

# M61018GP

## MOTOR DRIVER FOR CAMERA

REJ03F0071-0100Z

Rev.1.0

Sep.19.2003

### 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 I<sub>o</sub>=1A)
- Built-in DC motor driver circuit of 1.5CH

### Application

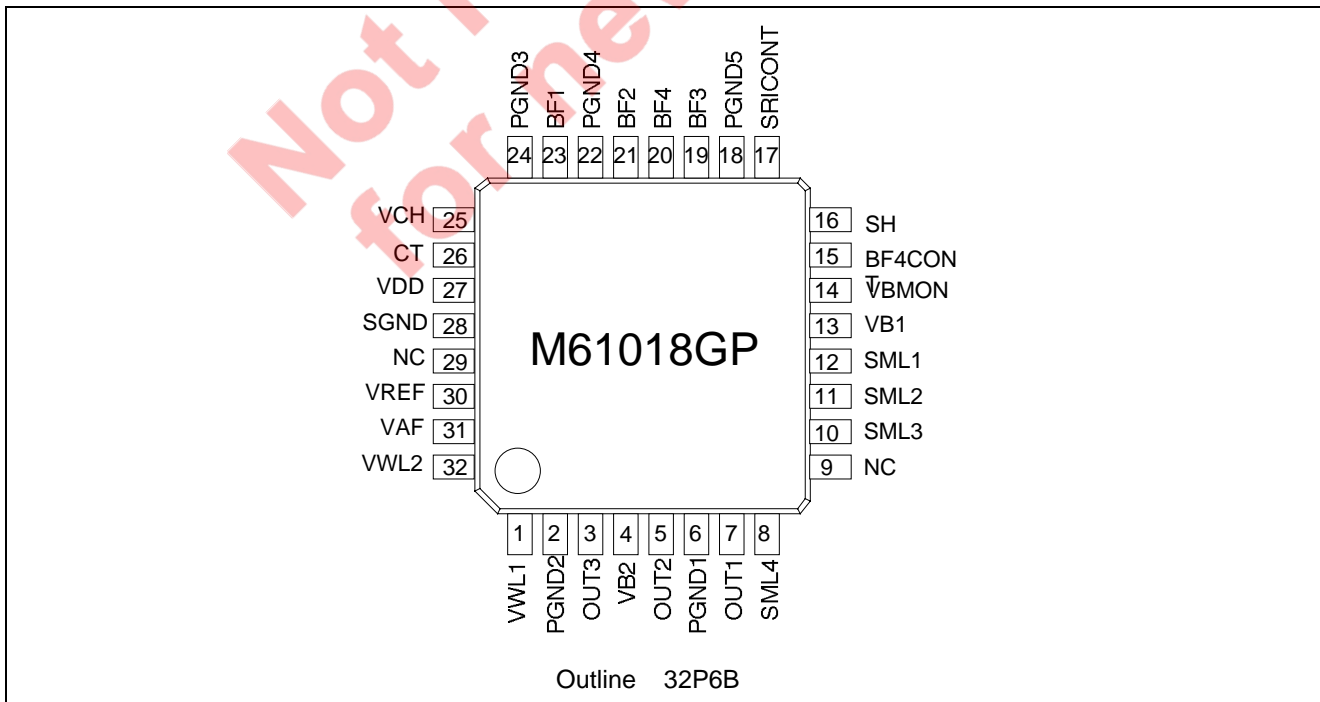
Motor driver for compact camera etc.

### Recommend Operating Condition

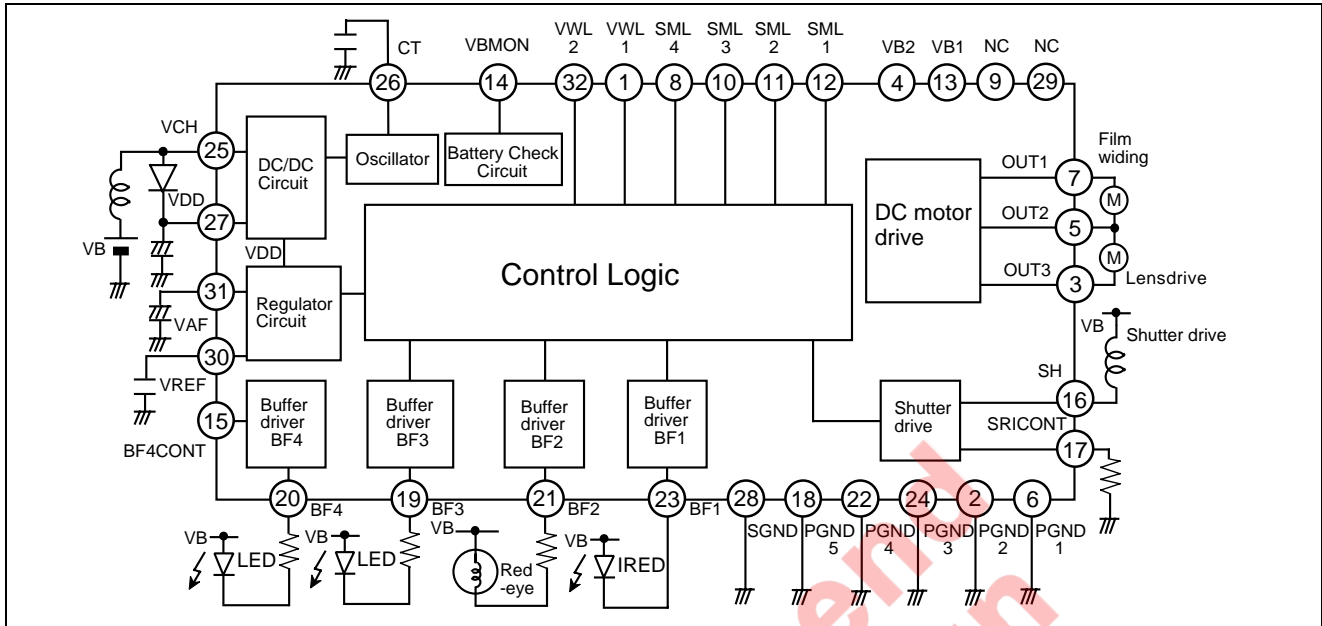
Rated supply voltage.....3.0V

Supply voltage range.....1.8 to 3.5V

### Pin Configuration



Block Diagram

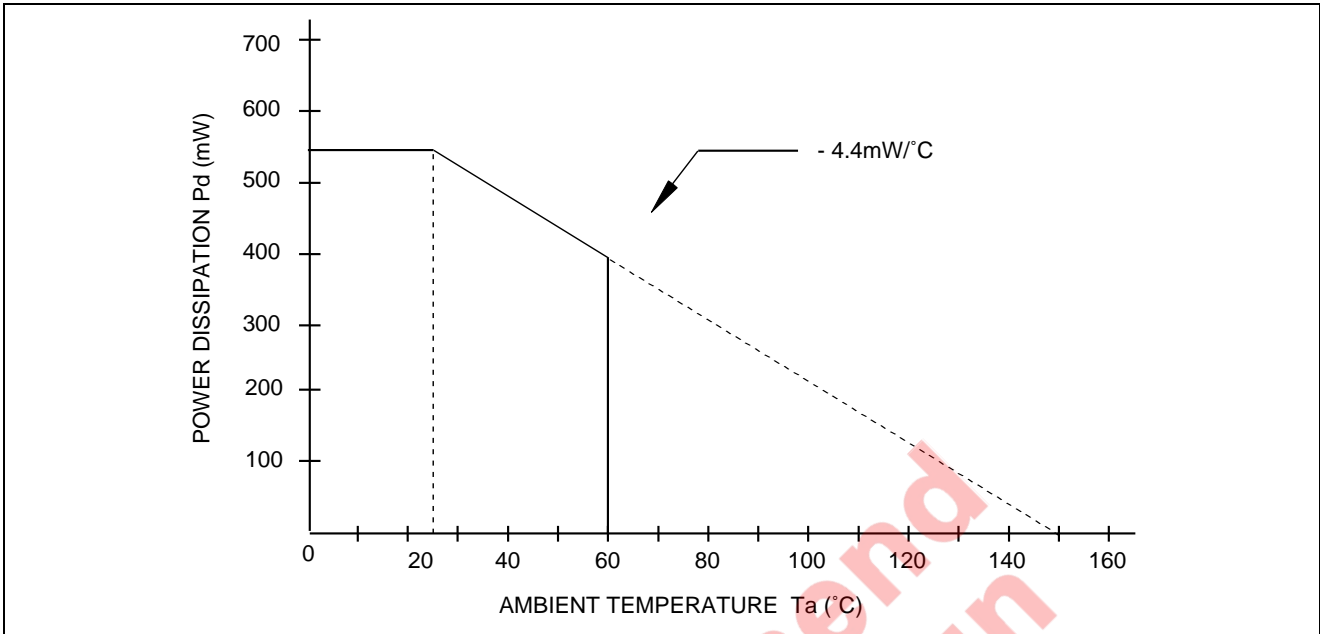


Absolute Maximum Ratings

(Ta=25°C, unless otherwise noted)

Parameter	Symbol	Rated	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	

Thermal Derating (Maximum Rating)



Not recommended for new design

## Electrical Characteristics

(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 <sub>p,p</sub>	
	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

## Electrical Characteristics (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	2/3VB	2/3VB	V	
				-0.15		+0.15		

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

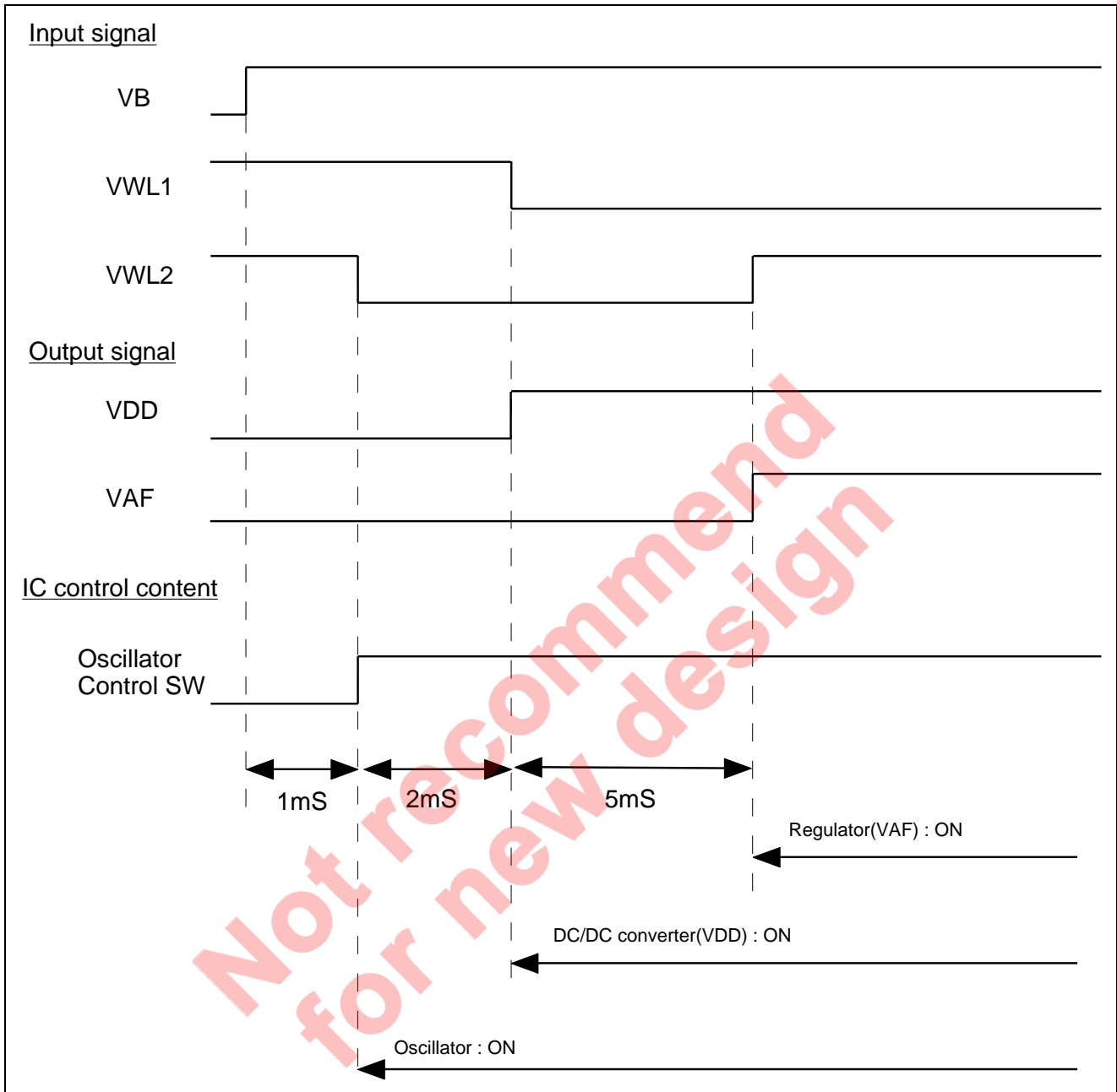
INPUT						Motor each output			Buffer each output				
SML1	SML2	SML3	SML4	MOTOR1	MOTOR2	out1	out2	out3	SH	BF1	BF2	BF3	Note
H	H	H	H	Stand-by	Stand-by	OFF	OFF	OFF	Stand-by	OFF	OFF	OFF	MOTOR1 control
H	H	H	L	Forward rotation	Stand-by	H	L	OFF	Stand-by	OFF	OFF	OFF	
H	H	L	H	Reverse rotation	Stand-by	L	H	OFF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

Sequence Time Chart Example



Description of Pin

Ta=25°C

PIN NO.	PIN NAME	PERIPHERAL CIRCUIT OF PINS	Parameter	Limits			Unit	NOTE
				min	typ	max		
1	VWL1 (INPUT)		$V_{IN,H}$	VDD	—	6.0	V	
			$V_{IN,L}$	0	—	0.3	V	
			$I_{IN,H}$	—	—	3.0	$\mu$ A	$V_{IH}=5.5V$
			$I_{IN,L}$	-70	-45	-25	$\mu$ A	$V_{IL}=0V$
2	PGND2							
3	OUT3		$I_{OUT}$	1.8	—	—	A	$V_B=3.0V$
			$V_{SAT}$	—	—	0.5	V	$I_o=500mA$ Upper side+Lower side (saturation voltage total)
4	VB2							
5	OUT2		$I_{OUT}$	1.8	—	—	A	$V_B=3.0V$
			$V_{SAT}$	—	—	0.5	V	$I_o=500mA$ Upper side+Lower side (saturation voltage total)
6	PGND1							
7	OUT1		$I_{OUT}$	1.8	—	—	A	$V_B=3.0V$
			$V_{SAT}$	—	—	0.5	V	$I_o=500mA$ Upper side+Lower side (saturation voltage total)



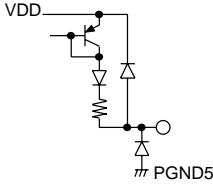
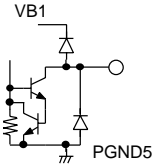
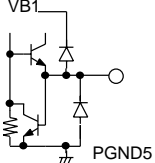

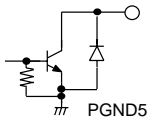
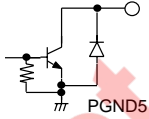
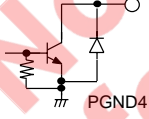
Description of Pin (cont.)

Ta=25°C

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


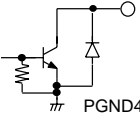

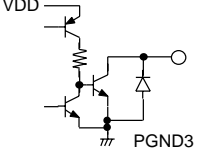
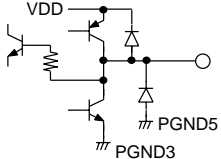


Description of Pin (cont.)

Ta=25°C

PIN NO.	PIN NAME	PERIPHERAL CIRCUIT OF PINS	Parameter	Limits			Unit	NOTE
				min	typ	max		
15	BF4CONT (INPUT)		$V_{IN,H}$	4.2	—	6.0	V	
			$V_{IN,L}$	0	—	0.3	V	
			$I_{IN,H}$	—	—	3.0	$\mu$ A	$V_{IH}=5.5V$
			$I_{IN,L}$	-70	-45	-25	$\mu$ A	$V_{IL}=0V$
16	SH		$I_{OUT}$	700	—	—	mA	$V_B=3.0V$
			$V_{SAT}$	—	—	0.5	V	$I_o=500mA$ $SRICONT=0V$
17	SRICONT		$I_{OUT}$	700	—	—	mA	$V_B=3.0V$
			$V_{OUT}$	480	580	680	mV	$1\Omega$ Between SRICONT to GND
18	PGND5							
19	BF3		$I_{OUT}$	800	—	—	mA	$V_B=3.0V$
			$V_{SAT}$	—	—	0.5	V	$I_o=500mA$
20	BF4		$I_{OUT}$	150	—	—	mA	$V_B=3.0V$
			$V_{SAT}$	—	—	0.5	V	$I_o=100mA$
21	BF2		$I_{OUT}$	800	—	—	mA	$V_B=3.0V$
			$V_{SAT}$	—	—	0.5	V	$I_o=500mA$

Description of Pin (cont.)

Ta=25°C

PIN NO.	PIN NAME	PERIPHERAL CIRCUIT OF PINS	Parameter	Limits			Unit	NOTE
				min	typ	max		
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							

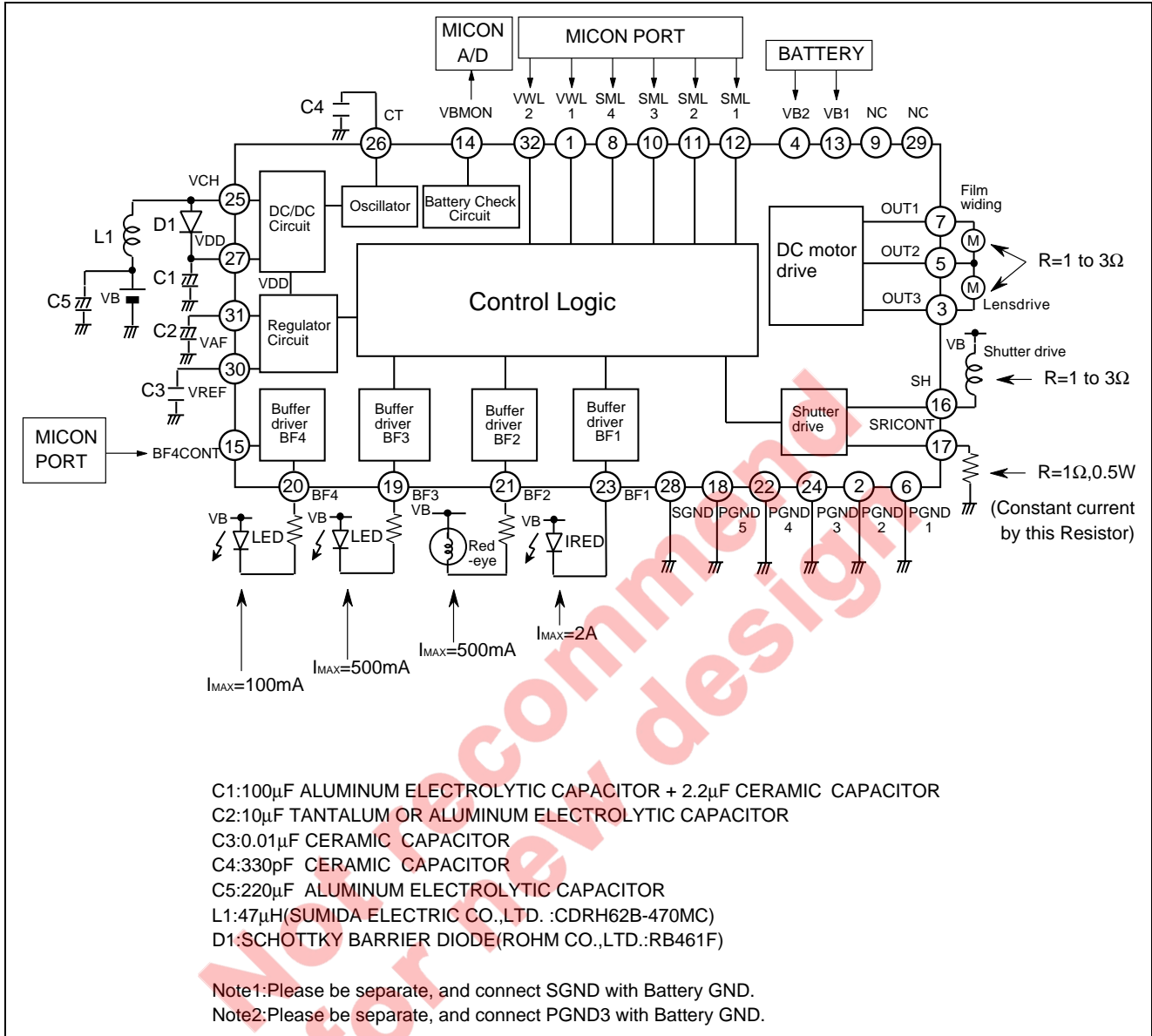
Description of Pin (cont.)

Ta=25°C

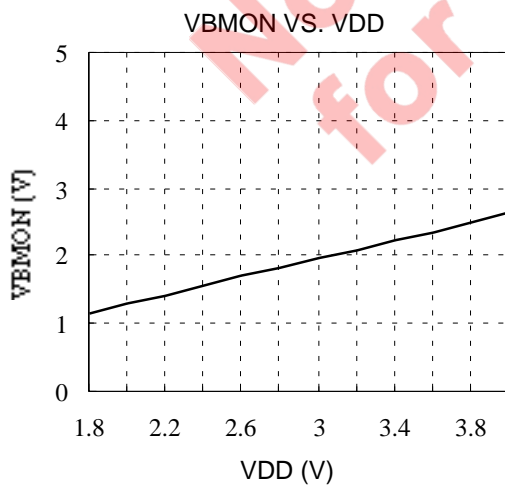
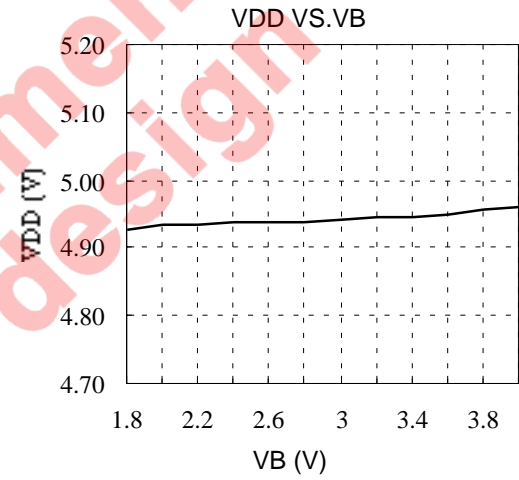
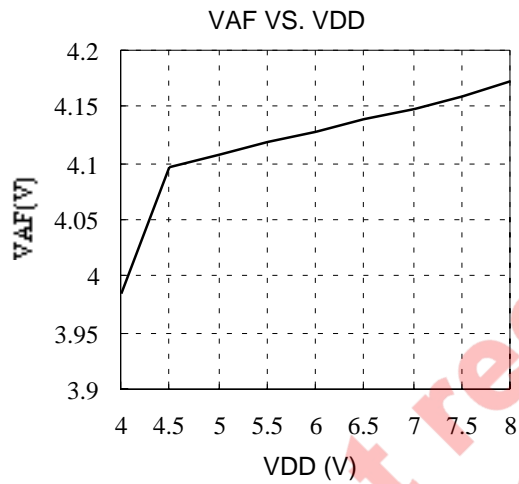
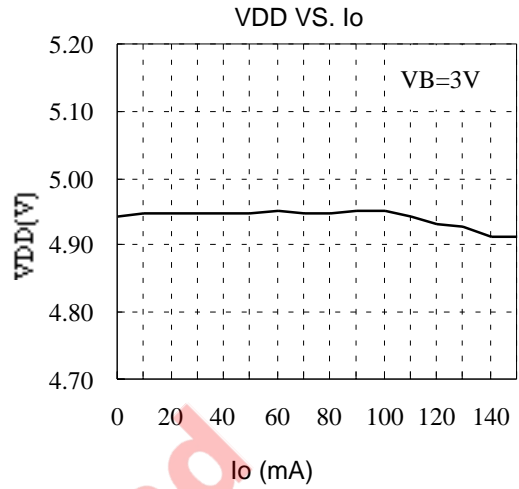
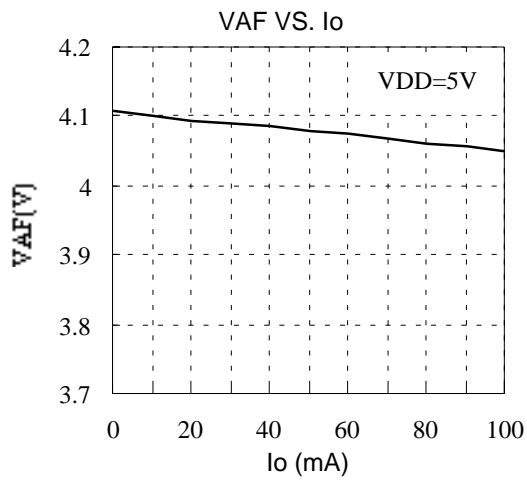
PIN NO.	PIN NAME	PERIPHERAL CIRCUIT OF PINS	Parameter	Limits			Unit	NOTE	
				min	typ	max			
29	NC								
30	VREF		$V_{OUT}$	1.5	1.6	1.7	V		
31	VAF		$V_{OUT}$	3.9	4.1	4.3	V	VDD=4.5 to 5.5V IL=0 to 50mA	
32	VWL2 (INPUT)		$V_{IN,H}$	VDD	—	6.0	V		
					-0.3				
			$V_{IN,L}$	0	—	0.3	V		
			$I_{IN,H}$	—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

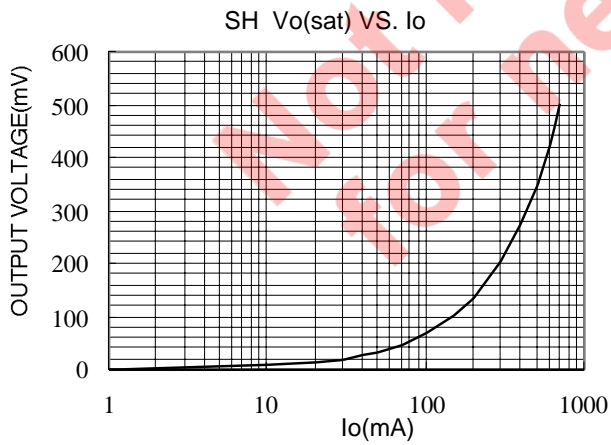
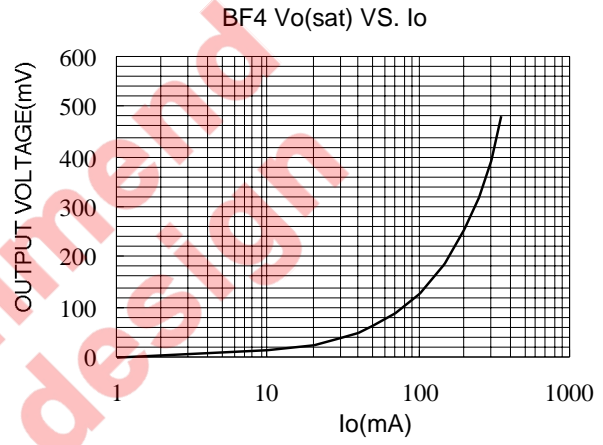
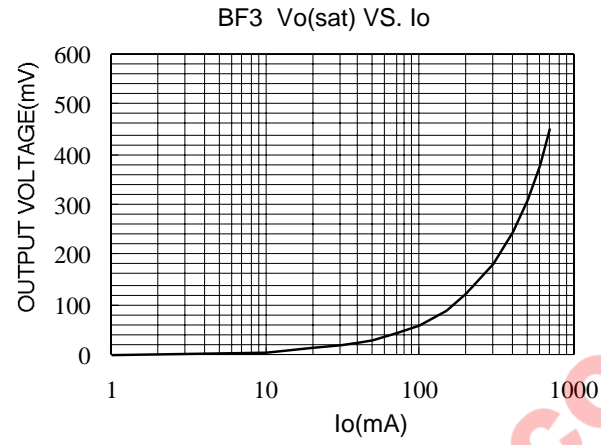
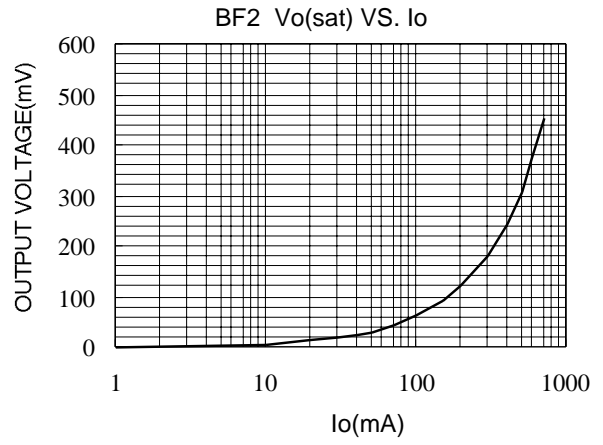
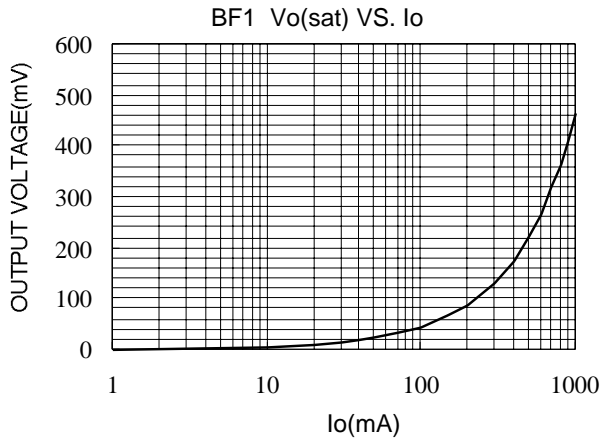
Not recommended for new design

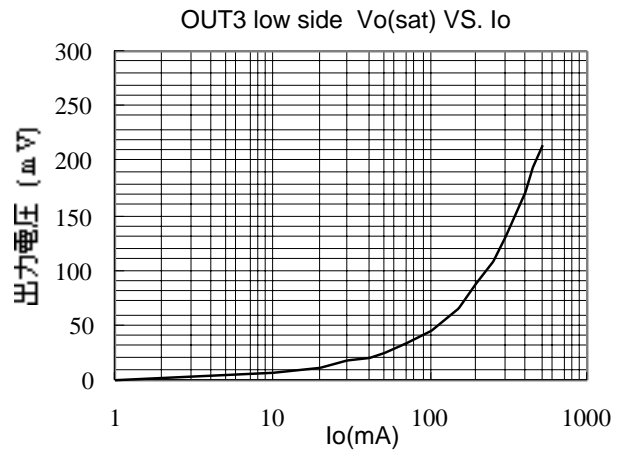
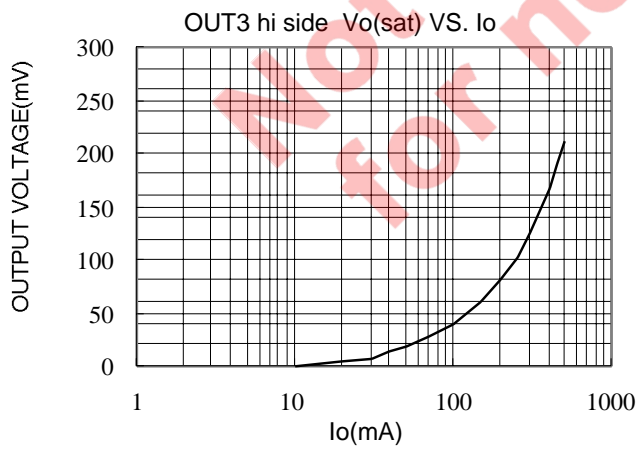
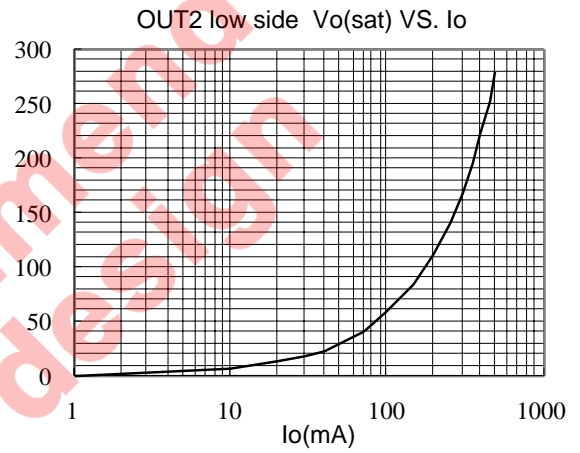
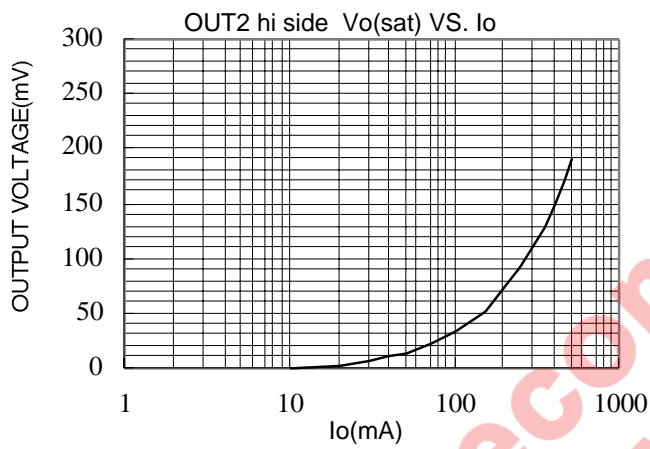
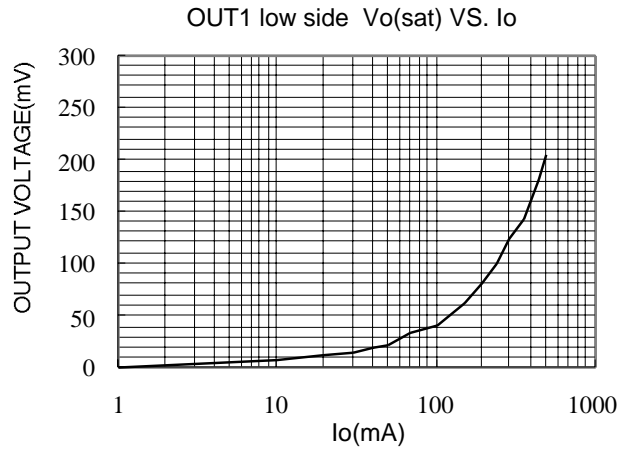
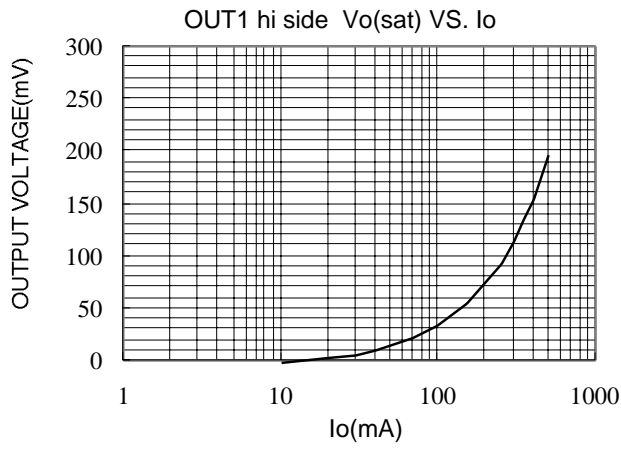
Application Example



Typical Performance Data (Ta=25°C)





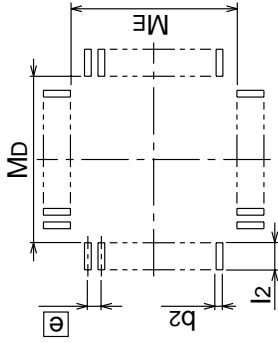
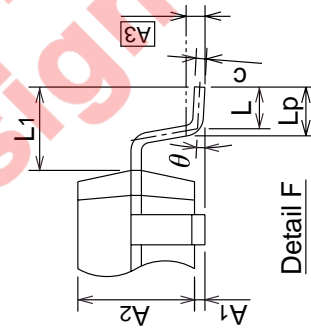
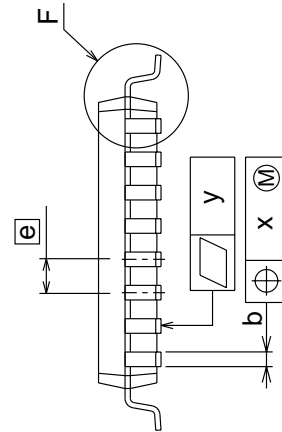
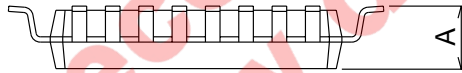
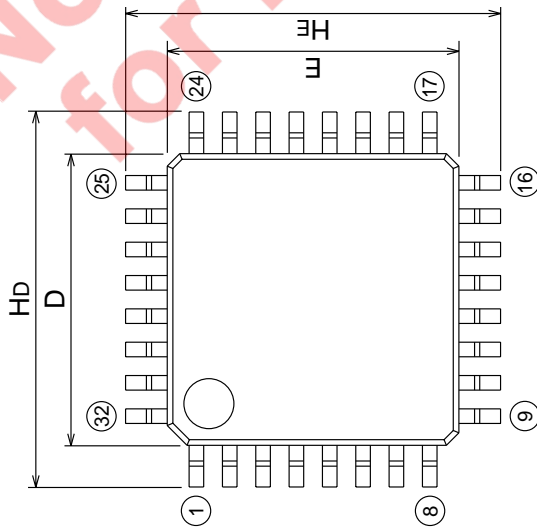




Package Dimensions

32P6B-A Plastic 32pin 7X7mm bgaLQFP

EIAJ Package Code LQFP32-P-77-0.80	JEDEC Code -	Weight(g) 0.17	Lead Material Alloy 42
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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
$\theta$	0°	-	10°
b2	-	0.5	-
l2	1.0	-	-
MD	-	7.4	-
ME	-	7.4	-

Not recommended for new design

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