ROHM SEMICONDUCTOR

Technical Note

CMOS LDO Regulators for Portable Equipments

1ch 200mA
CMOS LDO Regulators

BU□□TA2WNVX series, BU□□TA2WHFV series

No.11020ECT01

●Description

BU□□TA2WNVX /HFV series is high-performance FULL CMOS regulator with 200-mA output, which is mounted on microminiature package SSON004X1216 (1.2 mm × 1.6 mm × 0.6 mm) &HVSOF5(1.6mm × 1.6mm × 0.6mm). It has excellent noise characteristics and load responsiveness characteristics despite its low circuit current consumption of 40 µA. It is most appropriate for various applications such as power supplies for logic IC, RF, and camera modules.
Microminiature package SSON004X1216 & HVSOF5 with built-in heatsink is adopted for the package, which contributes to the space-saving design of the set.

●Features

1) High-accuracy output voltage of ±1% (±25 mV on 1.5-V & 1.8-V products)
2) High ripple rejection: 70 dB (Typ., 1 kHz, VOUT≤1.8 V))
3) Compatible with small ceramic capacitor (C_{IN}=C_O=1.0 µF)
4) Low current consumption: 40 µA
5) ON/OFF control of output voltage
6) With built-in overcurrent protection circuit and overheat protection circuit
7) With built-in output discharge circuit
8) Adopting microminiature power package SSON004X1216

●Applications

Battery-powered portable equipment, etc.

●Line up

■ 200 mA BU□□TA2WNVX / HFV series

Product Name	1.5	1.8	2.5	2.6	2.7	2.8	2.85	2.9	3.0	3.1	3.2	3.3	3.4	Package
BU□□TA2WNVX	○	○	○	○	○	○	○	○	○	○	○	○	○	SSON004X1216
BU□□TA2WHFV	○	○	○	○	○	○	○	○	○	○	○	○	○	HVSOF5

Model name: BH□□TA2W□□□
(a = □□, b = □□□)

Symbol	Contents					
a	Specification of output voltage					
	□□	Output voltage (V)	□□	Output voltage (V)	□□	Output voltage (V)
	15	1.5V(Typ.)	28	2.8V(Typ.)	32	3.2V(Typ.)
	18	1.8V(Typ.)	2J	2.85V(Typ.)	33	3.3V(Typ.)
	25	2.5V(Typ.)	29	2.9V(Typ.)	34	3.4V(Typ.)
	26	2.6V(Typ.)	30	3.0V(Typ.)	-	-
	27	2.7V(Typ.)	31	3.1V(Typ.)	-	-
b	Package	NVX :SSON004X1216 HFV :HVSOF5				

●Absolute maximum rating

Parameter	Symbol	Ratings	Unit
Maximum applied power voltage	VMAX	-0.3 ~ +6.5	V
Power dissipation	Pd1	220*1 (SSON004X1216)	mW
	Pd2	410*2 (HVSOF5)	
Maximum junction temperature	TjMAX	+125	℃
Operational temperature range	Topr	-40 ~ +85	℃
Storage temperature range	Tstg	-55 ~ +125	℃

*1 When 1 PCB (70 mm × 70 mm, thickness 1.6-mm glass epoxy) a standard ROHM board is implemented. Reduced to 2.2 mW/°C when used at Ta=25°C or higher.

*2 When 1 PCB (70 mm × 70 mm, thickness 1.6-mm glass epoxy) a standard ROHM board is implemented. Reduced to 4.1 mW/°C when used at Ta=25°C or higher.

●Recommended operating range (Do not exceed Pd.)

Parameter	Symbol	Ratings	Unit
Input power supply voltage	VIN	2.5 ~ 5.5	V
Maximum output current	IMAX	200	mA

●Recommended operating conditions

Parameter	Symbol	Ratings			Unit	Conditions
		Min.	Typ.	Max.		
Input capacitor	C_{IN}	0.5*3	1.0	–	µF	A ceramic capacitor is recommended.
Output capacitor	C_O	0.5*3	1.0	–	µF	A ceramic capacitor is recommended.

*3 Set the capacity value of the capacitor so that it does not fall below the minimum value, taking temperature characteristics, DC device characteristics, and change with time into consideration.

●Electrical characteristics

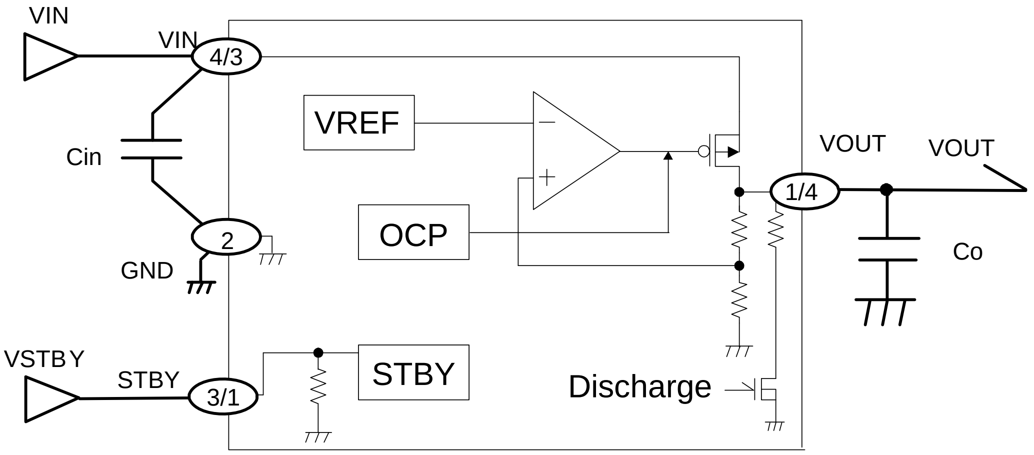
(Unless otherwise specified Ta=25℃, VIN=VOUT+1.0 V (VIN=3.5 V on VOUT=1.8-V and1.5-V products),
STBY=1.5 V, C_{IN}=1.0 µF, C_O=1.0 µF)

Parameter		Symbol	Limits			Unit	Conditions
			Min.	Typ.	Max.		
Output voltage		VOUT	VOUT ×0.99	VOUT	VOUT ×1.01	V	IOUT=10 µA, VOUT≥2.5 V
			VOUT -25 mV		VOUT +25 mV		IOUT=10 µA, VOUT<2.5 V
Circuit current		IIN	-	40	95	µA	IOUT=0mA
Circuit current (at STBY)		ISTBY	-	-	1	µA	STBY=0 V
Ripple rejection		RR	55	70	-	dB	VRR=-20 dBv, fRR=1 kHz, IOUT=10 mA, 1.5 V≤VOUT≤1.8 V
				65			VRR=-20 dBv,fRR=1 kHz, IOUT=10 mA, 2.5 V≤VOUT
Input/Output voltage difference		VSAT	-	400	800	mV	2.5 V≤VOUT≤2.6 V (VIN=0.98*VOUT, IOUT=200 mA)
			-	360	720	mV	2.7 V≤VOUT≤2.85 V (VIN=0.98*VOUT, IOUT=200 mA)
			-	330	660	mV	2.9 V≤VOUT≤3.1 V (VIN=0.98*VOUT,IOUT=200 mA)
			-	300	600	mV	3.2 V≤VOUT≤3.4 V (VIN=0.98*VOUT, IOUT=200 mA)
Line regulation		VDL	-	2	20	mV	VIN=VOUT+1.0 V to 5.5 V, IOUT=10 µA
Load regulation		VDLO	-	10	80	mV	IOUT=0.01 mA to 100 mA
Overcurrent protection detection current		ILMAX	250	400	700	mA	Vo=VOUT*0.8
Output short-circuit current		ISHORT	20	70	150	mA	Vo=0 V
Output discharge resistance		RDSC	20	40	80	Ω	VIN=4.0 V, STBY=0 V
Standby pull-down resistance		RSTB	500	1000	2000	kΩ	
Standby control	ON	VSTBH	1.5	-	5.5	V	
	OFF	VSTBL	-0.3	-	0.3	V	

* This product does not have radiation-proof design.

●Block diagram, recommended circuit diagram, and pin configuration diagram

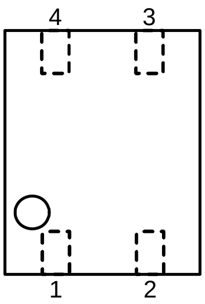
BH□□TA2WNVX



Recommended ceramic capacitor for Cin & Co
Murata Manufacturing Co., Ltd.
GRM188B11A105KA61D

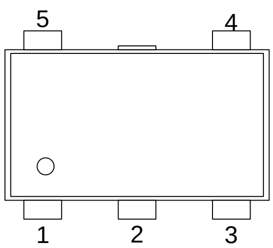
Fig.1 Recommended circuit diagram

BU□□TA2WNVX(SSON004X1216)



PIN No.	Symbol	Function
1	VOUT	Voltage output
2	GND	Grounding
3	STBY	ON/OFF control of output voltage (High: ON, Low: OFF)
4	VIN	Power input

BU□□TA2WHFV(HVSOF5)



PIN No.	Symbol	Function
1	STBY	ON/OFF control of output voltage (High:ON, Low:OFF)
2	GND	Grounding
3	VIN	Power input
4	VOUT	Voltage output
5	N.C.	No Connect

●Input/Output terminal equivalent circuit schematic

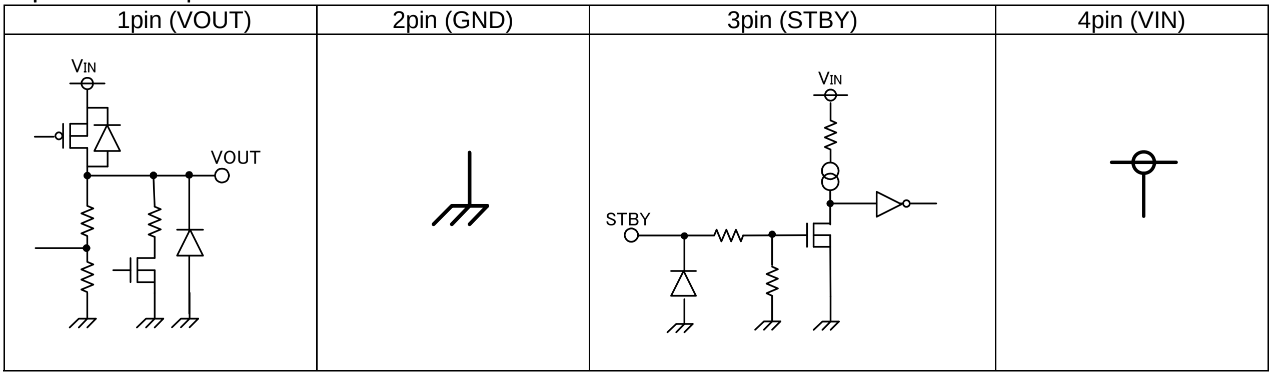


Fig. 2 Input/Output equivalent circuit

●About input/output capacitor

It is recommended to place a capacitor as close as possible to the pins between the input terminal and GND or between the output terminal and GND.
The capacitor between the input terminal and GND becomes valid when source impedance increases or when wiring is long. The larger the capacity of the output capacitor between the output terminal and GND is, the better the stability and characteristics in output load fluctuation become. However, please check the status of actual implementation. Ceramic capacitors generally have variation, temperature characteristics, and direct current bias characteristics and the capacity value also decreases with time depending on the usage conditions. It is recommended to select a ceramic capacitor upon inquiring about detailed data of the related manufacturer.

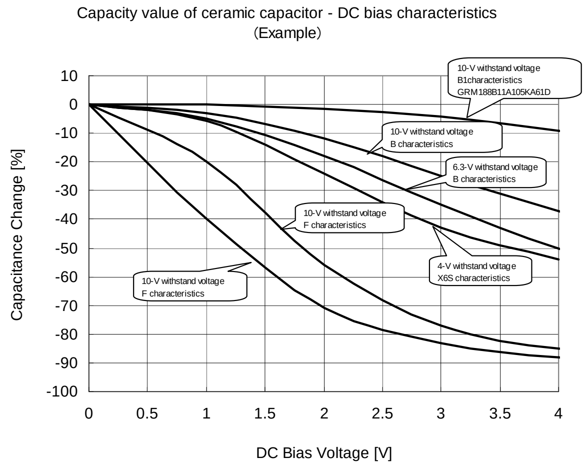


Fig.3 Capacity – bias characteristics

●About the equivalent series resistance (ESR) of a ceramic capacitor

Capacitors generally have ESR (equivalent series resistance) and it operates stably in the ESR-IOUT area shown on the right. Since ceramic capacitors, tantalum capacitors, electrolytic capacitors, etc. generally have different ESR, please check the ESR of the capacitor to be used and use it within the stability area range shown in the right graph for evaluation of the actual application.

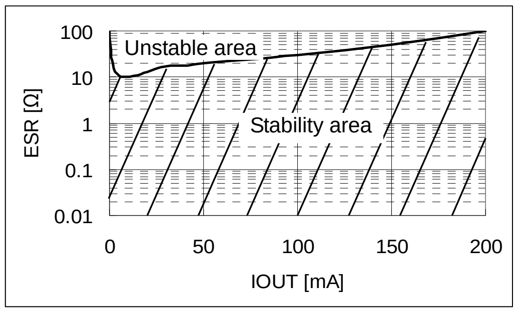


Fig.4 Stability area characteristics (Example)

●Reference data BU15TA2WNVX / HFV (Ta=25ºC unless otherwise specified.)

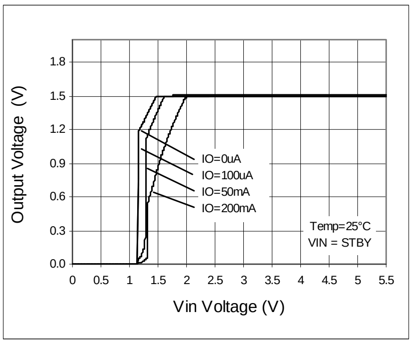


Fig. 5 Output Voltage

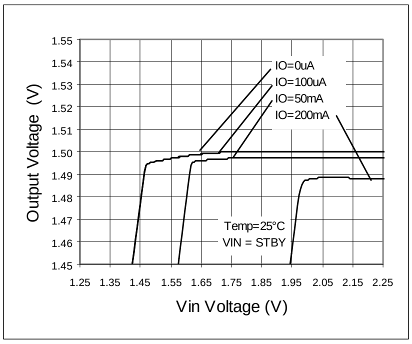


Fig. 6 Line Regulation

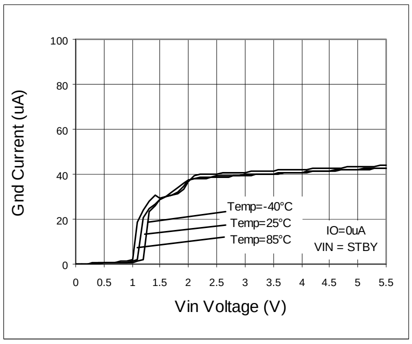


Fig. 7 Circuit Current IGND

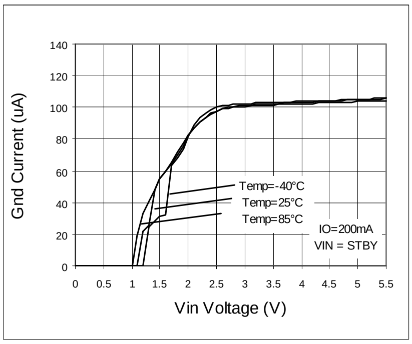


Fig. 8 Circuit Current IGND

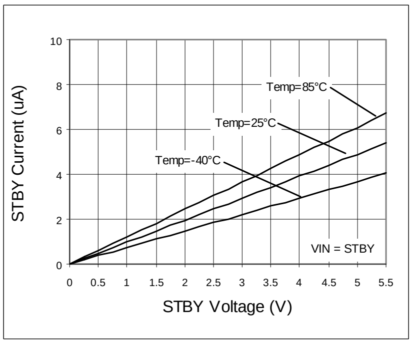


Fig. 9 STBY Input Current

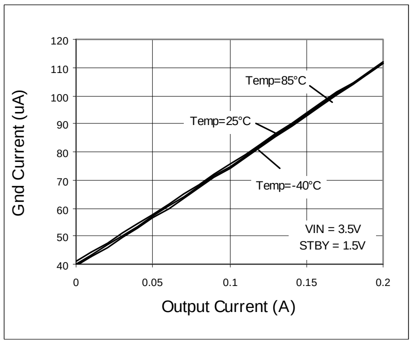


Fig. 10 IOUT - IGND

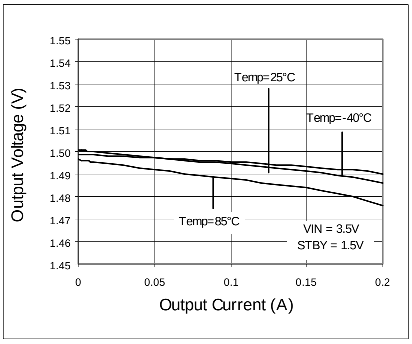


Fig. 11 Load Regulation

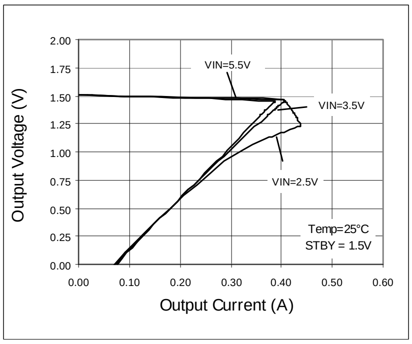


Fig. 12 OCP Threshold

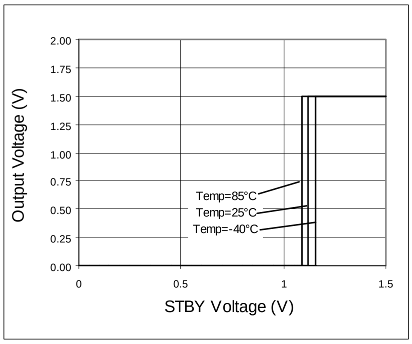


Fig. 13 STBY Threshold

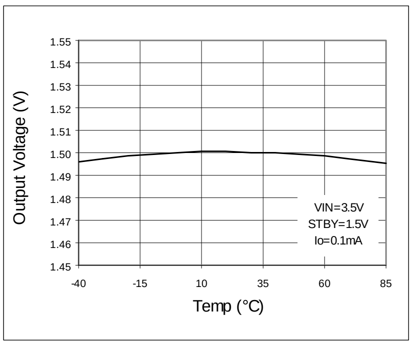


Fig. 14 VOUT vs. Temp

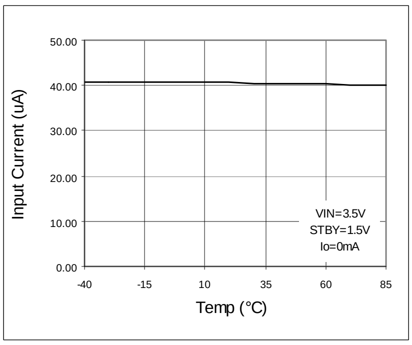


Fig. 15 IGND vs. Temp

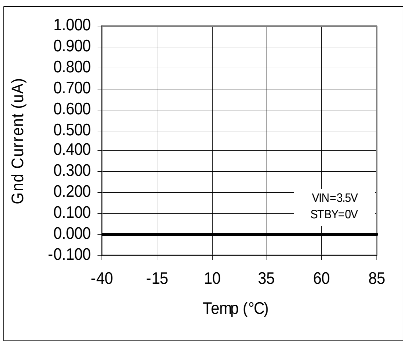


Fig. 16 IGND vs. Temp (STBY)

●Reference data BU15TA2WNVX /HFV (Ta=25ºC unless otherwise specified.)

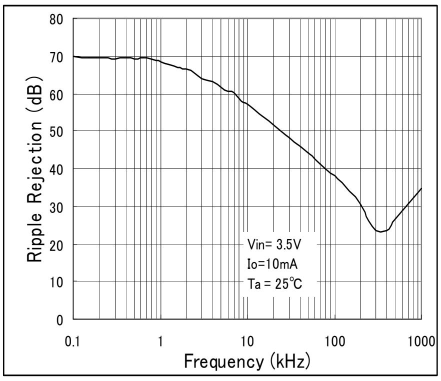


Fig. 17 Ripple Rejection vs. Freq.

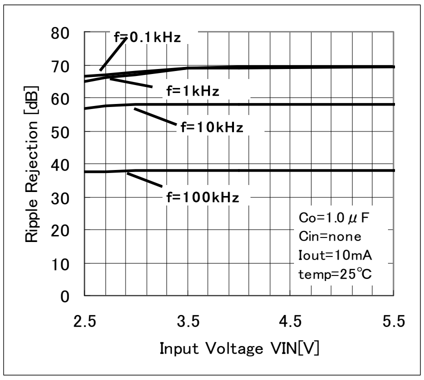


Fig. 18 Ripple Rejection vs. VIN (Iout=10 mA)

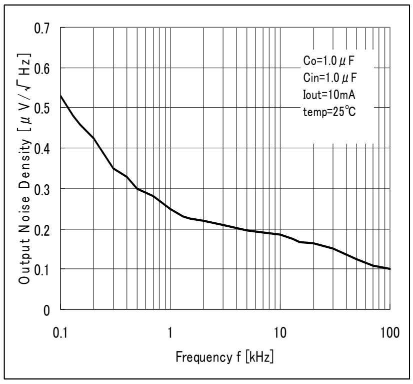


Fig. 19 Output Noise Spectral Density vs. Freq.

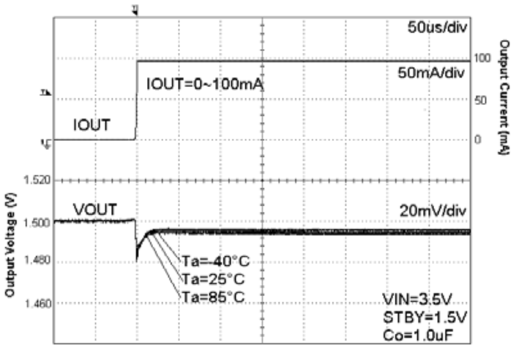


Fig. 20 Load Response

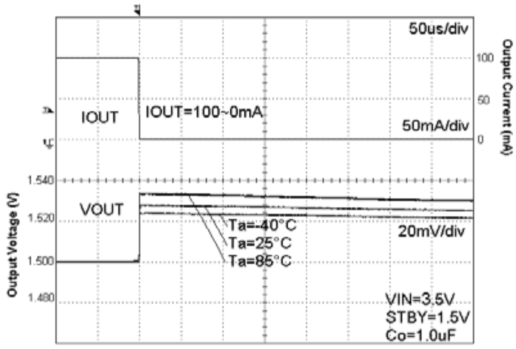


Fig. 21 Load Response

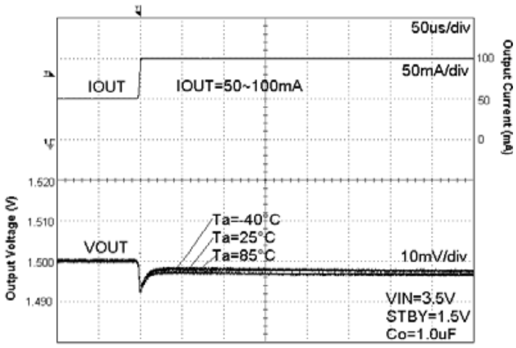


Fig. 22 Load Response

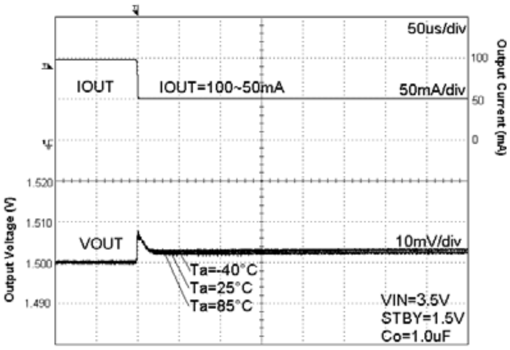


Fig. 23 Load Response

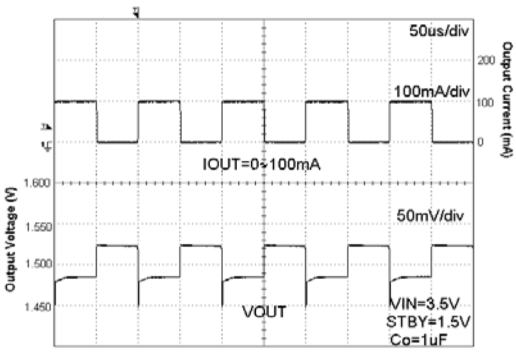


Fig. 24 Load Response
Current Pulse=10 kHz

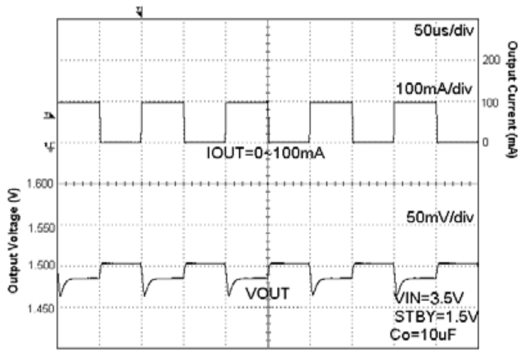


Fig. 25 Load Response
Current Pulse=10 kHz

●Reference data BU15TA2WNVX / HFV (Ta=25ºC unless otherwise specified.)

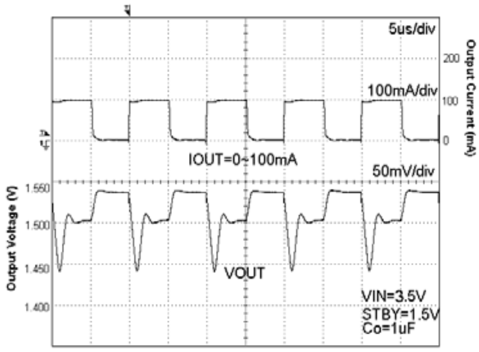


Fig. 26 Load Response
Current Pulse=100 kHz

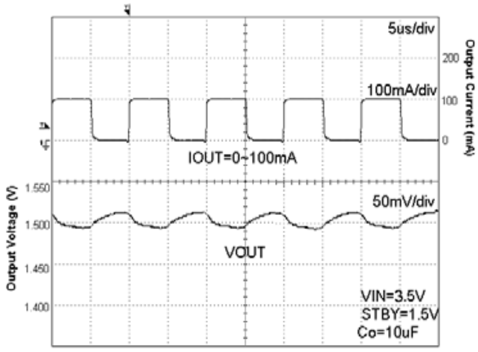


Fig. 27 Load Response
Current Pulse=100 kHz

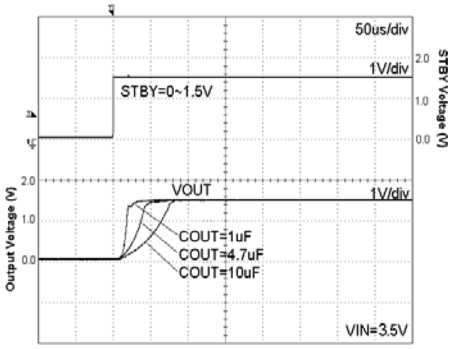


Fig. 28 Startup Time
Iout = 0 mA

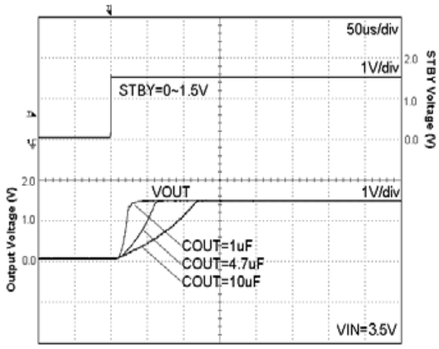


Fig. 29 Startup Time
Iout = 200 mA

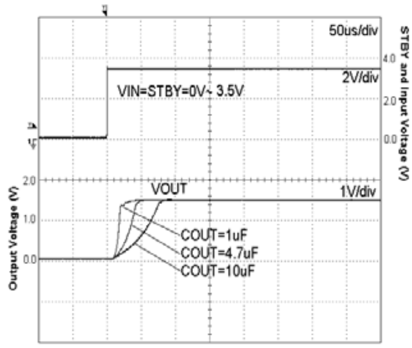


Fig. 30 Startup Time (STBY=VIN)
Iout = 0 mA

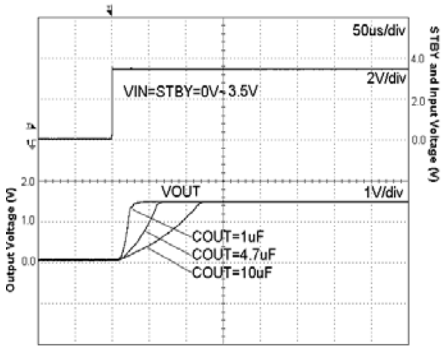


Fig. 31 Startup Time (STBY=VIN)
Iout = 200mA

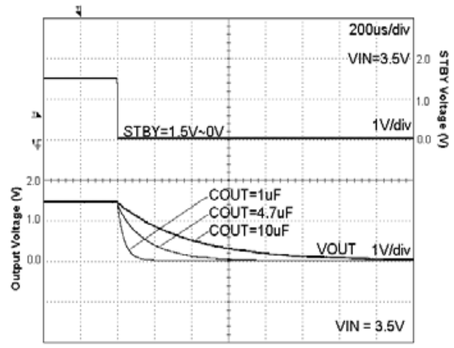


Fig. 32 Discharge Time
Iout = 0 mA

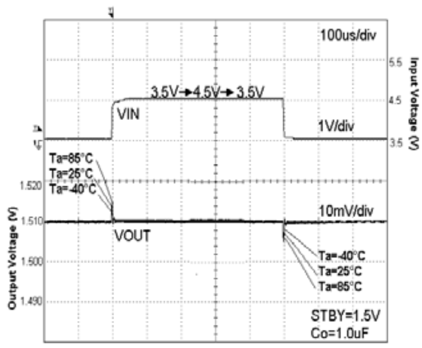


Fig. 33 VIN Response
Iout = 10 mA

●Reference data BU18TA2WNVX / HFV (Unless otherwise specified, Ta=25℃)

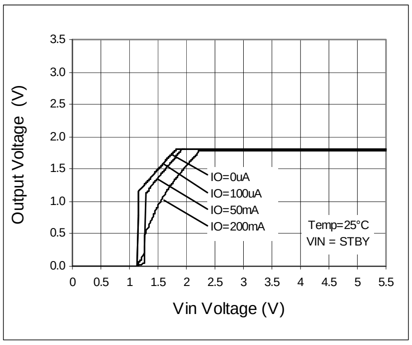


Fig. 34 Output Voltage

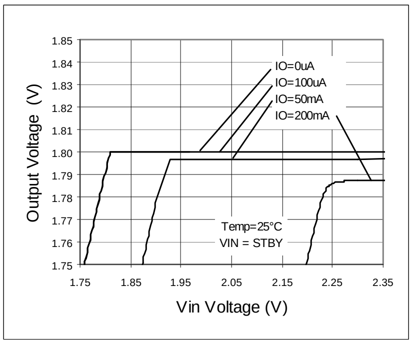


Fig. 35 Line Regulation

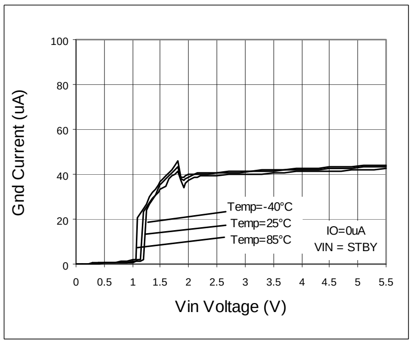


Fig. 36 Circuit Current IGND

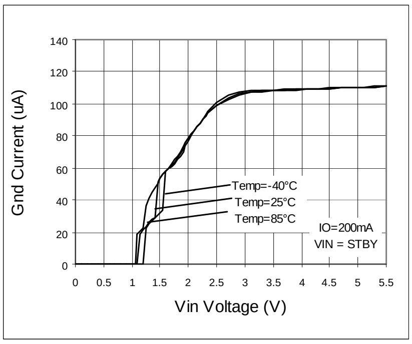


Fig. 37 Circuit Current IGND

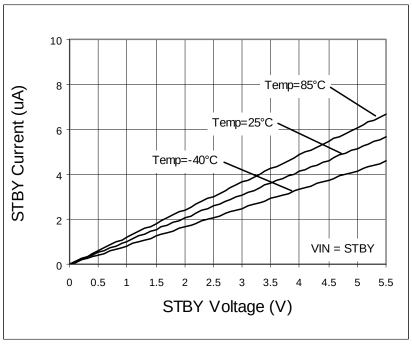


Fig. 38 STBY Input Current

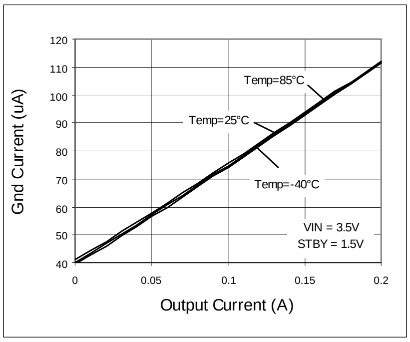


Fig. 39 IOUT - IGND

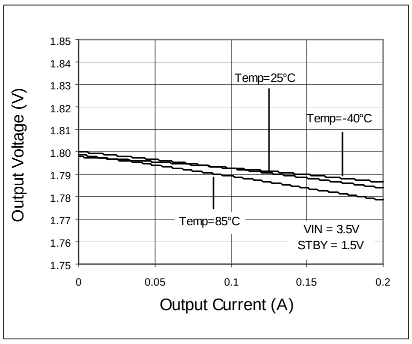


Fig. 40 Load Regulation

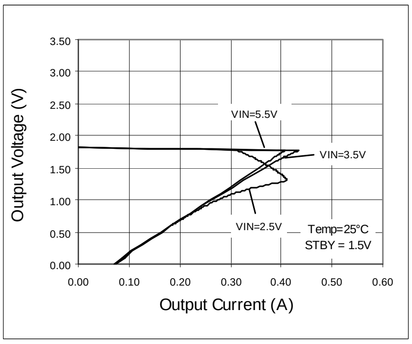


Fig. 41 OCP Threshold

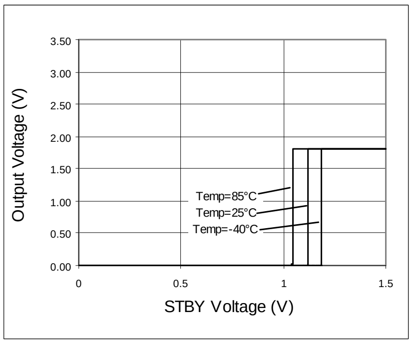


Fig. 42 STBY Threshold

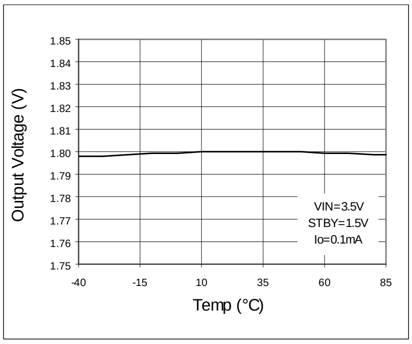


Fig. 43 VOUT vs Temp

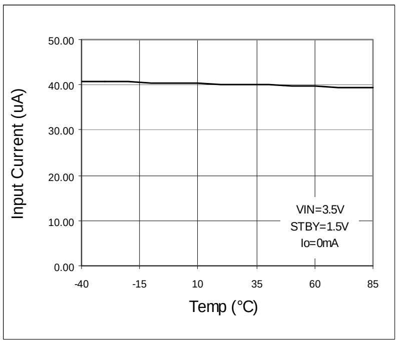


Fig. 44 IGND vs Temp

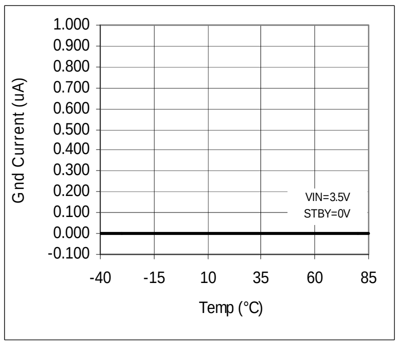


Fig. 45 IGND vs Temp (STBY)

●Reference data　BU18TA2WNVX / HFV　(Unless otherwise specified, Ta=25℃)

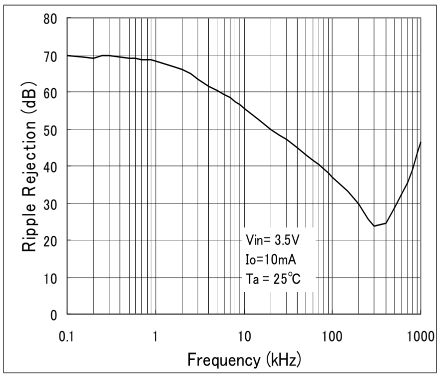


Fig. 46 Ripple Rejection VS Freq.

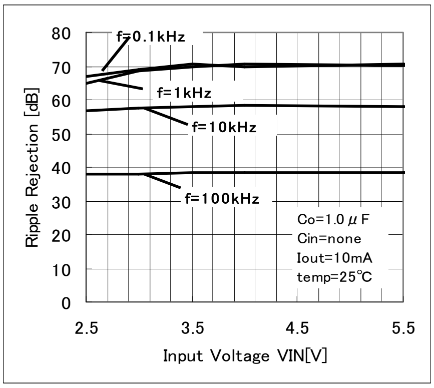


Fig. 47 Ripple Rejection VS VIN

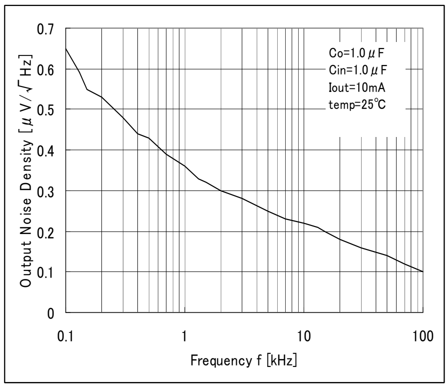


Fig. 48 Output Noise Spectrl Density VS Freq.

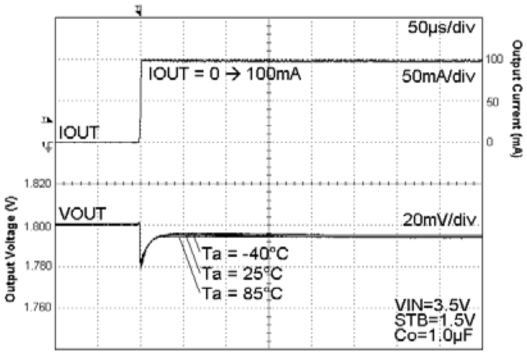


Fig. 49 Load Response

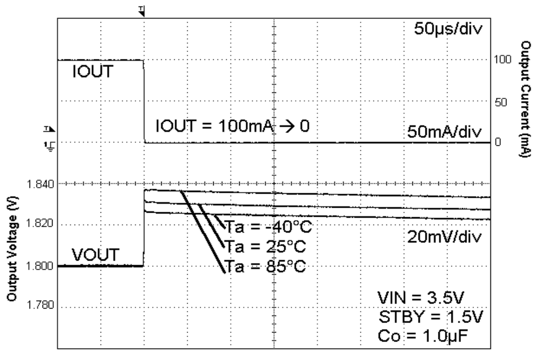


Fig. 50 Load Response

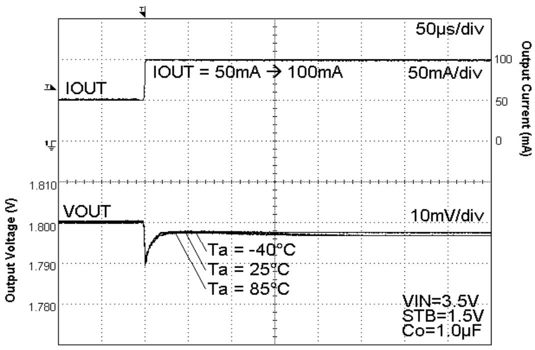


Fig. 51 Load Response

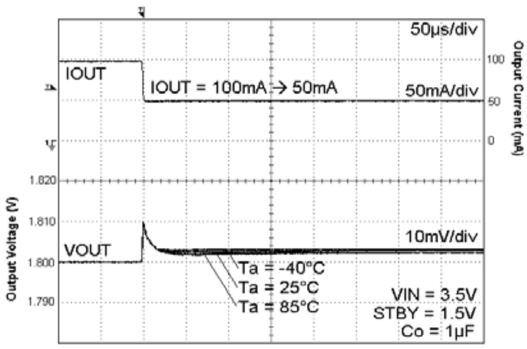


Fig. 52 Load Response

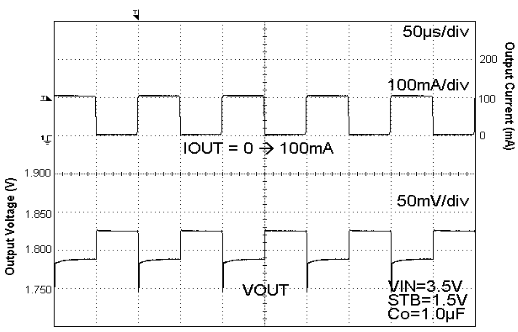


Fig. 53 Load Response
Current Pulse=10kHz

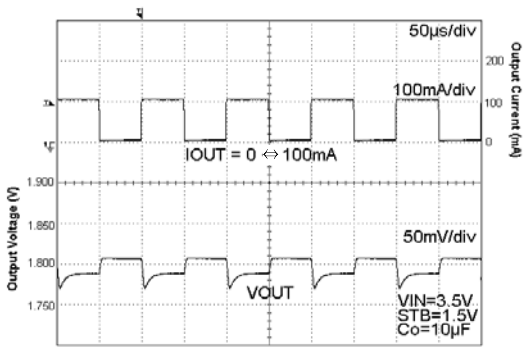


Fig. 54 Load Response
Current Pulse=10kHz

●Reference data BU18TA2WNVX / HFV (Unless otherwise specified, Ta=25℃)

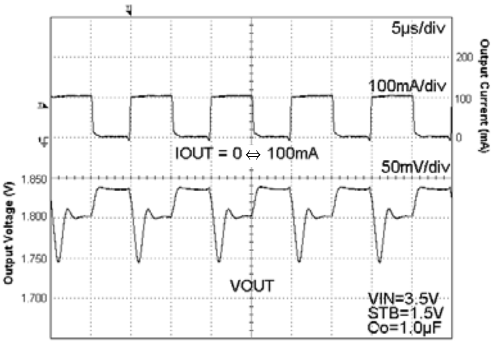


Fig. 55 Load Response
Current Pulse=100kHz

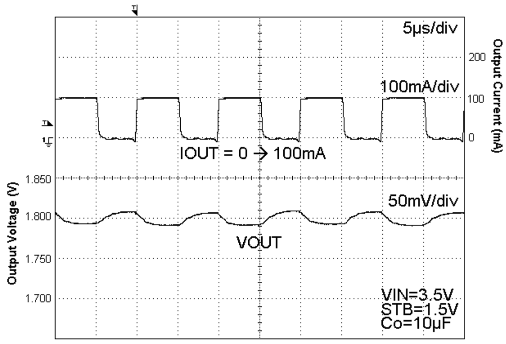


Fig. 56 Load Response
Current Pulse=100kHz

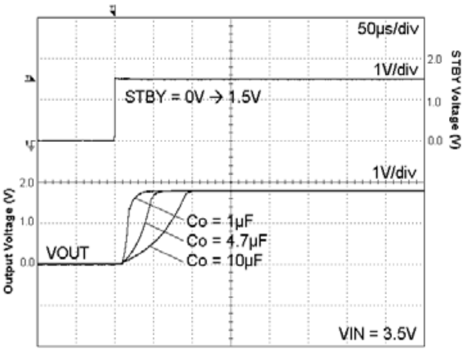


Fig. 57 Start Up Time
Iout = 0mA

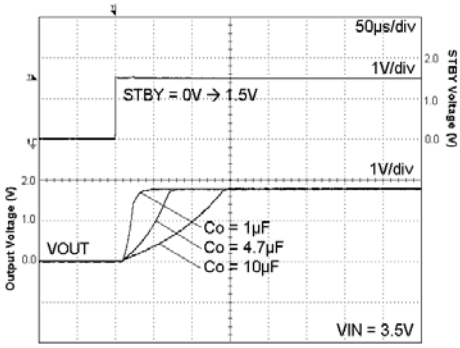


Fig. 58 Start Up Time
Iout = 200mA

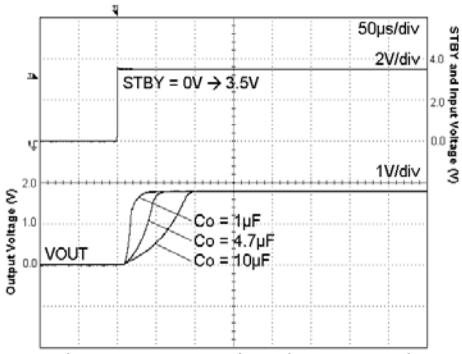


Fig. 59 Start Up Time (STBY=VIN)
Iout = 0mA

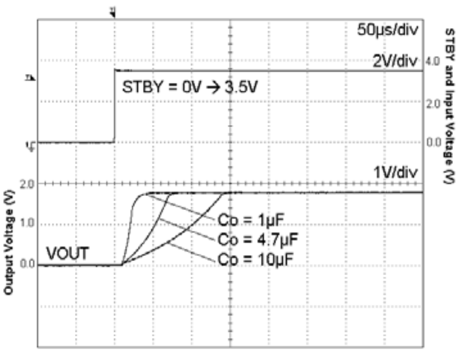


Fig. 60 Start Up Time(STBY=VIN)
Iout = 200mA

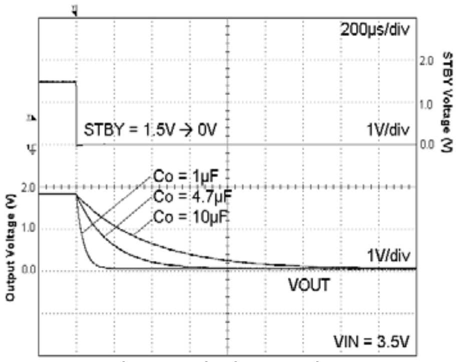


Fig. 61 Discharge Time
Iout = 0mA

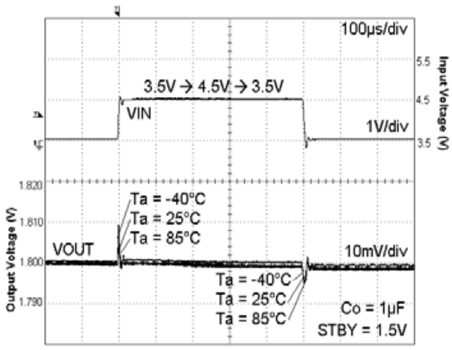


Fig. 62 VIN Response
Iout = 10mA

●Reference data BU25TA2WNVX / HFV (Unless otherwise specified, Ta=25℃)

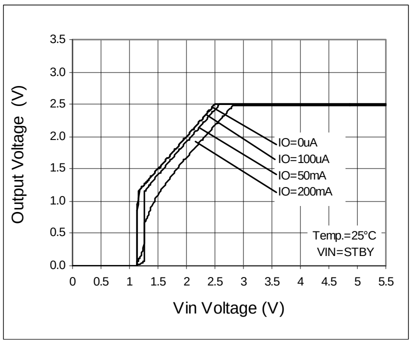


Fig. 63 Output Voltage

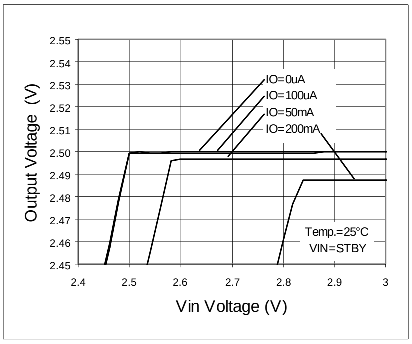


Fig. 64 Line Regulation

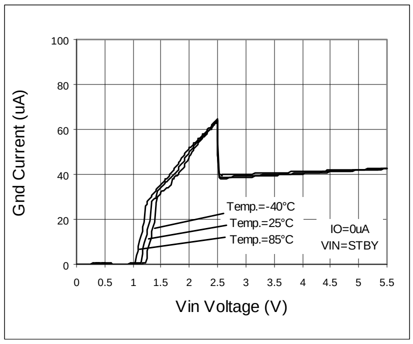


Fig. 65 Circuit Current IGND

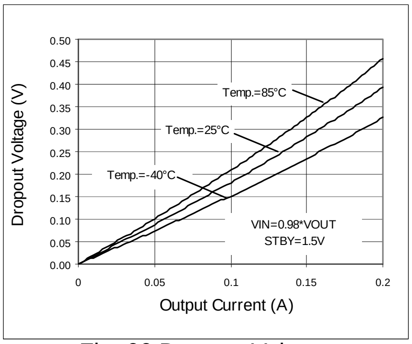


Fig. 66 Dropout Voltage

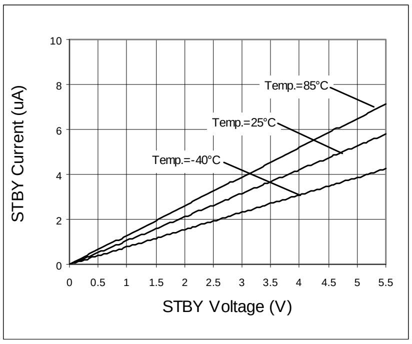


Fig. 67 STBY Input Current

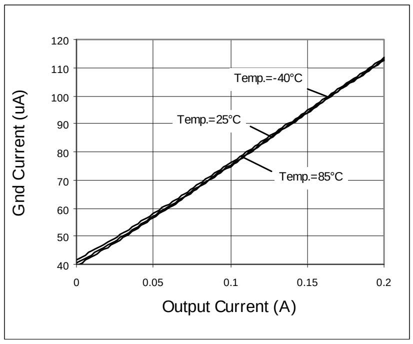


Fig. 68 IOUT - IGND

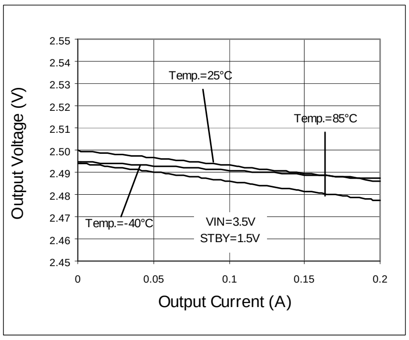


Fig. 69 Load Regulation

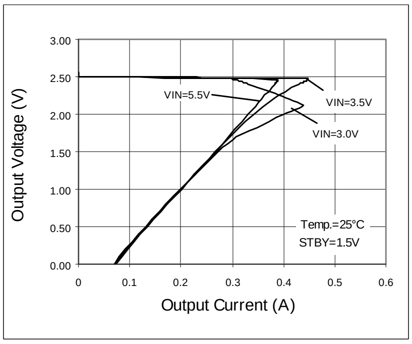


Fig. 70 OCP Threshold

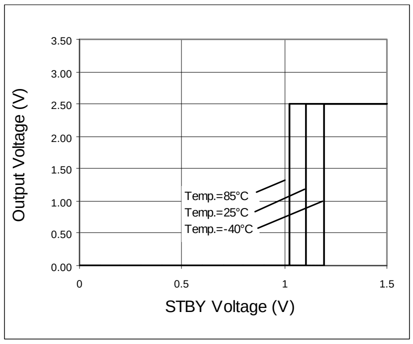


Fig. 71 STBY Threshold

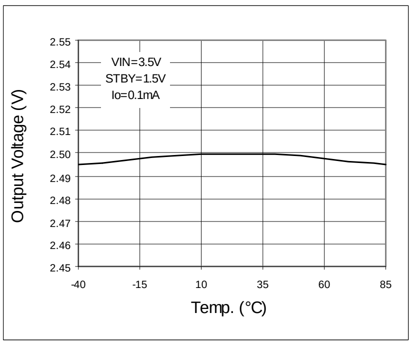


Fig. 72 VOUT vs Temp

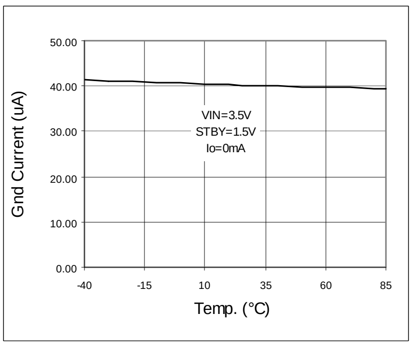


Fig. 73 IGND vs Temp

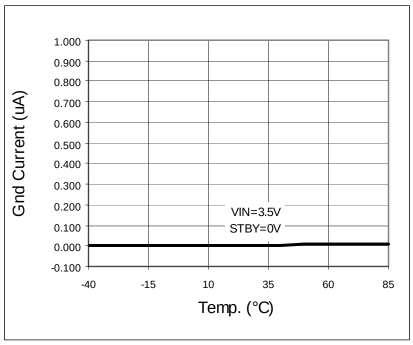


Fig. 74 IGND vs Temp (STBY)

●Reference data BU25TA2WNVX / HFV (Unless otherwise specified, Ta=25℃)

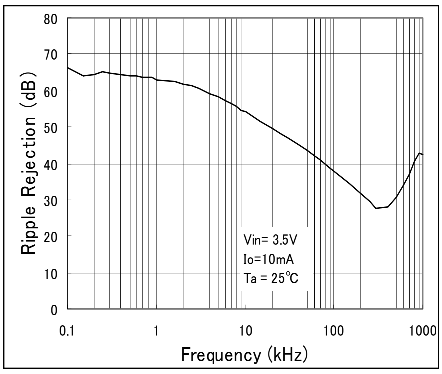


Fig. 75 Ripple Rejection VS Freq.

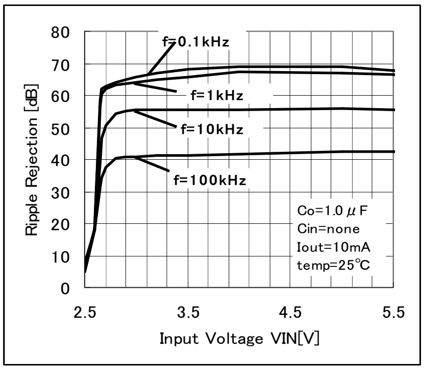


Fig. 76 Ripple Rejection VS VIN

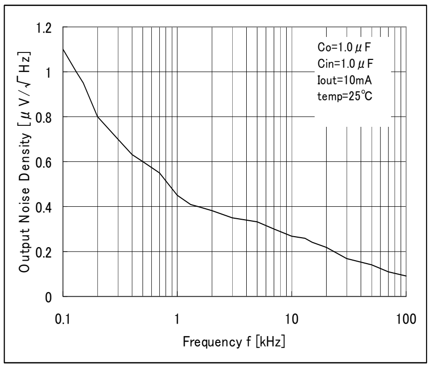


Fig. 77 Output Noise Spectrl Density VS Freq.

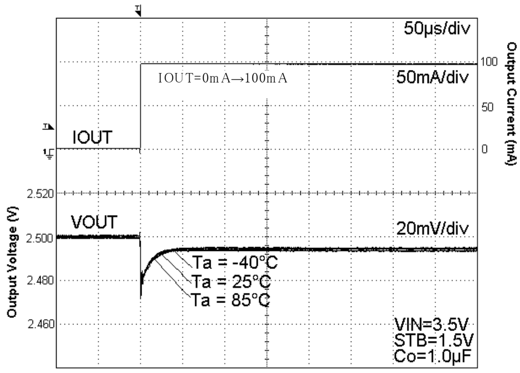


Fig. 78 Load Response

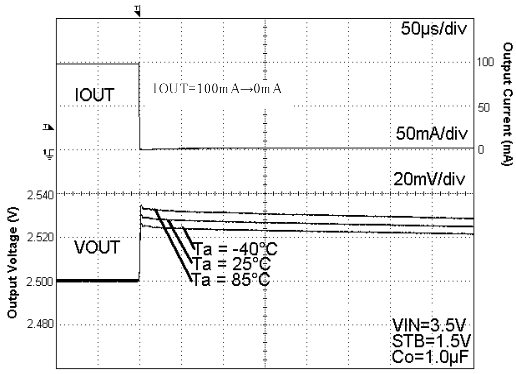


Fig. 79 Load Response

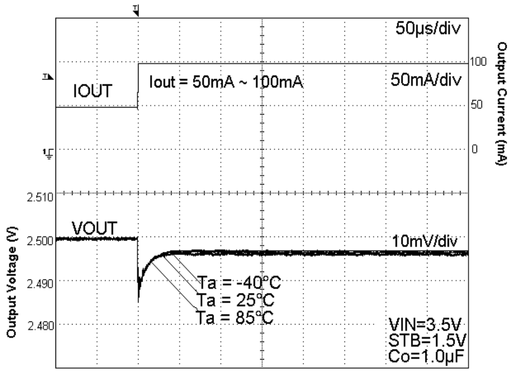


Fig. 80 Load Response

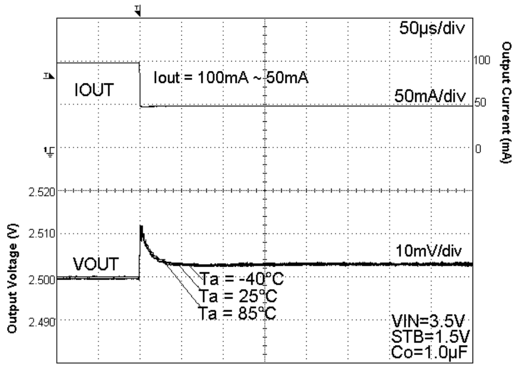


Fig. 81 Load Response

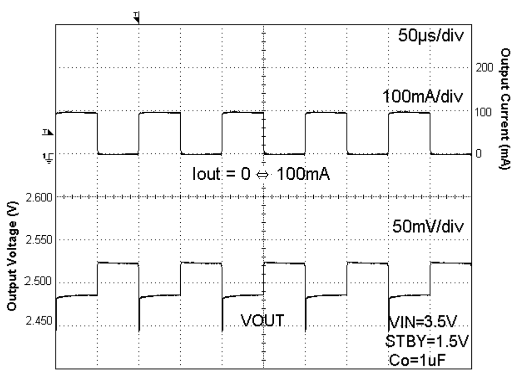


Fig. 82 Load Response Current Pulse=10kHz

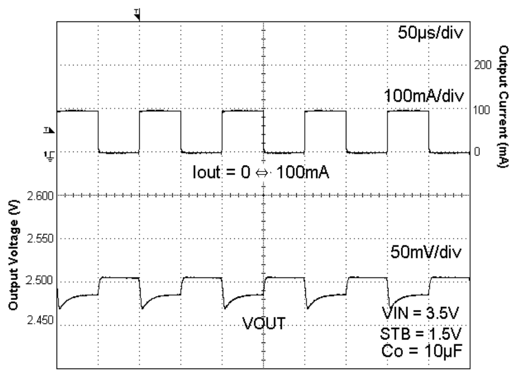


Fig. 83 Load Response Current Pulse=10kHz

●Reference data BU25TA2WNVX / HFV (Unless otherwise specified, Ta=25℃)

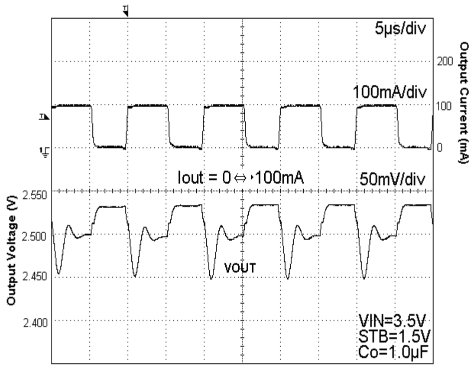


Fig. 84 Load Response
Current Pulse=100kHz

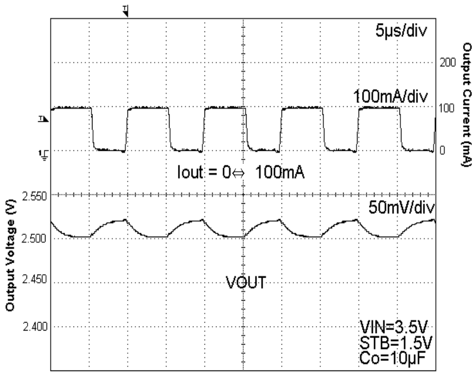


Fig. 85 Load Response
Current Pulse=100kHz

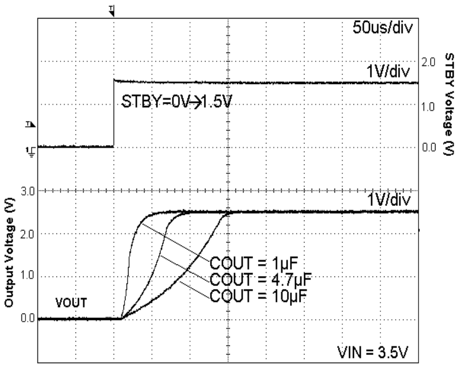


Fig. 86 Start Up Time
Iout = 0mA

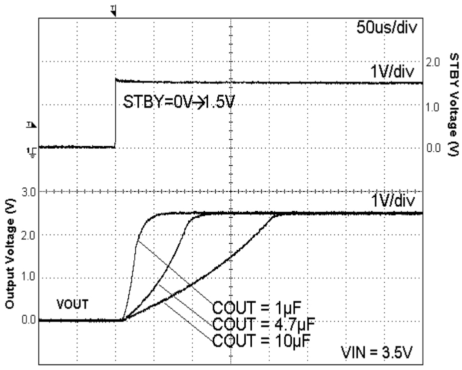


Fig. 87 Start Up Time
Iout = 200mA

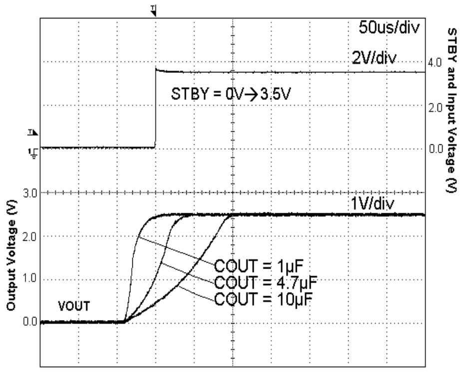


Fig. 88 Start Up Time (STBY=VIN)
Iout = 0mA

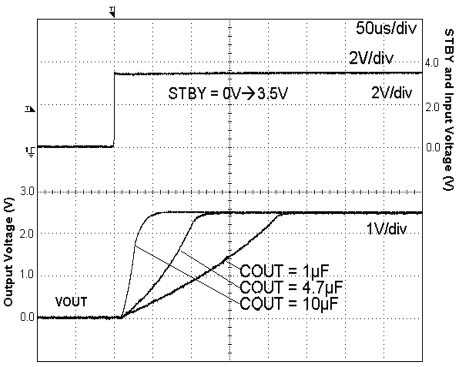


Fig. 89 Start Up Time(STBY=VIN)
Iout = 200mA

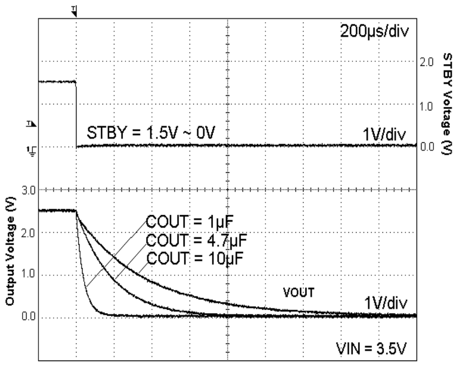


Fig. 90 Discharge Time
Iout = 0mA

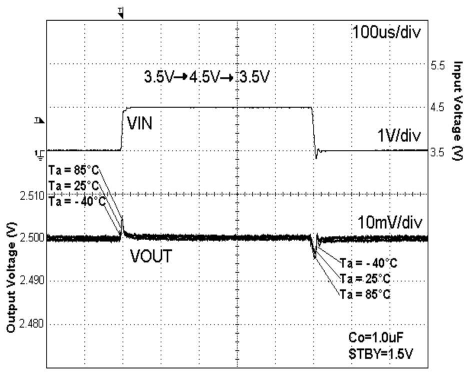


Fig. 91 VIN Response
Iout = 10mA

●Reference data BU28TA2WNVX / HFV (Unless otherwise specified, Ta=25℃)

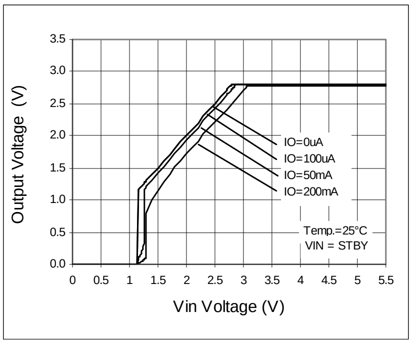


Fig. 92 Output Voltage

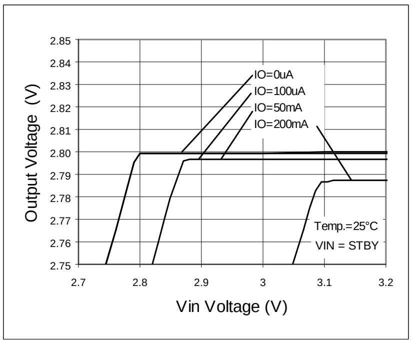


Fig. 93 Line Regulation

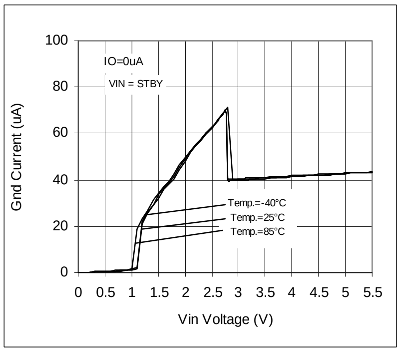


Fig. 94 Circuit Current IGND

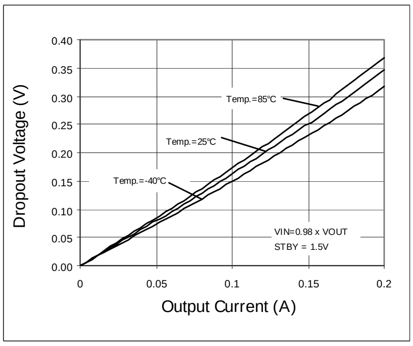


Fig. 95 Dropout Voltage

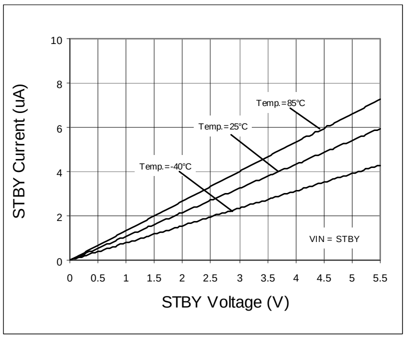


Fig. 96 STBY Input Current

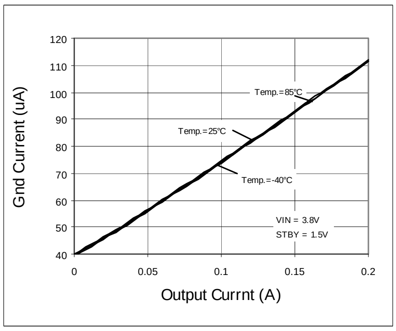


Fig. 97 IOUT - IGND

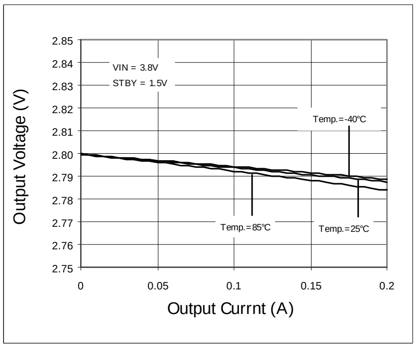


Fig. 98 Load Regulation

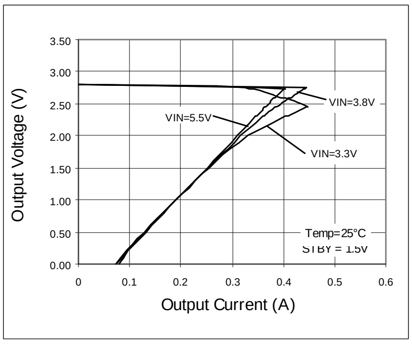


Fig. 99 OCP Threshold

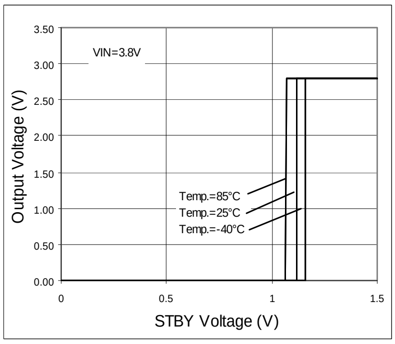


Fig. 100 STBY Threshold

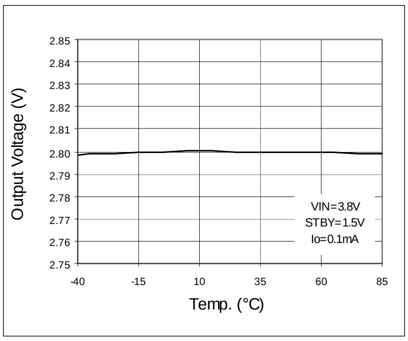


Fig. 101 VOUT vs Temp

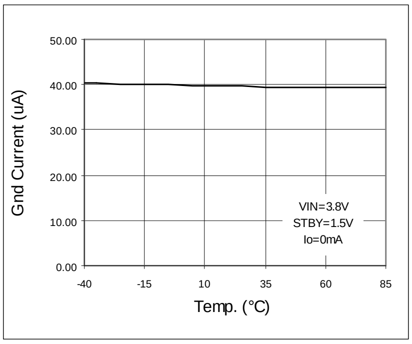


Fig. 102 IGND vs Temp

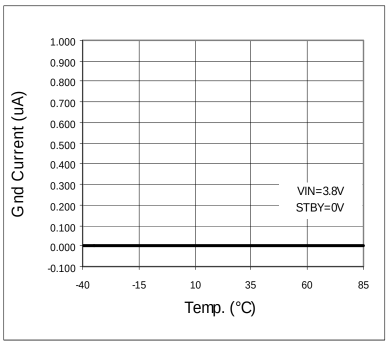


Fig. 103 IGND vs Temp (STBY)

●Reference data BU28TA2WNVX / HFV (Unless otherwise specified, Ta=25℃)

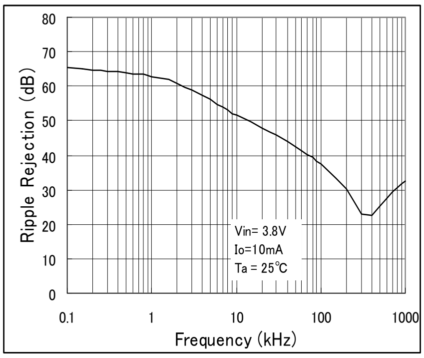


Fig. 104 Ripple Rejection VS Freq.

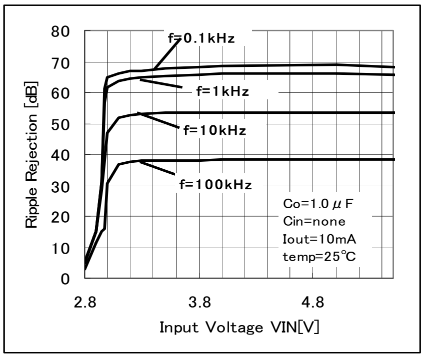


Fig. 105 Ripple Rejection VS VIN

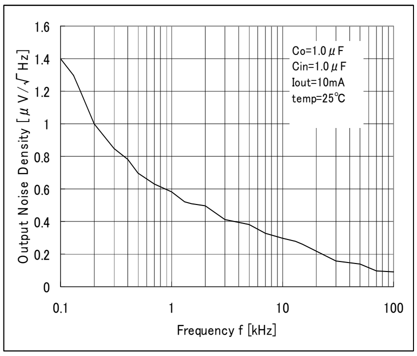


Fig. 106 Output Noise Spectrl Density VS Freq.

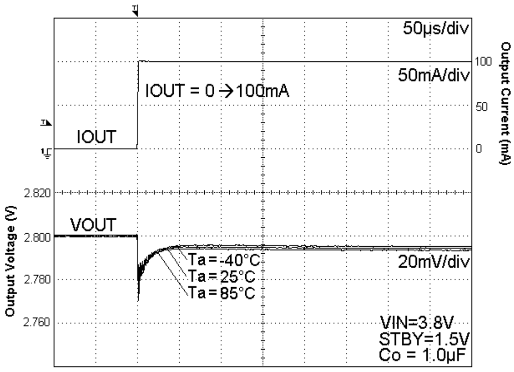


Fig. 107 Load Response

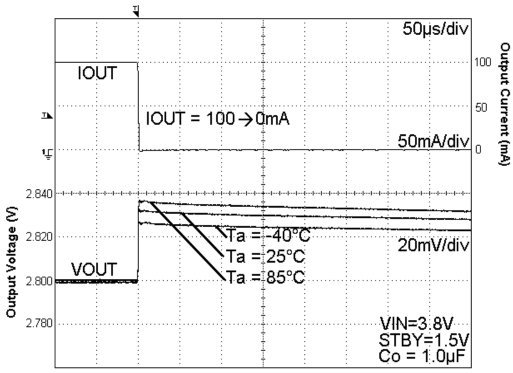


Fig. 108 Load Response

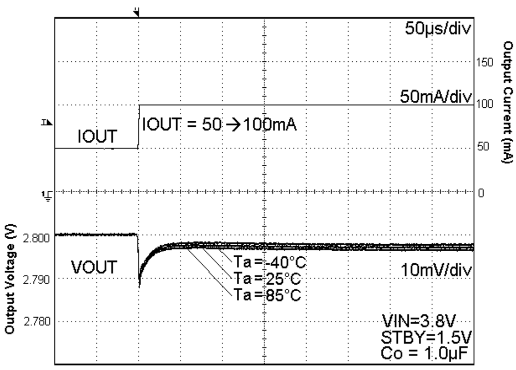


Fig.109 Load Response

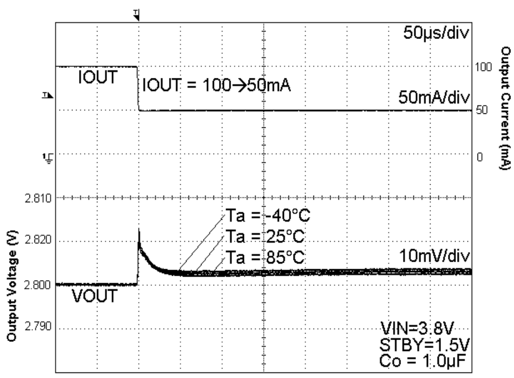


Fig. 110 Load Response

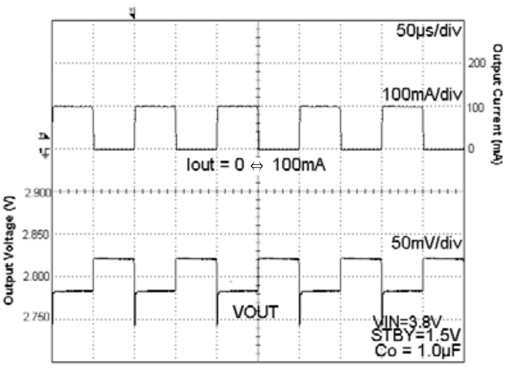


Fig. 111 Load Response
Current Pulse=10kHz

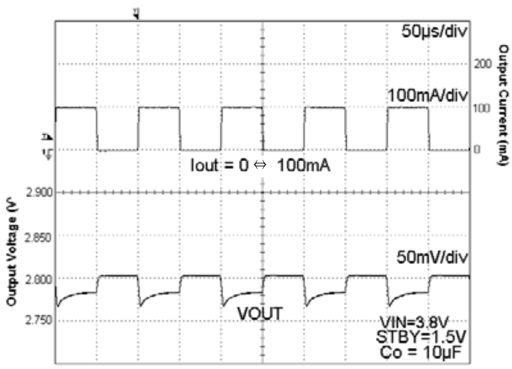


Fig. 112 Load Response
Current Pulse=10kHz

●Reference data BU28TA2WNVX / HFV (Unless otherwise specified, Ta=25℃)

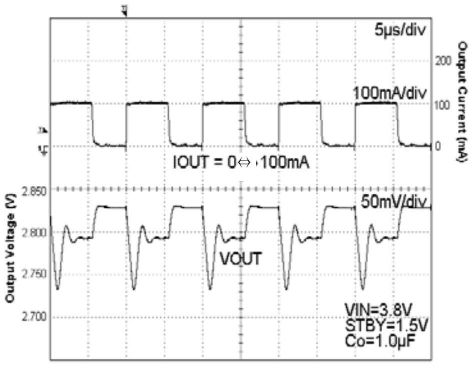


Fig. 113 Load Response
Current Pulse=100kHz

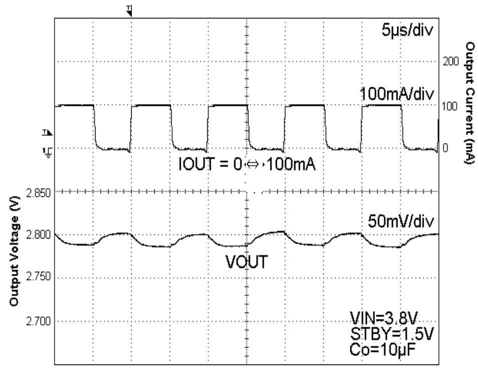


Fig. 114 Load Response
Current Pulse=100kHz

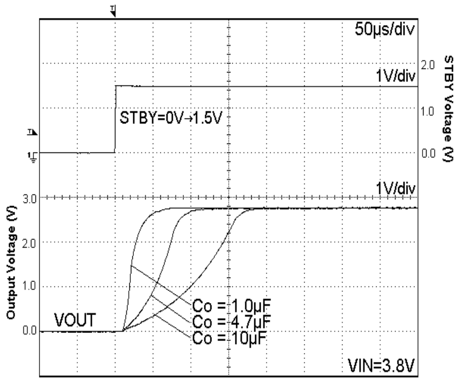


Fig. 115 Start Up Time
Iout = 0mA

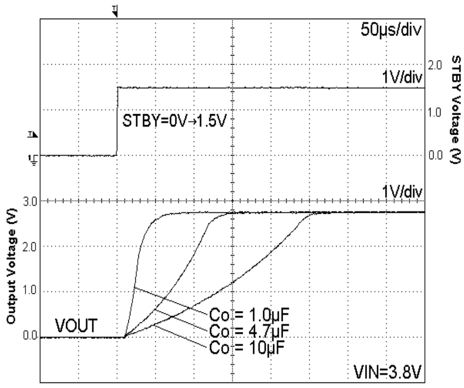


Fig. 116 Start Up Time
Iout = 200mA

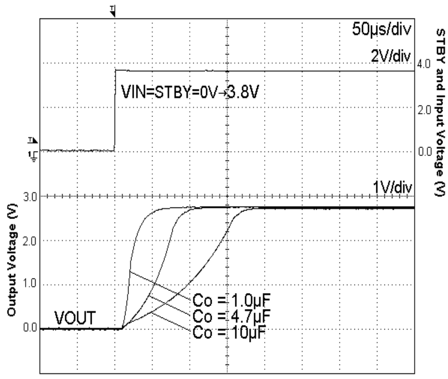


Fig. 117 Start Up Time (STBY=VIN)
Iout = 0mA

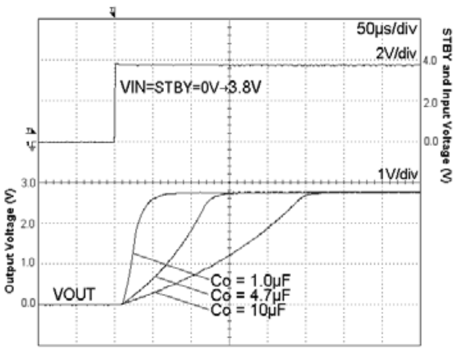


Fig. 118 Start Up Time(STBY=VIN)
Iout = 200mA

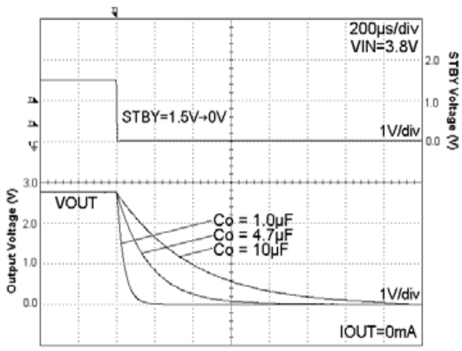


Fig. 119 Discharge Time
Iout = 0mA

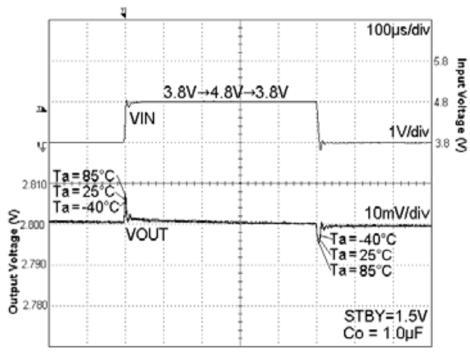


Fig.120 VIN Response
Iout = 10mA

●Reference data　BU30TA2WNVX / HFV　(Unless otherwise specified, Ta=25℃)

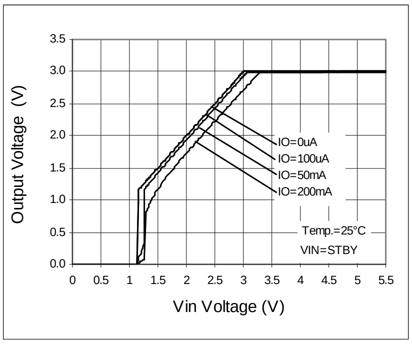


Fig. 121 Output Voltage

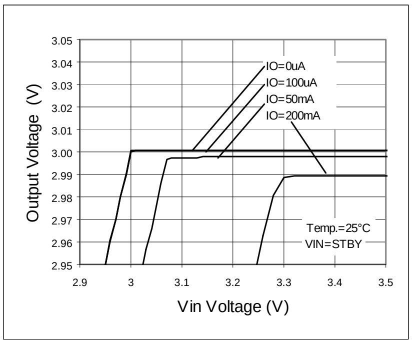


Fig. 122 Line Regulation

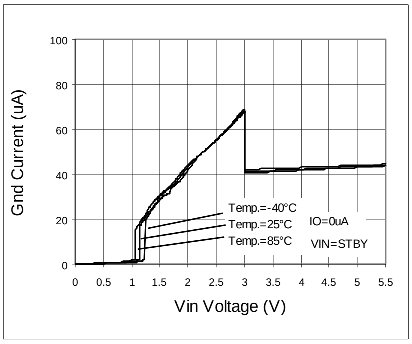


Fig. 123 Circuit Current IGND

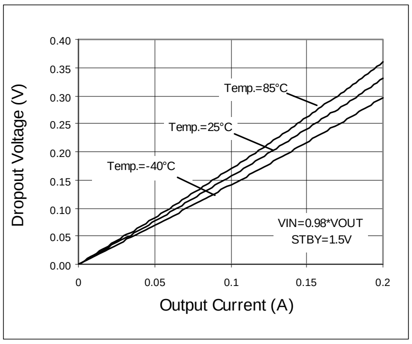


Fig. 124 Dropout Voltage

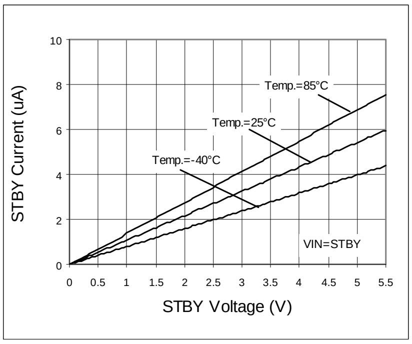


Fig. 125 STBY Input Current

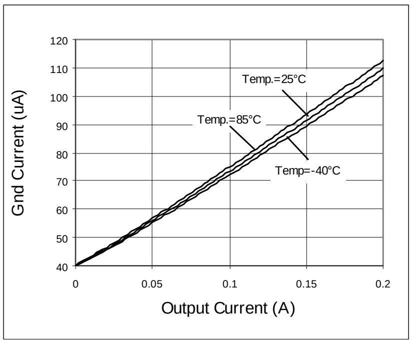


Fig. 126 IOUT - IGND

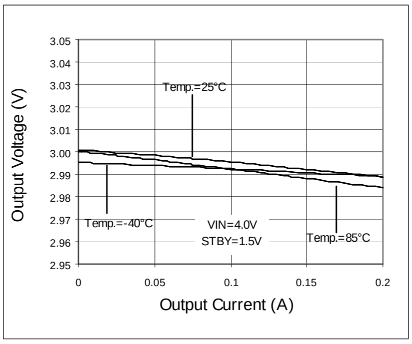


Fig. 127 Load Regulation

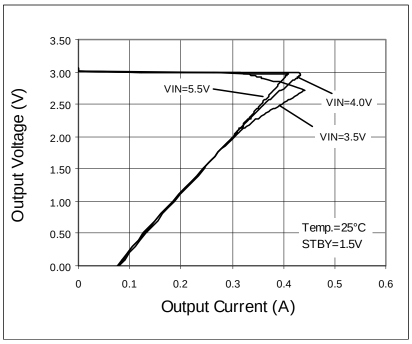


Fig.128 OCP Threshold

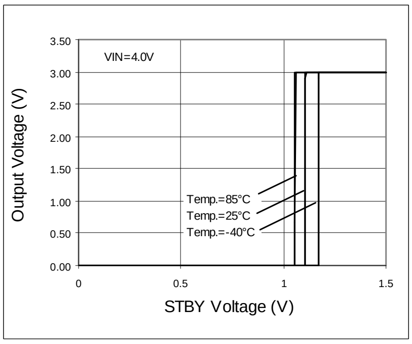


Fig. 129 STBY Threshold

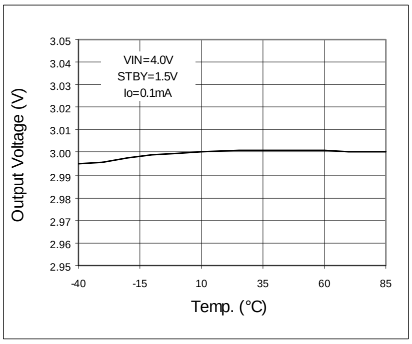


Fig. 130 VOUT vs Temp

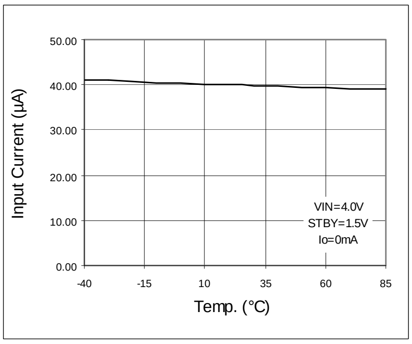


Fig. 131 IGND vs Temp

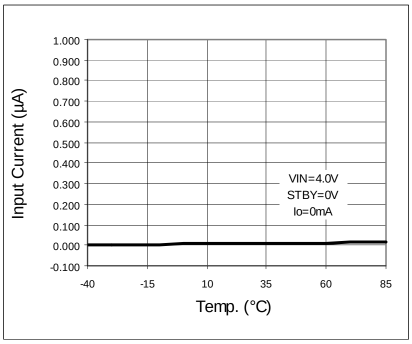


Fig. 132 IGND vs Temp (STBY)

●Reference data BU30TA2WNVX / HFV (Unless otherwise specified, Ta=25℃)

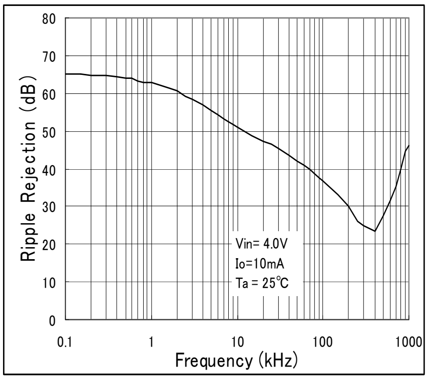


Fig. 133 Ripple Rejection VS Freq.

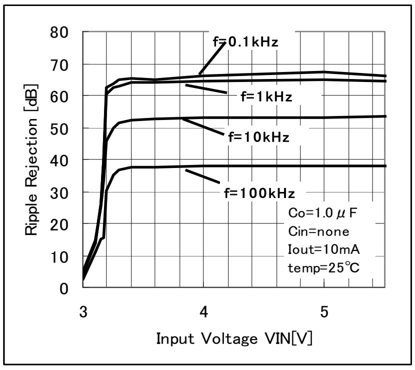


Fig. 134 Ripple Rejection VS VIN

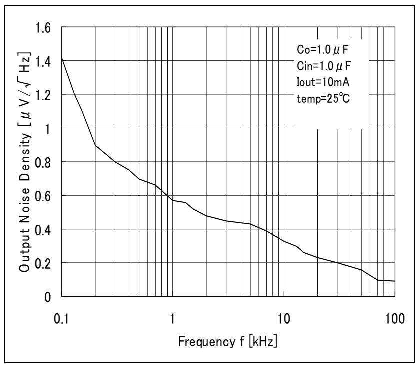


Fig. 135 Output Noise Spectrl Density VS Freq.

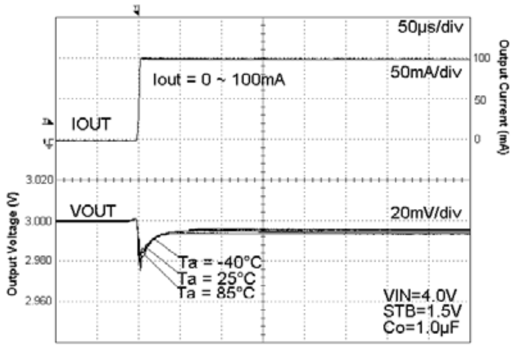


Fig. 136 Load Response

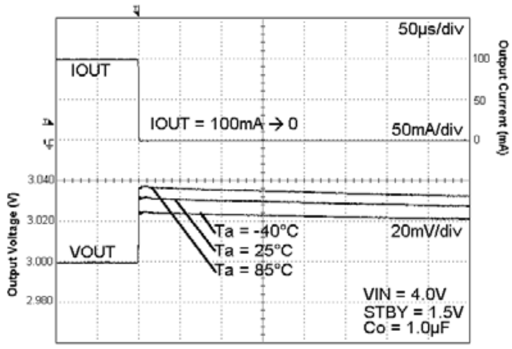


Fig. 137 Load Response

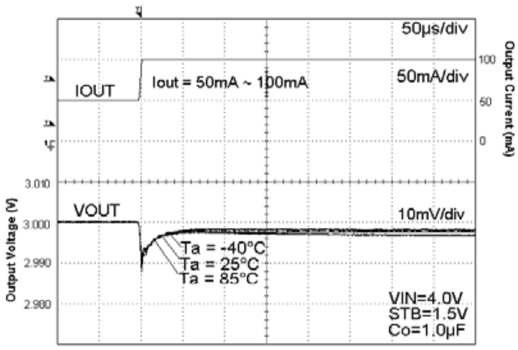


Fig. 138 Load Response

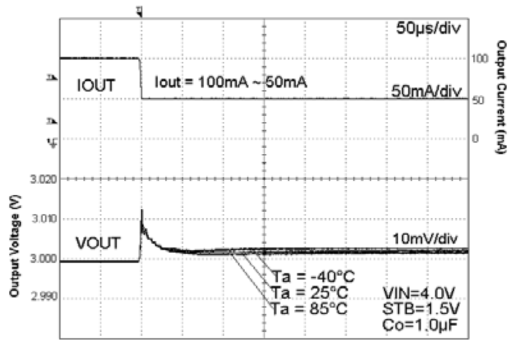


Fig. 139 Load Response

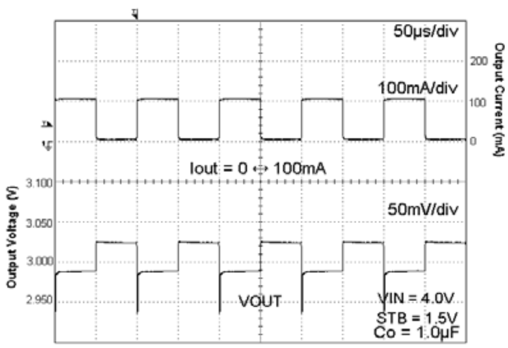


Fig. 140 Load Response
Current Pulse=10kHz

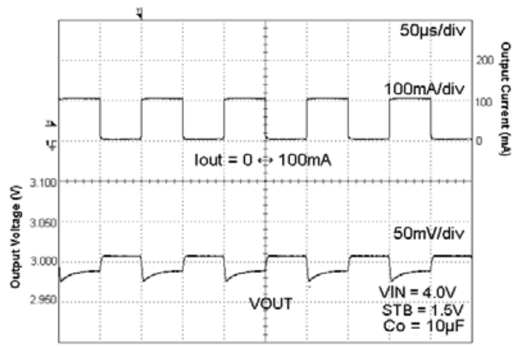


Fig. 141 Load Response
Current Pulse=10kHz

●Reference data BU30TA2WNVX / HFV (Unless otherwise specified, Ta=25℃)

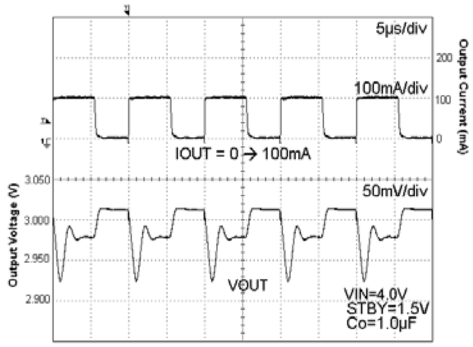


Fig. 142 Load Response
Current Pulse=100kHz

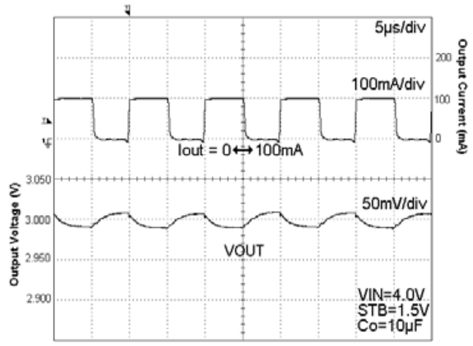


Fig. 143 Load Response
Current Pulse=100kHz

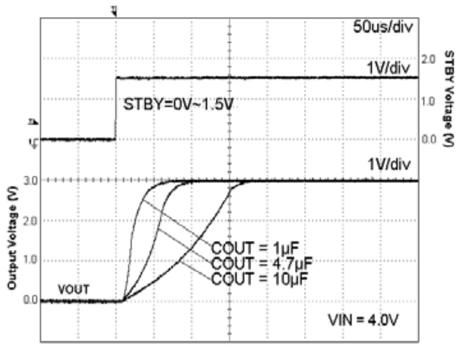


Fig. 144 Start Up Time
Iout = 0mA

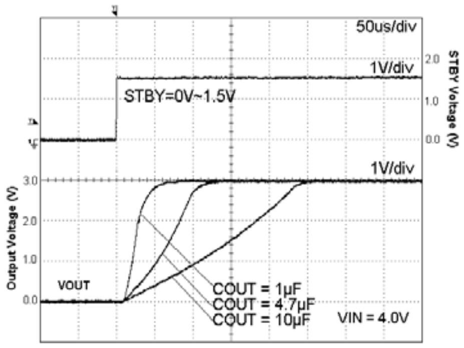


Fig. 145 Start Up Time
Iout = 200mA

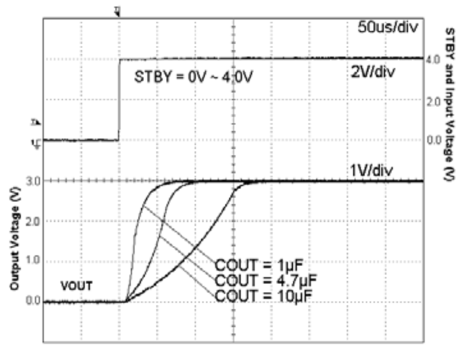


Fig. 146 Start Up Time (STBY=VIN)
Iout = 0mA

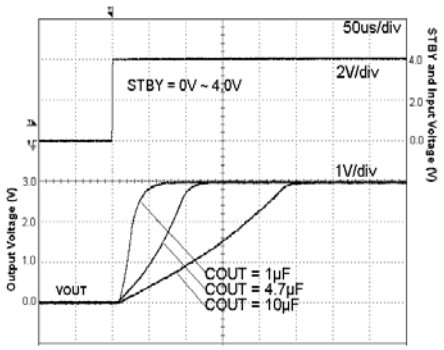


Fig. 147 Start Up Time(STBY=VIN)
Iout = 200mA

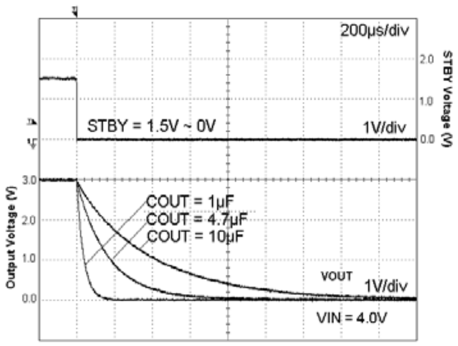


Fig. 148 Discharge Time
Iout = 0mA

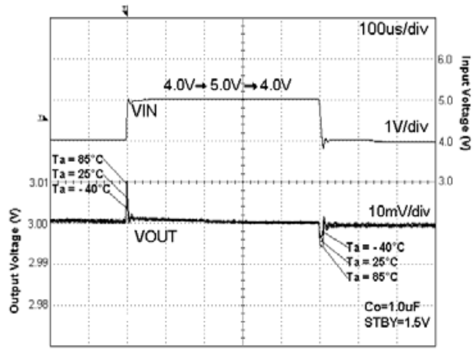


Fig. 149 VIN Response
Iout = 10mA

●Reference data　BU33TA2WNVX / HFV　(Unless otherwise specified, Ta=25℃)

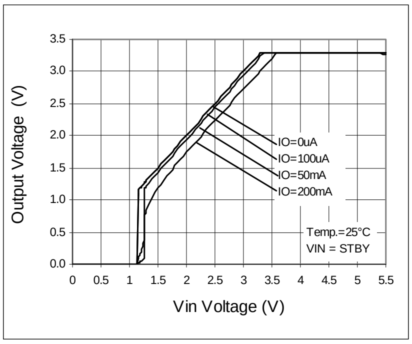


Fig. 150 Output Voltage

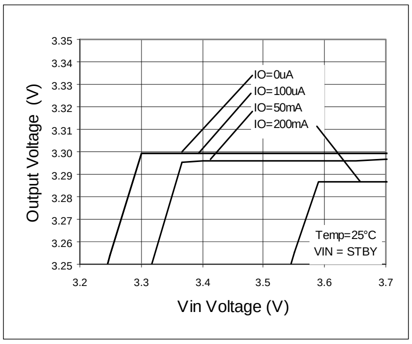


Fig. 151 Line Regulation

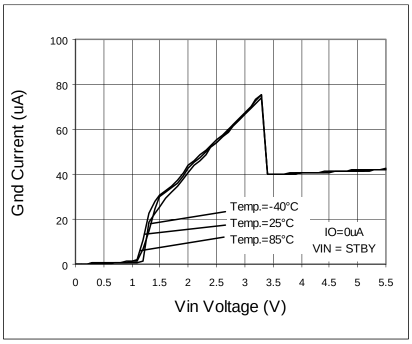


Fig. 152 Circuit Current IGND

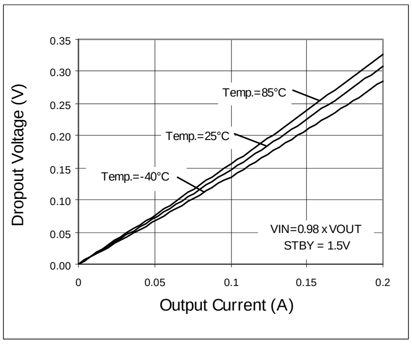


Fig. 153 Dropout Voltage

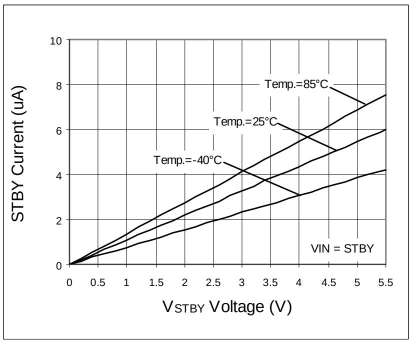


Fig. 154 STBY Input Current

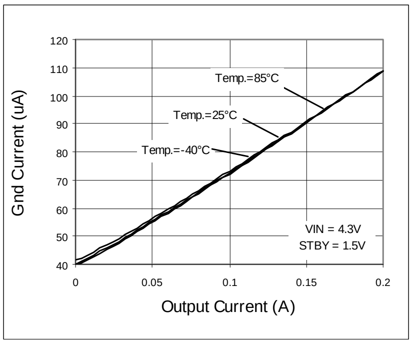


Fig. 155 IOUT - IGND

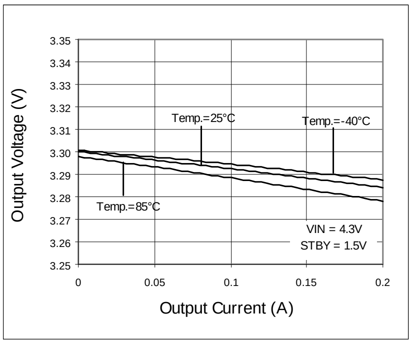


Fig. 156 Load Regulation

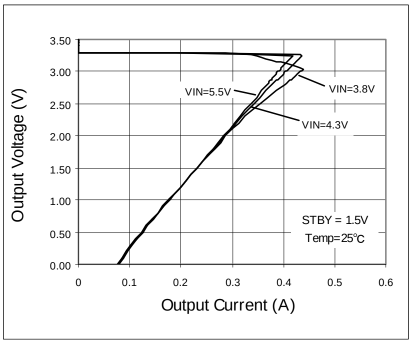


Fig. 157 OCP Threshold

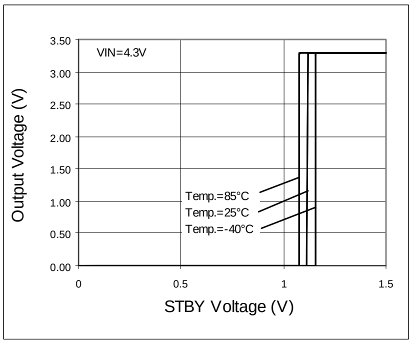


Fig. 158 STBY Threshold

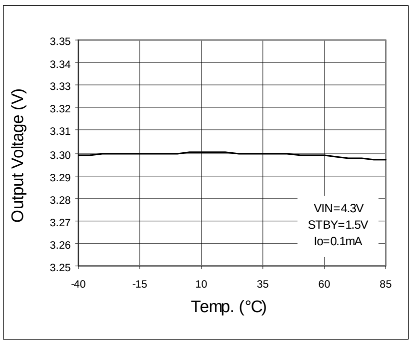


Fig. 159 VOUT vs Temp

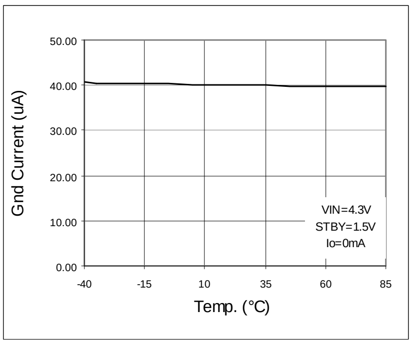


Fig. 160 IGND vs Temp

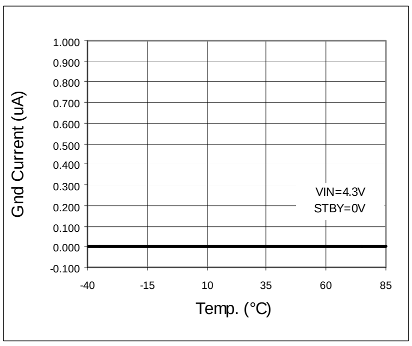


Fig. 161 IGND vs Temp (STBY)

●Reference data BU33TA2WNVX / HFV (Unless otherwise specified, Ta=25℃)

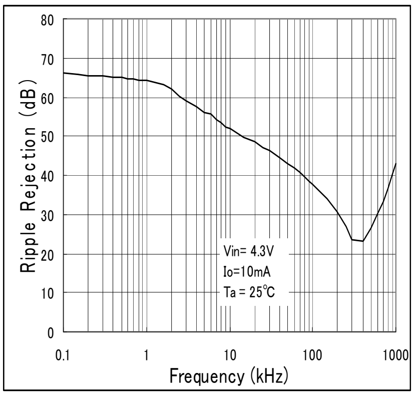


Fig. 162 Ripple Rejection VS Freq.

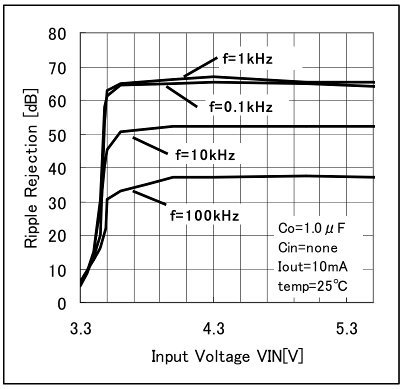


Fig. 163 Ripple Rejection VS VIN

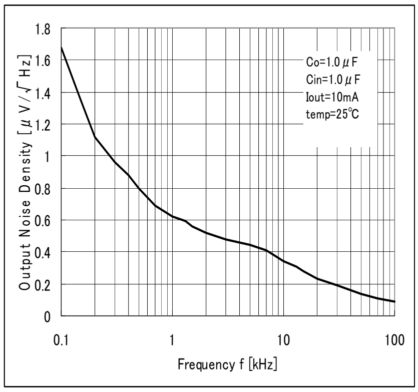


Fig. 164 Output Noise Spectrl Density VS Freq.

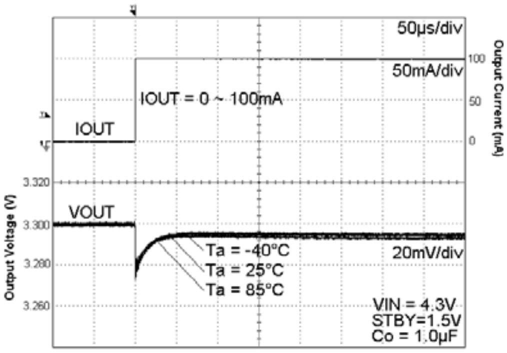


Fig. 165 Load Response

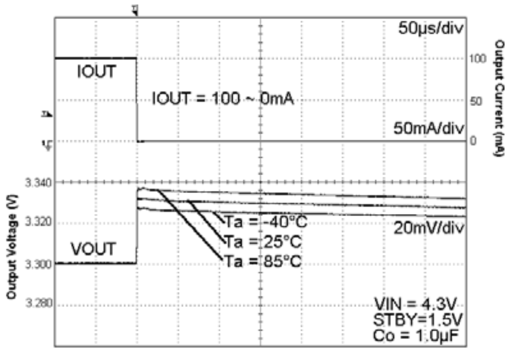


Fig. 166 Load Response

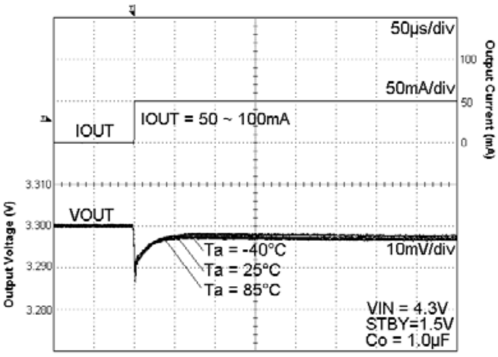


Fig. 167 Load Response

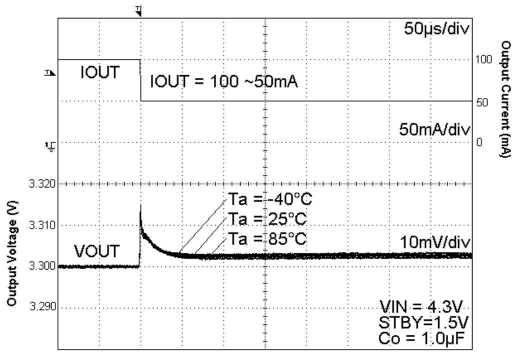


Fig. 168 Load Response

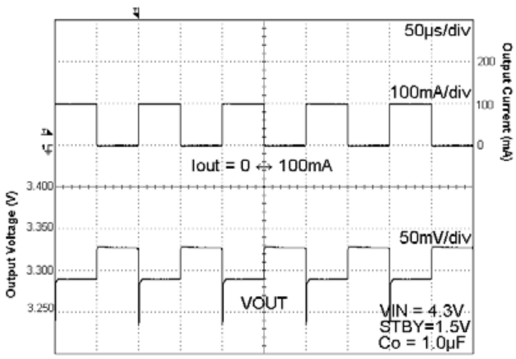


Fig. 169 Load Response
Current Pulse=10kHz

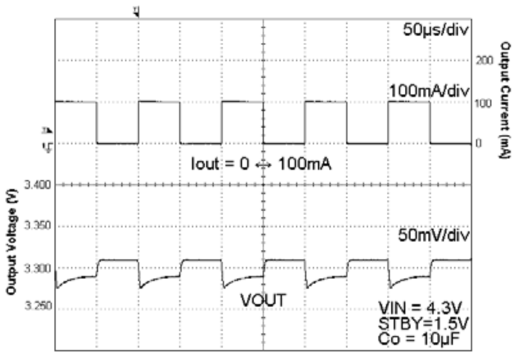


Fig. 170 Load Response
Current Pulse=10kHz

●Reference data BU33TA2WNVX / HFV (Unless otherwise specified, Ta=25℃)

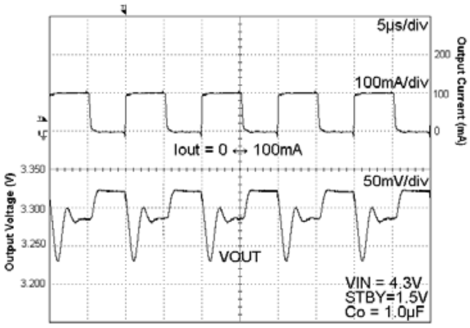


Fig. 171 Load Response
Current Pulse=100kHz

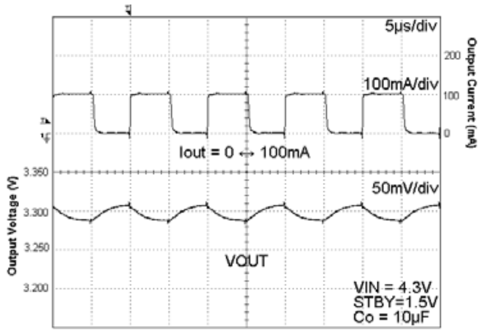


Fig. 172 Load Response
Current Pulse=100kHz

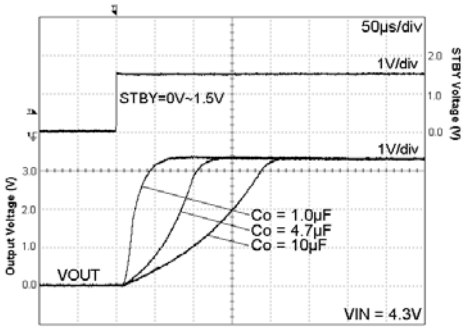


Fig. 173 Start Up Time
Iout = 0mA

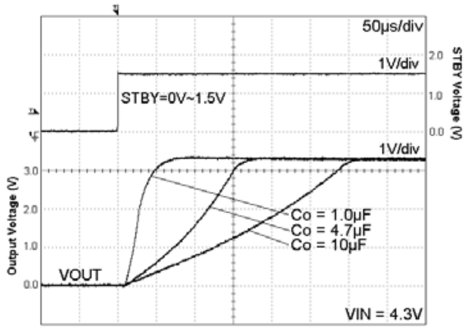


Fig. 174 Start Up Time
Iout = 200mA

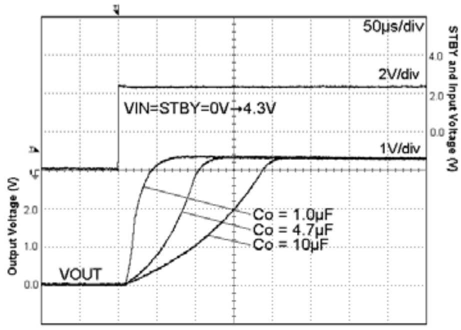


Fig. 175 Start Up Time (STBY=VIN)
Iout = 0mA

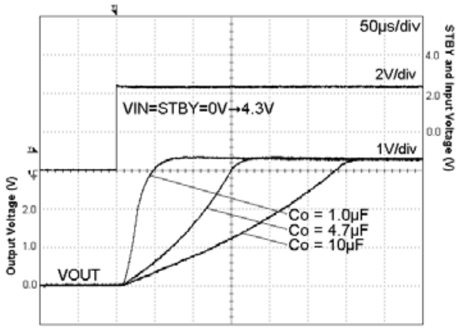


Fig. 176 Start Up Time(STBY=VIN)
Iout = 200mA

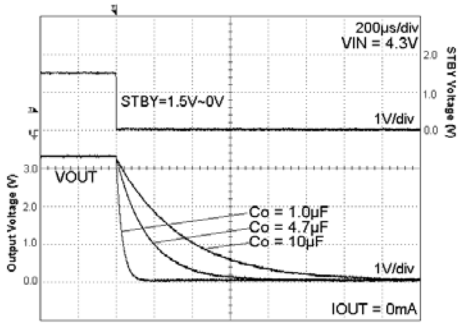


Fig. 177 Discharge Time
Iout = 0mA

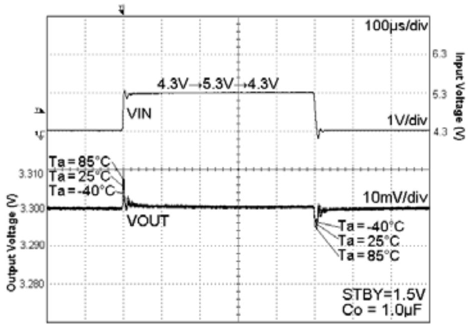


Fig. 178 VIN Response
Iout = 10mA

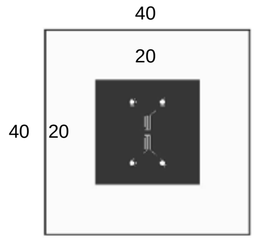
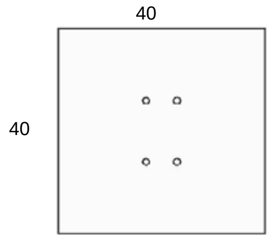
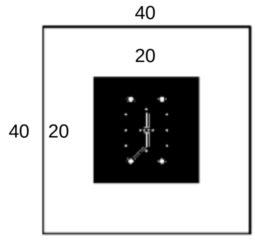
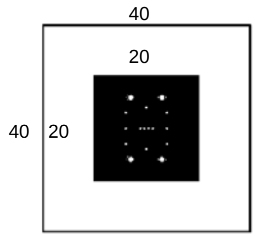
● About power dissipation (Pd)

As for power dissipation, an approximate estimate of the heat reduction characteristics and internal power consumption of IC are shown, so please use these for reference. Since power dissipation changes substantially depending on the implementation conditions (board size, board thickness, metal wiring rate, number of layers and through holes, etc.), it is recommended to measure Pd on a set board. Exceeding the power dissipation of IC may lead to deterioration of the original IC performance, such as causing operation of the thermal shutdown circuit or reduction in current capability. Therefore, be sure to prepare sufficient margin within power dissipation for usage.

Calculation of the maximum internal power consumption of IC (P_{MAX})

$P_{MAX}=(V_{IN}-V_{OUT})\times I_{OUT}(MAX.)$ (V_{IN}: Input voltage V_{OUT}: Output voltage $I_{OUT}(MAX)$: Maximum output current)

Measurement conditions

		Evaluation Board 1 (Single-side Board)	Evaluation Board 2 (Double-side Board)
Layout of Board for Measurement (Unit: mm) IC Implementation Position		 Top Layer (Top View)  Bottom Layer (Top View)	 Top Layer (Top View)  Bottom Layer (Top View)
Measurement State		With board implemented (Wind speed 0 m/s)	With board implemented (Wind speed 0 m/s)
Board Material		Glass epoxy resin (Single-side board)	Glass epoxy resin (Double-side board)
Board Size		40 mm x 40 mm x 0.8 mm	40 mm x 40 mm x 0.8 mm
Wiring Rate	Top layer	Metal (GND) wiring rate: Approx. 25%	Metal (GND) wiring rate: Approx. 25%
	Bottom layer	Metal (GND) wiring rate: Approx 0%	Metal (GND) wiring rate: Approx 25%
Through Hole		0 holes	Diameter 0.5 mm × 12 holes
Power Dissipation		1100 mW	1250 mW
Thermal Resistance		θja=91℃/W	θja=80℃/W

○SSON004X1216

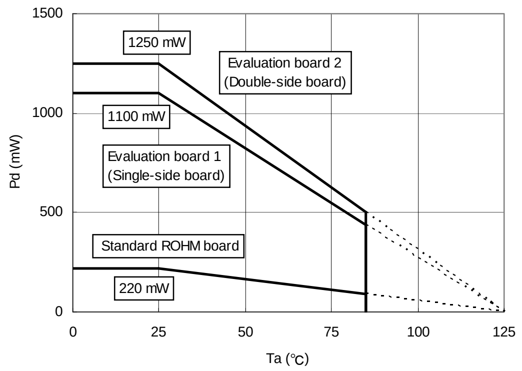


Fig.179 SSON004X1216
Power dissipation heat reduction characteristics
(Reference)

* Please design the margin so that PMAX becomes is than Pd (PMAX<Pd) within the usage temperature range.

- Standard ROHM board -
Size: 70 mm × 70 mm × 1.6 mm
Material: Glass epoxy board

○HVSOF5

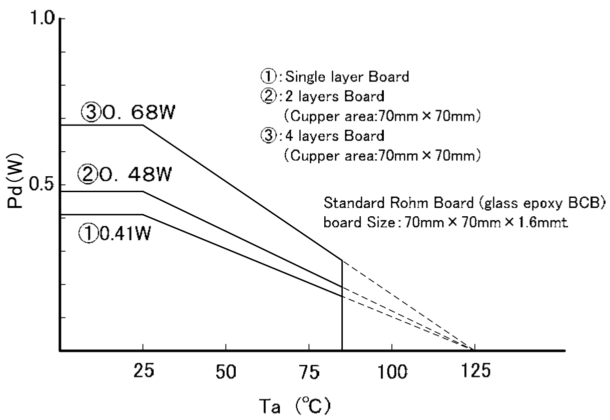


Fig.180 HVSOF5
Power dissipation heat reduction characteristics
(Reference)

* Please design the margin so that PMAX becomes is than Pd (PMAX<Pd) within the usage temperature range.

●DEVICE TYPE & Mark

○SSON004X1216

Device type : BUXXTA2WNVX

(a: XX)

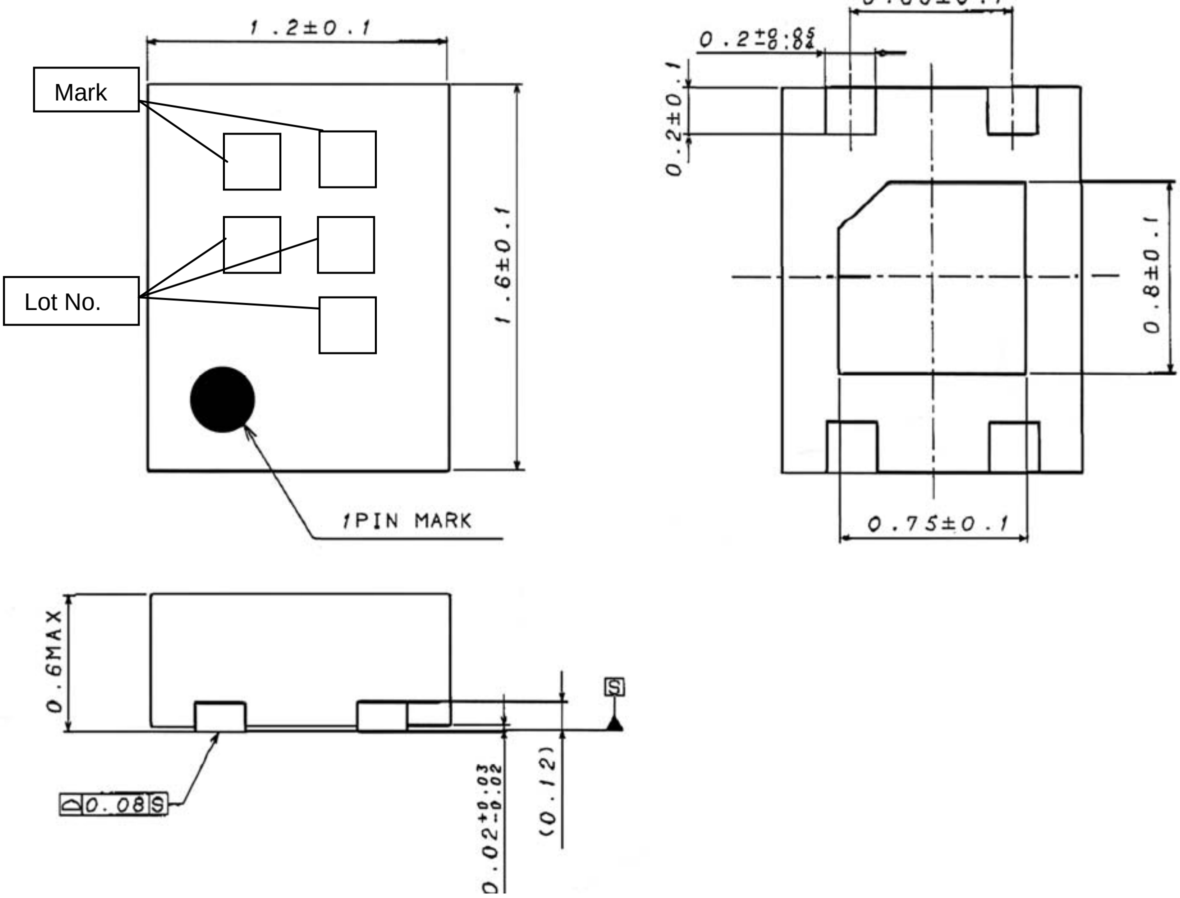
○HVSOF5

Device type : BUXXTA2WHFV

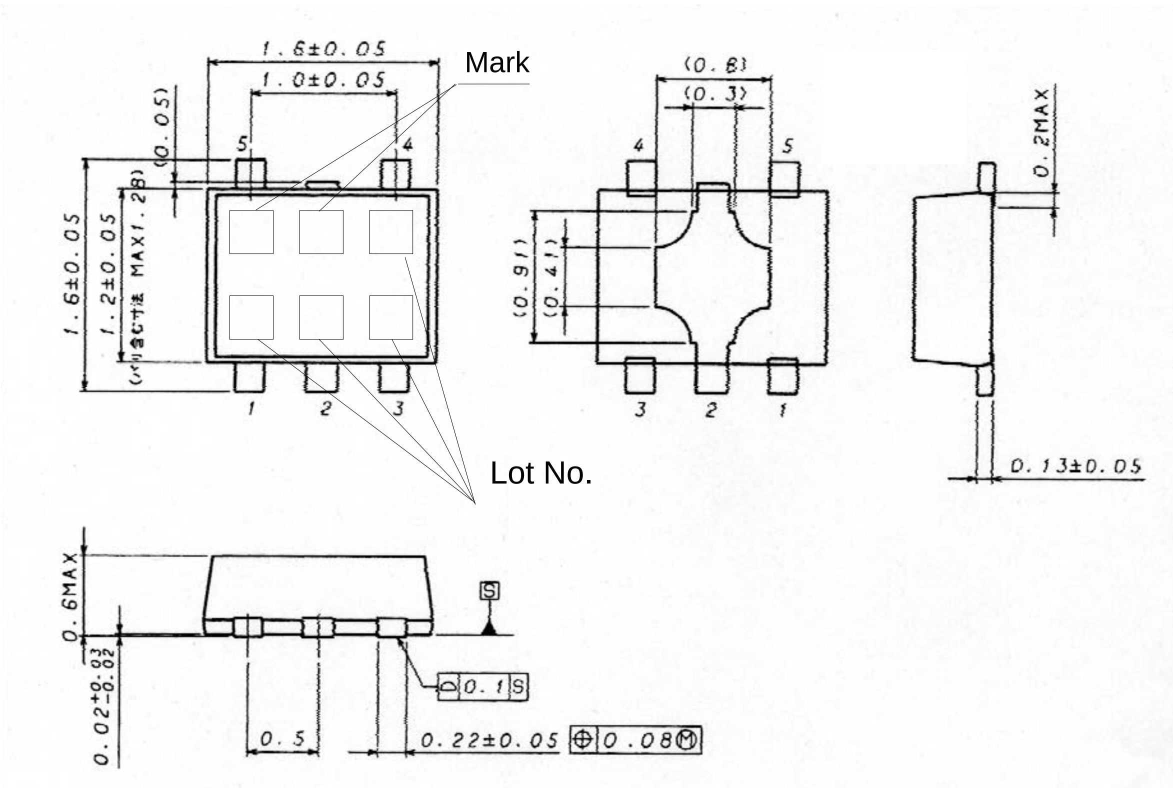
(a: XX)

	XX	output voltage	package	
			SSON004X1216	HVSOF5
a	15	1.5V typ.	AA	BA
	18	1.8V typ.	AB	BB
	25	2.5V typ.	AC	BD
	26	2.6V typ.	AD	BE
	27	2.7V typ.	AE	BF
	28	2.8V typ.	AF	BG
	2J	2.85V typ.	AG	BH
	29	2.9V typ.	AH	BJ
	30	3.0V typ.	AJ	BK
	31	3.1V typ.	AK	BL
	32	3.2V typ.	AL	BM
	33	3.3V typ.	AM	BN
	34	3.4V typ.	AN	BP

○SSON004X1216



○HVSOF5



●Notes for use

・About absolute maximum rating
Breakage may occur when absolute maximum ratings such as applied voltage and operating temperature range are exceeded. Short mode or open mode cannot be specified at occurrence of a break, so please prepare physical safety measures (e.g., fuse) if such special mode in which the absolute maximum rating is exceeded can be assumed.

・About GND potential
Please be sure that the potential of the GND terminal is the lowest in any operating condition.

・About thermal design
Please provide thermal design with sufficient margin, taking power dissipation (Pd) in actual usage conditions into consideration.

・About short between pins and misattachment
Please be careful regarding the IC direction and misalignment at attachment onto a printed circuit board. Misattachment may cause a break of IC. Short caused by foreign matter between outputs, output and power supply, or GNDs may also lead to a break.

・About operation in a strong electromagnetic field
Please note that usage in a strong electromagnetic field may cause malfunction.

・About common impedance
Please give due consideration to wiring of the power source and GND by reducing common-mode ripple or making ripple as small as possible (e.g., making the wiring as thick and short as possible, or reducing ripple by L·C), etc.

・About STBY terminal voltage
Set STBY terminal voltage to 0.3 V or less to put each channel into a standby state and to 1.5 V or more to put each channel into an operating state. Do not fix STBY terminal voltage to 0.3 V or more and 1.5 V or less or do not lengthen the transition time. This may cause malfunction or failure. When shorting the VIN terminal and STBY terminal for usage, the status will be "STBY=VIN＝LOW" at turning the power OFF, and discharge of the VOUT terminal cannot operate, which means voltage may remain for a certain time in the VOUT terminal. Since turning the power ON again in this state may cause overshoot, turn the power ON for use after the VOUT terminal is completely discharged.

・About overcurrent protection circuit
Output has a built-in overcurrent protection circuit, which prevents IC break at load short. Note that this protection circuit is effective for prevention of breaks due to unexpected accidents. Please avoid usage by which the protection circuit operates continuously.

・About thermal shutdown
Output is OFF when the thermal circuit operates since a temperature protection circuit is built in to prevent thermal breakdown. However, it recovers when the temperature returns to a certain temperature. The thermal circuit operates at emergency such as overheating of IC. Since it is prepared to prevent IC breakdown, please do not use it in a state in which protection works.

●About reverse current
For applications on which reverse current is assumed to flow into IC, it is recommended to prepare a path to let the current out by putting a bypass diode between the VIN-VOUT terminals.

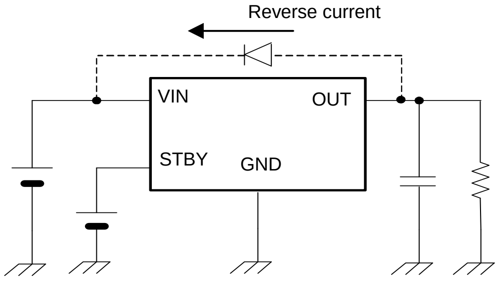


Fig.181 Example of bypass diode connection

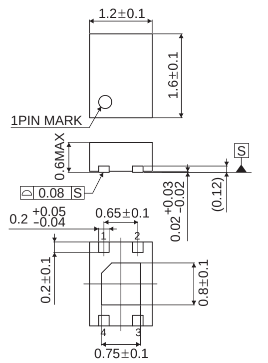
●About testing on a set board
When connecting a capacitor to a terminal with low impedance for testing on a set board, please be sure to discharge for each process since IC may be stressed. As a countermeasure against static electricity, prepare grounding in the assembly process and take sufficient care in transportation and storage. In addition, when connecting a capacitor to a jig in a testing process, please do so after turning the power OFF and remove it after turning the power OFF.

●Ordering part number

B	U	1	5	T	A	2	W	N	V	X	-	T	R

- **Part No.** (B U)
- **Output voltage** (1 5)
  - 15: 1.5V, 18: 1.8V, 25: 2.5V, 26: 2.6V, 27: 2.7V, 28: 2.8V, 2J: 2.85V
  - 29: 2.9V, 30: 3.0V, 31: 3.1V, 32: 3.2V, 33: 3.3V, 34: 3.4V
- **Lineup** (T A 2)
- **Shutdown Swich** (W)
  - W : Includes switch
- **Package** (N V X)
  - NVX : SSON004X1216
  - HFV : HVSOF5
- **Packaging and forming specification** (T R)
  - TR: Embossed tape and reel

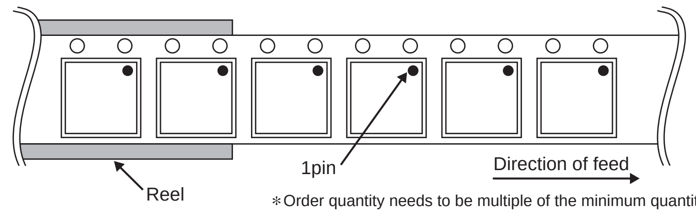
SSON004X1216



(Unit : mm)

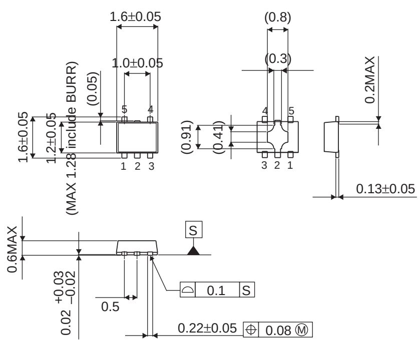
<Tape and Reel information>

Tape	Embossed carrier tape
Quantity	5000pcs
Direction of feed	TR (The direction is the 1pin of product is at the upper right when you hold reel on the left hand and you pull out the tape on the right hand)



※Order quantity needs to be multiple of the minimum quantity.

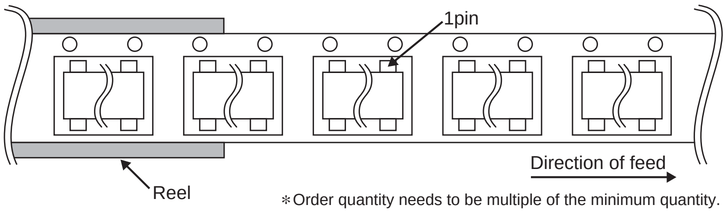
HVSOF5



(Unit : mm)

<Tape and Reel information>

Tape	Embossed carrier tape
Quantity	3000pcs
Direction of feed	TR (The direction is the 1pin of product is at the upper right when you hold reel on the left hand and you pull out the tape on the right hand)



※Order quantity needs to be multiple of the minimum quantity.

Notes

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