	Iout	VB=2.85V Vout≥4.5V	100	—	—	mA	*1
Regulator	Output voltage	VAF	VDD=4.5 to 5.5V IAF=50mA	3.90	4.10	4.30	V	
	Load stability	ΔVAF	VDD=5V IAF=0 to 20mA	-10	—	10	mV	
	Ripple voltage	Vrip	VB=2.85V VDD ≥4.5V	0	—	10	MV_P-P	
	Response time	TAF	CVAF=10μF CVREF=0.1μF	0		10	ms	
DC motor driver	Operating voltage	VB(DC motor)	VB voltage	1.6	—	3.5	V	
	Maximum output current	Iomax	t=10S	1.8	—	—	A	
	Continual maximum output current	Iocont		500	—	—	mA	
	Output saturation voltage	Vsat(DC motor)	Io=500mA Upper side+Lower side (saturation voltage total)	0	—	0.5	V	
	Spark killer diode forward voltage	VSF(DC motor)	Io=600mA	—	—	1.5	V	
	Overheat protection circuit operating temperature	Taohp		135	150	165	°C	
	Overheat protection hysteresis	ΔTaohp		25	40	55	°C	
Shutter driver	Operating voltage	VB(shutter)	VB voltage	1.6	—	3.5	V	
	Simple output bias current	Isht1	1Ω Between SRICONT to GND	480	580	680	mA	
	Maximum output current	Isht2		700	—	—	mA	
	Output saturation voltage	Vsat(shutter)	Io=500mA SRICONT=0V	—	—	0.5	V	
	Spark killer diode forward voltage	VSF(shutter)	Io=600mA	—	—	1.5	V	

Note : *1 L=47μH, CVDD=100μF

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Electrical Characterristics (cont.)

(Ta=25°C,VB=3.0V,unless otherwise noted)

Classification	Parameter	Symbol	Test condition	Limits			Unit	Note
				min	typ	max		
Buffer1	Operating voltage	VB(BF1)	VB voltage	1.6	—	3.5	V	
	Maximum output current	Ibf1	t=1S	2.0	—	—	A	
	Output saturation voltage	Vsat(BF1)	Io=1A	—	—	0.5	V	
Buffer2	Operating voltage	VB(BF2)	VB voltage	1.6	—	3.5	V	
	Maximum output current	Ibf2	t=1S	800	—	—	mA	
	Output saturation voltage	Vsat(BF2)	Io=500mA	—	—	0.5	V	
Buffer3	Operating voltage	VB(BF3)	VB voltage	1.6	—	3.5	V	
	Maximum output current	Ibf3	t=1S	800	—	—	mA	
	Output saturation voltage	Vsat(BF3)	Io=500mA	—	—	0.5	V	
Buffer4	Operating voltage	VB(BF4)	VB voltage	1.6	—	3.5	V	
	Maximum output current	Ibf4		150	—	—	mA	
	Output saturation voltage	Vsat(BF4)	Io =100mA	—	—	0.5	V	
	Input current	Ibf4cont	BF4CONT=0V	-70	-50	-30	μA	
	H input voltage	VinH		4.2	—	6.0	V	
	L input voltage	VinL		0	—	0.3	V	
BC	Output voltage	Vbc	VB=1.6 to 3.5V	2/3VB -0.15	2/3VB	2/3VB +0.15	V	

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VWL truth table

VWL1	VWL2	Output condition
H	H	Output OFF condition
H	L	Oscillation start (Oscillator ON) condition
L	L	DC/DC converter (5V)output condition
L	H	DC/DC&VAF regulator output condition VBMON output condition

* It needs the interval over 2mS in case of moving from the oscillation on to the output condition of DC/DC converter.

SML truth table

INPUT						Motor each output			Buffer each output				
SML1	SML2	SML3	SML4	MOTOR1	MOTOR2	out1	out2	out3	SH	BF1	BF2	BF3	Note
H	H	H	H	Stand-by	Stand-by	OFF	OFF	OFF	Stand-by	OFF	OFF	OFF	MOTOR1
H	H	H	L	Forward rotation	Stand-by	H	L	OFF	Stand-by	OFF	OFF	OFF	control
H	H	L	H	Reverse rotation	Stand-by	L	H	OFF	Stand-by	OFF	OFF	OFF	
H	H	L	L	Brake	Stand-by	L	L	OFF	Stand-by	OFF	OFF	OFF	
H	L	H	H	Stand-by	Stand-by	OFF	OFF	OFF	Stand-by	OFF	OFF	OFF	MOTOR2
H	L	H	L	Stand-by	Forward rotation	OFF	H	L	Stand-by	OFF	OFF	OFF	control
H	L	L	H	Stand-by	Reverse	OFF	L	H	Stand-by	OFF	OFF	OFF	
H	L	L	L	Stand-by	Brake	OFF	L	L	Stand-by	OFF	OFF	OFF	
L	H	H	H	Stand-by	Stand-by	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Shutter control
L	H	H	L	Stand-by	Stand-by	OFF	OFF	OFF	ON	OFF	OFF	OFF	
L	H	L	H	Stand-by	Stand-by	OFF	OFF	OFF	Stand-by	ON	OFF	OFF	BF1
L	H	L	L	Stand-by	Stand-by	OFF	OFF	OFF		ON	OFF	OFF	Shutter+BF1
L	L	H	H	Stand-by	Stand-by	OFF	OFF	OFF	Stand-by	OFF	OFF	OFF	
L	L	H	L	Stand-by	Stand-by	OFF	OFF	OFF	Stand-by	OFF	ON	OFF	BF2
L	L	L	H	Stand-by	Stand-by	OFF	OFF	OFF	Stand-by	OFF	OFF	ON	BF3
L	L	L	L	Stand-by	Stand-by	OFF	OFF	OFF	Stand-by	OFF	ON	ON	BF2+BF3

* Please pass through the Brake or Stand-by mode by all means in case of moving from forward rotation to Reverse

rotation or from Reverse rotation to forward rotation by the motor control.

(ex.)Forward rotation --> Brake --> Reverse rotation, Reverse rotation-->Stand-by --> Forward rotation

BF4 truth table

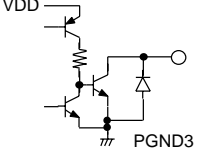| Input	Output
BF4CONT	BF4
H	OFF
L	L

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Sequence Time Chart Example
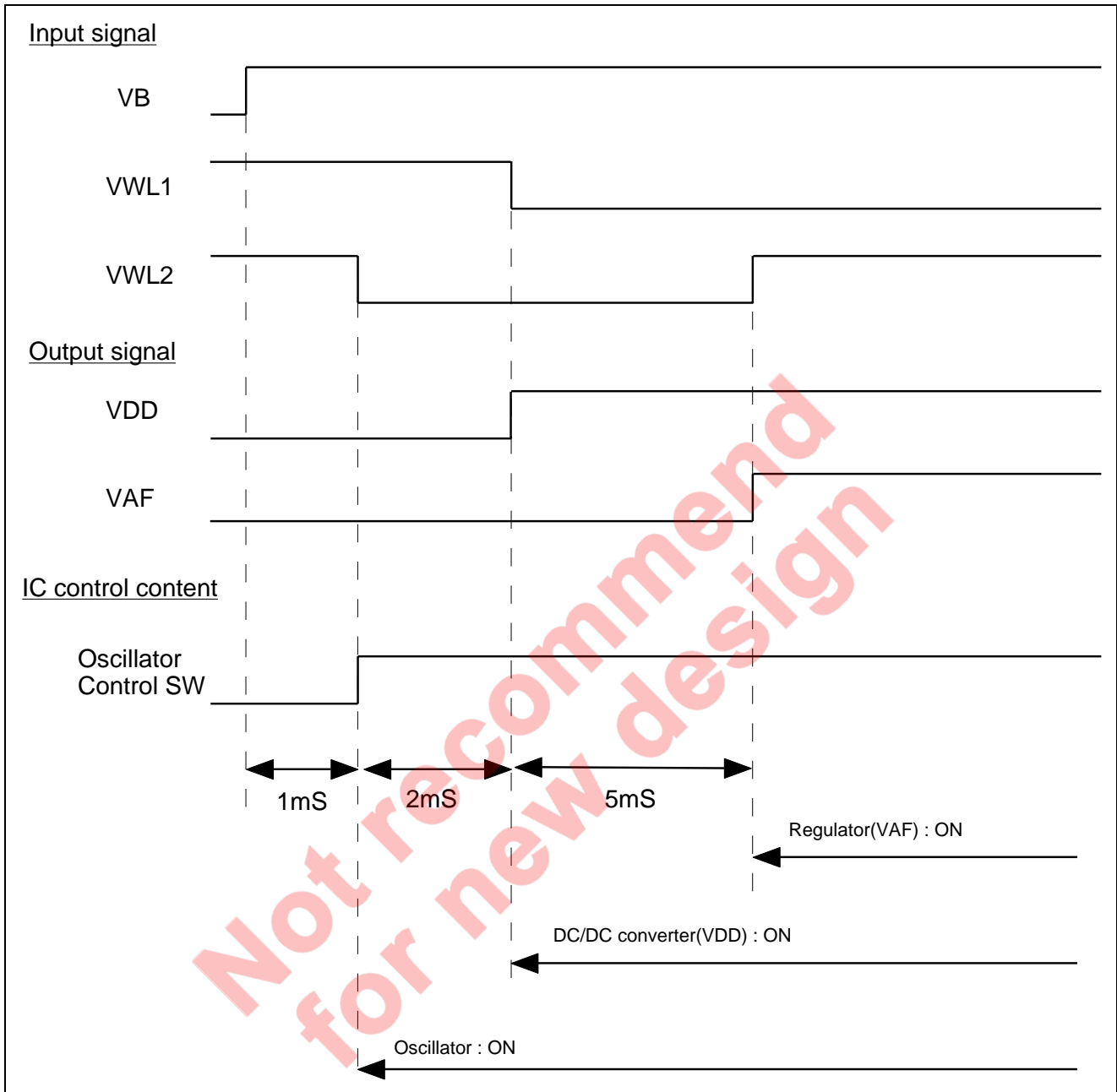
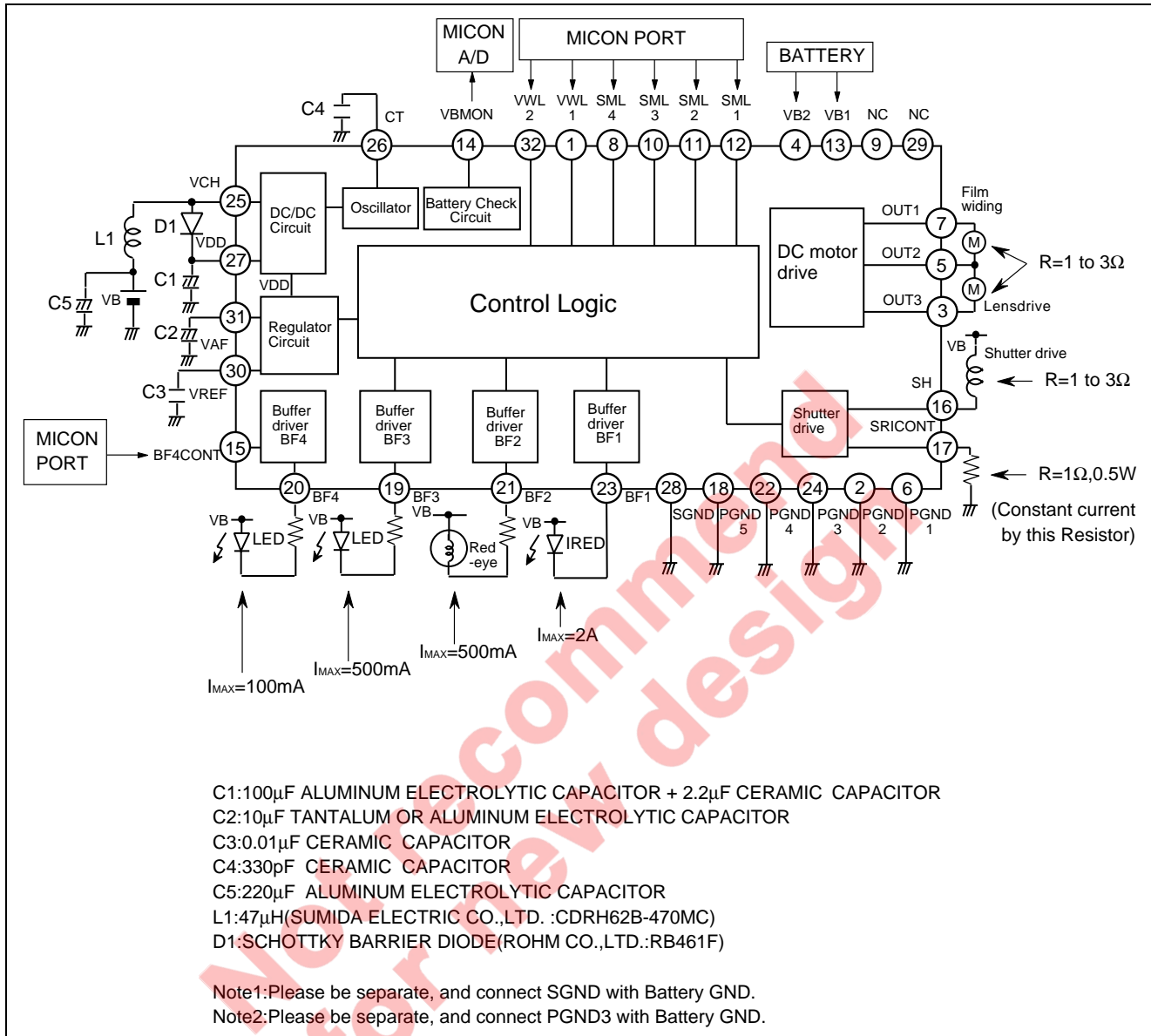### Description of Pin

Ta=25°C

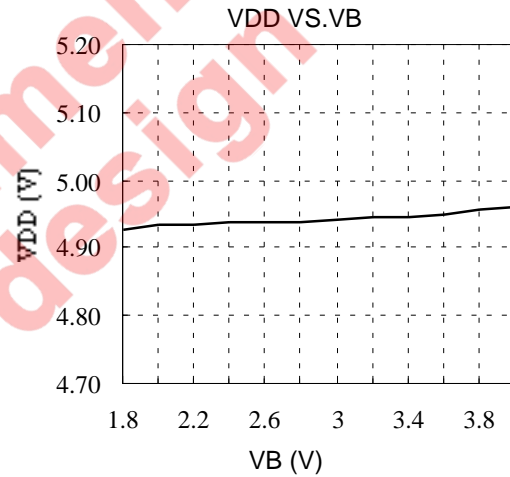| PIN NO.	PIN NAME	PERIPHERAL CIRCUIT OF PINS	Parameter	Limits min	typ	max	Unit	NOTE
1	VWL1 (INPUT)		$V_{IN}H$	VDD -0.3	—	6.0	V	
			$V_{IN}L$	0	—	0.3	V	
			$I_{IN}H$	—	—	3.0	µA	VIH=5.5V
			$I_{IN}L$	-70	-45	-25	µA	VIL=0V
2	PGND2							
3	OUT3		I_{OUT}	1.8	—	—	A	VB=3.0V
			V_{SAT}	—	—	0.5	V	Io=500mA Upper side+Lower side (saturation voltage total)
4	VB2							
5	OUT2		I_{OUT}	1.8	—	—	A	VB=3.0V
			V_{SAT}	—	—	0.5	V	Io=500mA Upper side+Lower side (saturation voltage total)
6	PGND1							
7	OUT1		I_{OUT}	1.8	—	—	A	VB=3.0V
			V_{SAT}	—	—	0.5	V	Io=500mA Upper side+Lower side (saturation voltage total)
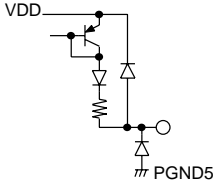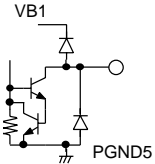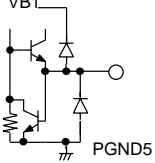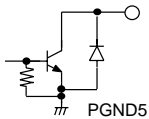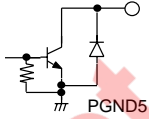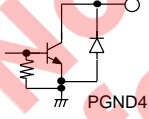
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Description of Pin (cont.)

Ta=25°C

PIN NO.	PIN NAME	PERIPHERAL CIRCUIT OF PINS	Parameter	Limits			Unit	NOTE
				min	typ	max		
8	SML4 (INPUT)	VDD ... PGND5	$V_{IN}H$	2.0	—	6.0	V	
			$V_{IN}L$	0	—	0.3	V	
			$I_{IN}H$	—	—	3.0	µA	VIH=5.5V
			$I_{IN}L$	-60	-40	-20	µA	VIL=0V
9	NC							
10	SML3 (INPUT)	VDD ... PGND5	$V_{IN}H$	2.0	—	6.0	V	
			$V_{IN}L$		—	0.3	V	
			$I_{IN}H$	—	—	3.0	µA	VIH=5.5V
			$I_{IN}L$	-60	-40	-20	µA	VIL=0V
11	SML2 (INPUT)	VDD ... PGND5	$V_{IN}H$	2.0	—	6.0	V	
			$V_{IN}L$		—	0.3	V	
			$I_{IN}H$	—	—	3.0	µA	VIH=5.5V
			$I_{IN}L$	-60	-40	-20	µA	VIL=0V
12	SML1 (INPUT)	VDD ... PGND5	$V_{IN}H$	2.0	—	6.0	V	
			$V_{IN}L$	0	—	0.3	V	
			$I_{IN}H$	—	—	3.0	µA	VIH=5.5V
			$I_{IN}L$	-60	-40	-20	µA	VIL=0V
13	VB1	VB1						
14	VBMON	VB1 ... PGND1	V_{OUT}	2/3VB -0.15	2/3VB	2/3VB +0.15	V	VB=1.6 to 3.5V

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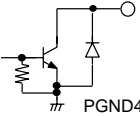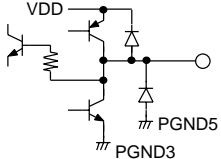
Description of Pin (cont.)

Ta=25°C

PIN NO.	PIN NAME	PERIPHERAL CIRCUIT OF PINS	Parameter	Limits			Unit	NOTE
				min	typ	max		
15	BF4CONT (INPUT)	VDD ... PGND5	$V_{IN}H$	4.2	—	6.0	V	
			$V_{IN}L$	0	—	0.3	V	
			$I_{IN}H$	—	—	3.0	µA	VIH=5.5V
			$I_{IN}L$	-70	-45	-25	µA	VIL=0V
16	SH	VB1 ... PGND5	I_{OUT}	700	—	—	mA	VB=3.0V
			V_{SAT}	—	—	0.5	V	Io=500mA SRICONT=0V
17	SRICONT	VB1 ... PGND5	I_{OUT}	700	—	—	mA	VB=3.0V
			V_{OUT}	480	580	680	mV	1Ω Between SRICONT to GND
18	PGND5	PGND5						
19	BF3	PGND5	I_{OUT}	800	—	—	mA	VB=3.0V
			V_{SAT}	—	—	0.5	V	Io=500mA
20	BF4	PGND5	I_{OUT}	150	—	—	mA	VB=3.0V
			V_{SAT}	—	—	0.5	V	Io=100mA
21	BF2	PGND4	I_{OUT}	800	—	—	mA	VB=3.0V
			V_{SAT}	—	—	0.5	V	Io=500mA

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Description of Pin (cont.)

Ta=25°C

PIN NO.	PIN NAME	PERIPHERAL CIRCUIT OF PINS	Parameter	Limits min	typ	max	Unit	NOTE
22	PGND4							
23	BF1		I_{OUT}	2	—	—	A	VB=3.0V
			V_{SAT}	—	—	0.5	V	Io=1A
24	PGND3							
25	VCH		I_{OUT}	1	—	—	A	VB=3.0V
26	CT		I_{OUT1}	2.5	5.0	10.0	µA	DISCHARGE CURRENT
			I_{OUT2}	-45	-30	-15	µA	CHARGE CURRENT
27	VDD		V_{OUT}	4.5	5.0	5.5	V	
28	SGND							

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Description of Pin (cont.)

Ta=25°C

PIN NO.	PIN NAME	PERIPHERAL CIRCUIT OF PINS	Parameter	Limits min	typ	max	Unit	NOTE
29	NC							
30	VREF		V_{OUT}	1.5	1.6	1.7	V	
31	VAF		V_{OUT}	3.9	4.1	4.3	V	VDD=4.5 to 5.5V IL=0 to 50mA
32	VWL2 (INPUT)		$V_{IN}H$	VDD -0.3	—	6.0	V	
			$V_{IN}L$	0	—	0.3	V	
			$I_{IN}H$	—	—	3.0	µA	VIH=5.5V
			$I_{IN}L$	-70	-45	-25	µA	VIL=0V

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Application Example

MICON A/D

MICON PORT

BATTERY

C4

CT

VBMON

VWL 2

VWL 1

SML 4

SML 3

SML 2

SML 1

VB2

VB1

NC

NC

26 14 32 1 8 10 11 12 4 13 9 29

VCH

25 DC/DC Circuit

Oscillator

Battery Check Circuit

DC motor drive

OUT1 7 Film widing

L1

D1 VDD

27

VDD

OUT2 5

R=1 to 3Ω

C1 VB

31 Regulator Circuit

Control Logic

OUT3 3 Lensdrive

C5

C2 VAF

VB Shutter drive

30 VREF

SH R=1 to 3Ω

C3

Shutter drive

16

MICON PORT

BF4CONT

15 Buffer driver BF4

Buffer driver BF3

Buffer driver BF2

Buffer driver BF1

SRICONT

17

R=1Ω,0.5W

20 BF4

19 BF3

21 BF2

23 BF1

28 18 22 24 2 6

(Constant current by this Resistor)

SGND PGND5 PGND4 PGND3 PGND2 PGND1

VB LED

VB LED

VB Red -eye

VB IRED

$I_{MAX}=100mA$

$I_{MAX}=500mA$

$I_{MAX}=500mA$

$I_{MAX}=2A$

C1:100μF ALUMINUM ELECTROLYTIC CAPACITOR + 2.2μF CERAMIC CAPACITOR
C2:10μF TANTALUM OR ALUMINUM ELECTROLYTIC CAPACITOR
C3:0.01μF CERAMIC CAPACITOR
C4:330pF CERAMIC CAPACITOR
C5:220μF ALUMINUM ELECTROLYTIC CAPACITOR
L1:47μH(SUMIDA ELECTRIC CO.,LTD. :CDRH62B-470MC)
D1:SCHOTTKY BARRIER DIODE(ROHM CO.,LTD.:RB461F)

Note1:Please be separate, and connect SGND with Battery GND.
Note2:Please be separate, and connect PGND3 with Battery GND.

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Typical Performance Data (Ta=25°C)

VAF VS. Io

VDD=5V

VDD VS. Io

VB=3V

VAF VS. VDD

VDD VS.VB

VBMON VS. VDD

BF1 Vo(sat) VS. Io

BF2 Vo(sat) VS. Io

BF3 Vo(sat) VS. Io

BF4 Vo(sat) VS. Io

SH Vo(sat) VS. Io

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OUT1 hi side Vo(sat) VS. Io

OUT1 low side Vo(sat) VS. Io

OUT2 hi side Vo(sat) VS. Io

OUT2 low side Vo(sat) VS. Io

OUT3 hi side Vo(sat) VS. Io

OUT3 low side Vo(sat) VS. Io

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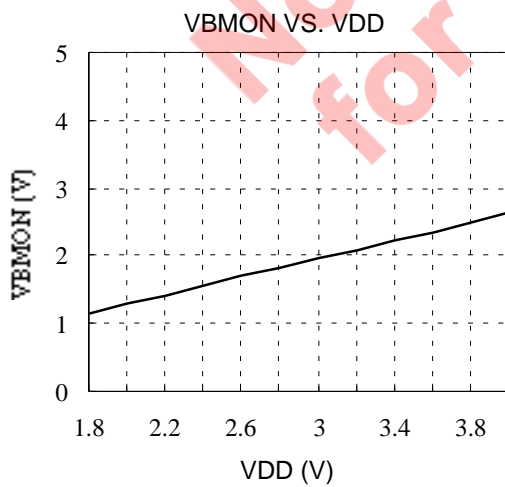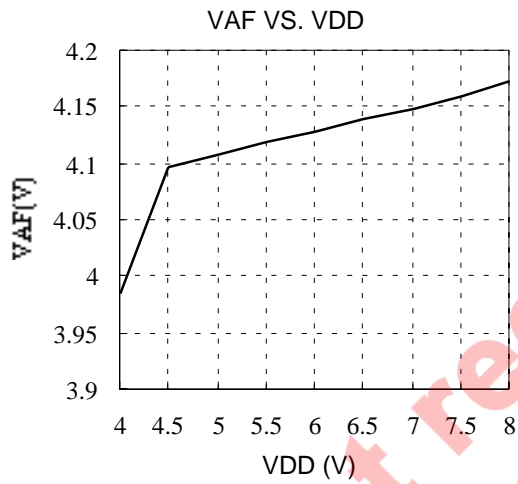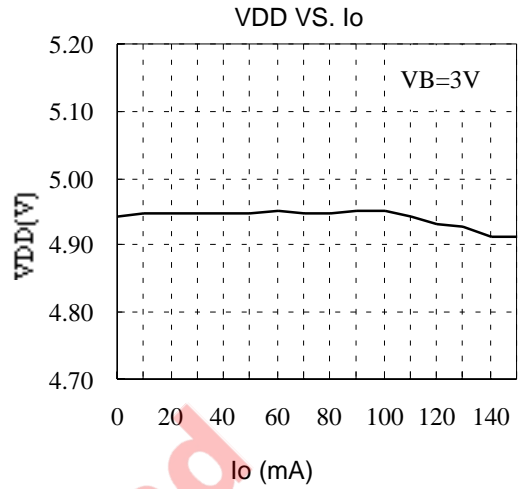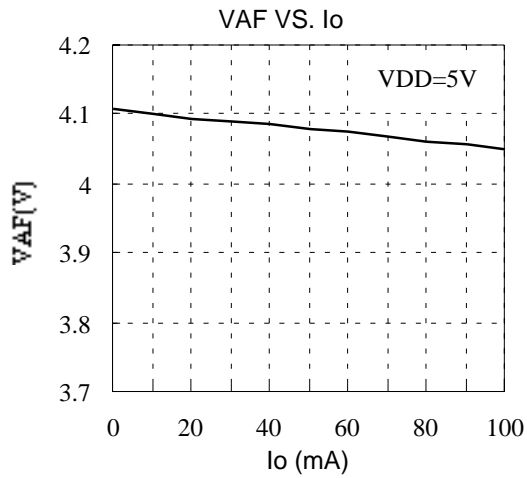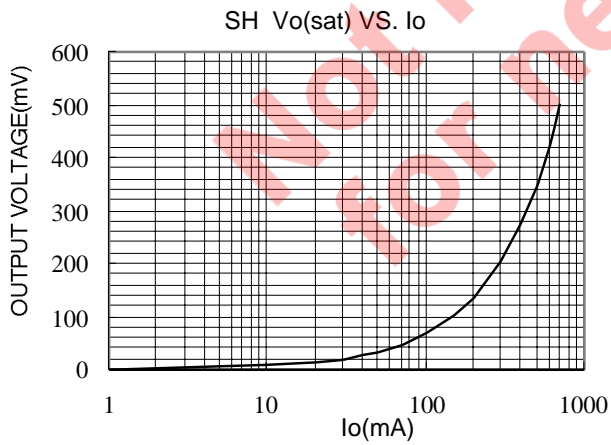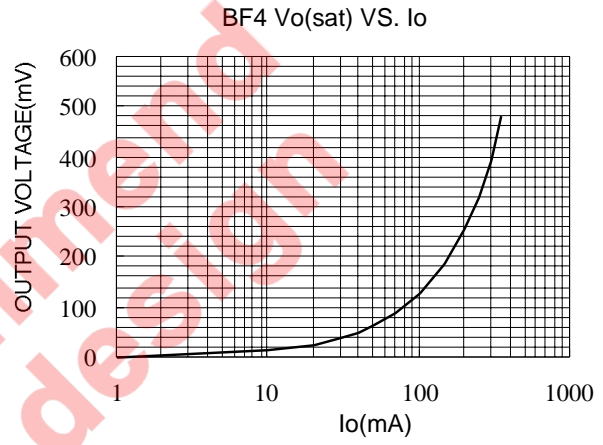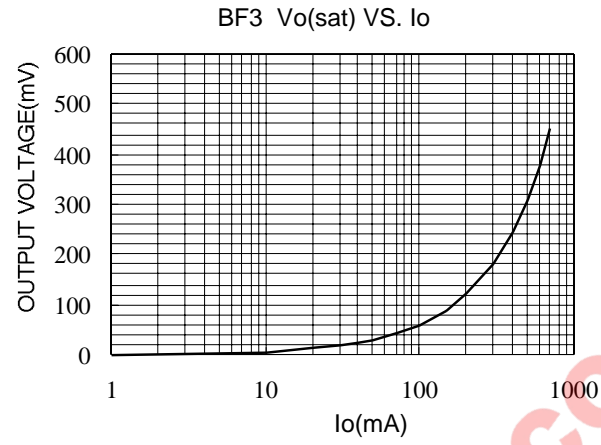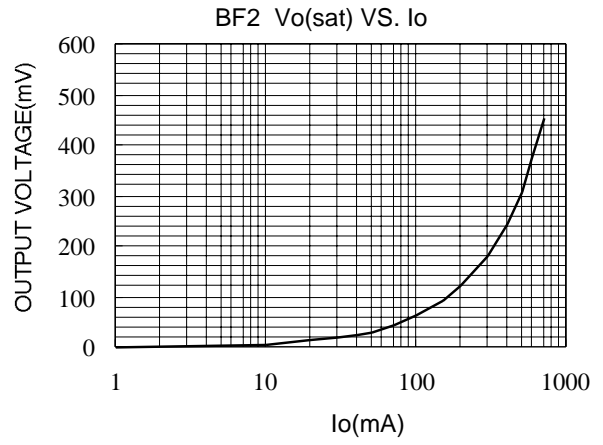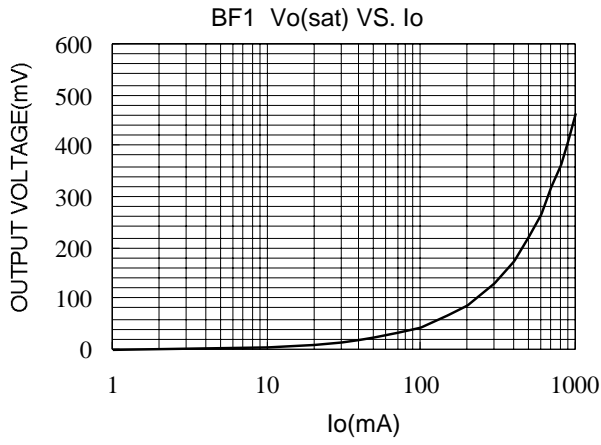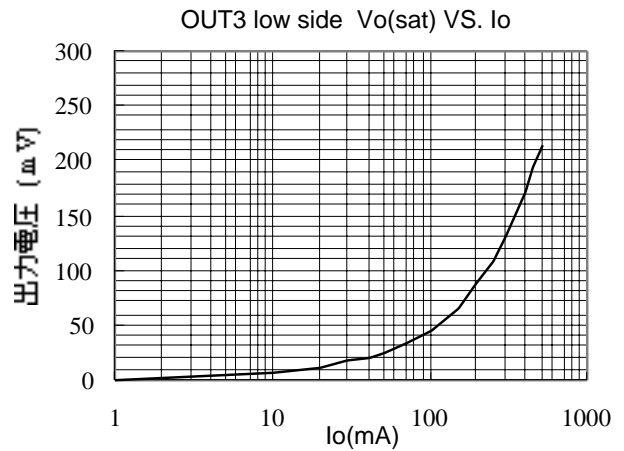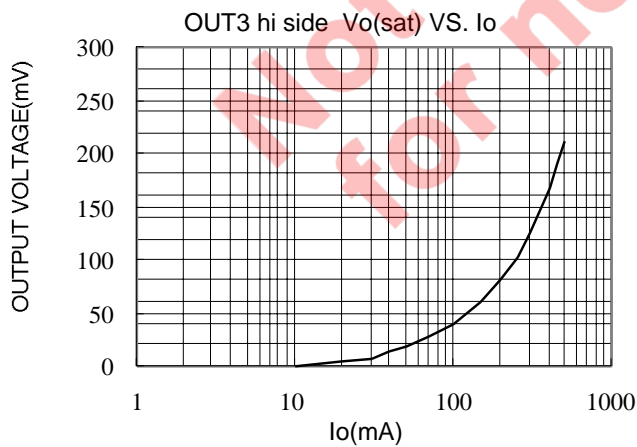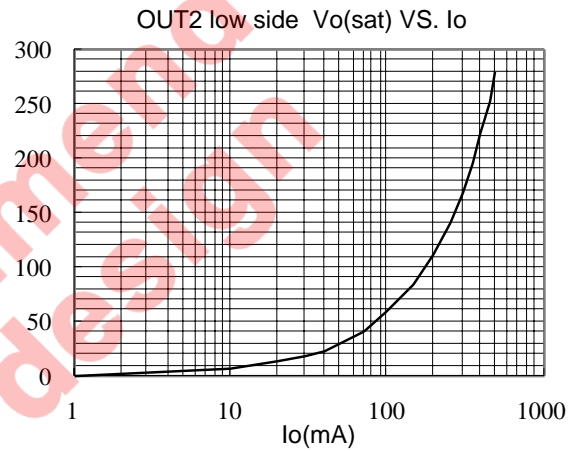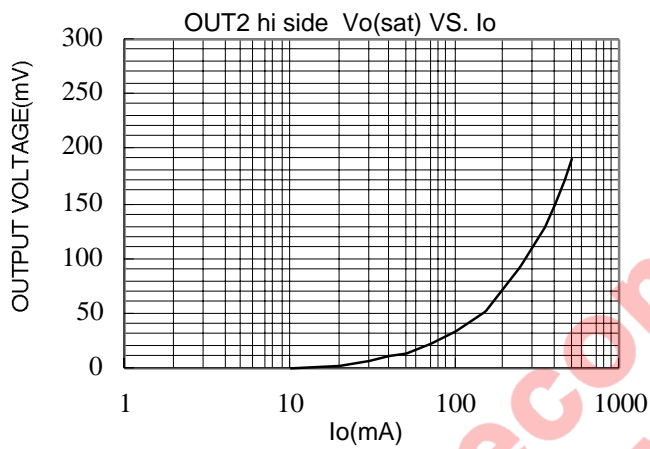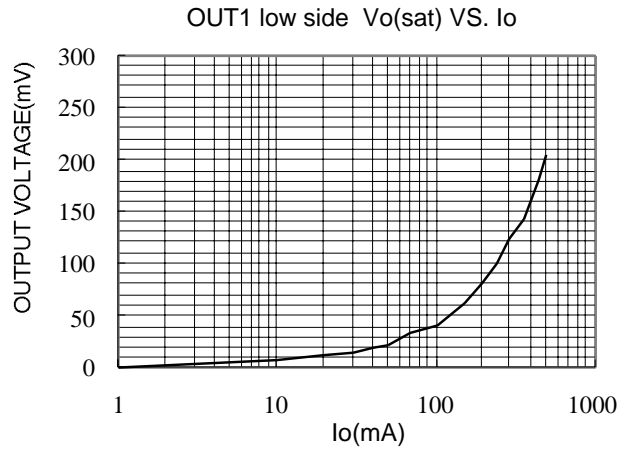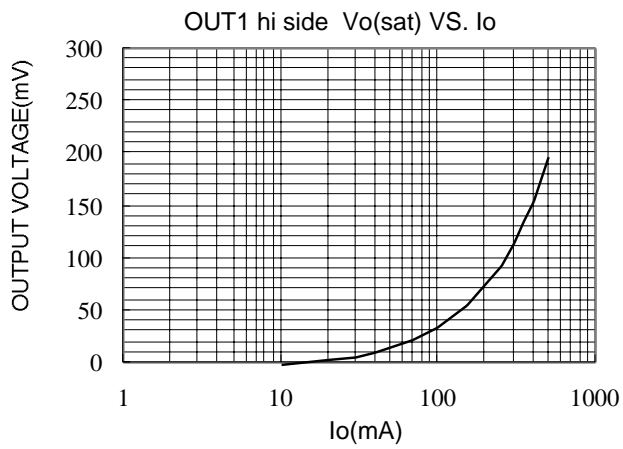
Package Dimensions

Plastic 32pin 7X7mm bgd LQFP

EIAJ Package Code	JEDEC Code	Weight(g)	Lead Material
32P6B-A LQFP32-P-77-0.80	–	0.17	Alloy 42
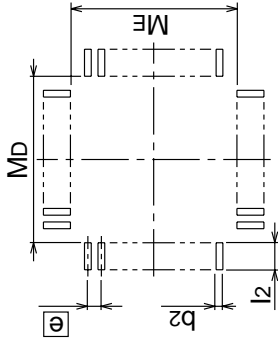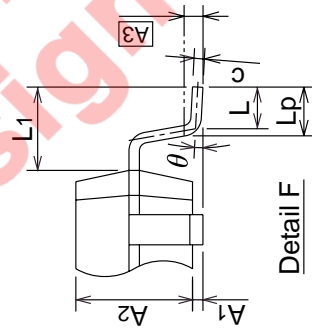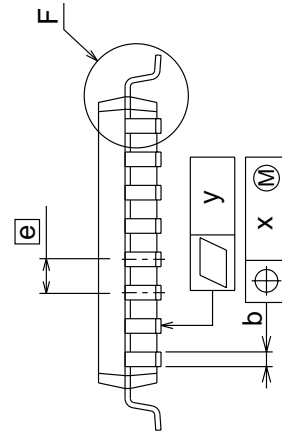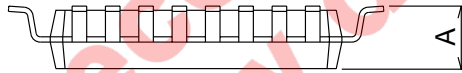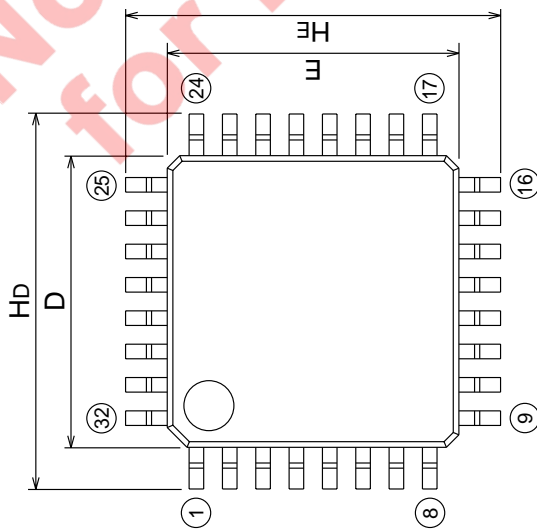
Recommended Mount Pad

Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	–	–	1.7
A1	0	0.1	0.2
A2	–	1.4	–
b	0.3	0.35	0.45
c	0.105	0.125	0.175
D	6.9	7.0	7.1
E	6.9	7.0	7.1
e	–	0.8	–
HD	8.8	9.0	9.2
HE	8.8	9.0	9.2
L	0.3	0.5	0.7
L1	–	1.0	–
Lp	0.45	0.6	0.75
A3	–	0.25	–
x	–	–	0.2
y	–	–	0.1
θ	0°	–	10°
b2	–	0.5	–
I2	1.0	–	–
MD	–	7.4	–
ME	–	7.4	–

Detail F

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Renesas Technology America, Inc.
450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500 Fax: <1> (408) 382-7501

Renesas Technology Europe Limited.
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Tel: <44> (1628) 585 100, Fax: <44> (1628) 585 900

Renesas Technology Europe GmbH
Dornacher Str. 3, D-85622 Feldkirchen, Germany
Tel: <49> (89) 380 70 0, Fax: <49> (89) 929 30 11

Renesas Technology Hong Kong Ltd.
7/F., North Tower, World Finance Centre, Harbour City, Canton Road, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2375-6836

Renesas Technology Taiwan Co., Ltd.
FL 10, #99, Fu-Hsing N. Rd., Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

Renesas Technology (Shanghai) Co., Ltd.
26/F., Ruijin Building, No.205 Maoming Road (S), Shanghai 200020, China
Tel: <86> (21) 6472-1001, Fax: <86> (21) 6415-2952

Renesas Technology Singapore Pte. Ltd.
1, Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001