Linear Regulator Series

BUxxJA2MNVX-C Series Dropout Voltage

This application note provides design values of the “Dropout voltage” that are necessary for designing circuits. From the operating temperature and output current of the target specification, check the maximum value of the input/output voltage difference in the next page and use it as the circuit design value. The values listed in this material are “design reference values” that are necessary for designing devices, and the values are not guaranteed. Check the latest data sheet for the guaranteed values.

What is dropout voltage

The dropout voltage is the difference between the input and output voltages that is necessary for the stabilizing operation of a linear regulator. When the input voltage approaches the output voltage, stabilizing operation cannot be maintained and the output starts dropping in proportion to the input. The voltage at which this situation starts, i.e., the difference between the input and output voltages that is necessary for the stabilizing operation, is referred to as the dropout voltage (Figure 1).

Figure 2 shows the relation between the input and output voltages and the dropout voltage. The dropout voltage varies with the circuit configuration of ICs. Compared with a standard linear regulator, an LDO has a smaller dropout voltage. Simply stated, the operation can be performed with the input voltage closer to the output voltage as the dropout voltage is smaller. On the other hand, the dropout voltage is not important in an application where 2.5 V is generated from 5 V.

For example, Figure 3 shows the relation between the output current and temperature. It can be said that the dropout voltage is a parameter that varies with the output current and temperature. Therefore, if only the specifications at ordinary temperature are considered in the design, the circuit may not work at high temperature.

Study of dropout voltage and characteristics

The minimum value of the input voltage is determined by adding the output voltage to the dropout voltage at the load current to be used. At this time, the operation can work as DC, but the control performance is degraded. When there are fluctuations in the load, a large current cannot be supplied in a short period of time from input to output, as the dropout voltage is small. In other words, the load responsiveness will slow down. The slowness in responsiveness will also show up as a degradation in the PSRR characteristics. If only the minimum voltage amount of the dropout voltage is secured in order to focus on efficiency, the expected characteristics of the LDO will not be achieved. Increase the input voltage until the high-speed load responsiveness and PSRR performance is achieved, and find a trade-off between efficiency and each characteristic.

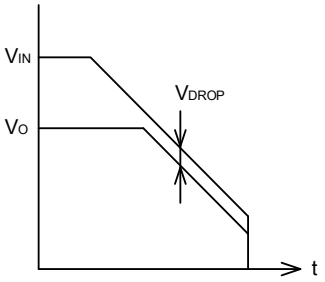

Figure 1. Dropout voltage

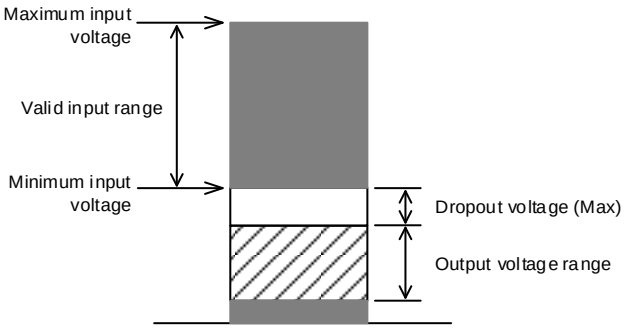

Figure 2. Relation between the input and output voltages

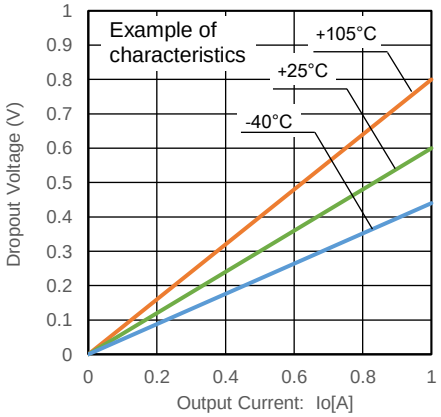

Figure 3. Relation with the output current and temperature

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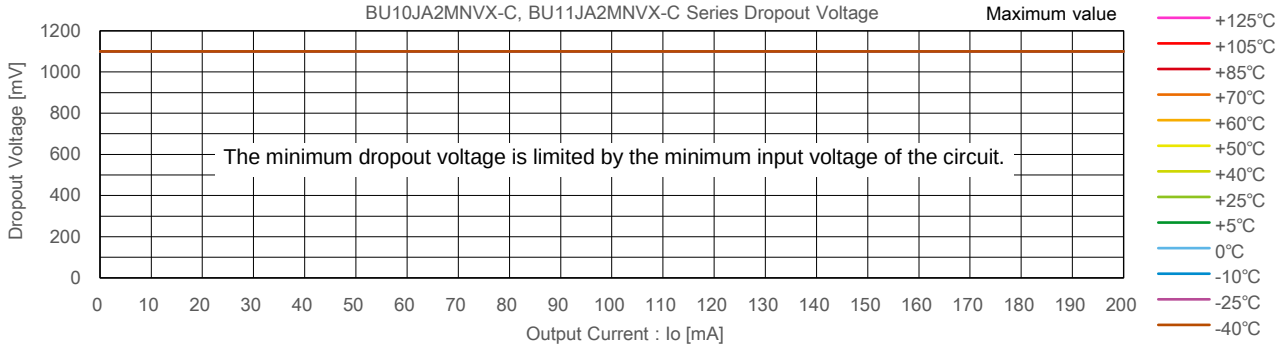
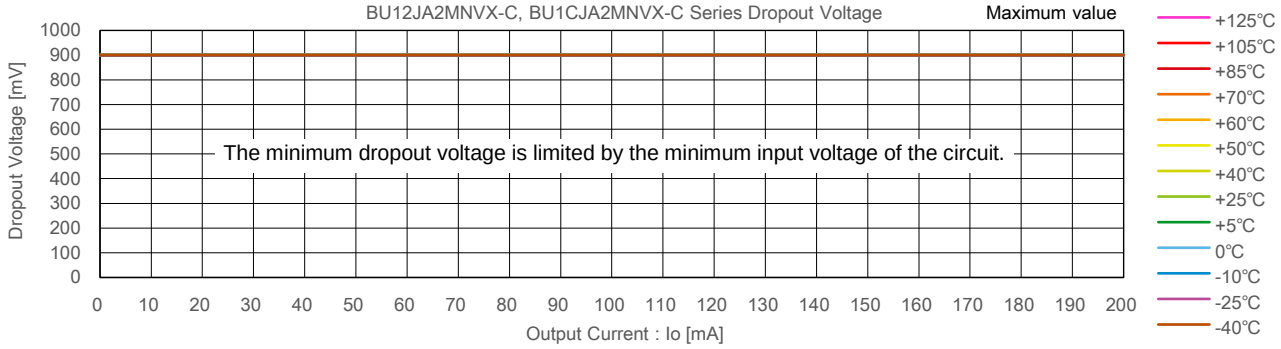
Maximum value, BU10JA2MNVX-C, BU11JA2MNVX-C



I_O [mA]	Dropout Voltage Maximum Value [mV]												
	-40℃	-25℃	-10℃	0℃	+5℃	+25℃	+40℃	+50℃	+60℃	+70℃	+85℃	+105℃	+125℃
0	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
20	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
40	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
60	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
80	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
120	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
140	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
160	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
180	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
200	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100

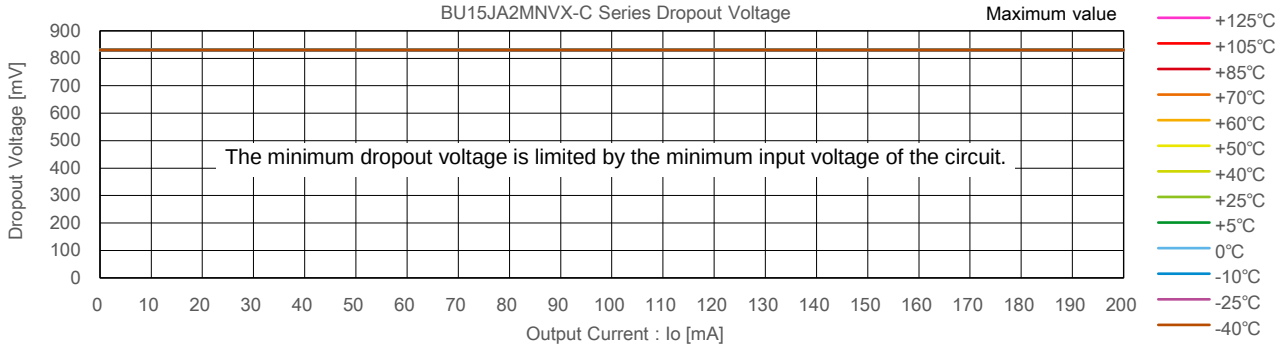
Maximum value, BU12JA2MNVX-C, BU1CJA2MNVX-C



I_O [mA]	Dropout Voltage Maximum Value [mV]												
	-40℃	-25℃	-10℃	0℃	+5℃	+25℃	+40℃	+50℃	+60℃	+70℃	+85℃	+105℃	+125℃
0	900	900	900	900	900	900	900	900	900	900	900	900	900
20	900	900	900	900	900	900	900	900	900	900	900	900	900
40	900	900	900	900	900	900	900	900	900	900	900	900	900
60	900	900	900	900	900	900	900	900	900	900	900	900	900
80	900	900	900	900	900	900	900	900	900	900	900	900	900
100	900	900	900	900	900	900	900	900	900	900	900	900	900
120	900	900	900	900	900	900	900	900	900	900	900	900	900
140	900	900	900	900	900	900	900	900	900	900	900	900	900
160	900	900	900	900	900	900	900	900	900	900	900	900	900
180	900	900	900	900	900	900	900	900	900	900	900	900	900
200	900	900	900	900	900	900	900	900	900	900	900	900	900

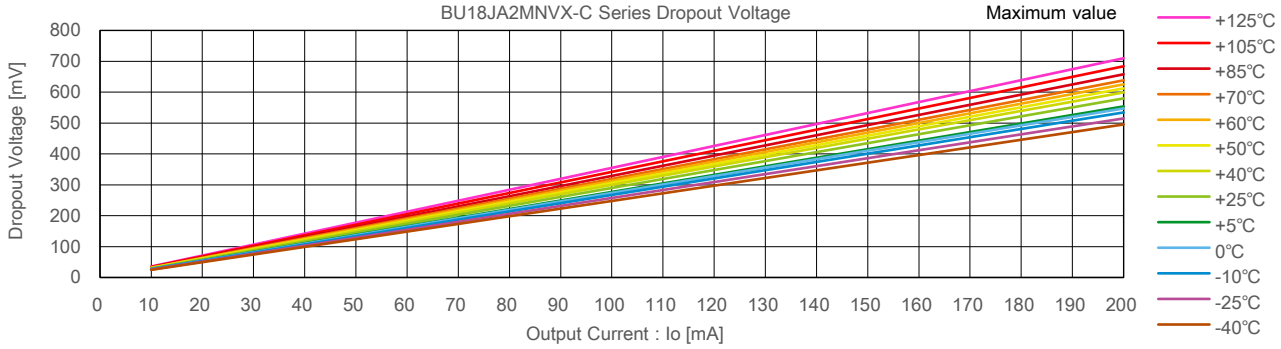
These values are “design reference values” that are necessary for circuit design, and the values are not guaranteed. Check the latest data sheet for the guaranteed values.

Maximum value, BU15JA2MNVX-C



I_O [mA]	Dropout Voltage Maximum Value [mV]												
	-40℃	-25℃	-10℃	0℃	+5℃	+25℃	+40℃	+50℃	+60℃	+70℃	+85℃	+105℃	+125℃
0	830	830	830	830	830	830	830	830	830	830	830	830	830
20	830	830	830	830	830	830	830	830	830	830	830	830	830
40	830	830	830	830	830	830	830	830	830	830	830	830	830
60	830	830	830	830	830	830	830	830	830	830	830	830	830
80	830	830	830	830	830	830	830	830	830	830	830	830	830
100	830	830	830	830	830	830	830	830	830	830	830	830	830
120	830	830	830	830	830	830	830	830	830	830	830	830	830
140	830	830	830	830	830	830	830	830	830	830	830	830	830
160	830	830	830	830	830	830	830	830	830	830	830	830	830
180	830	830	830	830	830	830	830	830	830	830	830	830	830
200	830	830	830	830	830	830	830	830	830	830	830	830	830

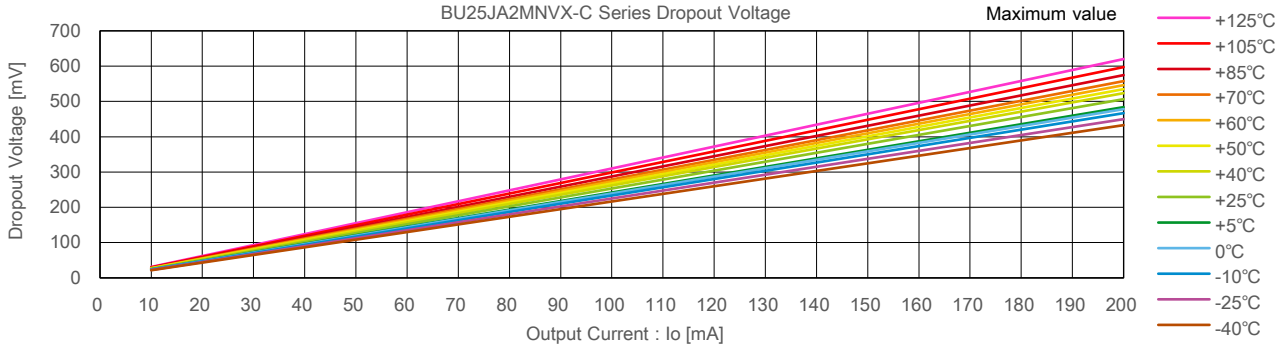
Maximum value, BU18JA2MNVX-C



I_O [mA]	Dropout Voltage Maximum Value [mV]												
	-40℃	-25℃	-10℃	0℃	+5℃	+25℃	+40℃	+50℃	+60℃	+70℃	+85℃	+105℃	+125℃
10	25	26	27	27	28	29	30	31	31	32	33	34	36
20	50	52	53	55	55	58	60	61	63	64	66	68	71
40	99	103	107	109	111	116	120	122	125	128	132	137	142
60	149	155	160	164	166	174	180	184	188	192	197	205	213
80	198	206	214	219	222	232	240	245	250	255	263	274	284
100	248	258	267	274	277	290	300	306	313	319	329	342	355
120	297	309	321	328	332	348	360	367	375	383	395	410	426
140	347	361	374	383	388	406	420	429	438	447	461	479	497
160	396	412	428	438	443	464	480	490	500	511	526	547	568
180	446	464	481	493	499	522	539	551	563	575	592	616	639
200	496	515	534	547	554	580	599	612	625	638	658	684	710

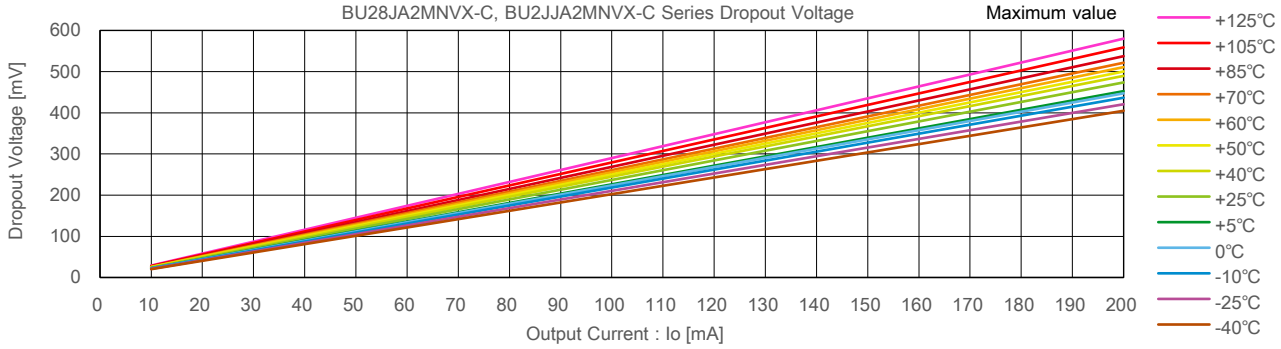
These values are “design reference values” that are necessary for circuit design, and the values are not guaranteed. Check the latest data sheet for the guaranteed values.

Maximum value, BU25JA2MNVX-C



I_O [mA]	Dropout Voltage Maximum Value [mV]												
	-40℃	-25℃	-10℃	0℃	+5℃	+25℃	+40℃	+50℃	+60℃	+70℃	+85℃	+105℃	+125℃
10	22	22	23	24	24	25	26	27	27	28	29	30	31
20	43	45	47	48	48	51	52	53	55	56	57	60	62
40	87	90	93	96	97	101	105	107	109	112	115	119	124
60	130	135	140	143	145	152	157	160	164	167	172	179	186
80	173	180	187	191	193	203	209	214	218	223	230	239	248
100	216	225	233	239	242	253	262	267	273	279	287	299	310
120	260	270	280	287	290	304	314	321	328	335	345	358	372
140	303	315	327	335	339	354	366	374	382	390	402	418	434
160	346	360	373	382	387	405	419	428	437	446	460	478	496
180	389	405	420	430	435	456	471	481	492	502	517	538	558
200	433	450	467	478	484	506	523	535	546	558	575	597	620

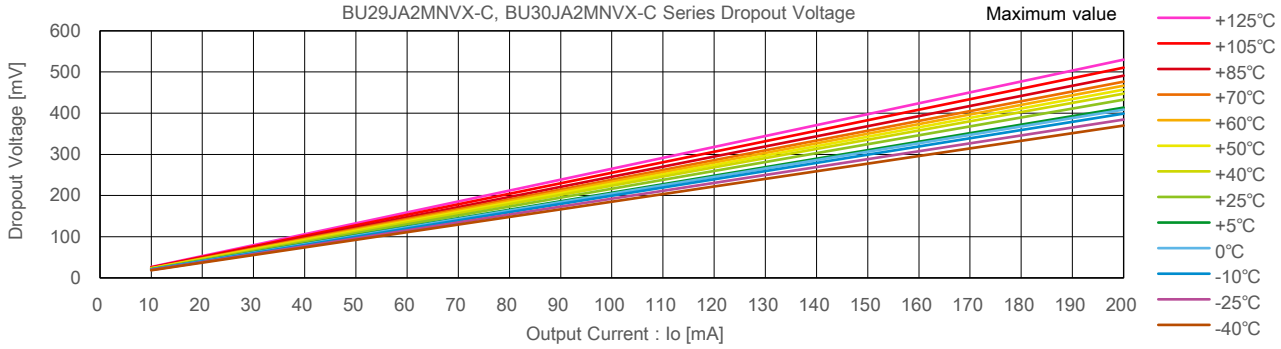
Maximum value, BU28JA2MNVX-C, BU2JJA2MNVX-C



I_O [mA]	Dropout Voltage Maximum Value [mV]												
	-40℃	-25℃	-10℃	0℃	+5℃	+25℃	+40℃	+50℃	+60℃	+70℃	+85℃	+105℃	+125℃
10	20	21	22	22	23	24	24	25	26	26	27	28	29
20	40	42	44	45	45	47	49	50	51	52	54	56	58
40	81	84	87	89	91	95	98	100	102	104	108	112	116
60	121	126	131	134	136	142	147	150	153	156	161	168	174
80	162	168	175	179	181	189	196	200	204	209	215	224	232
100	202	210	218	224	226	237	245	250	255	261	269	279	290
120	243	252	262	268	272	284	294	300	307	313	323	335	348
140	283	295	306	313	317	332	343	350	358	365	376	391	406
160	324	337	349	358	362	379	392	400	409	417	430	447	464
180	364	379	393	403	407	426	441	450	460	469	484	503	522
200	405	421	437	447	453	474	490	500	511	522	538	559	580

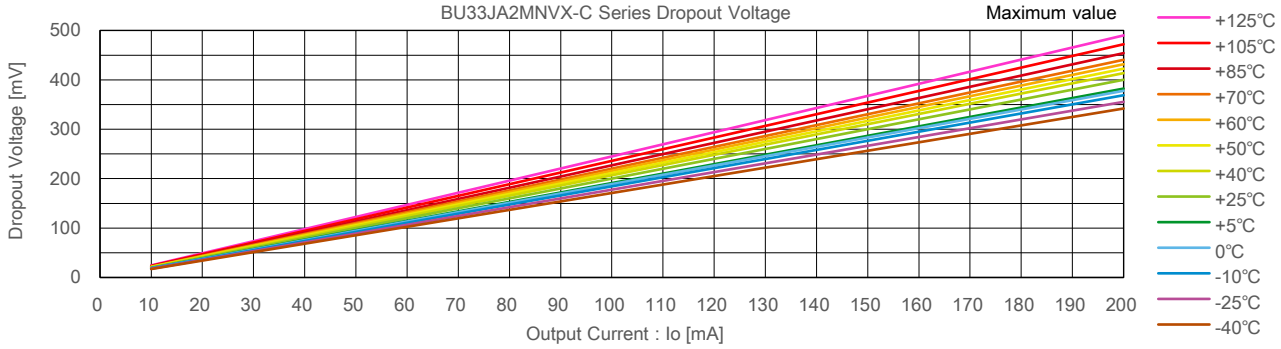
These values are “design reference values” that are necessary for circuit design, and the values are not guaranteed. Check the latest data sheet for the guaranteed values.

Maximum value, BU29JA2MNVX-C, BU30JA2MNVX-C



I_O [mA]	Dropout Voltage Maximum Value [mV]												
	-40℃	-25℃	-10℃	0℃	+5℃	+25℃	+40℃	+50℃	+60℃	+70℃	+85℃	+105℃	+125℃
10	18	19	20	20	21	22	22	23	23	24	25	26	26
20	37	38	40	41	41	43	45	46	47	48	49	51	53
40	74	77	80	82	83	87	89	91	93	95	98	102	106
60	111	115	120	123	124	130	134	137	140	143	147	153	159
80	148	154	160	163	165	173	179	183	187	191	196	204	212
100	185	192	199	204	207	216	224	229	233	238	246	255	265
120	222	231	239	245	248	260	268	274	280	286	295	306	318
140	259	269	279	286	289	303	313	320	327	334	344	357	371
160	296	308	319	327	331	346	358	366	373	381	393	408	424
180	333	346	359	368	372	390	403	411	420	429	442	459	477
200	370	384	399	409	413	433	447	457	467	477	491	511	530

Maximum value, BU33JA2MNVX-C



I_O [mA]	Dropout Voltage Maximum Value [mV]												
	-40℃	-25℃	-10℃	0℃	+5℃	+25℃	+40℃	+50℃	+60℃	+70℃	+85℃	+105℃	+125℃
10	17	18	18	19	19	20	21	21	22	22	23	24	24
20	34	36	37	38	38	40	41	42	43	44	45	47	49
40	68	71	74	76	76	80	83	85	86	88	91	94	98
60	103	107	111	113	115	120	124	127	129	132	136	142	147
80	137	142	148	151	153	160	165	169	173	176	182	189	196
100	171	178	184	189	191	200	207	211	216	220	227	236	245
120	205	213	221	227	229	240	248	254	259	264	272	283	294
140	239	249	258	264	268	280	290	296	302	308	318	330	343
160	274	284	295	302	306	320	331	338	345	352	363	378	392
180	308	320	332	340	344	360	372	380	388	397	409	425	441
200	342	355	369	378	382	400	414	423	432	441	454	472	490

These values are “design reference values” that are necessary for circuit design, and the values are not guaranteed. Check the latest data sheet for the guaranteed values.

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