

ZBM20

EVALUATION DATA

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Terminology Used

	Definition
V_{in}	Input voltage
V_{out}	Buffer voltage
I_{in}	Input current
I_{out}	Buffering current
T_a	Ambient temperature

1. Evaluation Method

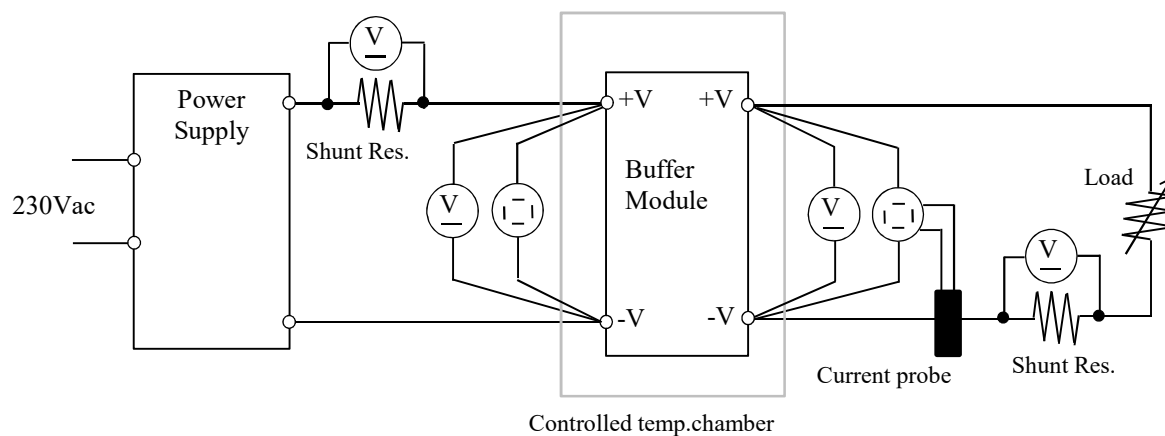
1-1 Circuit 1 used for determination

Steady state data

Input over voltage protection (OVP) characteristics

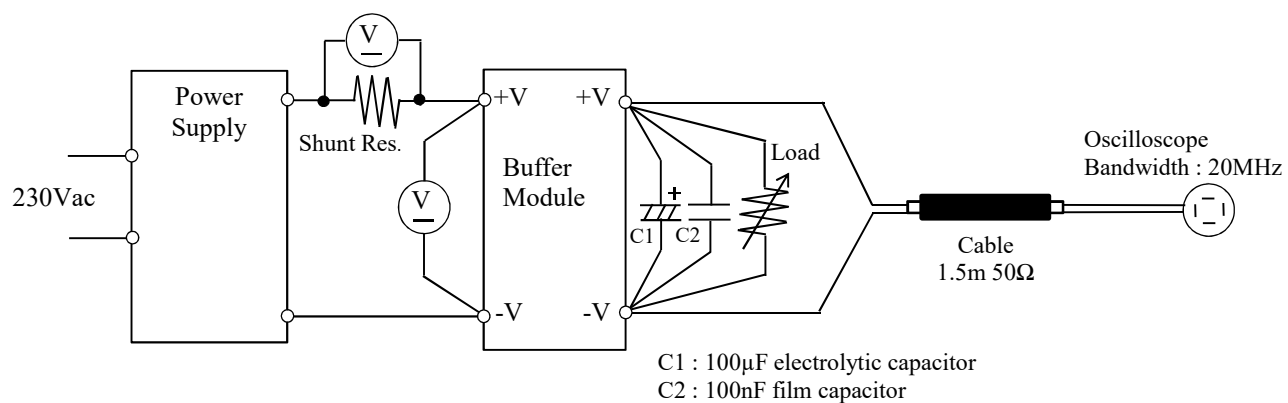
Buffer time characteristics

Response to brown out time characteristics



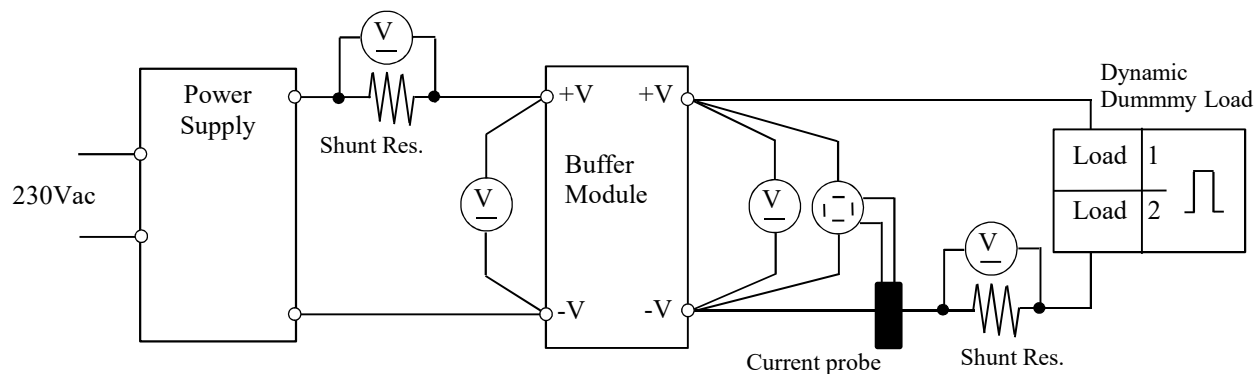
1-2 Circuit 2 used for determination

Ripple and noise waveform on buffer voltage

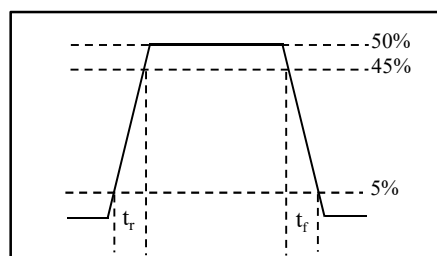


1-3 Circuit 3 used for determination

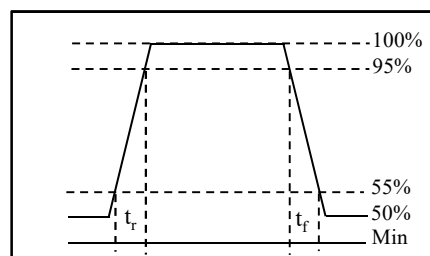
Dynamic load response characteristics



Buffering current waveform
Iout 0% <--> 50%

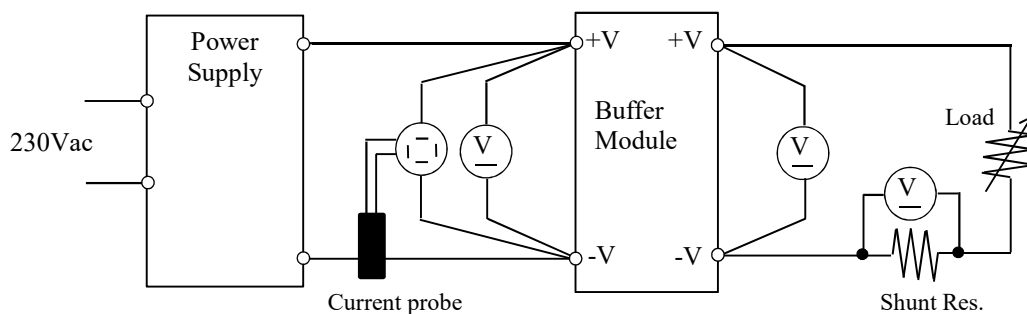


Buffering current waveform
Iout 50% <--> 100%



1-4 Circuit 4 used for determination

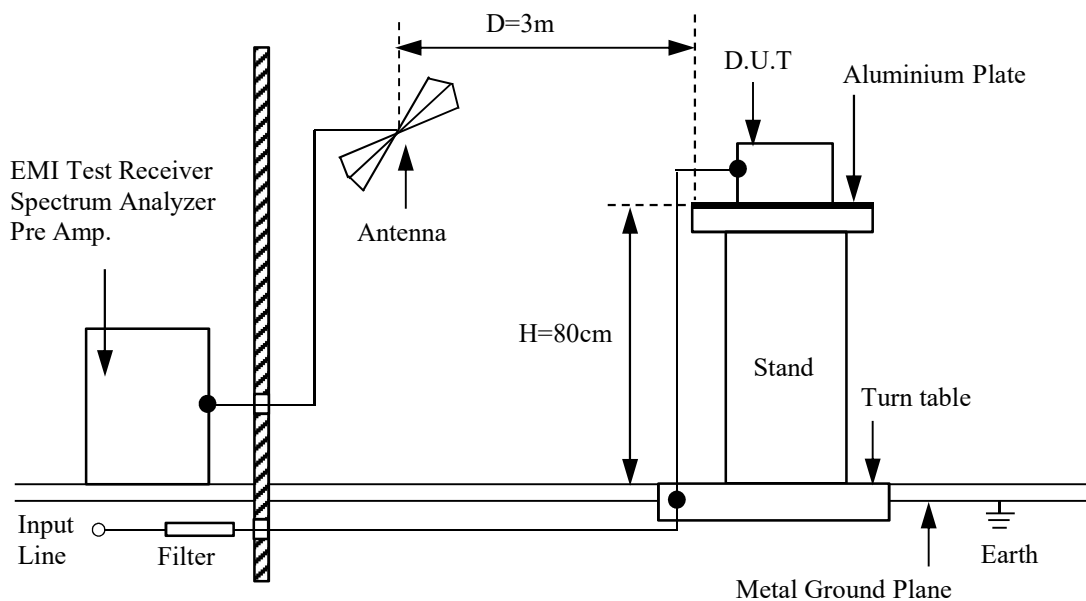
Inrush current waveform



1-5 Configuration used for determination

EMI Electro-Magnetic Interference characteristics

Radiated Emission



1-6 List of Equipment Used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA	DLM2054
2	DIGITAL MULTIMETER	YOKOGAWA	TY710
3	CURRENT PROBE/AMPLIFIER	YOKOGAWA	701933
4	DYNAMIC DUMMY LOAD	CHROMA	63106A
5	CONTROLLED TEMP. CHAMBER	ESPEC	SU-241
6	DC SOURCE	GENESIS	GEN60-85
7	DATA ACQUISITION UNIT	KEYSIGHT	34970A
8	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI
9	LISN	AFJ	AFJ LT32C/10
10	EMI TEST RECEIVER	R&S	ESR26
11	PREAMPLIFIER	SONOMA	310N
12	PREAMPLIFIER	COM-POWER	PAM-103
13	RF ANTENNA	TDK	HLP-3003C
14	BILOG ANTENNA	SCHAFFNER	CBL6112B

2. Characteristics

2-1 Steady state data

(1) Regulation - load, Temperature drift

(a) Fixed Mode

12V	1. Regulation-load	Condition	Ta : 25°C																								
	<table border="1"> <thead> <tr> <th>Iout \ Vin</th> <th>11.5VDC</th> <th>12VDC</th> <th>14.4VDC</th> </tr> </thead> <tbody> <tr> <td>0%</td> <td>11.076</td> <td>11.075</td> <td>11.075</td> </tr> <tr> <td>50%</td> <td>10.974</td> <td>10.973</td> <td>10.974</td> </tr> <tr> <td>100%</td> <td>10.864</td> <td>10.866</td> <td>10.860</td> </tr> <tr> <td>Load</td> <td>0.212V</td> <td>0.209V</td> <td>0.215V</td> </tr> <tr> <td>Regulation</td> <td>1.927%</td> <td>1.900%</td> <td>1.955%</td> </tr> </tbody> </table>	Iout \ Vin	11.5VDC	12VDC	14.4VDC	0%	11.076	11.075	11.075	50%	10.974	10.973	10.974	100%	10.864	10.866	10.860	Load	0.212V	0.209V	0.215V	Regulation	1.927%	1.900%	1.955%		
Iout \ Vin	11.5VDC	12VDC	14.4VDC																								
0%	11.076	11.075	11.075																								
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100%	10.864	10.866	10.860																								
Load	0.212V	0.209V	0.215V																								
Regulation	1.927%	1.900%	1.955%																								

2. Temperature drift

Conditions Vin : 12VDC
Iout : 100%

Ta	-25°C	25°C	70°C	Temperature Stability	
Vout	10.934	10.866	10.776	0.16V	0.015%

15V	1. Regulation-load	Condition	Ta : 25°C																								
	<table border="1"> <thead> <tr> <th>Iout \ Vin</th> <th>14.4VDC</th> <th>15VDC</th> <th>18VDC</th> </tr> </thead> <tbody> <tr> <td>0%</td> <td>13.823</td> <td>13.823</td> <td>13.823</td> </tr> <tr> <td>50%</td> <td>13.707</td> <td>13.707</td> <td>13.706</td> </tr> <tr> <td>100%</td> <td>13.589</td> <td>13.587</td> <td>13.586</td> </tr> <tr> <td>Load</td> <td>0.234V</td> <td>0.236V</td> <td>0.237V</td> </tr> <tr> <td>Regulation</td> <td>1.696%</td> <td>1.710%</td> <td>1.717%</td> </tr> </tbody> </table>	Iout \ Vin	14.4VDC	15VDC	18VDC	0%	13.823	13.823	13.823	50%	13.707	13.707	13.706	100%	13.589	13.587	13.586	Load	0.234V	0.236V	0.237V	Regulation	1.696%	1.710%	1.717%		
Iout \ Vin	14.4VDC	15VDC	18VDC																								
0%	13.823	13.823	13.823																								
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100%	13.589	13.587	13.586																								
Load	0.234V	0.236V	0.237V																								
Regulation	1.696%	1.710%	1.717%																								

2. Temperature drift

Conditions Vin : 15VDC
Iout : 100%

Ta	-25°C	25°C	70°C	Temperature Stability	
Vout	13.657	13.589	13.496	0.16V	0.012%

2. Characteristics

2-1 Steady state data

(1) Regulation - load, Temperature drift

(a) Fixed Mode

24V	1. Regulation-load	Condition				Ta : 25°C
	Iout \ Vin	23VDC	24VDC	27VDC	30VDC	
	0%	22.393	22.393	22.394	22.394	
	50%	22.297	22.302	22.311	22.311	
	100%	22.202	22.206	22.210	22.213	
	Load	0.191V	0.187V	0.184V	0.181V	
	Regulation	0.853%	0.835%	0.821%	0.808%	

2. Temperature drift

Conditions Vin : 24VDC
Iout : 100%

Ta	-25°C	25°C	70°C	Temperature Stability	
Vout	22.265	22.206	22.082	0.18V	0.009%

(b) VIN-1 Mode

24V	1. Regulation-load	Condition			Ta : 25°C
	Iout \ Vin	24VDC	27VDC	30VDC	
	5%	22.468	25.459	28.436	
	50%	22.659	25.649	28.621	
	100%	22.548	25.558	28.513	
	Load	0.191	0.190	0.185	
	Regulation	0.85%	0.74%	0.65%	

2. Temperature drift

Conditions Vin : 27VDC
Iout : 100%

Ta	-25°C	25°C	70°C	Temperature Stability	
Vout	26.257	25.558	25.145	1.112V	0.045%

2-1 Steady state data

(2) Ripple and noise on buffer voltage vs. input voltage

(a) Fixed Mode

12V

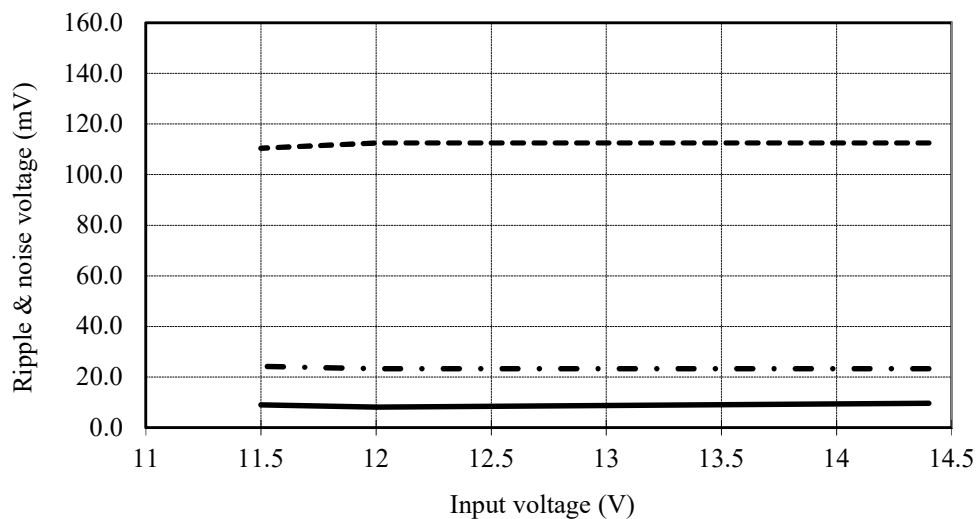
Conditions

Iout : 100%

Ta : -25°C -----

: 25°C -.-.-.-

: 70°C ———



15V

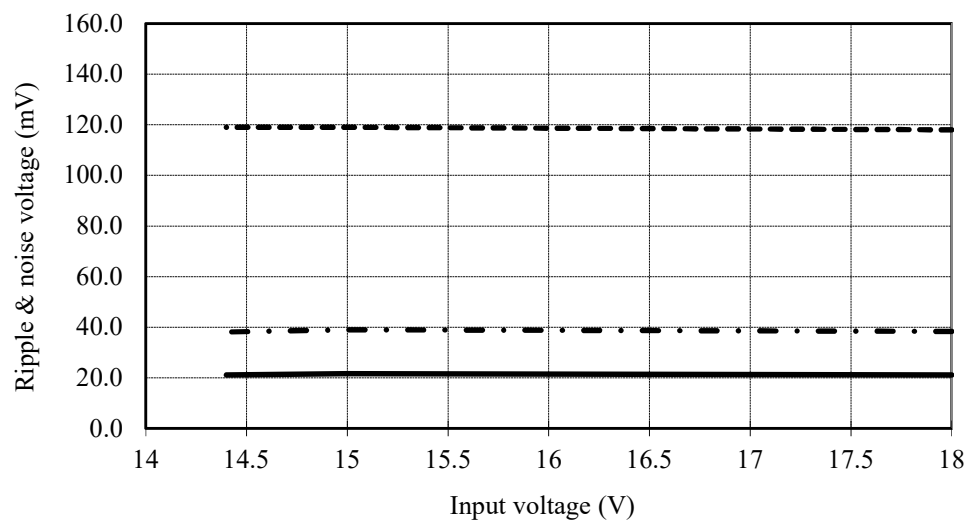
Conditions

Iout : 100%

Ta : -25°C -----

: 25°C -.-.-.-

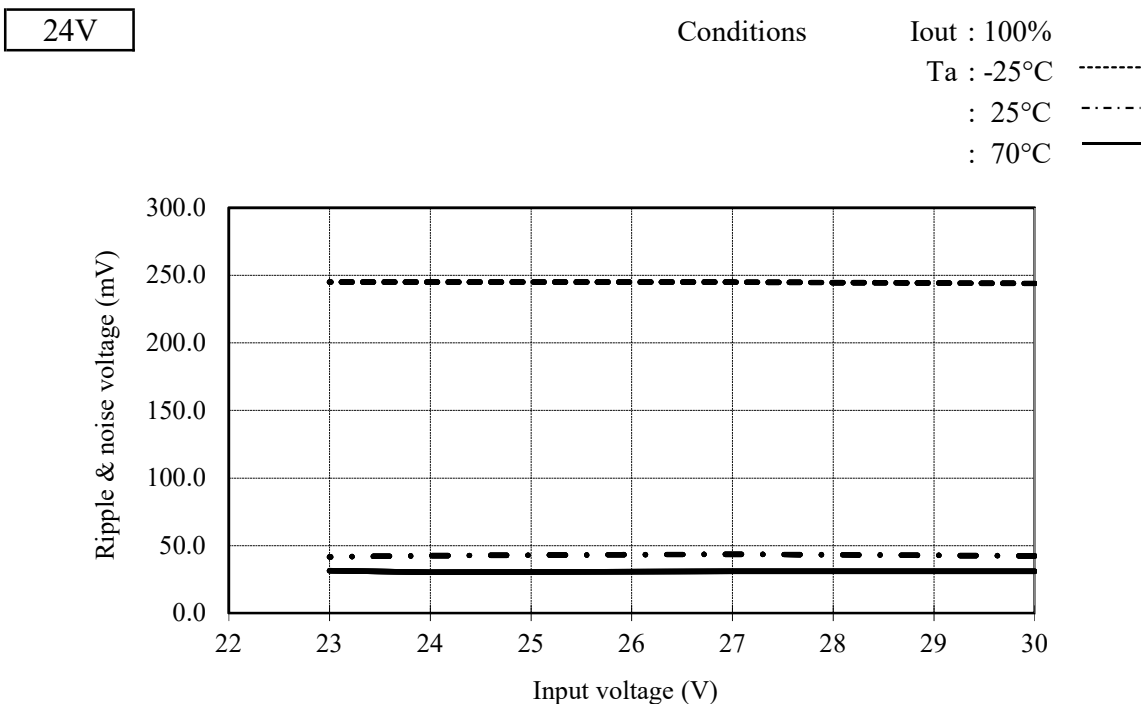
: 70°C ———



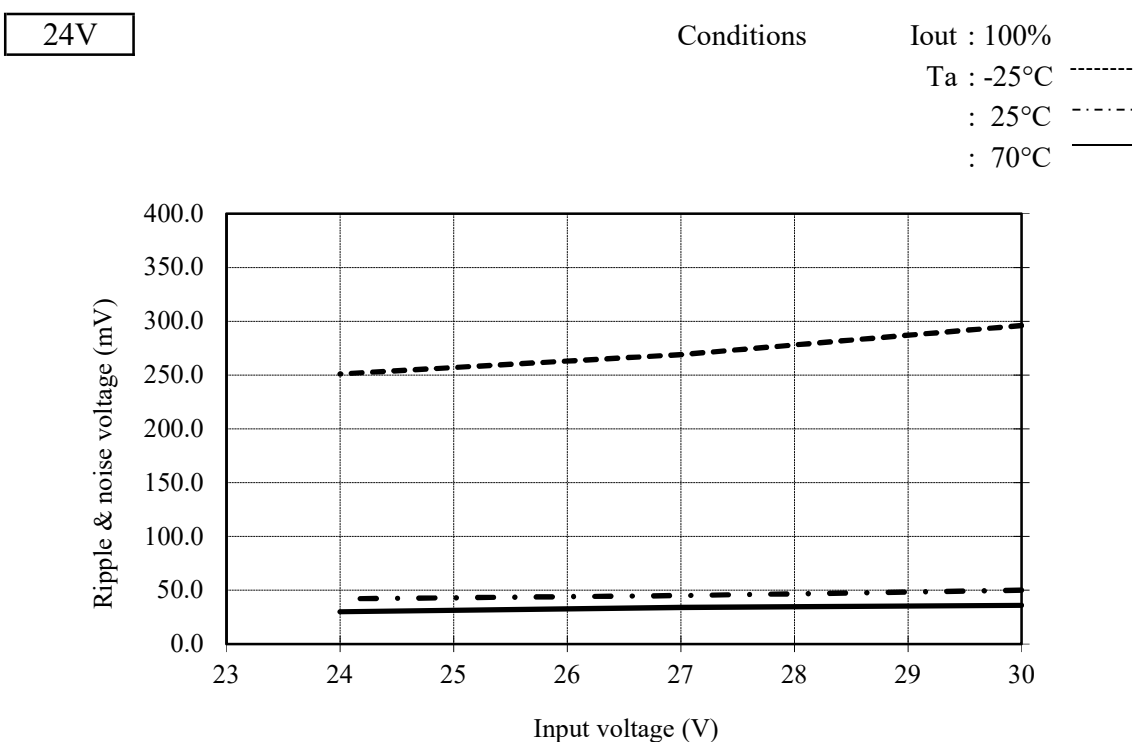
2-1 Steady state data

(2) Ripple and noise on buffer voltage vs. input voltage

(a) Fixed Mode



(b) VIN-1 Mode



2-1 Steady state data

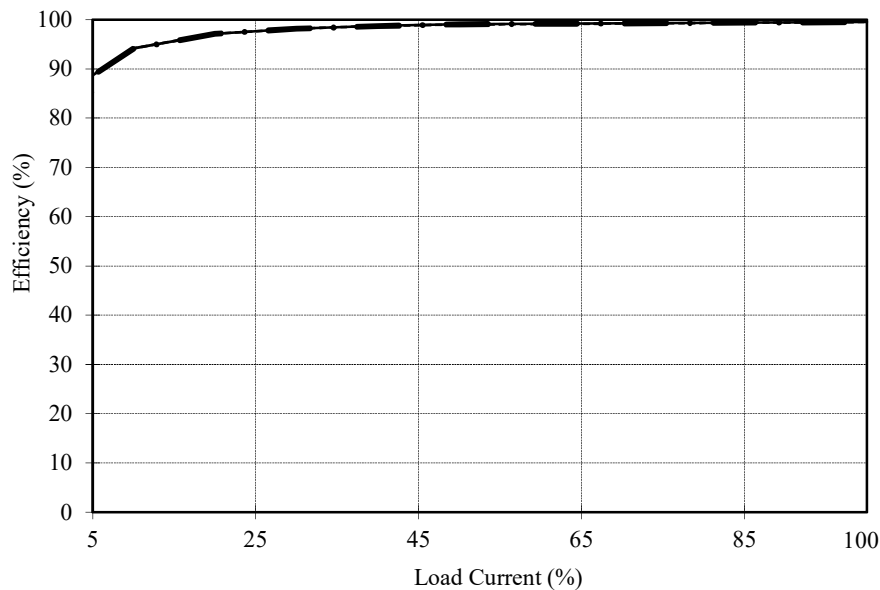
(3) Efficiency vs. load current

Ready mode

12V

Conditions

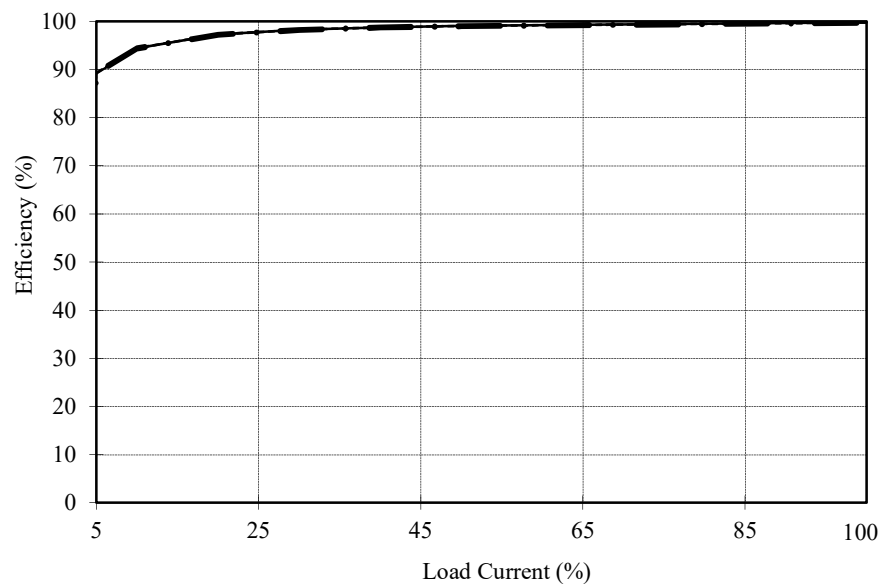
Ta : 25°C
 Vin : 11.5VDC ---
 12VDC -.-
 14.4VDC —



15V

Conditions

Ta : 25°C
 Vin : 14.4VDC ---
 15VDC -.-
 18VDC —



2-1 Steady state data

(3) Efficiency vs. load current

Ready mode

24V

Conditions

Ta : 25°C

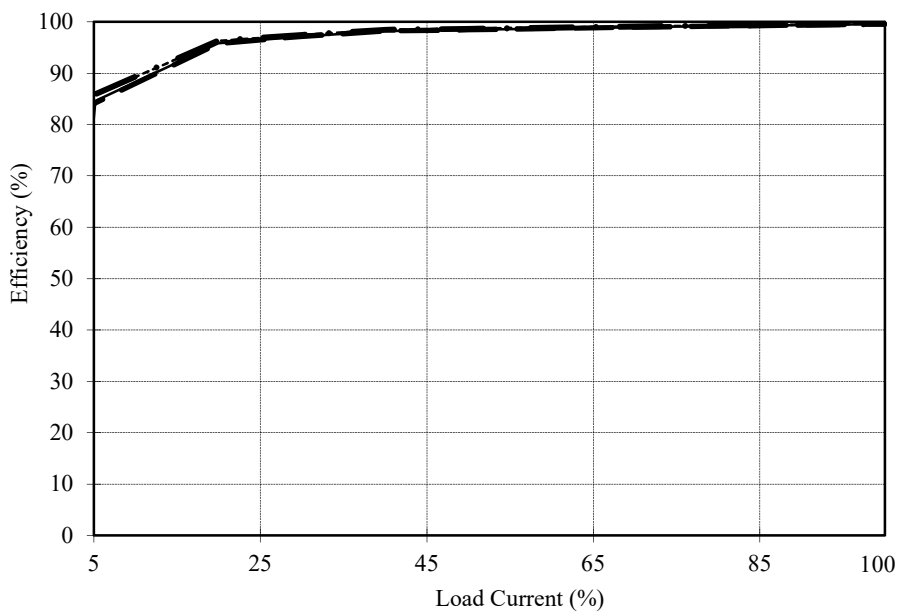
Vin : 23VDC

24VDC

27VDC

30VDC

- . - . .
—————
- - - -



2-2 Input over voltage protection (OVP) characteristics

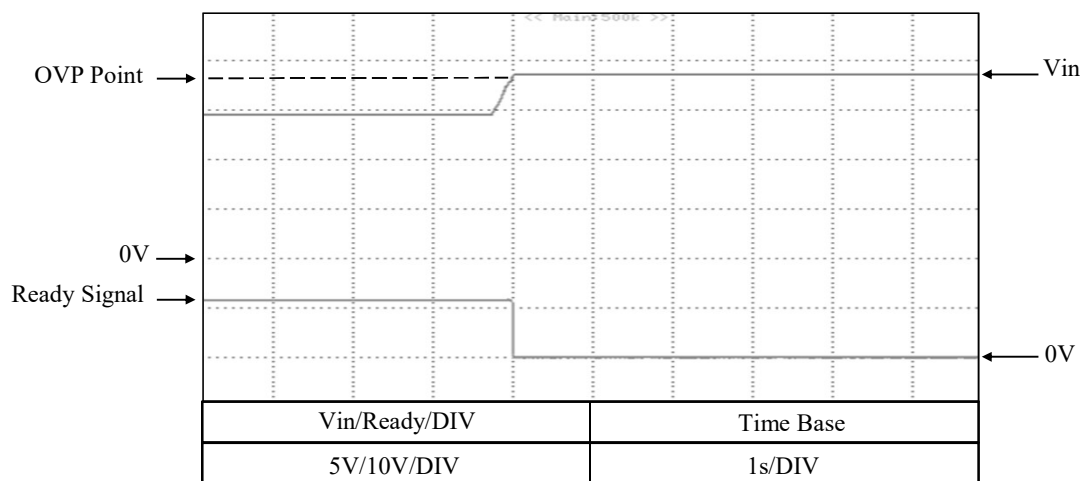
Ready Mode

12V

Conditions

Ta : 25°C

Iout : 0%

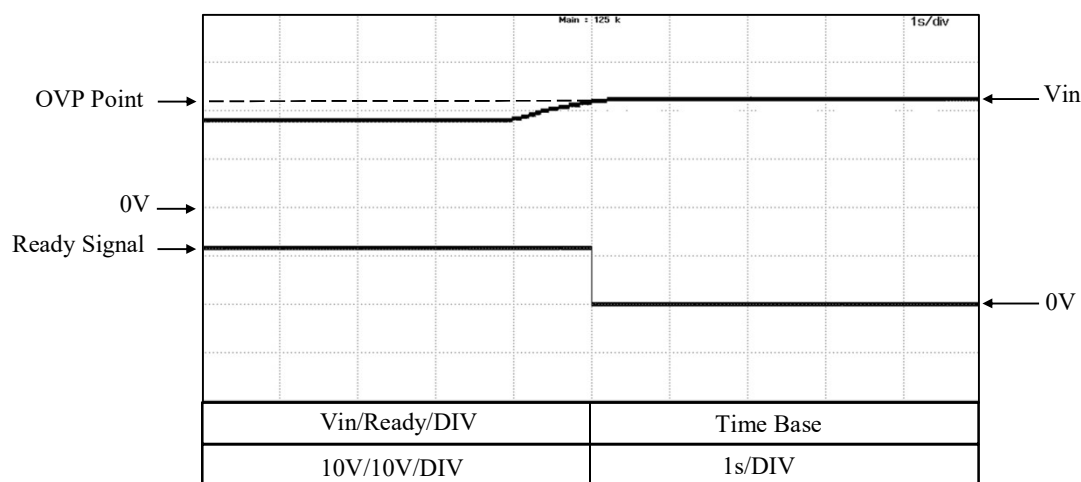


15V

Conditions

Ta : 25°C

Iout : 0%

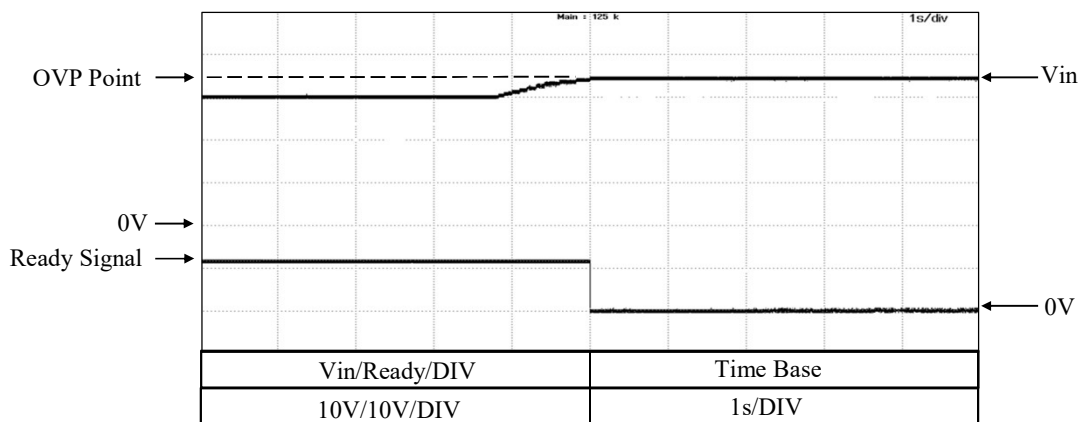


24V

Conditions

Ta : 25°C

Iout : 0%



2-3 Buffer time characteristics

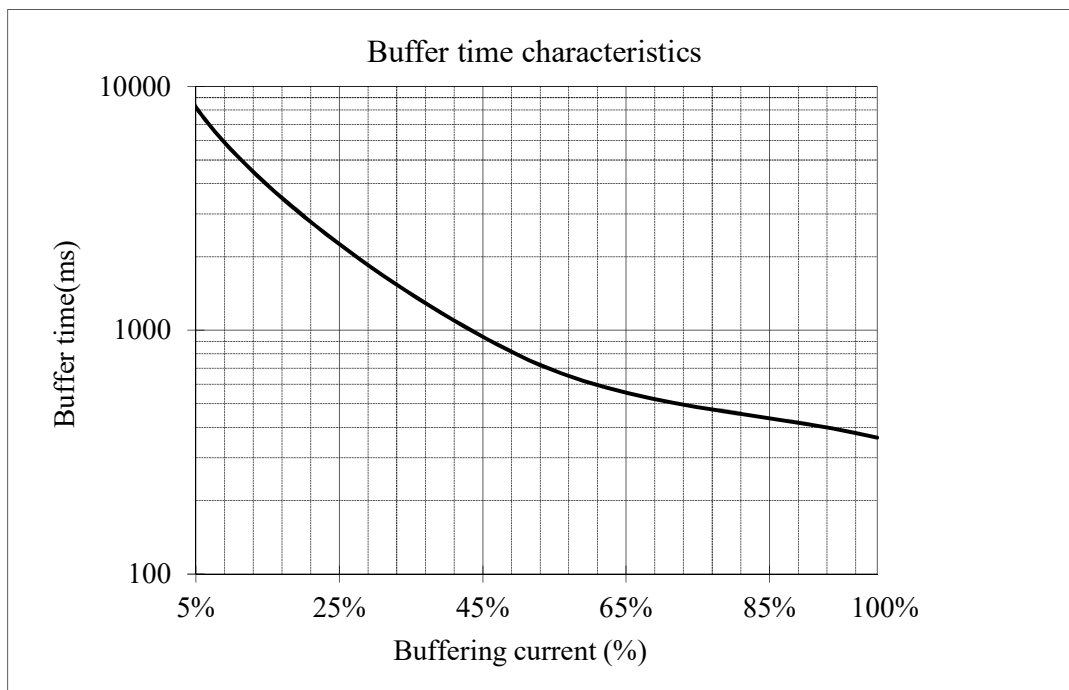
(a) Fixed mode

12V

Conditions

Vin : 12VDC

Ta : 25°C

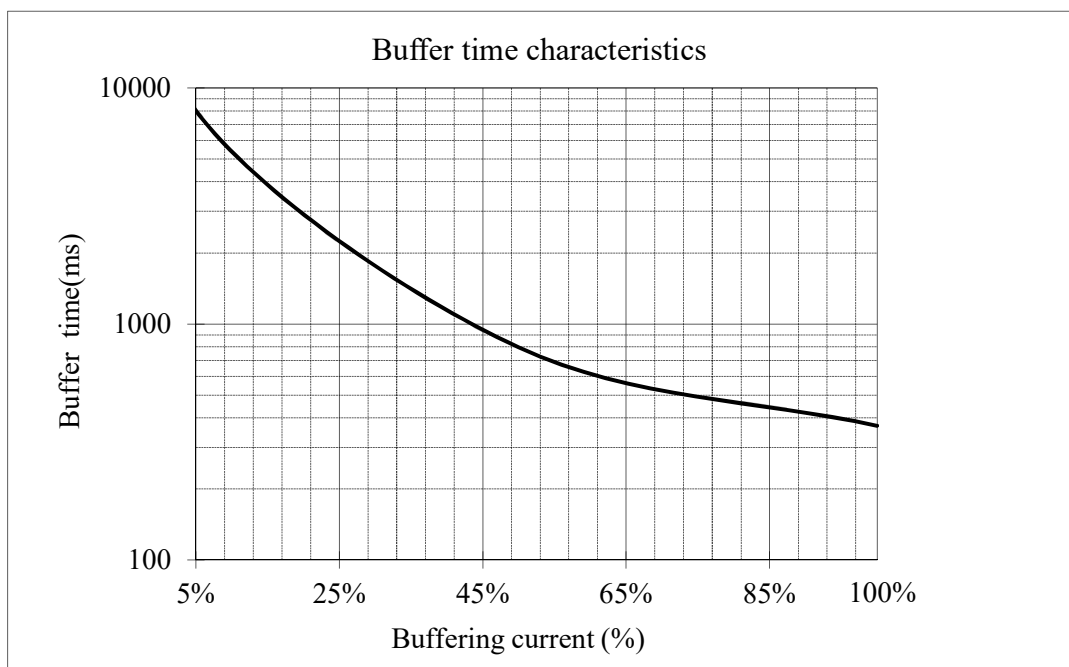


15V

Conditions

Vin : 15VDC

Ta : 25°C

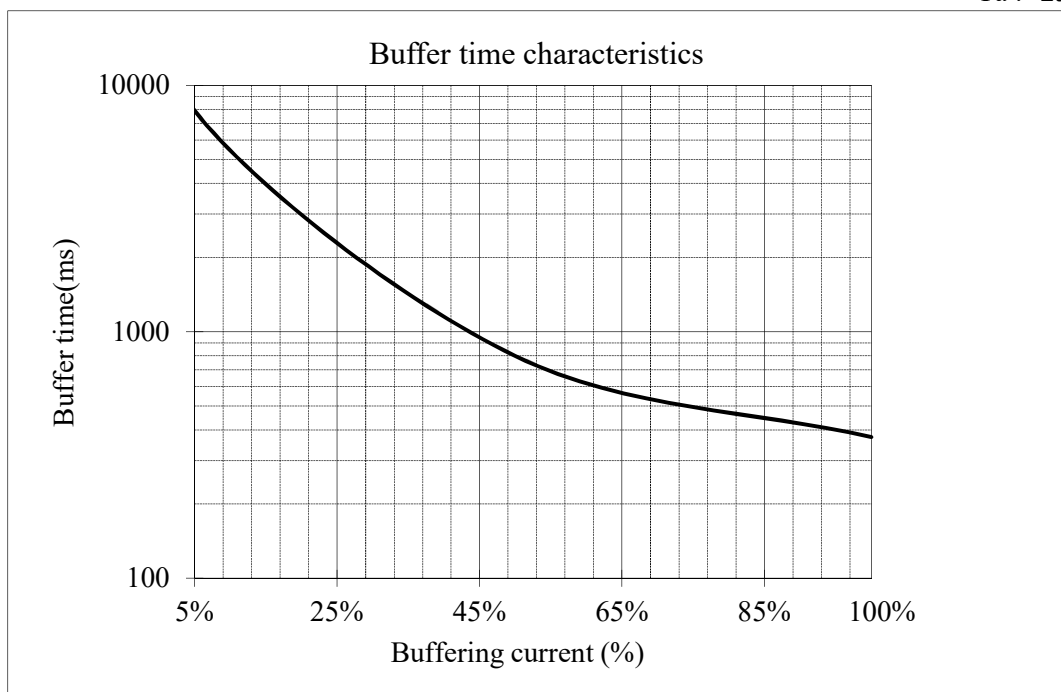


2-3 Buffer time characteristics

(a) Fixed mode

24V

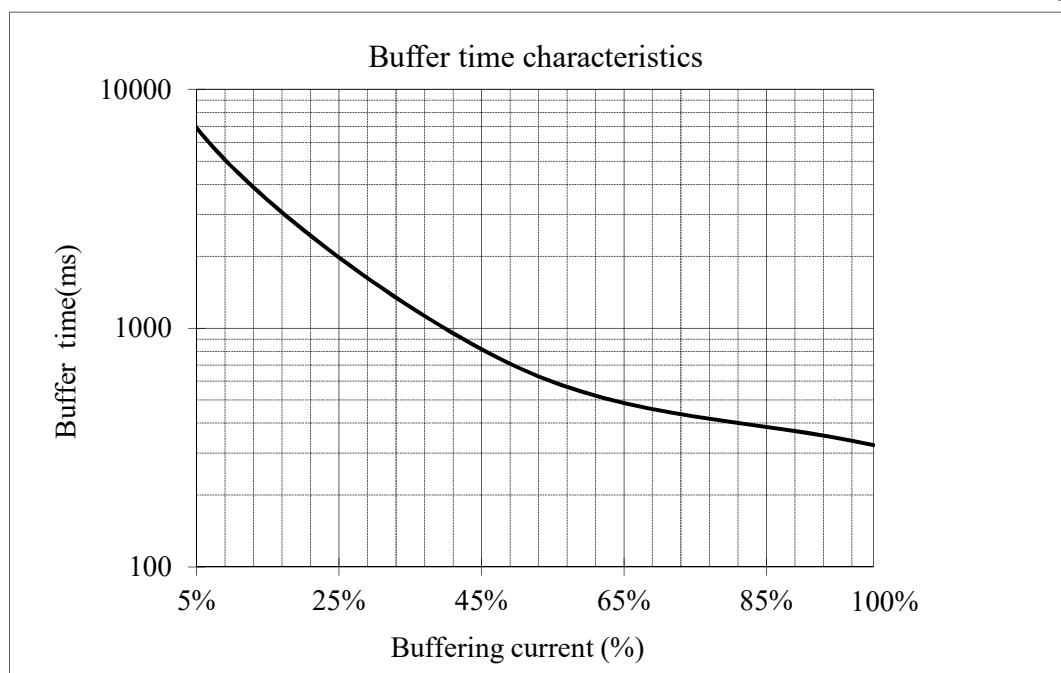
Conditions Vin : 24VDC
Ta : 25°C



(b) VIN-1 mode

24V

Conditions Vin : 27VDC
Ta : 25°C



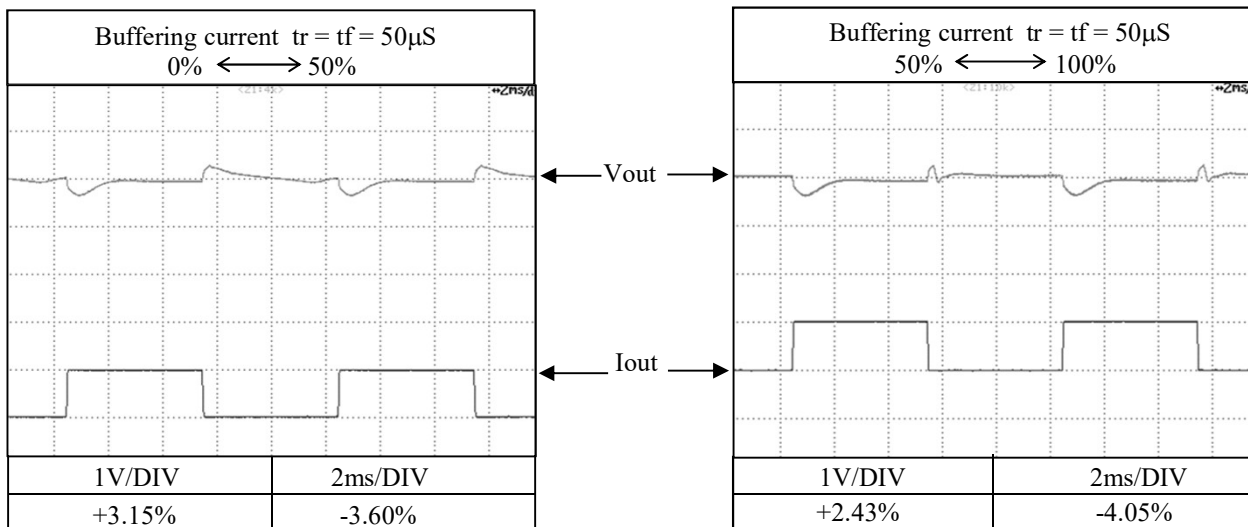
2-4 Dynamic load response characteristics

(a) Fixed Mode

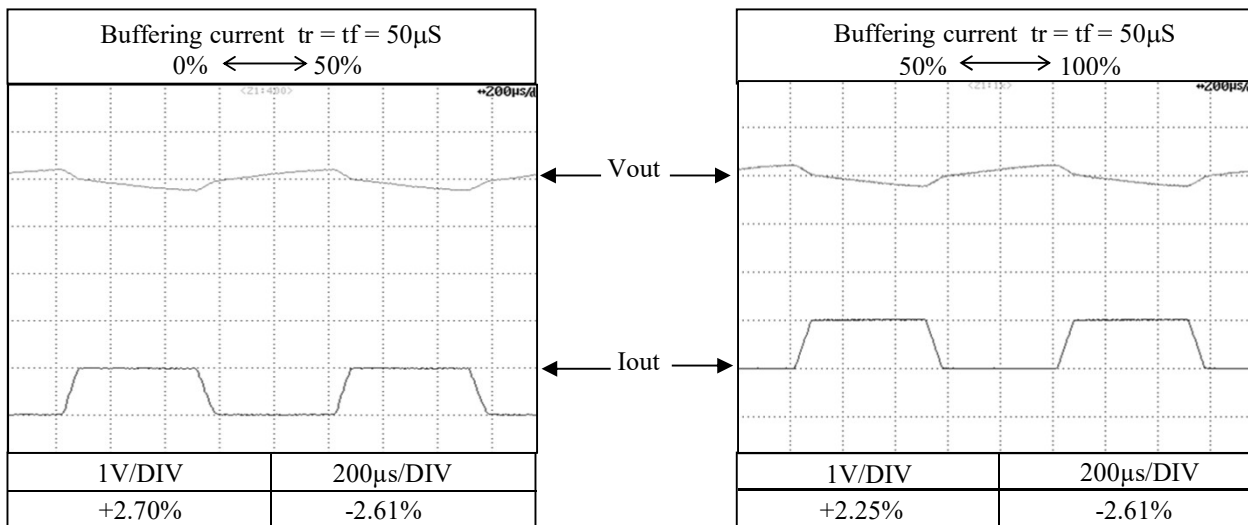
12V

Conditions $V_{in} : 12VDC$
 $T_a : 25^{\circ}C$

$f=100Hz$



$f=1KHz$



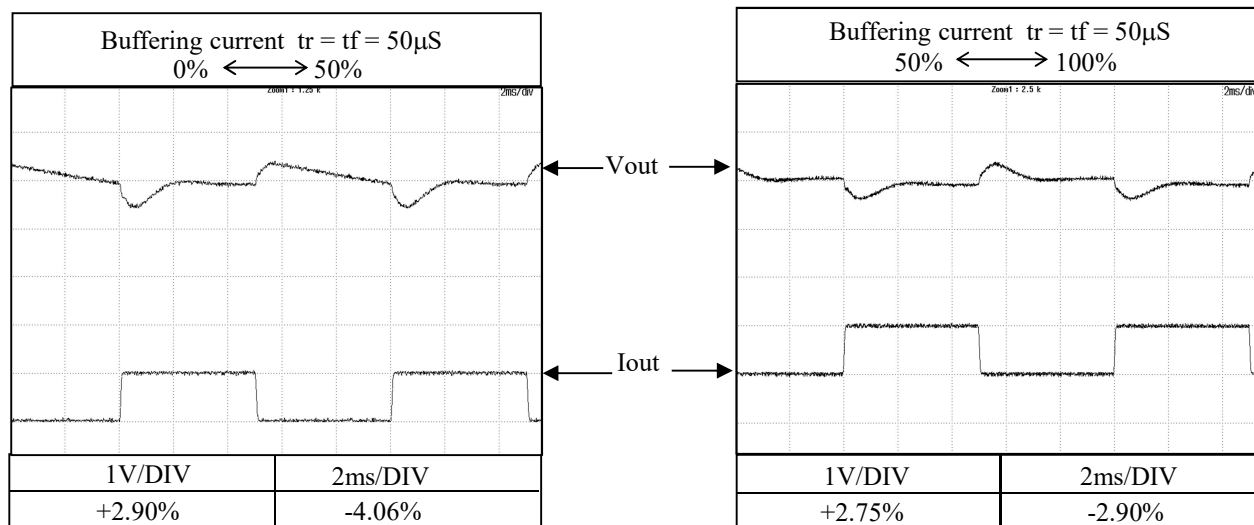
2-4 Dynamic load response characteristics

(a) Fixed Mode

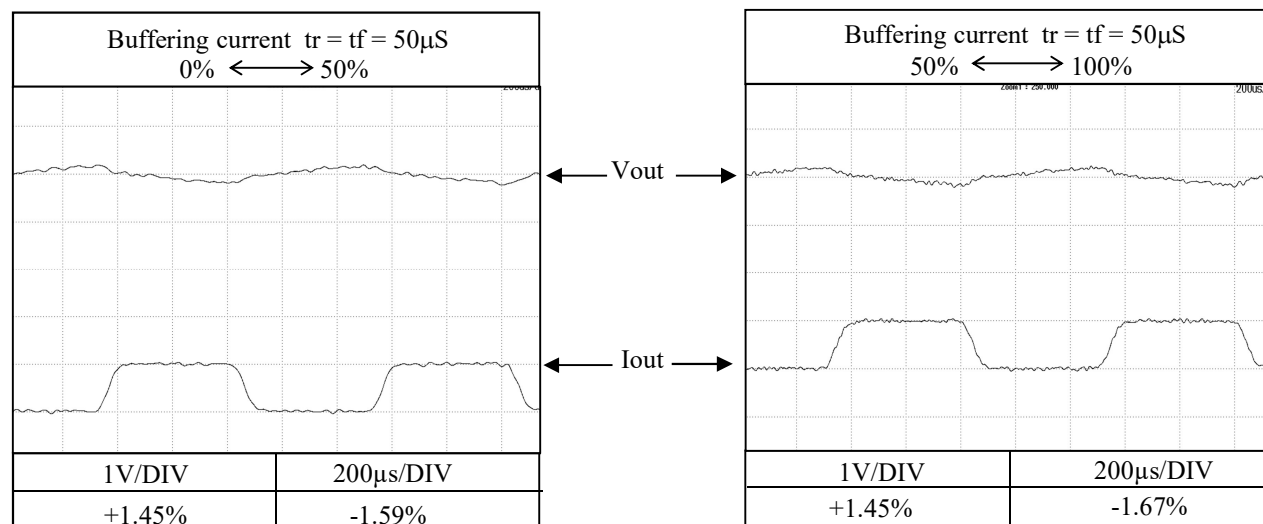
15V

Conditions Vin : 15VDC
Ta : 25°C

f=100Hz



f=1KHz



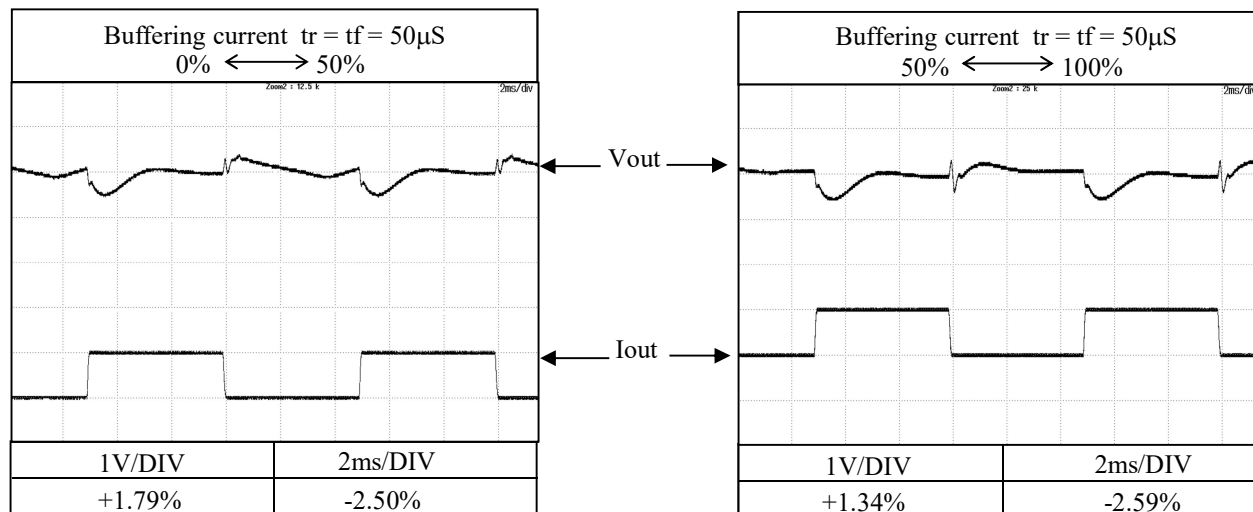
2-4 Dynamic load response characteristics

(a) Fixed Mode

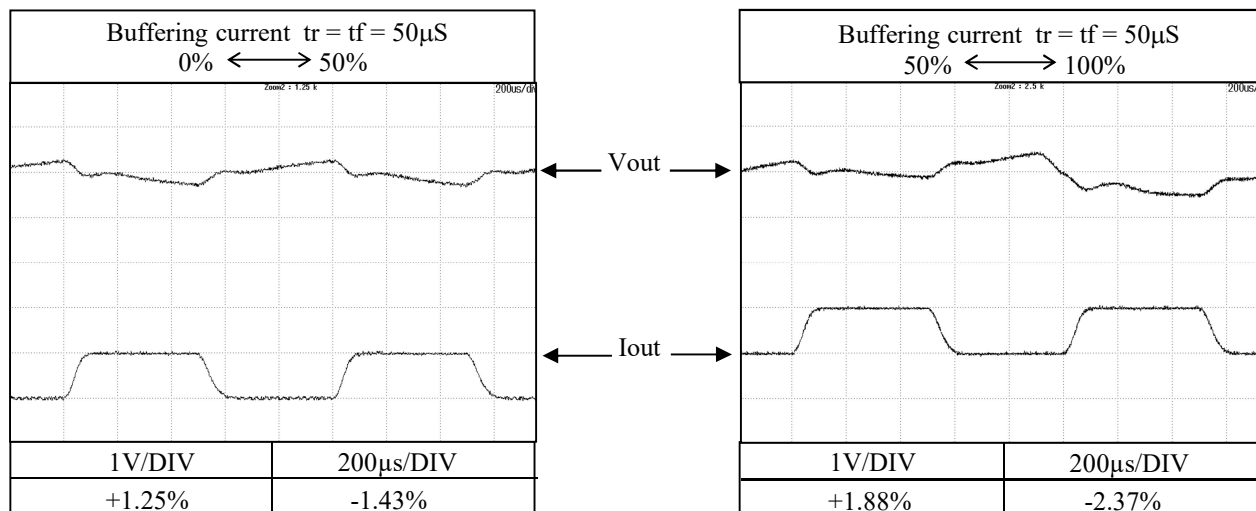
24V

Conditions Vin : 24VDC
Ta : 25°C

f=100Hz



f=1KHz



2-4 Dynamic load response characteristics

(b) VIN-1 Mode

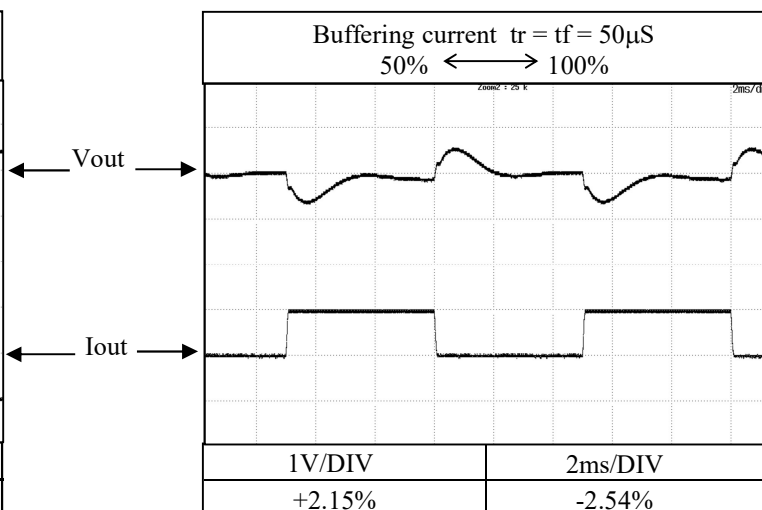
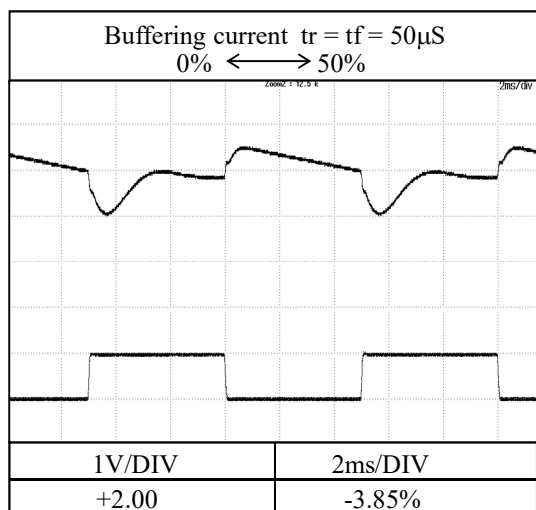
24V

Conditions

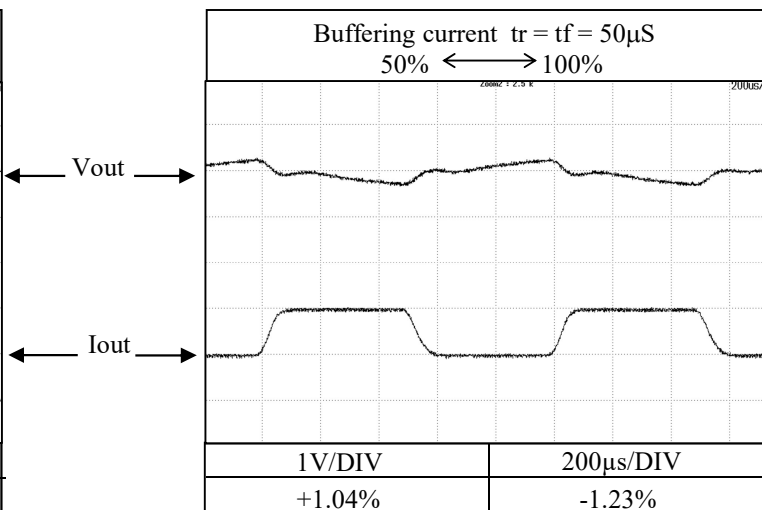
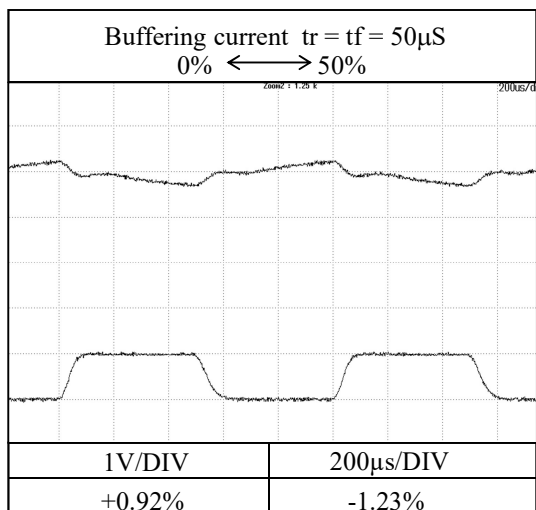
Vin : 27VDC

Ta : 25°C

f=100Hz



f=1KHz



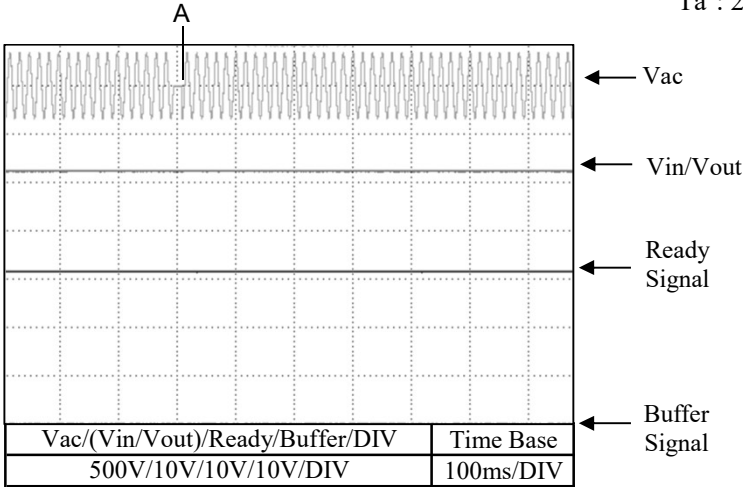
2-5 Response to brown out time characteristics

(a) Fixed Mode

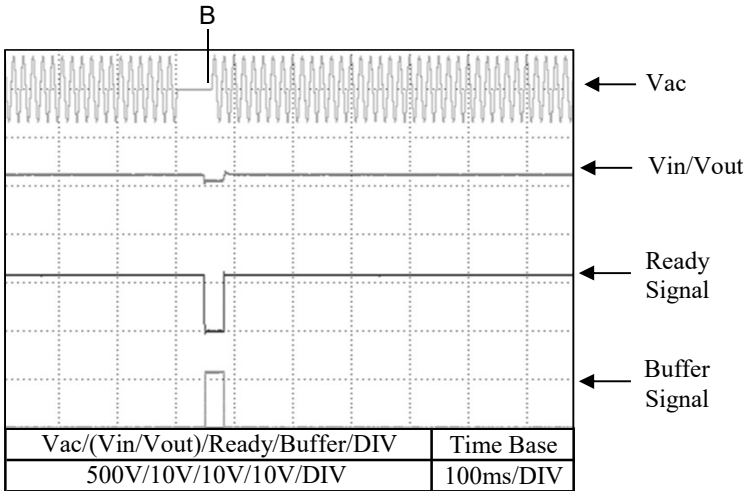
12V

Conditions Vin : 12VDC Iout : 100% Ta : 25°C

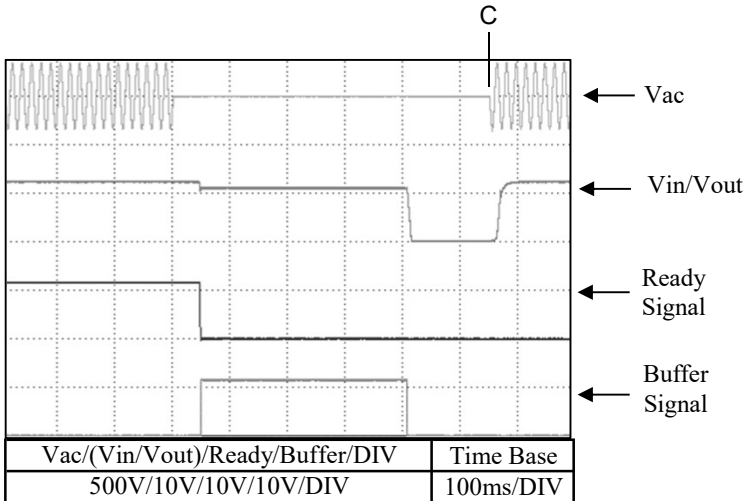
A=15ms



B=60ms



C=550ms



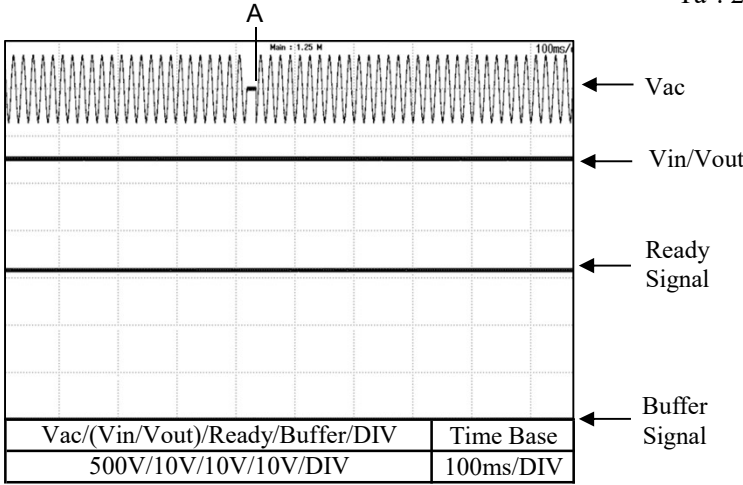
2-5 Response to brown out time characteristics

(a) Fixed Mode

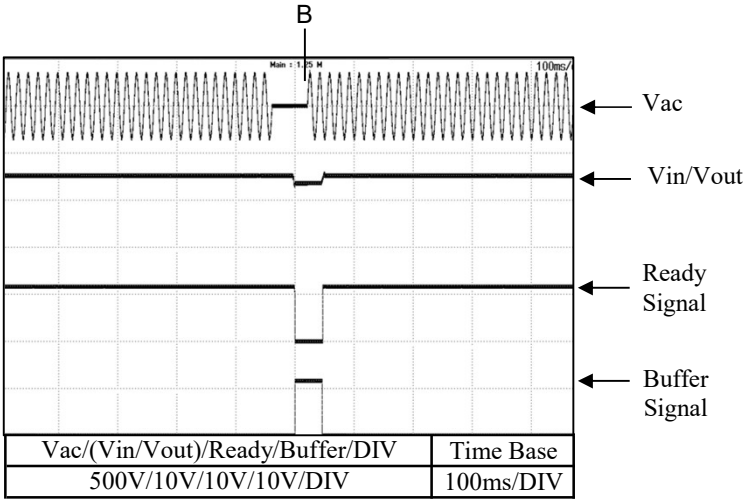
15V

Conditions Vin : 15VDC Iout : 100% Ta : 25°C

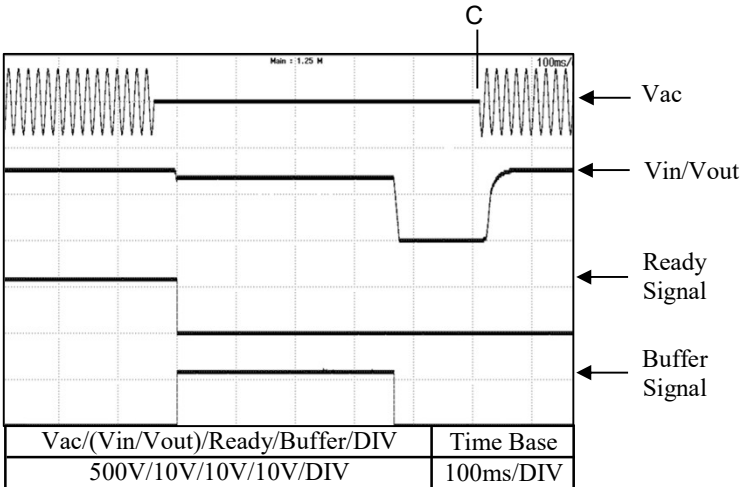
A=15ms



B=60ms



C=550ms



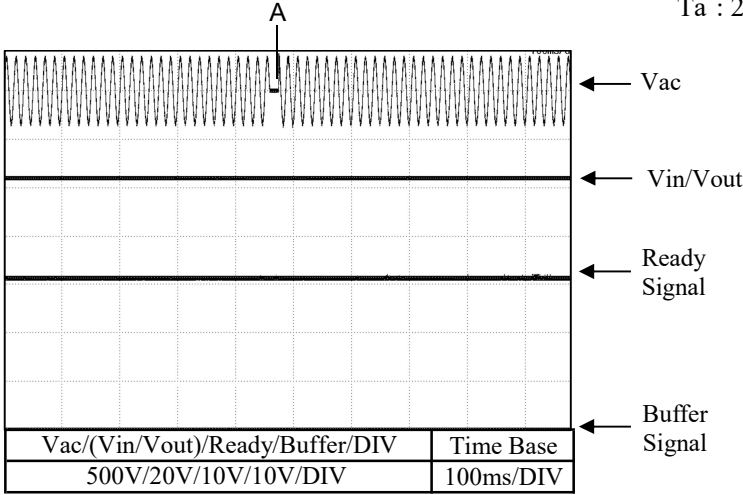
2-5 Response to brown out time characteristics

(a) Fixed Mode

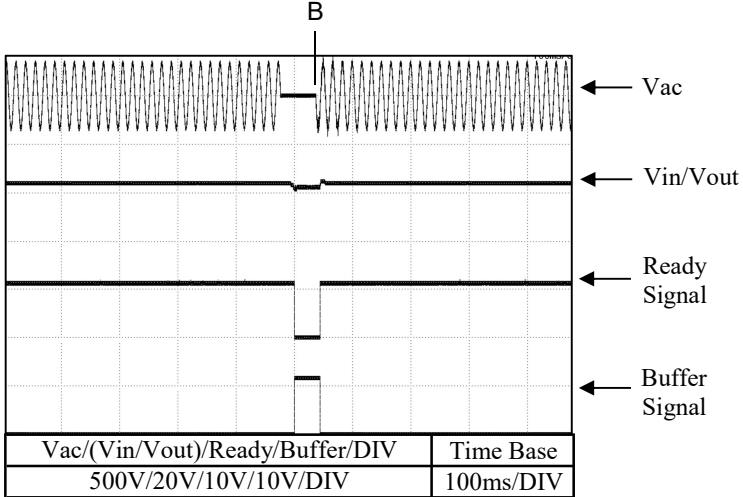
24V

Conditions Vin : 24VDC Iout : 100% Ta : 25°C

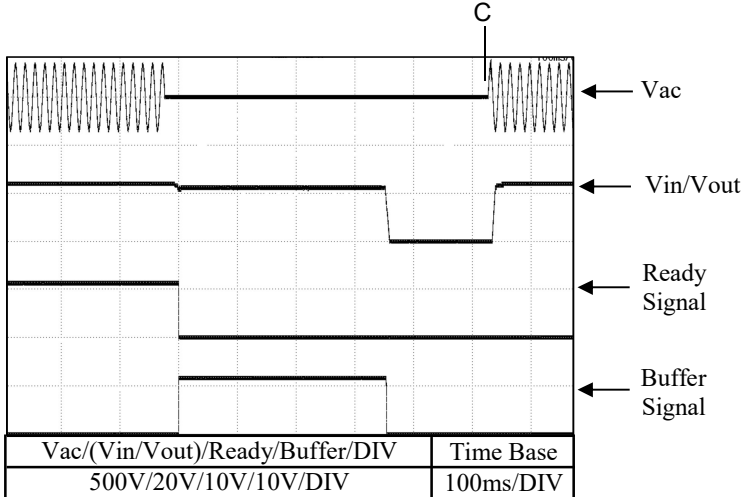
A=15ms



B=60ms



C=550ms



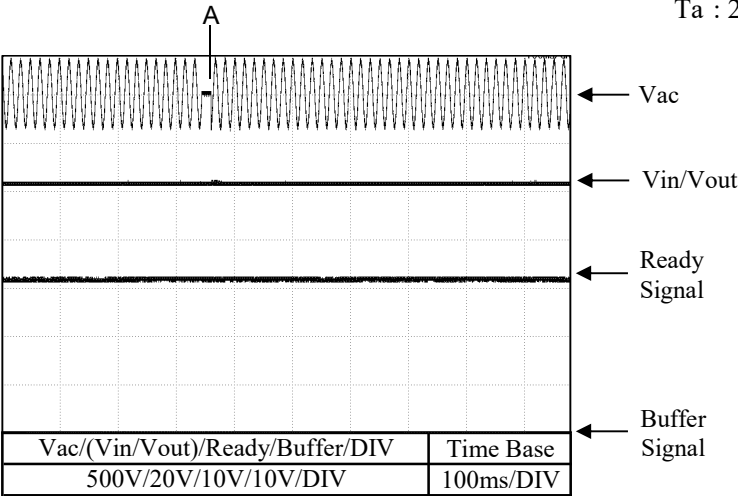
2-5 Response to brown out time characteristics

(b) VIN-1 Mode

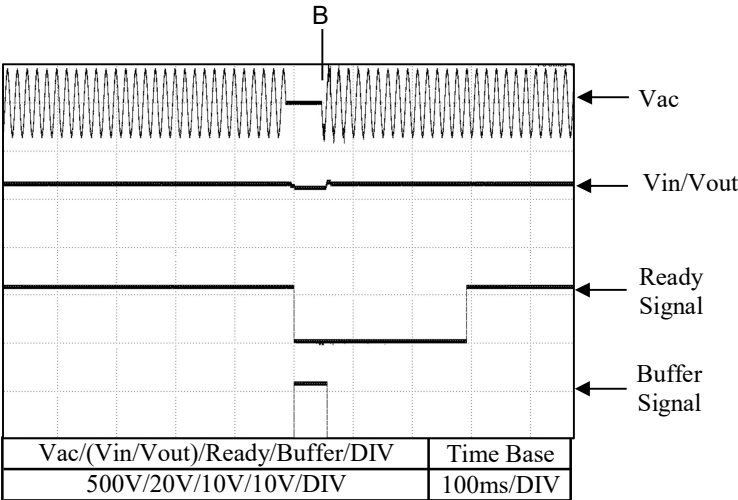
24V

Conditions Vin : 27VDC Iout : 100% Ta : 25°C

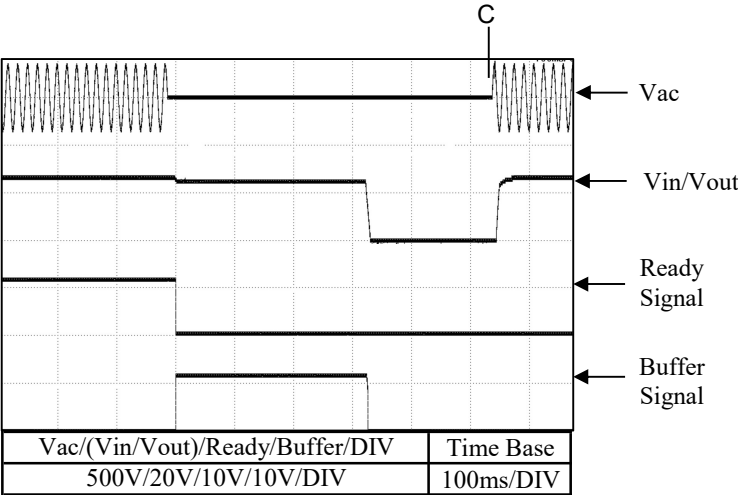
A=15ms



B=60ms



C=550ms



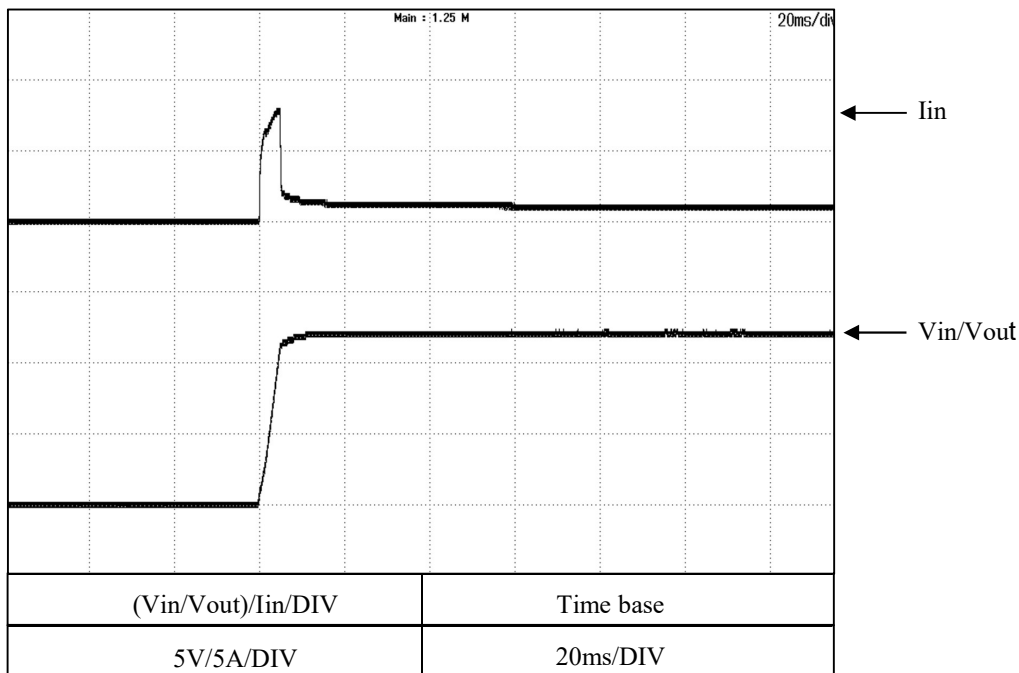
2-6 Inrush current waveform

Ready mode

12V

Conditions

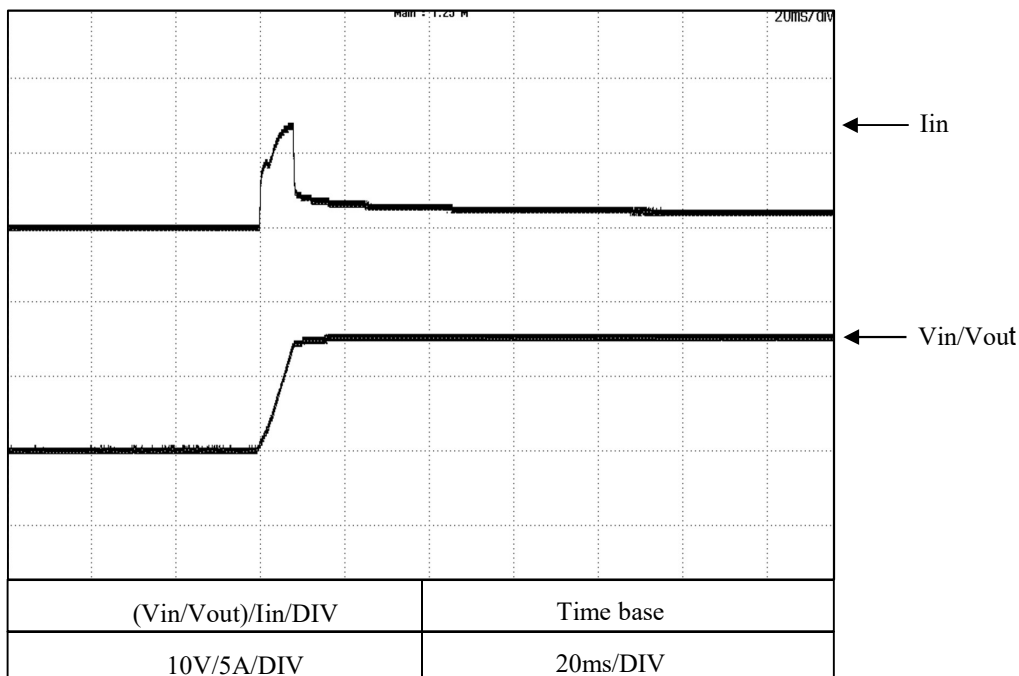
V_{in} = 12VDC
T_a = 25°C



15V

Conditions

V_{in} = 15VDC
T_a = 25°C



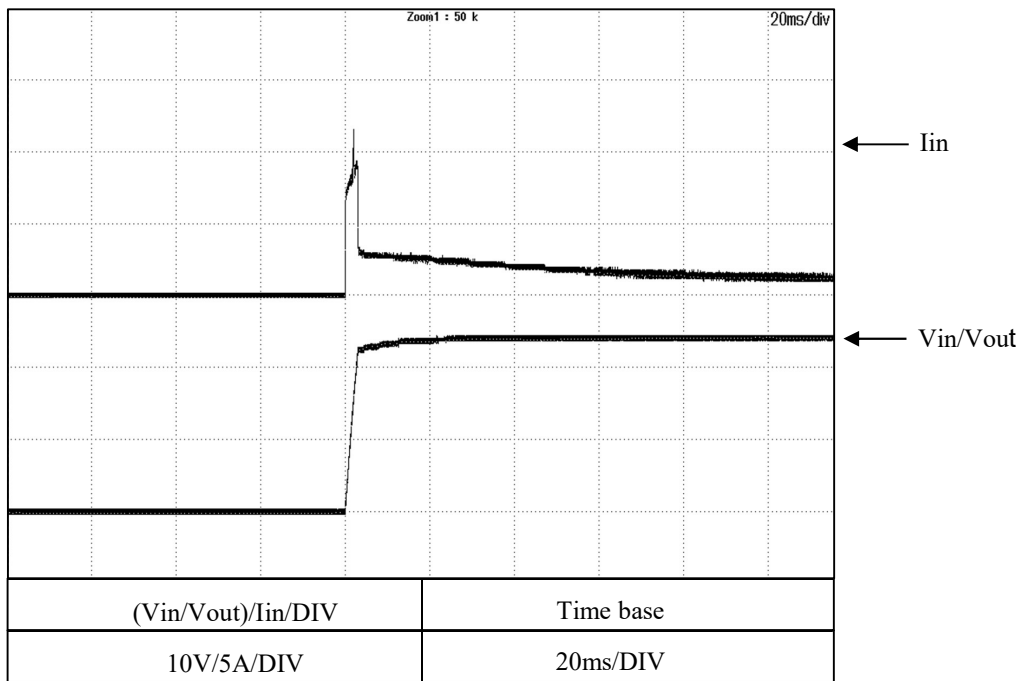
2-6 Inrush current waveform

Ready mode

24V

Conditions

V_{in} = 24VDC
T_a = 25°C



2-7 Electro-Magnetic Interference characteristics

Radiated Emission

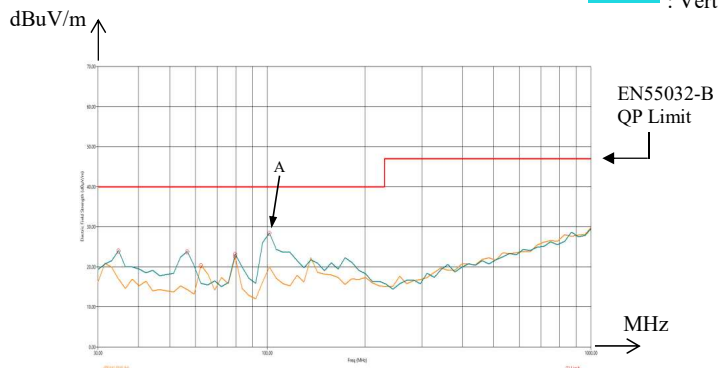
Ready mode

12V

Conditions

Vin : 12VDC
Iout : 0%
— : Horizontal
— : Vertical

Point A (101.59 MHz)		
Limit (dBuV/m)	Measured (dBuV/m)	(P)
40	27.10	V

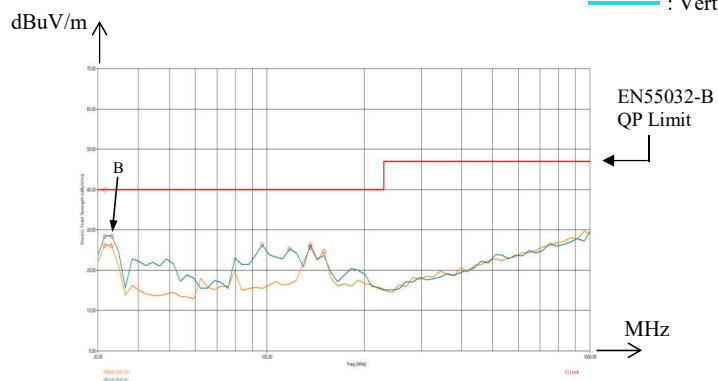


15V

Conditions

Vin : 15VDC
Iout : 0%
— : Horizontal
— : Vertical

Point B (33.08 MHz)		
Limit (dBuV/m)	Measured (dBuV/m)	(P)
40	26.16	V

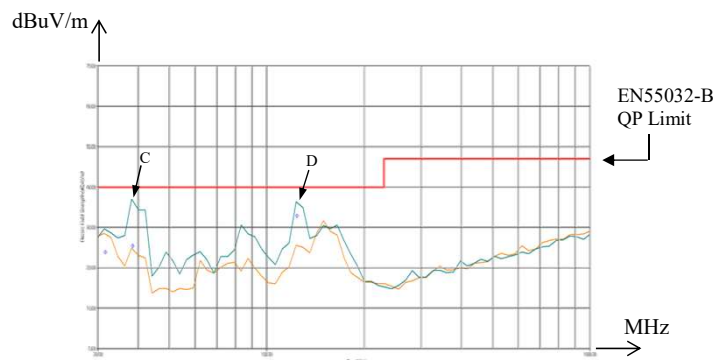


24V

Conditions

Vin : 24VDC
Iout : 0%
— : Horizontal
— : Vertical

Point C (38.29MHz)		
Limit (dBuV/m)	Measured (dBuV/m)	(P)
40	25.54	V



Point D (123.48MHz)		
Limit (dBuV/m)	Measured (dBuV/m)	(P)
40	33.00	V

Limits for CISPR32-B is the same as EN55032-B.
Indication is peak values.

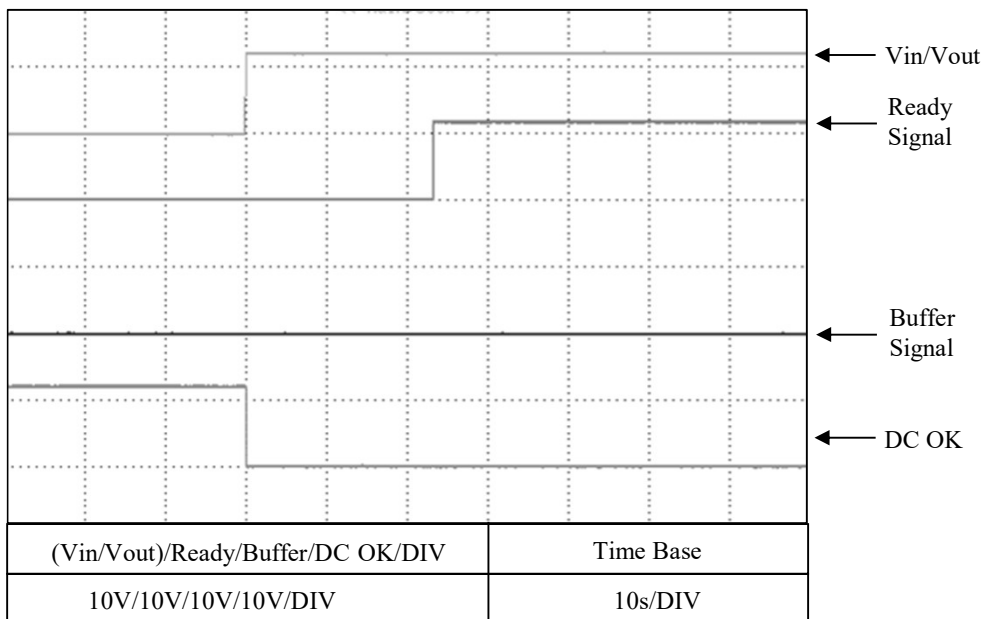
2-8 Signals timing characteristics

(a) Fixed mode

(1) Input start up phase, Ready mode

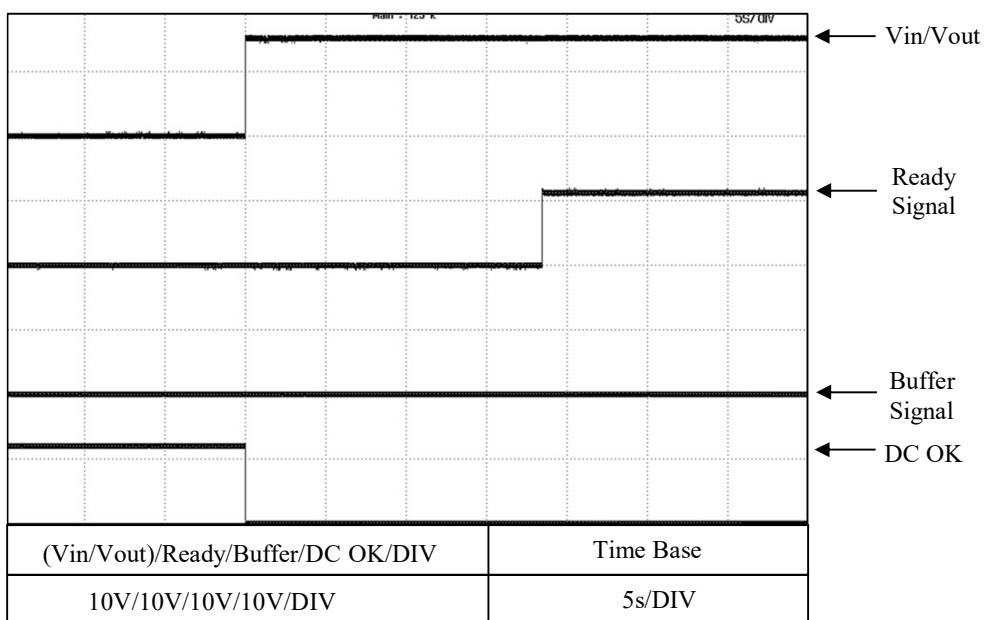
12V

Conditions Vin : 12VDC
Ta : 25°C



15V

Conditions Vin : 15VDC
Ta : 25°C



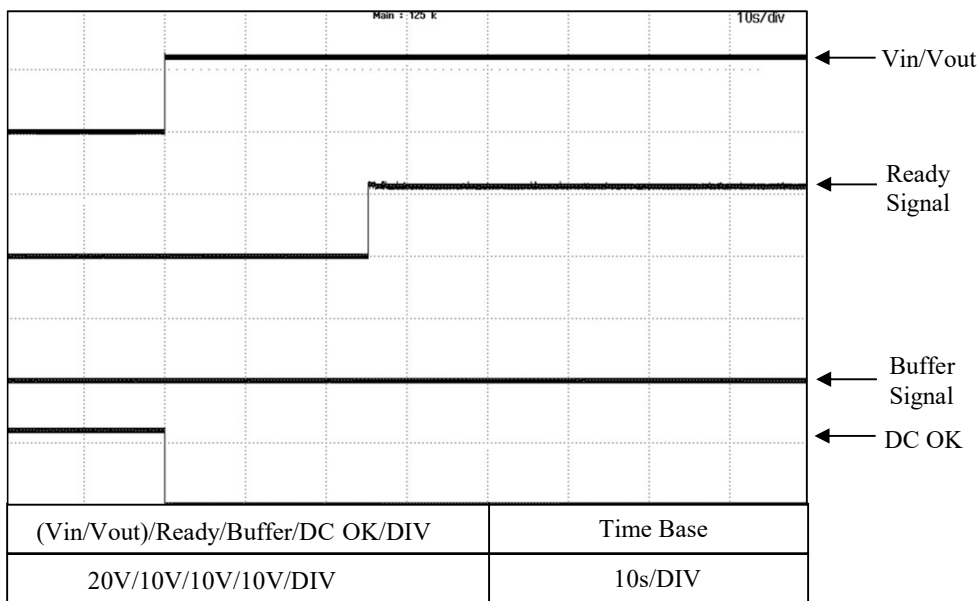
2-8 Signals timing characteristics

(a) Fixed mode

(1) Input start up phase, Ready mode

24V

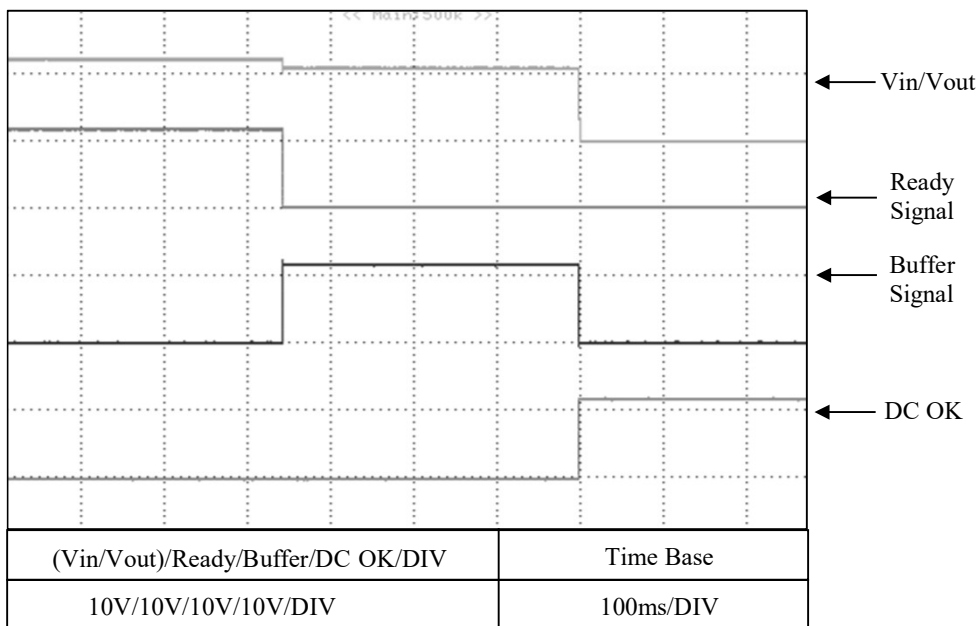
Conditions Vin : 24VDC
Ta : 25°C



(2) Input shutdown phase, Buffer mode

12V

Conditions Vin : 12VDC
Iout : 20A
Ta : 25°C



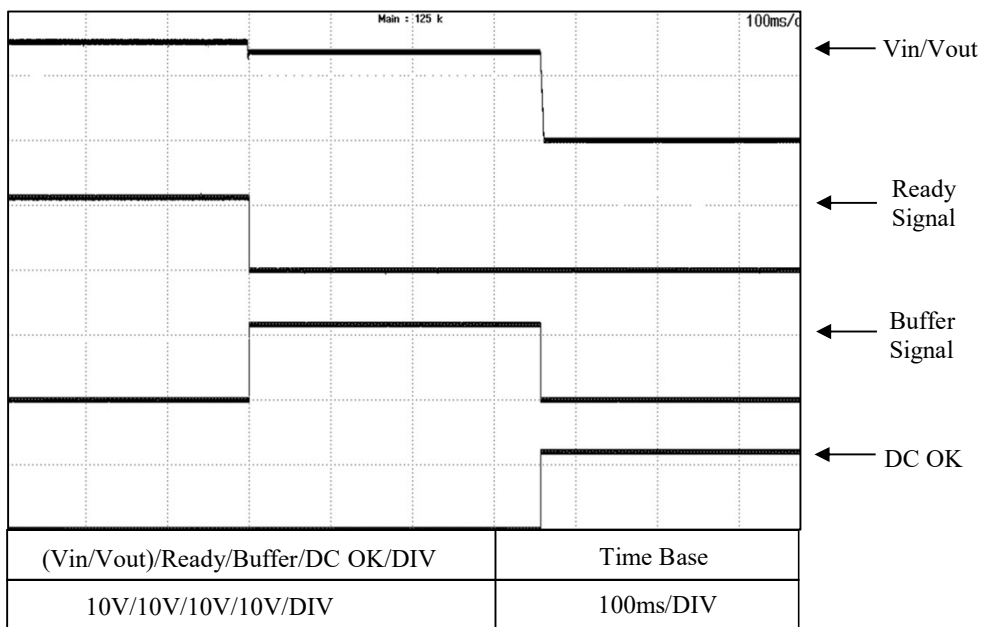
2-8 Signals timing characteristics

(a) Fixed mode

(2) Input shutdown phase, Buffer mode

15V

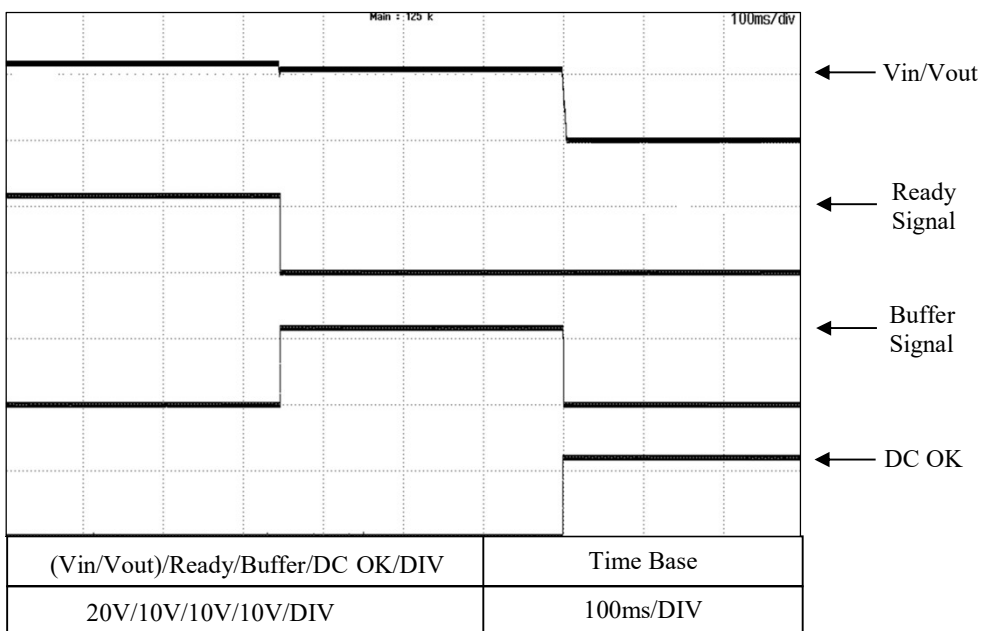
Conditions Vin : 15VDC
Iout : 20A
Ta : 25°C



(2) Input shutdown phase, Buffer mode

24V

Conditions Vin : 24VDC
Iout : 20A
Ta : 25°C



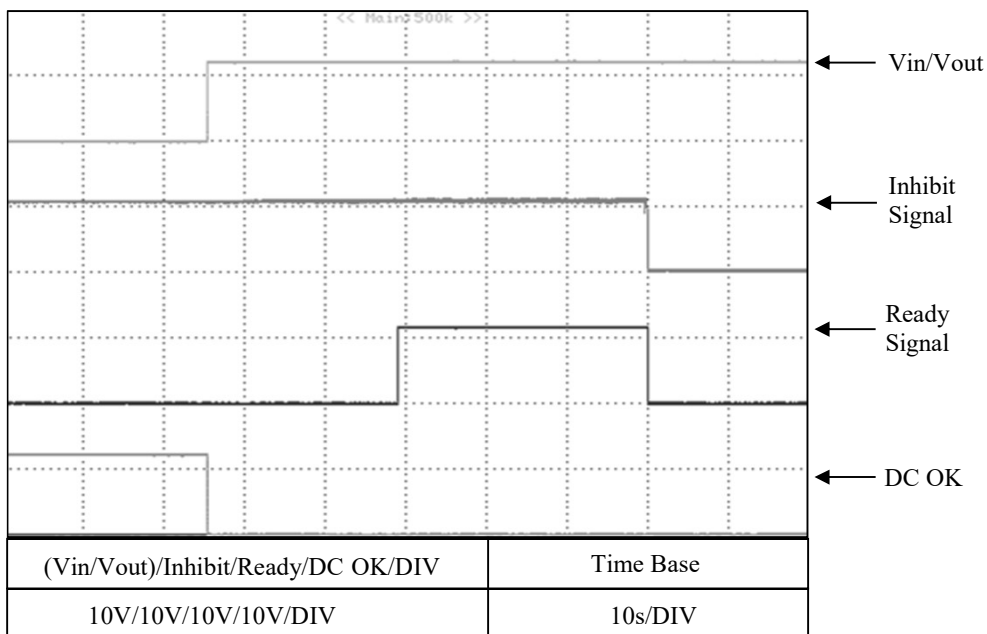
2-8 Signals timing characteristics

(a) Fixed mode

(3) Ready mode, Inhibit operation

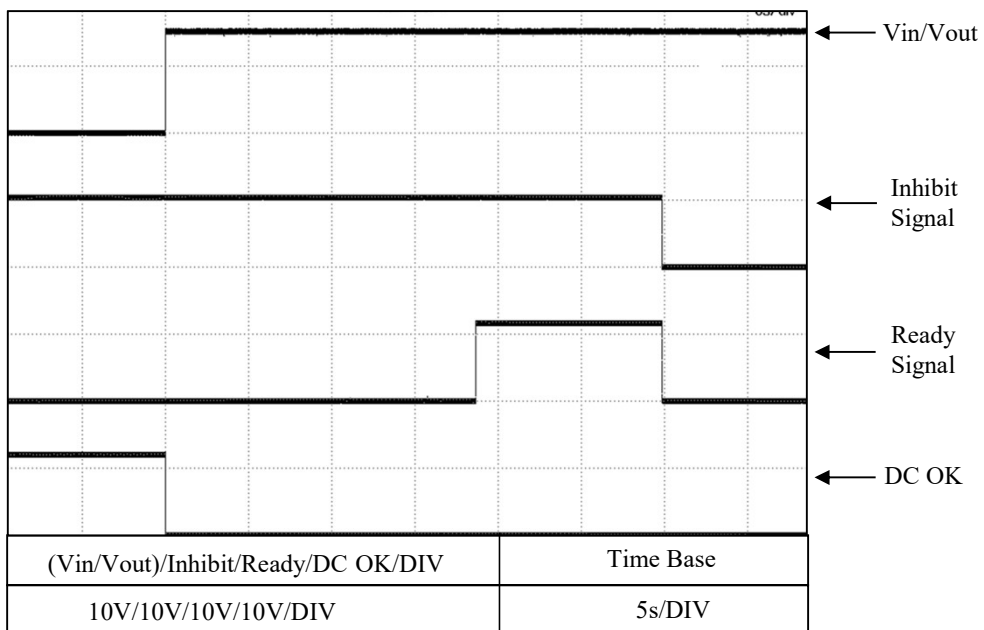
12V

Conditions Vin : 12VDC
Ta : 25°C



15V

Conditions Vin : 15VDC
Ta : 25°C



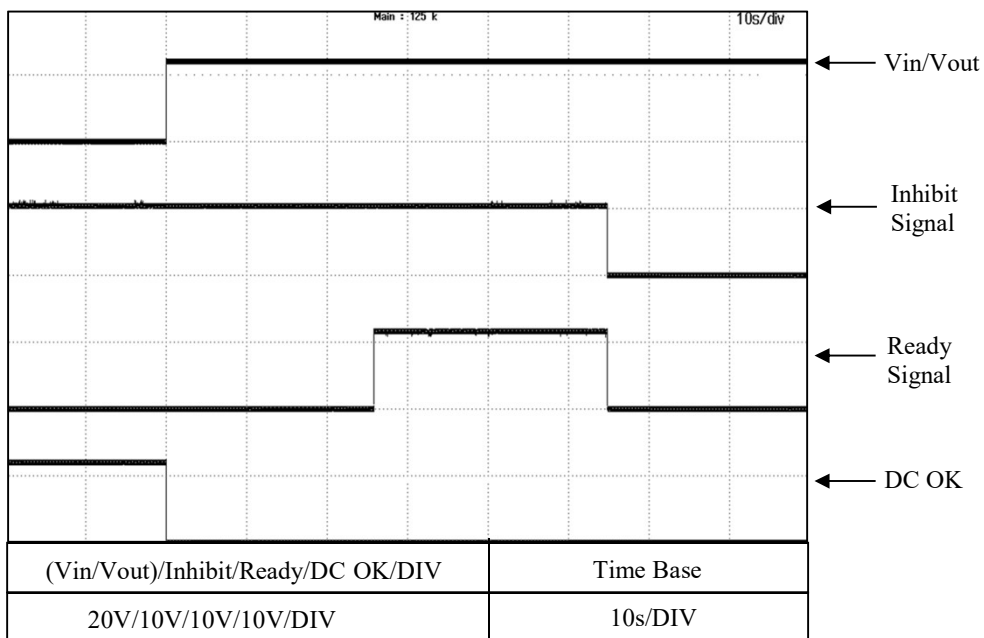
2-8 Signals timing characteristics

(a) Fixed mode

(3) Ready mode, Inhibit operation

24V

Conditions Vin : 24VDC
Ta : 25°C



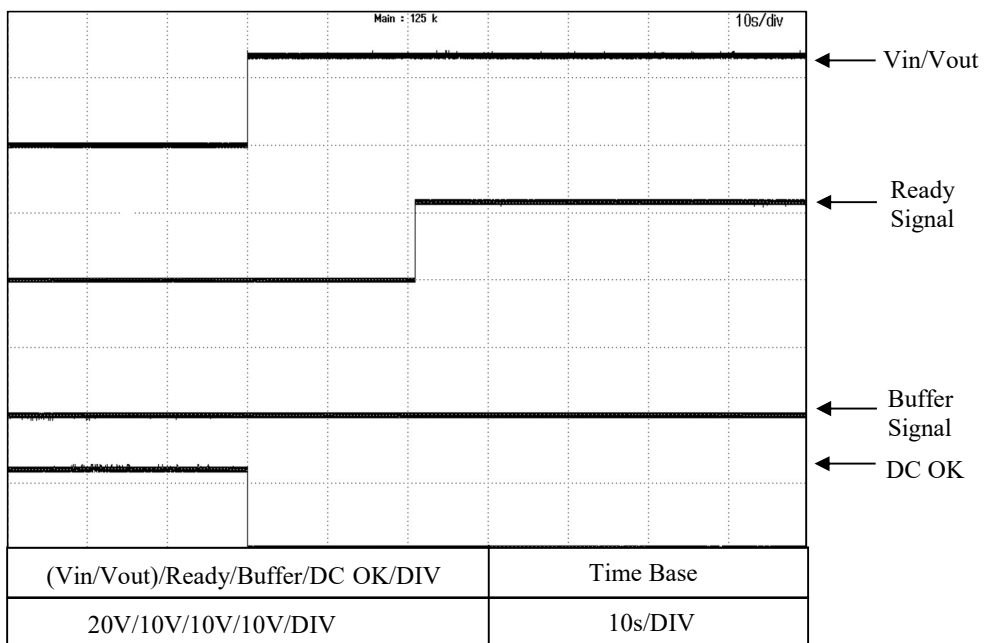
2-8 Signals timing characteristics

(b) VIN-1 mode

(1) Input start Up phase, Ready mode

24V

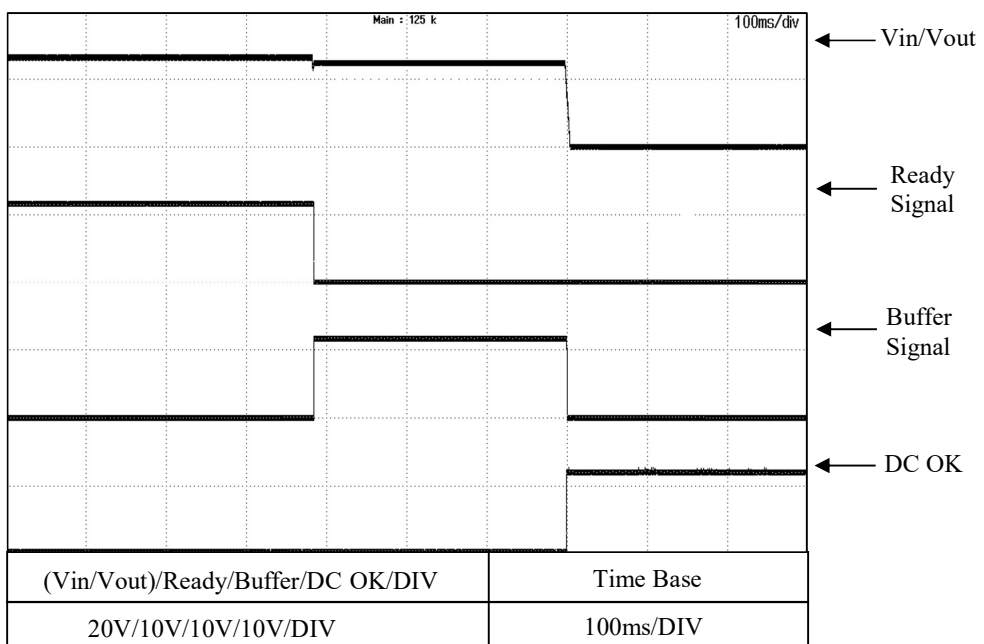
Conditions Vin : 27VDC
Ta : 25°C



(2) Input shutdown phase, Buffer mode

24V

Conditions Vin : 27VDC
Iout : 20A
Ta : 25°C



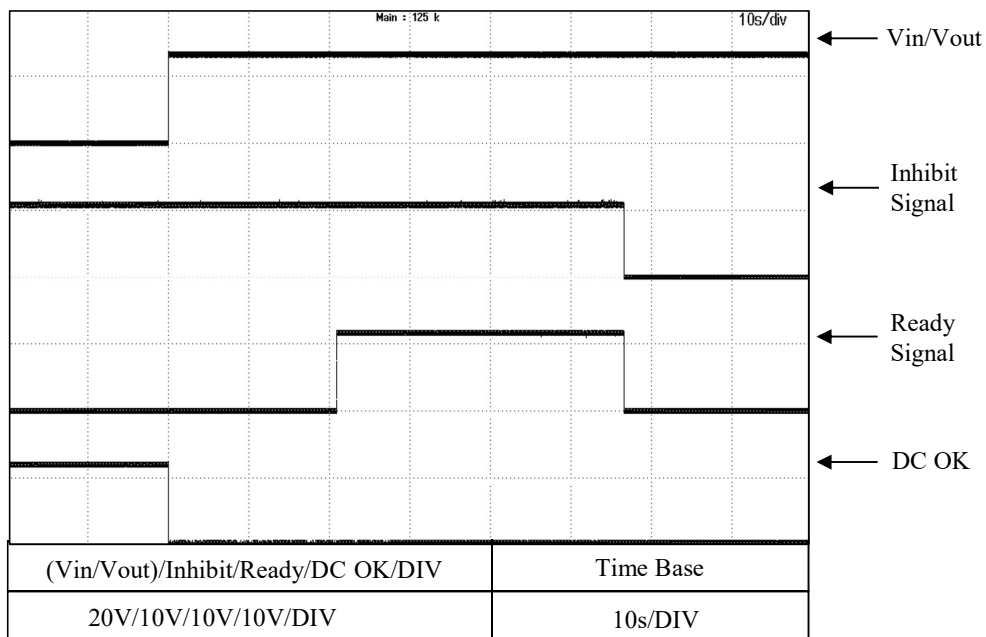
2-8 Signals timing characteristics

(b) VIN-1 mode

(3) Ready mode, Inhibit operation

24V

Conditions Vin : 27VDC
Ta : 25°C



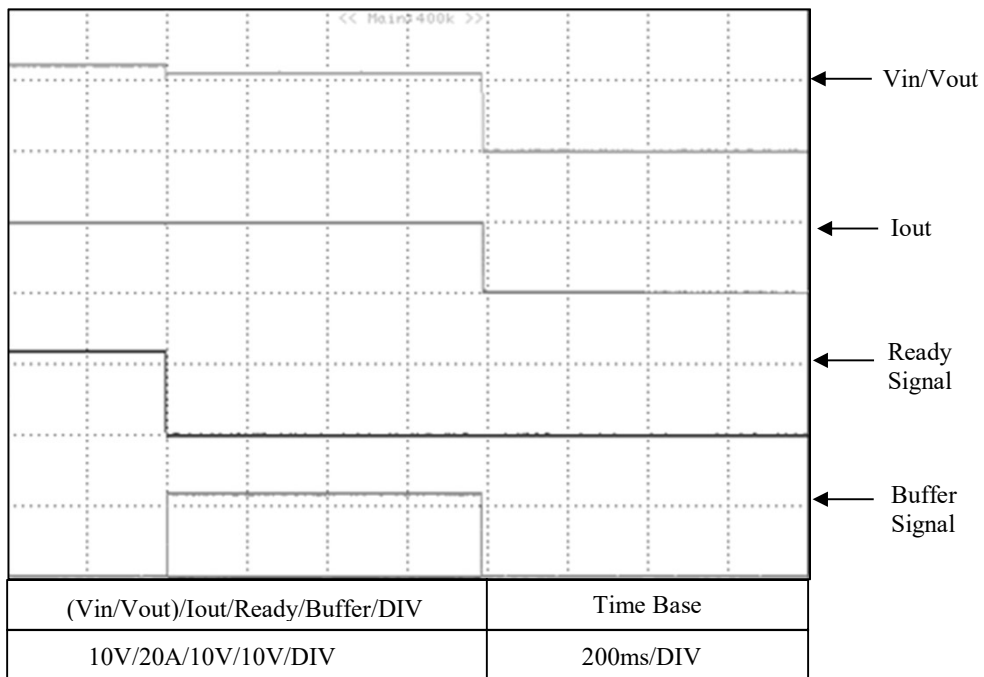
2-9 Parallel operation signals timing characteristics

Input shutdown phase, Buffer mode

(a) Fixed mode Unit in parallel = 2

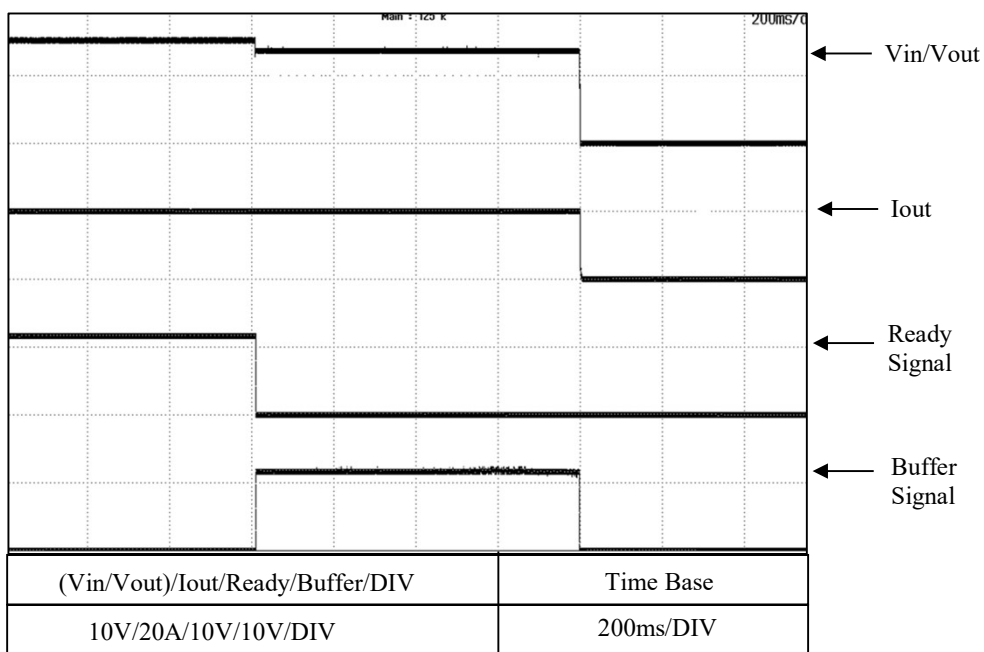
12V

Conditions Vin : 12VDC
Iout : 20A
Ta : 25°C



15V

Conditions Vin : 15VDC
Iout : 20A
Ta : 25°C



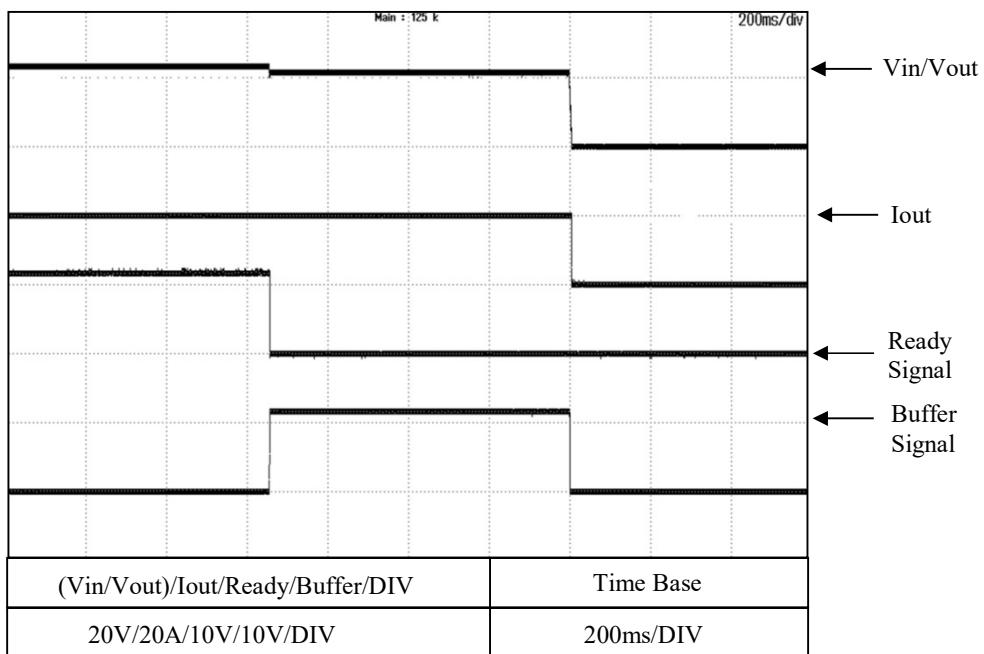
2-9 Parallel operation signals timing characteristics

Input shutdown phase, Buffer mode

(a) Fixed mode Unit in parallel = 2

24V

Conditions Vin : 24VDC
Iout : 20A
Ta : 25°C



(b) VIN-1 mode Unit in parallel = 2

24V

Conditions Vin : 27VDC
Iout : 20A
Ta : 25°C

