RICOH

R1182x SERIES

Low Voltage 150mA LDO REGULATOR

NO.EA-133-070621

OUTLINE

The R1182x Series are CMOS-based positive voltage regulator ICs with high output voltage accuracy and low supply current. Each of these ICs consists of a voltage reference unit, an error amplifier, resistor-net for voltage setting, a current limit circuit which prevents the destruction by excess current, and so on.

The output voltage of these ICs is fixed with high accuracy. The R1182 Series has low dropout voltage caused by built in low on resistance transistor. Further, the consumption current of IC itself is Typ. 3.0μA at no load, at the same time, compared with the conventional low supply current regulator, transient response is improved in all the load range by our original seamless technology.

Since the packages for these ICs are SOT-23-5 and ultra small PLP1616-6, high density mounting of the ICs on boards is possible.

FEATURES

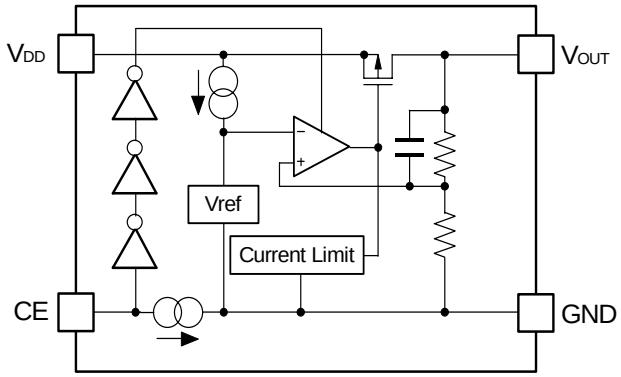
- Low Supply Current .....Typ. 3μA(Except the current through CE pull-down circuit)
- Standby Current .....Typ. 0.1μA
- Input Voltage Range ..... 1.5V to 6.0V
- Output Voltage .....1.2V to 4.0V
- Low Dropout Voltage.....Typ. 0.23V (I_{OUT}=150mA 3.0V Output type)
- Ripple Rejection.....Typ. 55dB at 1kHz (V_{OUT}=1.5V, I_{OUT}=30mA)
  Typ. 40dB at 10kHz (V_{OUT}=1.5V, I_{OUT}=30mA)
- High Output Voltage Accuracy .....±1.0% ($V_{OUT} \geqq$ 1.5V), ±15mV (V_{OUT}<1.5V)
- Low Temperature-Drift Coefficient of Output Voltage..... Typ. ±100ppm/°C
- Excellent Line Regulation .....Typ. 0.1%/V
- Small Packages SOT-23-5,PLP1616-6
- Built-in Fold Back Protection Circuit .....Typ. 50mA (Current at short mode)
- Ceramic capacitors are recommended to be used with this IC (0.1μF or more)

APPLICATIONS

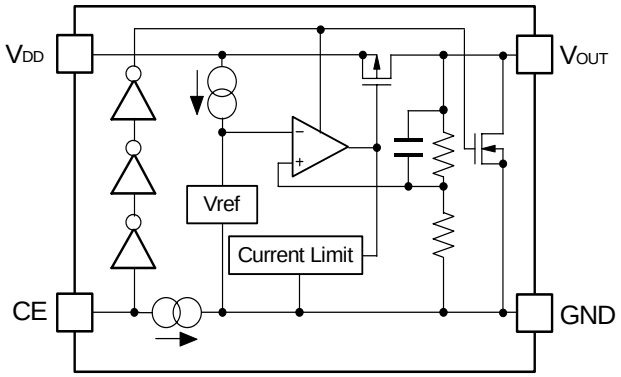
- Stable voltage reference.
- Power source for electrical appliances such as cameras, camcorders, mobile communication equipment.
- Power source for battery-powered equipment.

BLOCK DIAGRAMS

R1182xxx1B



R1182xxx1D



SELECTION GUIDE

The output voltage, auto discharge function*, and the package type for the ICs can be selected at the user's request.

The selection can be made with designating the part number as shown below:

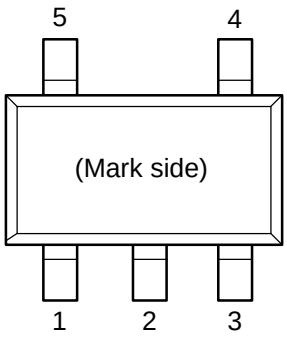
R1182x<u>xx</u>1x-<u>TR</u>-x ←Part Number
↑ ↑ ↑ ↑ ↑
a b c d e

Code	Contents
a	Designation of Package Type : N: SOT-23-5 (Mini mold) K: PLP1616-6
b	Setting Output Voltage (V_{OUT}) : Stepwise setting with a step of 0.1V in the range of 1.2V to 4.0V is possible. Exceptions 1.25V output type: R1182x121x5, 1.85V output type: R1182x181x5, 2.85V output type: R1182x281x5.
c	Designation of Mask Option B: active high, without auto discharge function* at OFF state. D: active high, with auto discharge function* at OFF state.
d	Designation of Taping Type : Ex. TR (refer to Taping Specifications; TR type is the standard direction.)
e	Designation of composition of pin plating: -F: Lead free plating (SOT-23-5) None: Au plating (PLP1616-6)

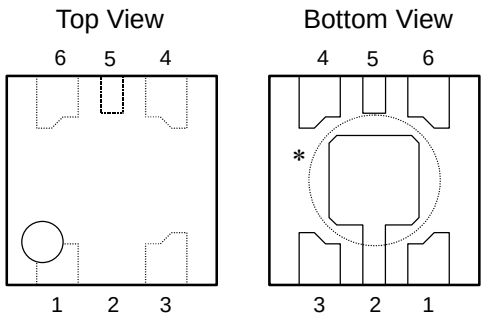
*) When the mode is into standby with CE signal, auto discharge transistor turns on, and it makes the turn-off speed faster than normal type.

PIN CONFIGURATIONS

- **SOT-23-5**



- **PLP1616-6**



PIN DESCRIPTIONS

- **SOT-23-5 (R1182N)**

Pin No	Symbol	Pin Description
1	GND	Ground Pin
2	V_{DD}	Input Pin
3	V_{OUT}	Output pin
4	NC	No Connection
5	CE	Chip Enable Pin

- **PLP1616-6 (R1180K)**

Pin No	Symbol	Pin Description
1	V_{DD}	Input Pin
2	GND	Ground Pin
3	CE	Chip Enable Pin
4	NC	No Connection
5	NC	No Connection
6	V_{OUT}	Output pin

∗ Tab in the ◌ parts have GND level.
(They are connected to the reverse side of this IC.)
Do not connect to other wires or land patterns.

ABSOLUTE MAXIMUM RATINGS

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	6.5	V
V_{CE}	Input Voltage (CE Pin)	−0.3 to 6.5	V
V_{OUT}	Output Voltage	−0.3 to V_{IN}+0.3	V
I_{OUT}	Output Current	200	mA
P_D	Power Dissipation (SOT-23-5) *	420	mW
	Power Dissipation (PLP1616-6) *	560	
Topt	Operating Temperature Range	−40 to 85	°C
Tstg	Storage Temperature Range	−55 to 125	°C

∗) For Power Dissipation, please refer to PACKAGE INFORMATION to be described.

ELECTRICAL CHARACTERISTICS

- **R1182xxx1B/D**

Topt=25°C

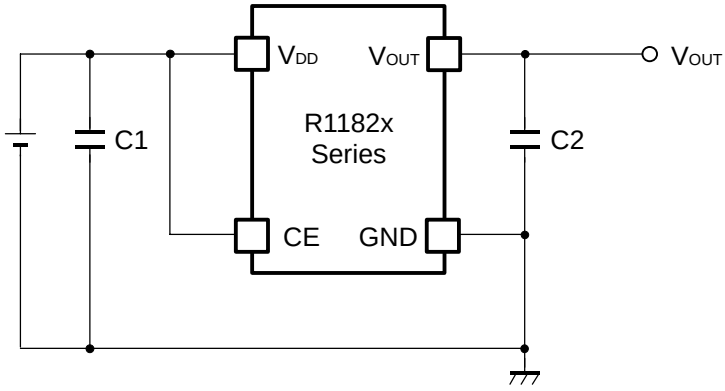
Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
V_{OUT}	Output Voltage	V_{IN}=Set V_{OUT}+1V I_{OUT}=1mA	V_{OUT} > 1.5V	×0.99		×1.01	V
			V_{OUT} ≦ 1.5V	(−15mV)		(+15mV)	
I_{OUT}	Output Current	V_{IN}−V_{OUT}=1.0V		150			mA
ΔV_{OUT}/ ΔI_{OUT}	Load Regulation	V_{IN}=Set V_{OUT}+1V 1mA ≦ I_{OUT} ≦ 150mA			30	80	mV
V_{DIF}	Dropout Voltage	Refer to the ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE					
I_{SS}	Supply Current	V_{IN}=Set V_{OUT}+1V, I_{OUT}=0mA			3.0	7.0	μA
Istandby	Supply Current (Standby)	V_{IN}=Set V_{OUT}+1V, V_{CE}=GND			0.1	1.0	μA
ΔV_{OUT}/ ΔV_{IN}	Line Regulation	Set V_{OUT}+0.5V ≦ V_{IN} ≦ 6.0V I_{OUT}=30mA			0.1	0.3	%/V
RR	Ripple Rejection	f=1kHz f=10kHz V_{OUT}=1.5V,I_{OUT}=30mA			55 40		dB
V_{IN}	Input Voltage			1.5		6.0	V
ΔV_{OUT}/ ΔTopt	Output Voltage Temperature Coefficient	I_{OUT}=30mA −40°C ≦ Topt ≦ 85°C			±100		ppm/°C
I_{lim}	Short Current Limit	V_{OUT}=0V			50		mA
I_{PD}	CE Pull-down Current			0.05	0.30	0.55	μA
V_{CEH}	CE Input Voltage "H"			1.0		6.0	V
V_{CEL}	CE Input Voltage "L"			0.0		0.4	V
en	Output Noise	BW=10Hz to 100kHz			30		μVrms
R_{LOW}	Nch Tr.On resistance for auto discharge function (Only applied to D Version)	CE="L"			50		Ω

- **ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE**

Topt = 25°C

Output Voltage V_{OUT} (V)	Dropout Voltage V_{DIF} (V)		
	Condition	Typ.	Max.
1.2 ≦ V_{OUT} < 1.3	I_{OUT}=150mA	0.60	0.82
1.3 ≦ V_{OUT} < 1.4		0.53	0.75
1.4 ≦ V_{OUT} < 1.5		0.46	0.67
1.5 ≦ V_{OUT} < 2.0		0.43	0.60
2.0 ≦ V_{OUT} < 2.8		0.31	0.40
2.8 ≦ V_{OUT} < 4.0		0.23	0.29
2.1 ≦ V_{OUT} < 2.8		0.19	0.23
V_{OUT}=4.0		0.25	0.40

TYPICAL APPLICATIONS



(External components example; Output capacitor: Ceramic type
Input capacitor: Ceramic type

Output Capacitor:	0.1μF	Kyocera	CM05B104K06AB
		Murata	GRM155B31C104KA87B
	1.0μF	Kyocera	CM05X5R105K06AB
		TDK	C1005JB0J105K
		Murata	GRM155B30J105KE18B

TEST CIRCUITS

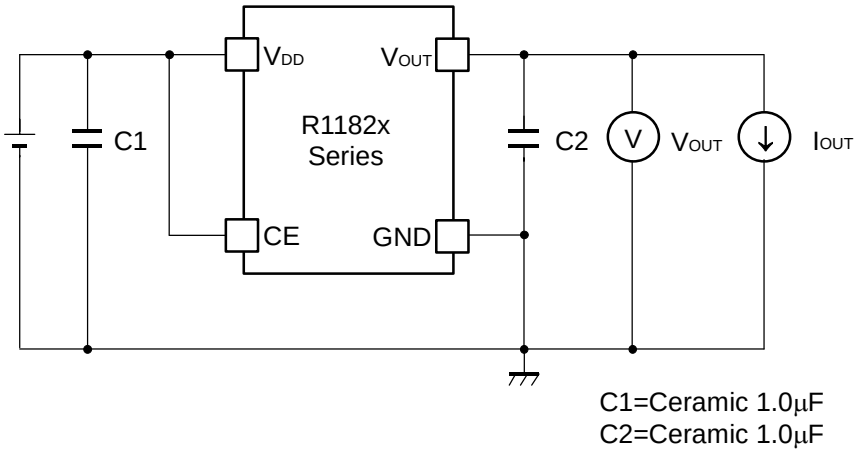


Fig.1 Standard test Circuit

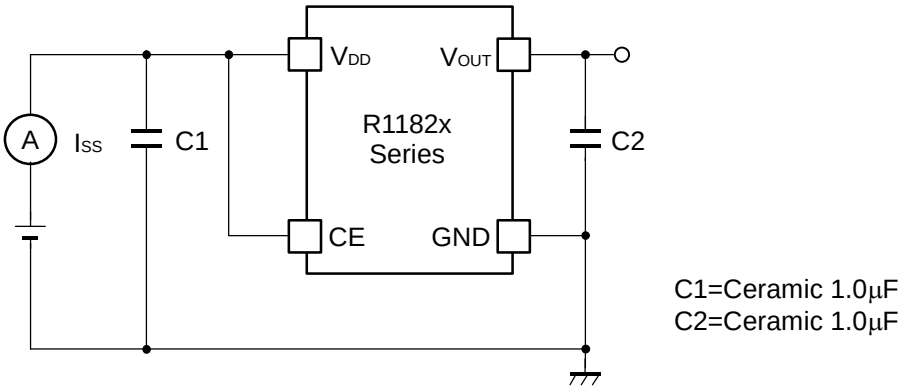


Fig.2 Supply Current Test Circuit

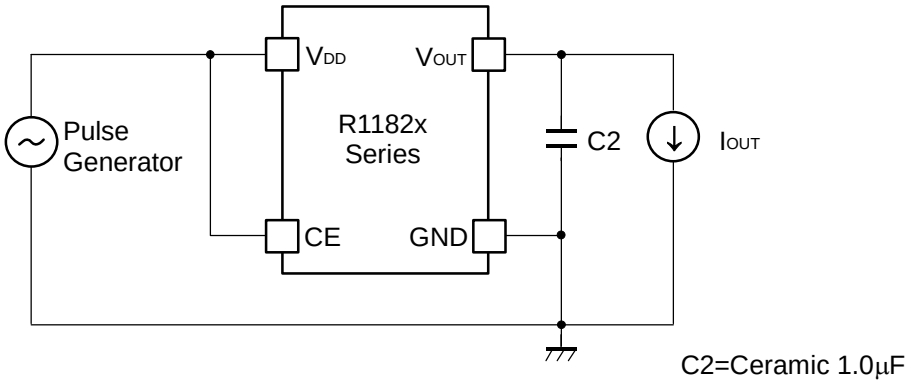


Fig.3 Ripple Rejection, Line Transient Response Test Circuit

TYPICAL CHARACTERISTICS

1) Output Voltage vs. Output Current (Topt=25°C)

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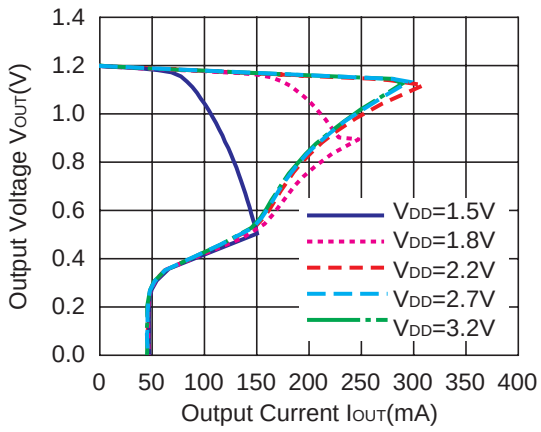

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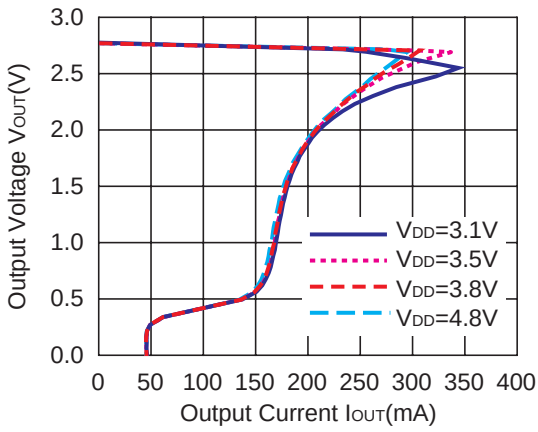

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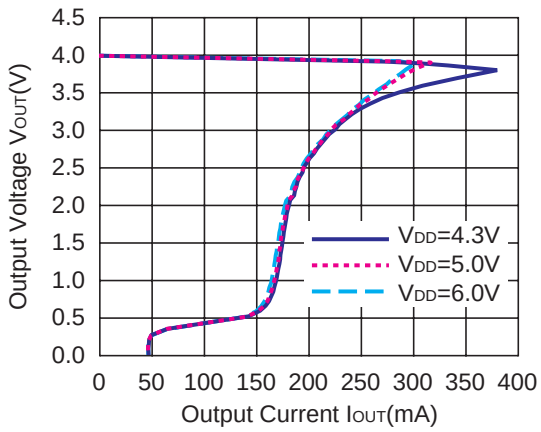

2) Output Voltage vs. Input Voltage (Topt=25°C)

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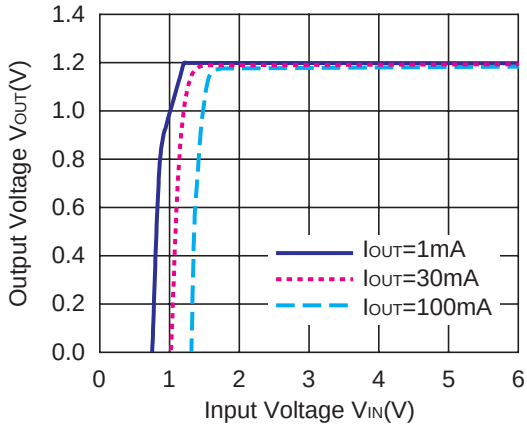

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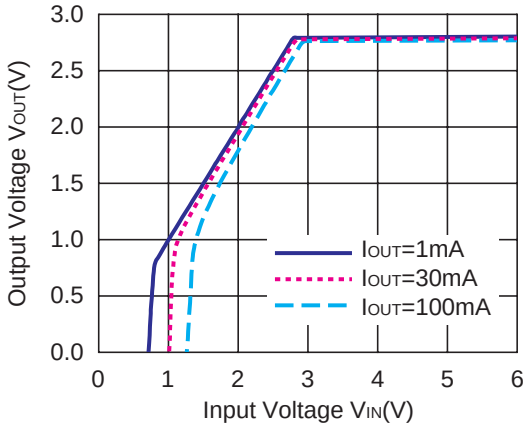

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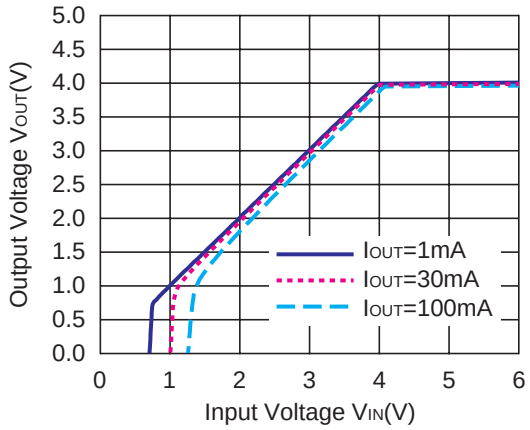

3) Supply Current vs. Input Voltage

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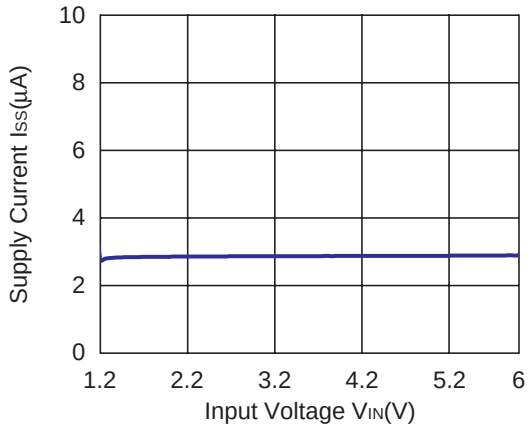

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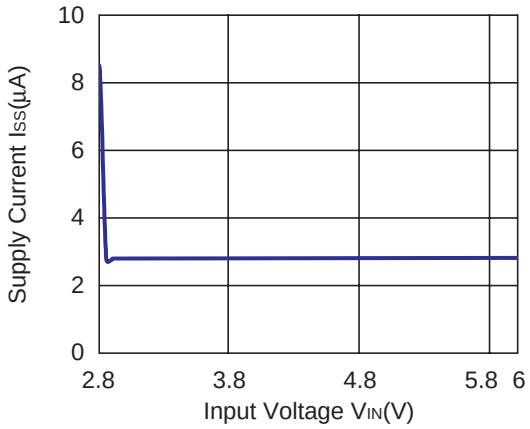

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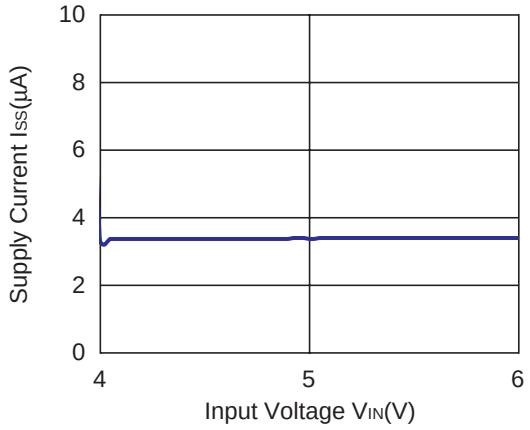
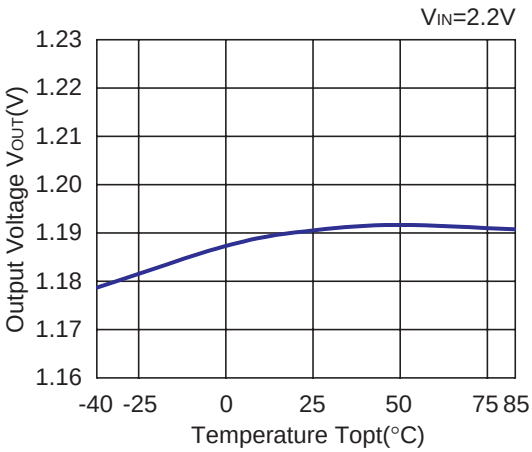


4) Output Voltage vs. Temperature (I_{OUT}=30mA)

R1182x121x



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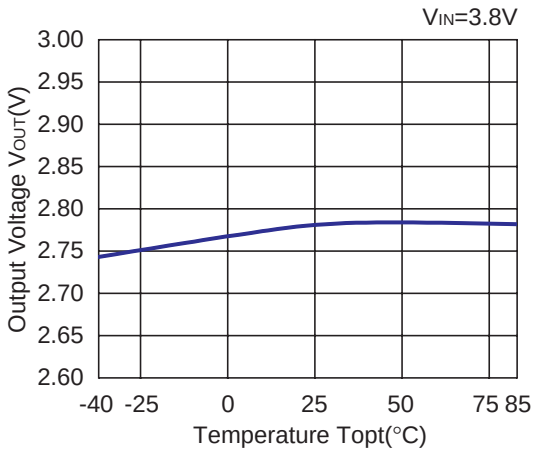

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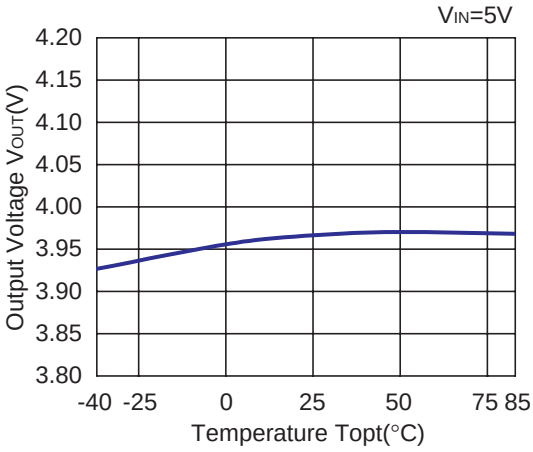

5) Supply Current vs. Temperature (Topt=25°C)

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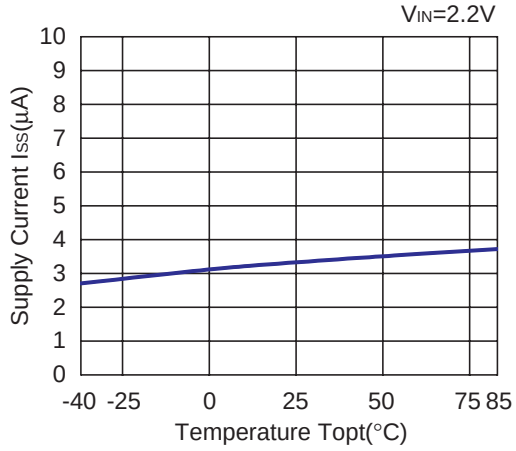

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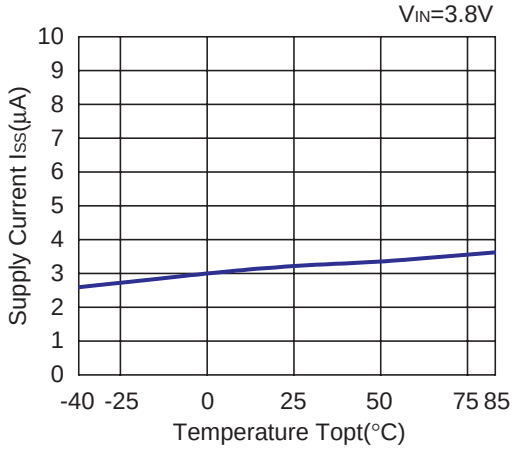

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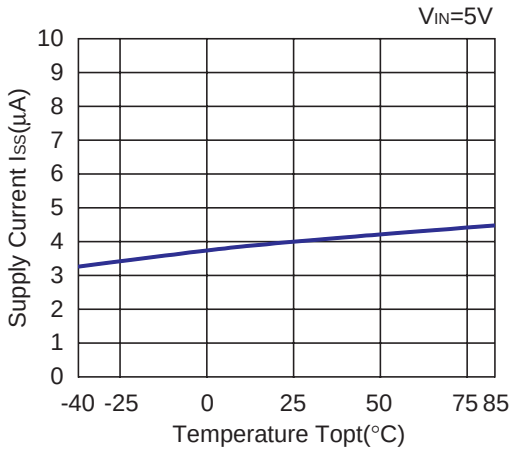

6) Dropout Voltage vs. Output Current

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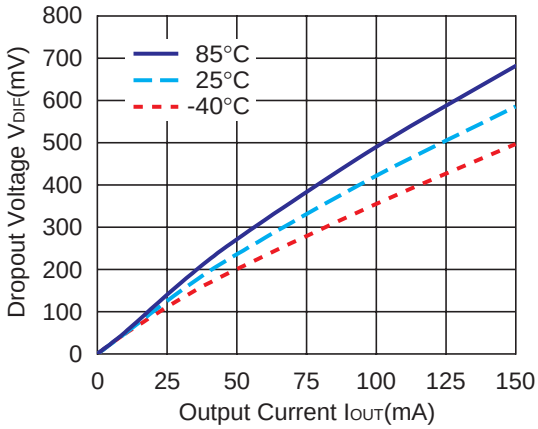

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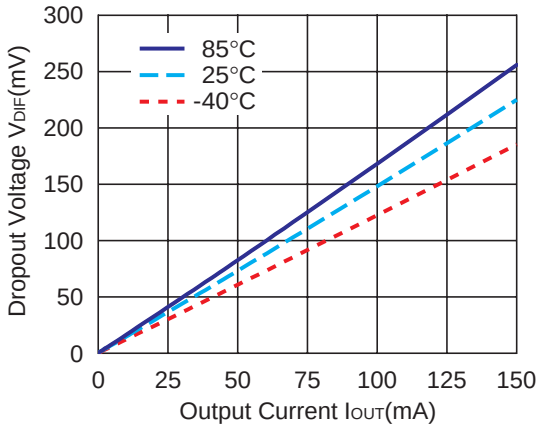

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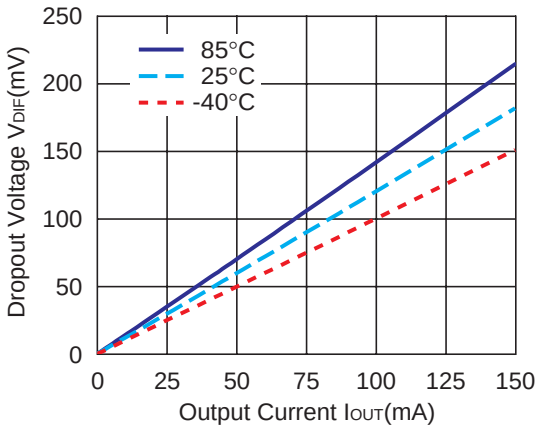
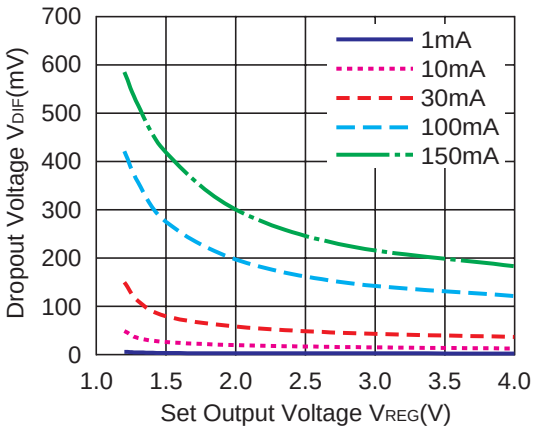


7) Dropout Voltage vs. Set Output Voltage (Topt=25°C)



8) Ripple Rejection vs. Input Bias Voltage (Vripple=0.2Vp-p)

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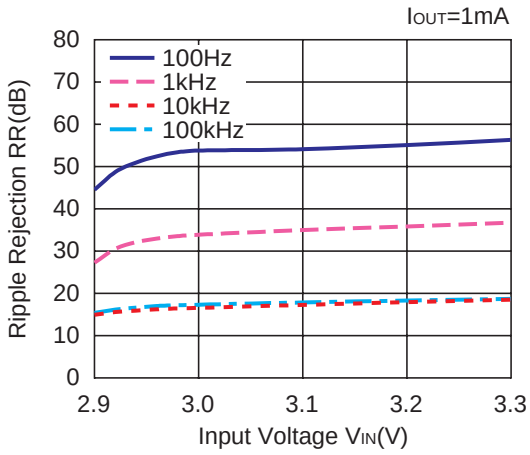

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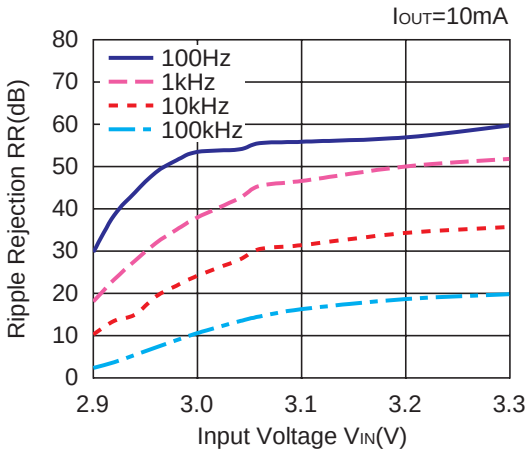

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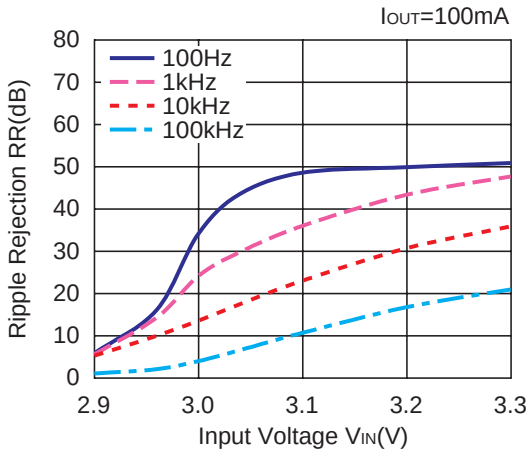
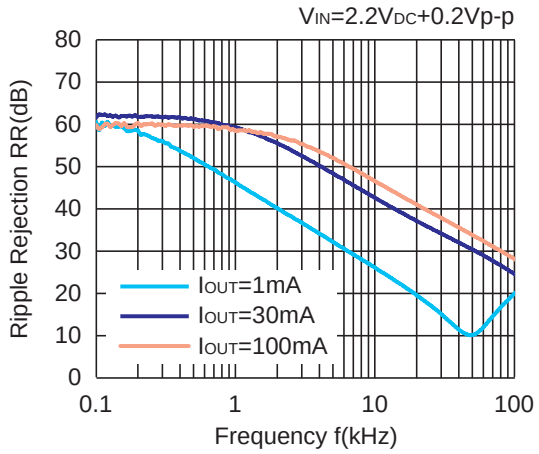


9) Ripple Rejection vs. Frequency (C_{OUT}=ceramic0.1µF)

R1182x121x



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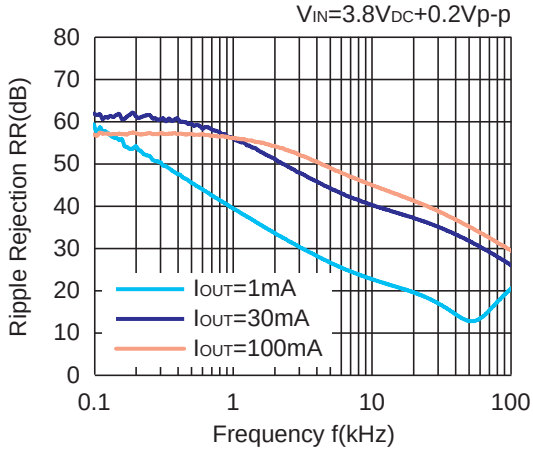

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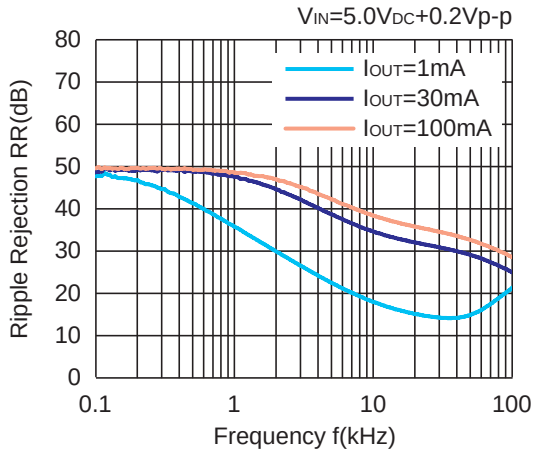

10) Input Transient Response (tr=tf=5µs, I_{OUT}=30mA)

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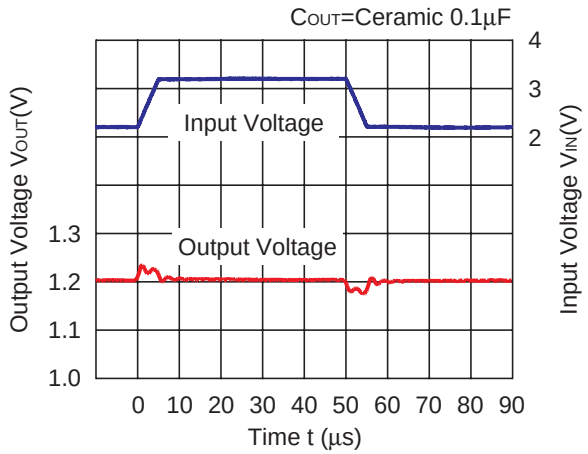

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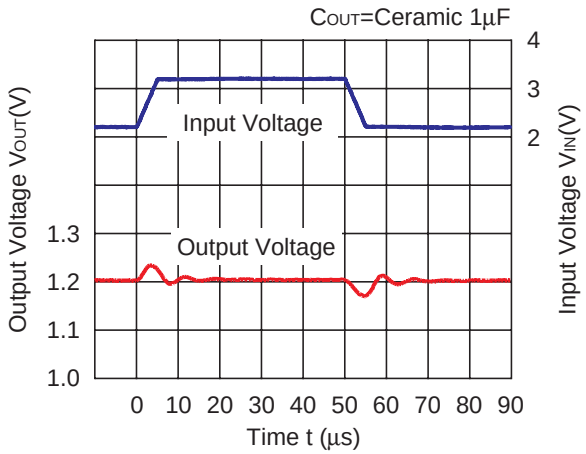

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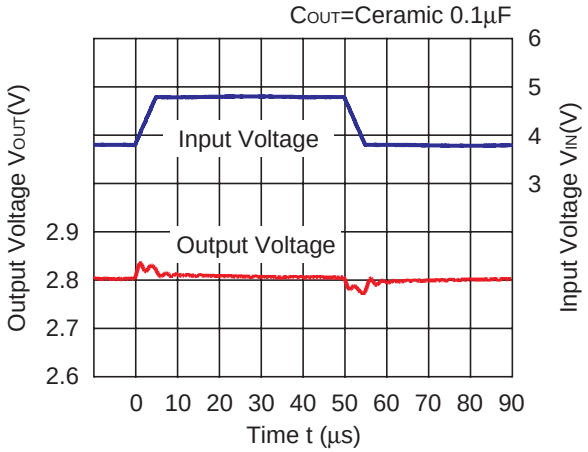

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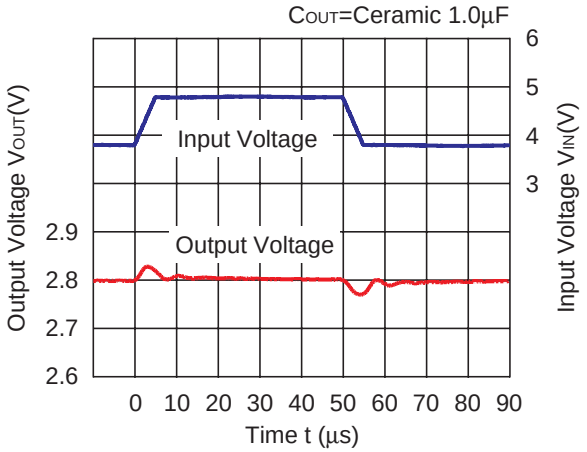

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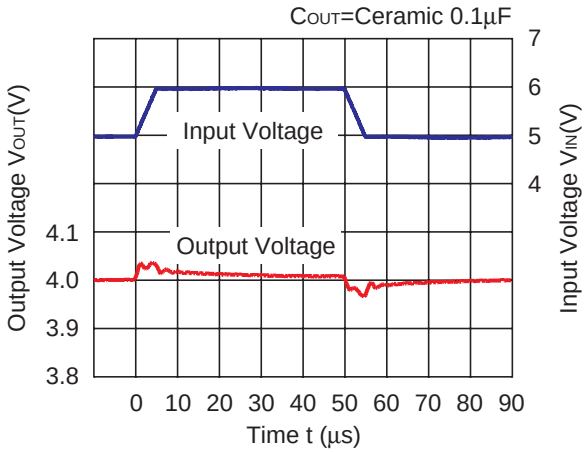

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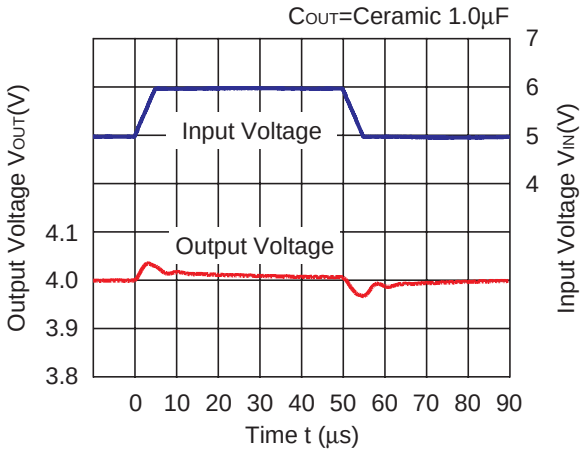
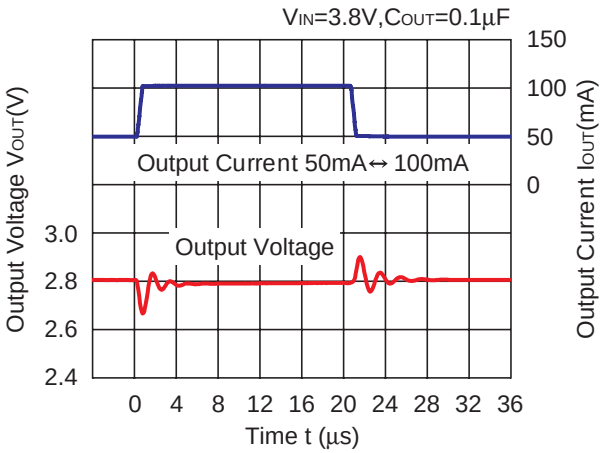


11) Load Transient Response (tr=tf=0.5µs, CIN=Ceramic 0.1µF)

R1182x281x



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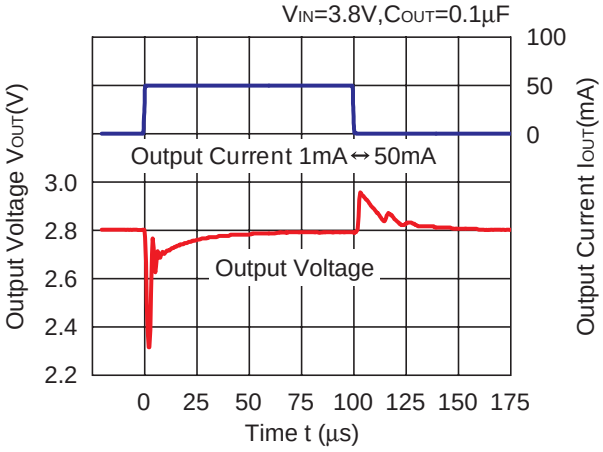

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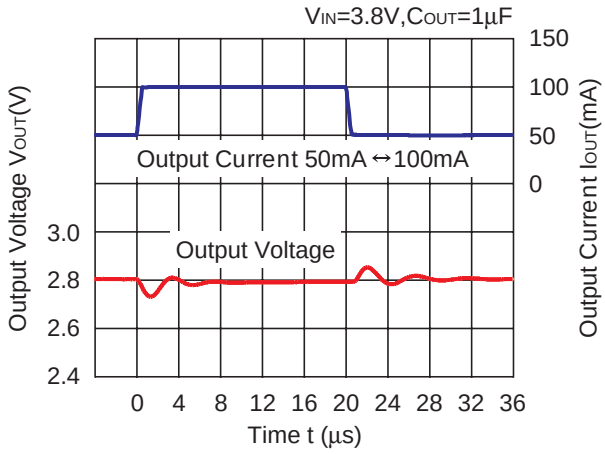

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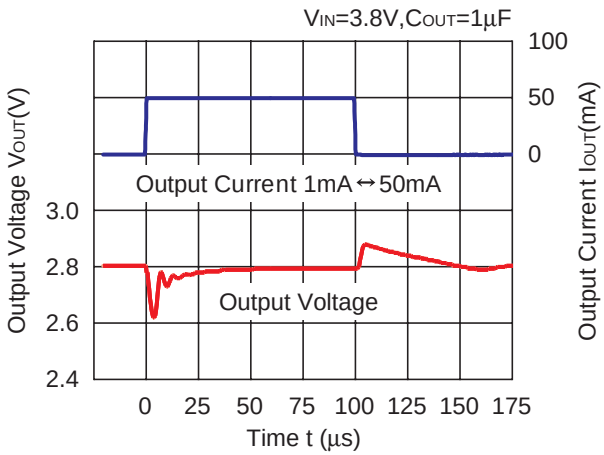

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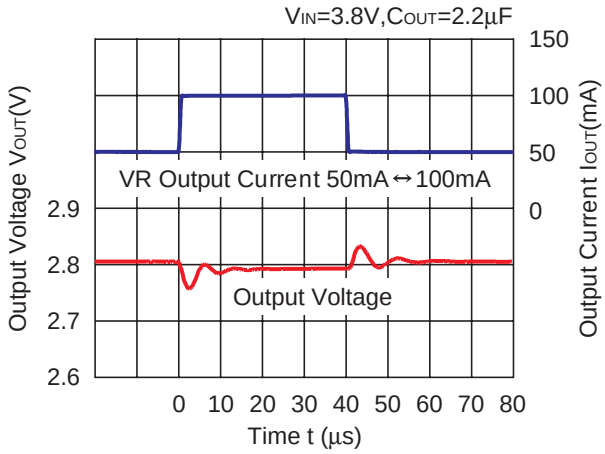

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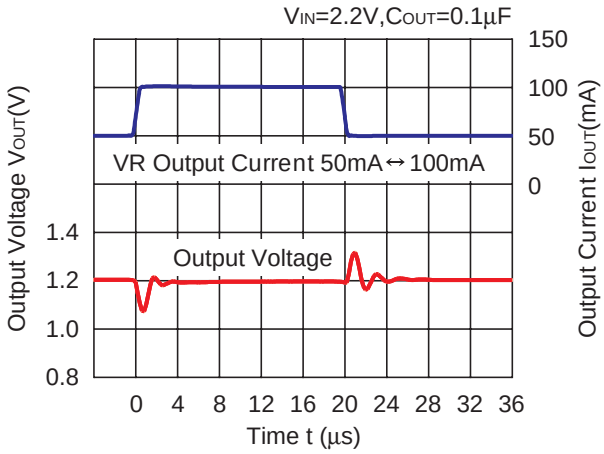

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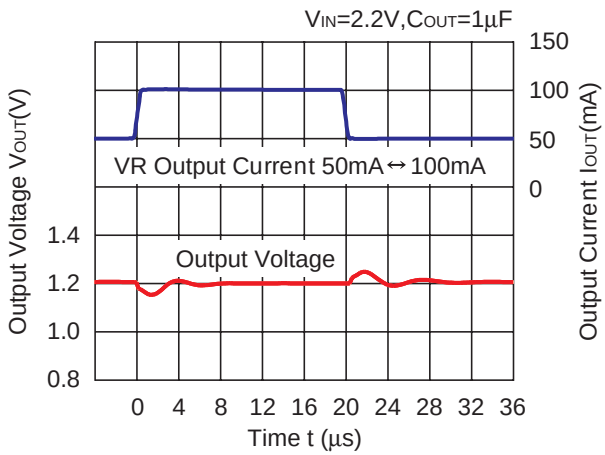

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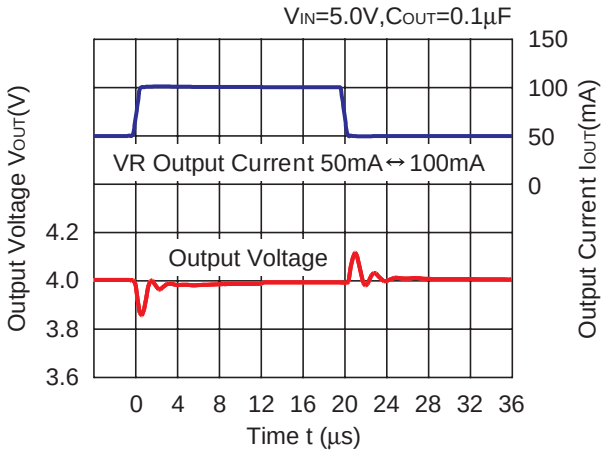

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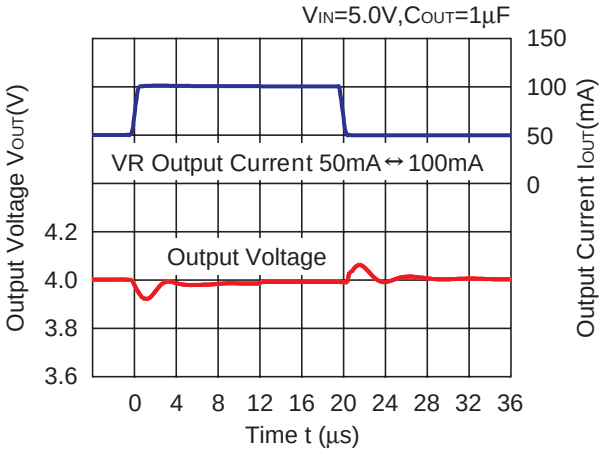
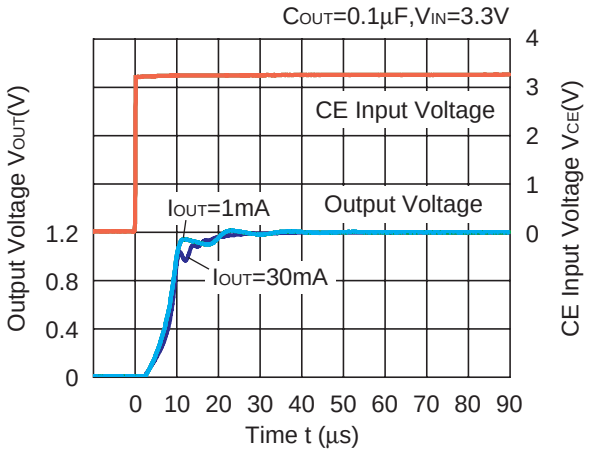


12) Turn on speed by CE pin (C_{IN}=Ceramic 0.1µF)

R1182x121x



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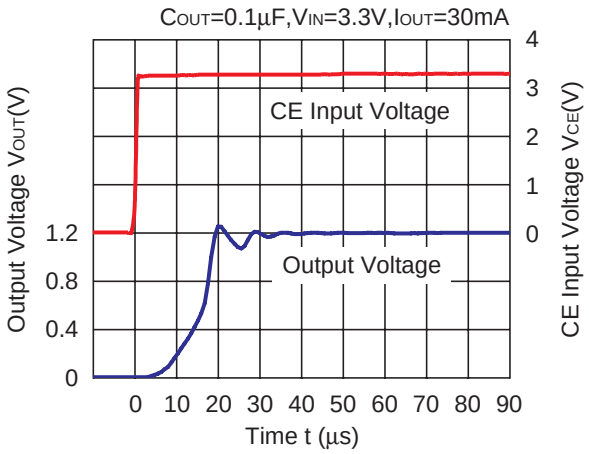

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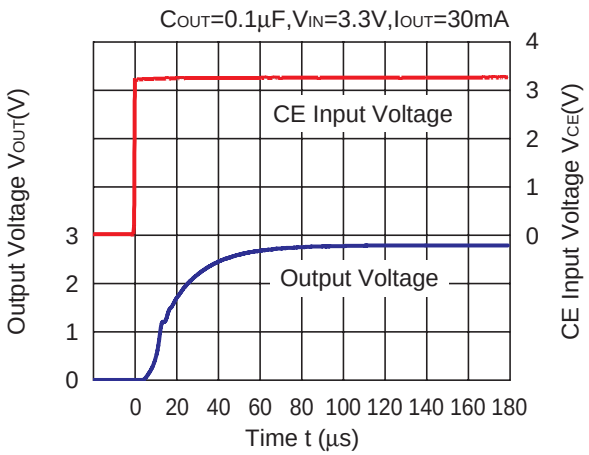

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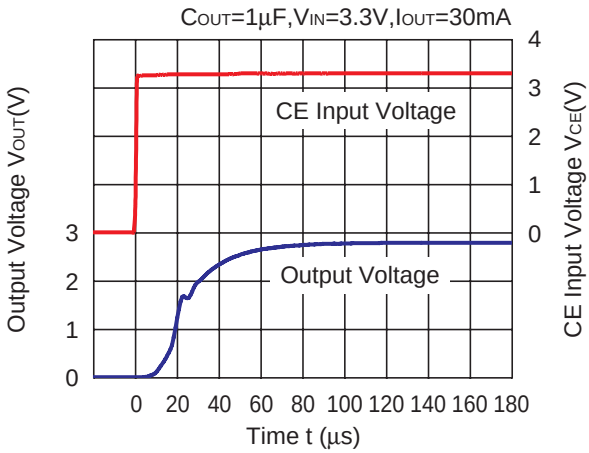

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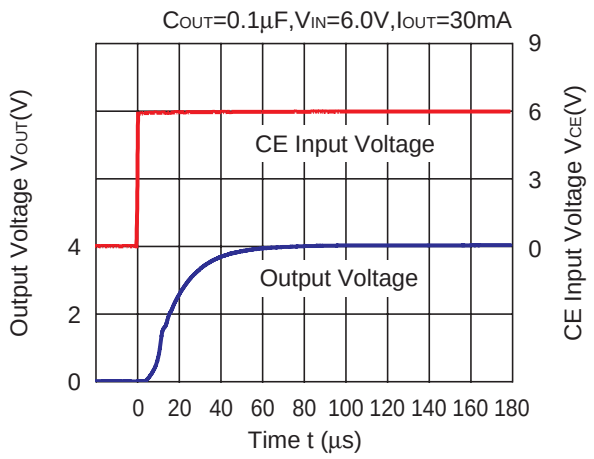

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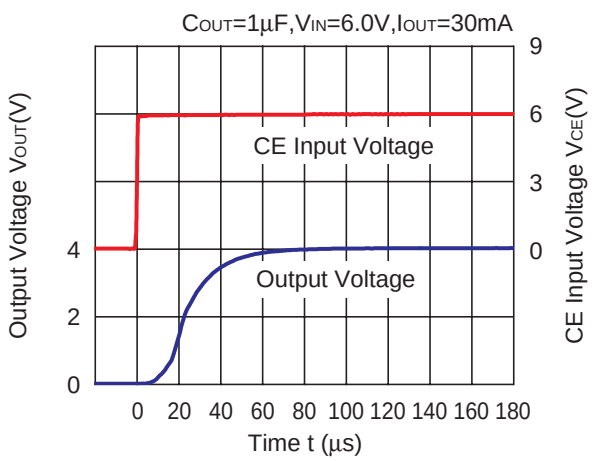
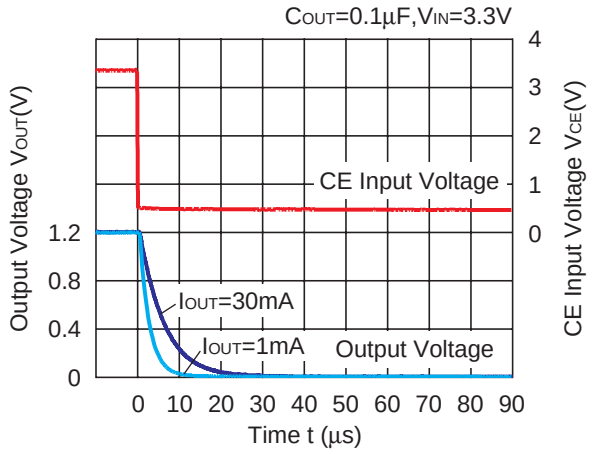


13) Turn-off Speed by CE pin (C_{IN}=Ceramic 0.1µF) (D version)

R1182x121D



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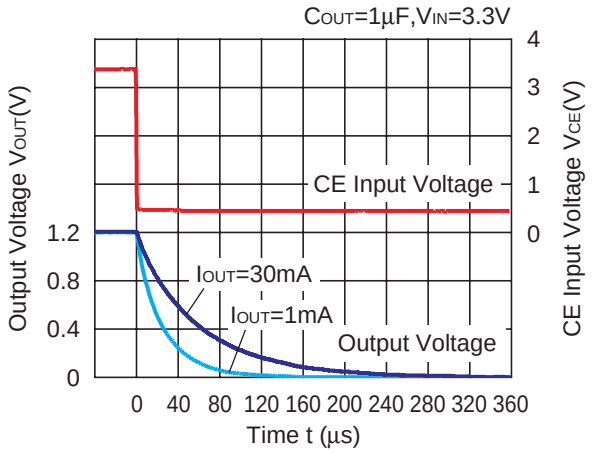

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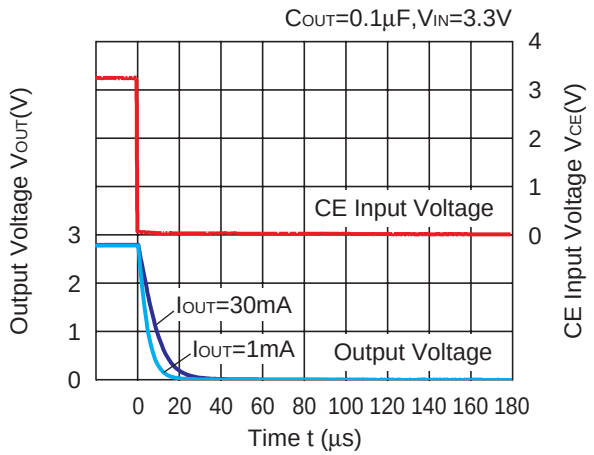

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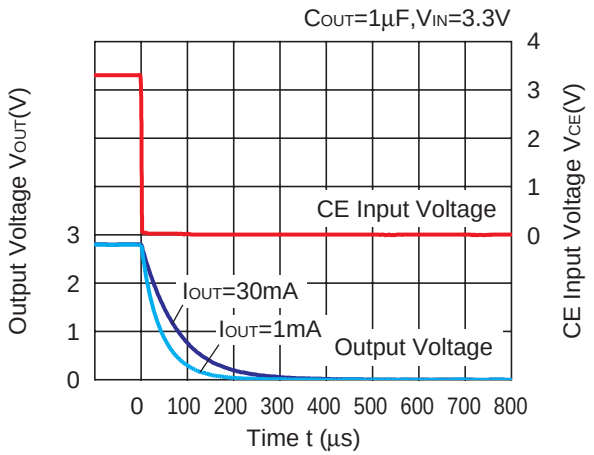

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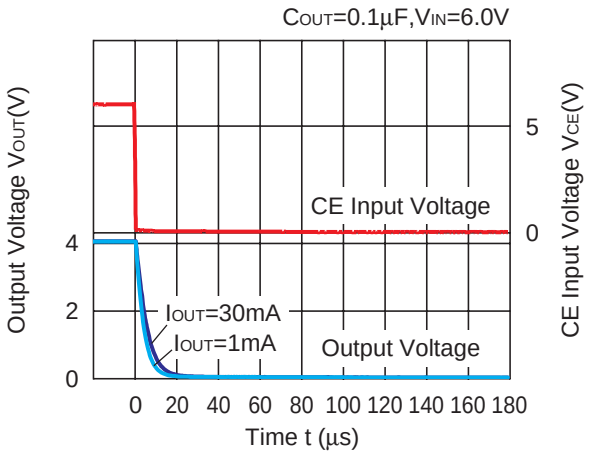

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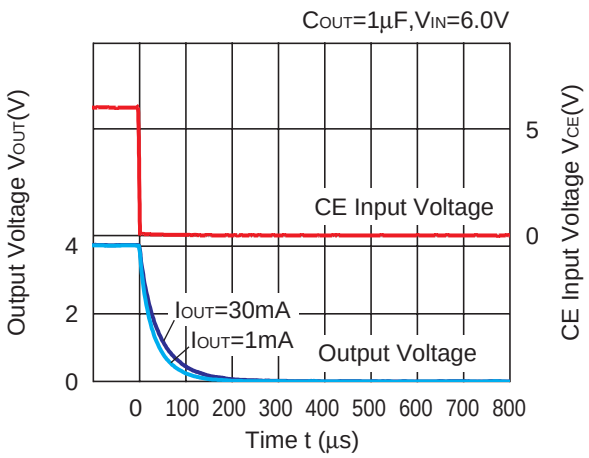


External Components and Technical Notes

Phase Compensation

In these ICs, phase compensation is made for securing stable operation even if the load current is varied. For this purpose, be sure to use a 0.1µF or more capacitor CL (Ceramic type).

If a tantalum capacitor is used, and its ESR (Equivalent Series Resistance) of CL is large, the loop oscillation may result. Because of this, select CL carefully considering its frequency characteristics.

Mounting on Board

Make V_{DD} and GND lines sufficient. If their impedance is high, pick-up the noise or unstable operation may result.

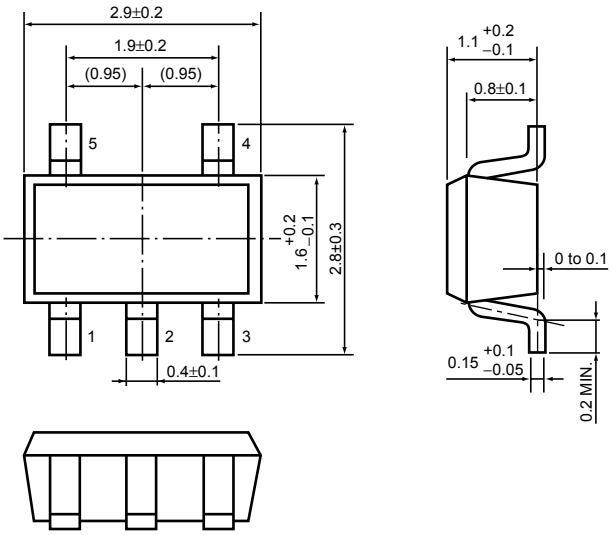
Connect the capacitor with a 0.1µF or more between V_{DD} and GND as close as possible.

Set external components, especially the output capacitor, as close as possible to the ICs and make wiring as short as possible. (Refer to the typical application)

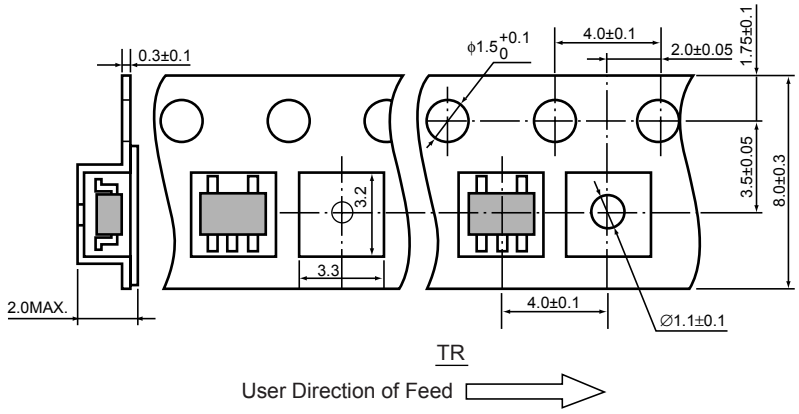
- **SOT-23-5 (SC-74A)**

Unit: mm

PACKAGE DIMENSIONS

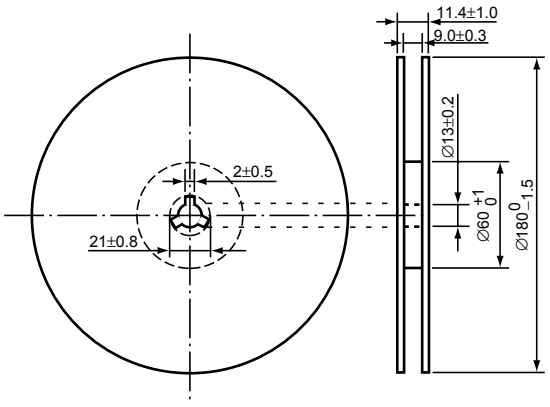


TAPING SPECIFICATION



TAPING REEL DIMENSIONS

(1reel=3000pcs)



POWER DISSIPATION (SOT-23-5)

This specification is at mounted on board. Power Dissipation (P_D) depends on conditions of mounting on board. This specification is based on the measurement at the condition below:
(Power Dissipation (SOT-23-5) is substitution of SOT-23-6.)

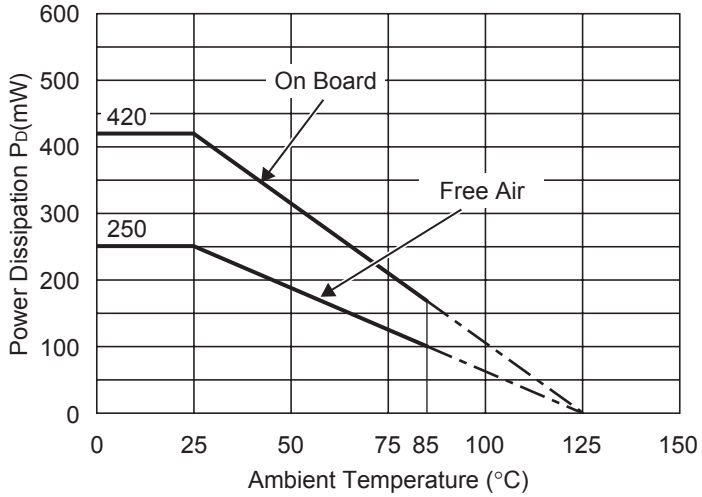
Measurement Conditions

	Standard Land Pattern
Environment	Mounting on Board (Wind velocity=0m/s)
Board Material	Glass cloth epoxy plactic (Double sided)
Board Dimensions	40mm × 40mm × 1.6mm
Copper Ratio	Top side : Approx. 50% , Back side : Approx. 50%
Through-hole	ϕ0.5mm × 44pcs

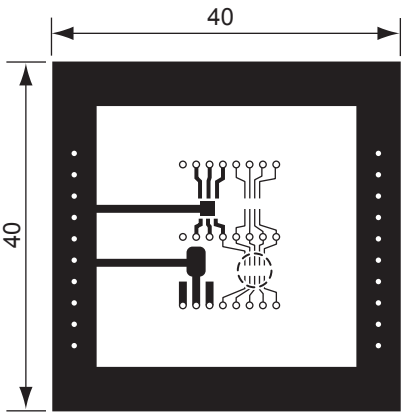
Measurement Result

(Topt=25°C,Tjmax=125°C)

	Standard Land Pattern	Free Air
Power Dissipation	420mW	250mW
Thermal Resistance	θja=(125−25°C)/0.42W=263°C/W	400°C/W



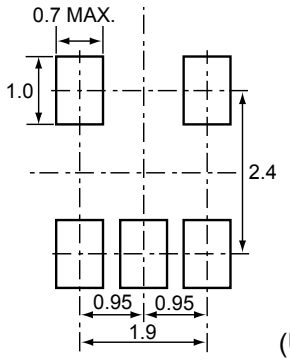
Power Dissipation



Measurement Board Pattern

IC Mount Area Unit : mm

RECOMMENDED LAND PATTERN

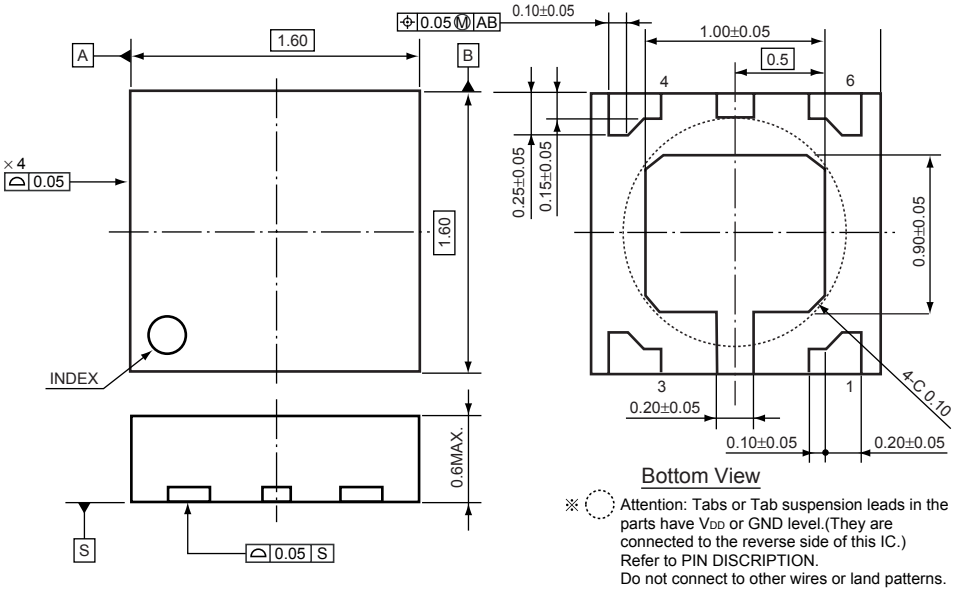


(Unit: mm)

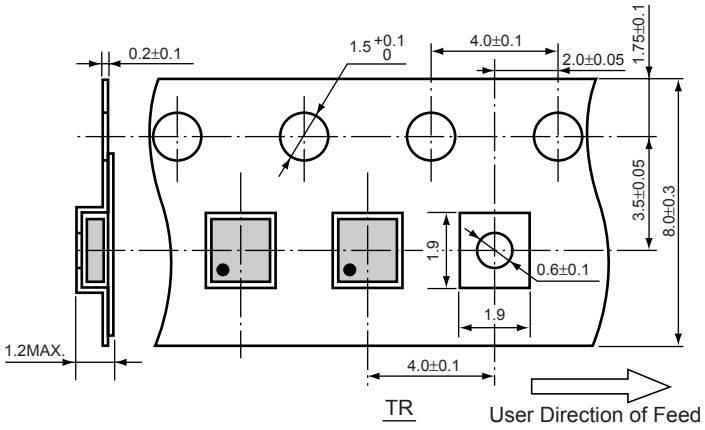
- **PLP1616-6**

Unit: mm

PACKAGE DIMENSIONS

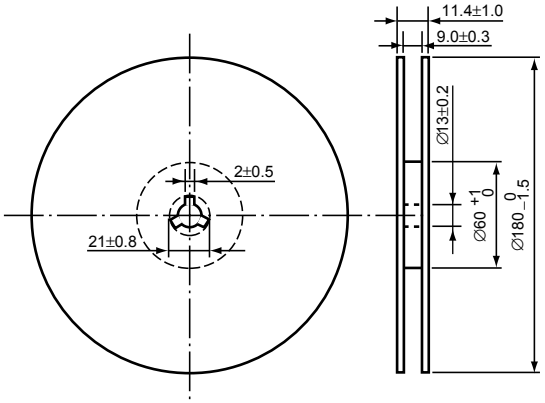


TAPING SPECIFICATION



TAPING REEL DIMENSIONS

(1reel=5000pcs)



POWER DISSIPATION (PLP1616-6)

This specification is at mounted on board. Power Dissipation (P_D) depends on conditions of mounting on board. This specification is based on the measurement at the condition below:
(PLP1616-6 is a reference value calculated from the PLP1820-6 package.)

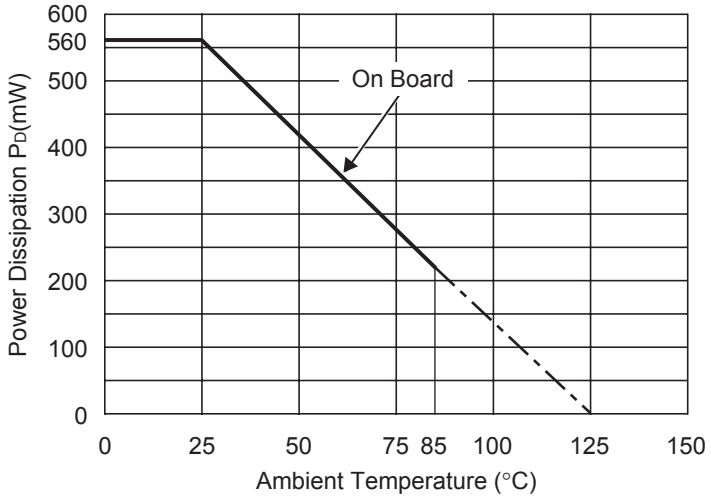
Measurement Conditions

	Standard Land Pattern
Environment	Mounting on Board (Wind velocity=0m/s)
Board Material	Glass cloth epoxy plactic (Double sided)
Board Dimensions	40mm × 40mm × 1.6mm
Copper Ratio	Top side : Approx. 50% , Back side : Approx. 50%
Through-hole	ϕ0.54mm × 30pcs

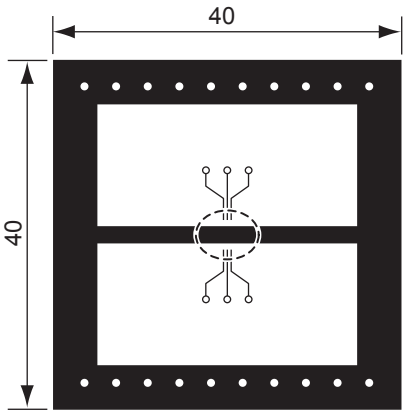
Measurement Result

(Topt=25°C,Tjmax=125°C)

	Standard Land Pattern
Power Dissipation	560mW
Thermal Resistance	θja=(125−25°C)/0.56W=179°C/W

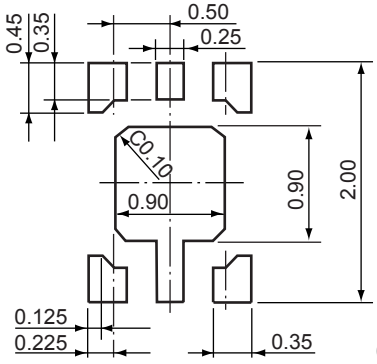


Power Dissipation



Measurement Board Pattern
IC Mount Area Unit : mm

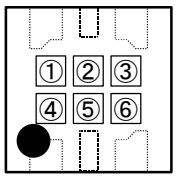
RECOMMENDED LAND PATTERN



(Unit: mm)

R1182K SERIES MARK SPECIFICATION

- **PLP1616-6**



①to④ : Product Code (refer to Part Number vs. Product Code)

⑤, ⑥ : Lot Number

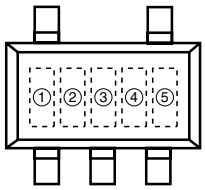
- **Part Number vs. Product Code**

Part Number	Product Code			
	①	②	③	④
R1182K121B	E	1	2	B
R1182K131B	E	1	3	B
R1182K141B	E	1	4	B
R1182K151B	E	1	5	B
R1182K161B	E	1	6	B
R1182K171B	E	1	7	B
R1182K181B	E	1	8	B
R1182K191B	E	1	9	B
R1182K201B	E	2	0	B
R1182K211B	E	2	1	B
R1182K221B	E	2	2	B
R1182K231B	E	2	3	B
R1182K241B	E	2	4	B
R1182K251B	E	2	5	B
R1182K261B	E	2	6	B
R1182K271B	E	2	7	B
R1182K281B	E	2	8	B
R1182K291B	E	2	9	B
R1182K301B	E	3	0	B
R1182K311B	E	3	1	B
R1182K321B	E	3	2	B
R1182K331B	E	3	3	B
R1182K341B	E	3	4	B
R1182K351B	E	3	5	B
R1182K361B	E	3	6	B
R1182K371B	E	3	7	B
R1182K381B	E	3	8	B
R1182K391B	E	3	9	B
R1182K401B	E	4	0	B
R1182K121B5	E	1	2	5
R1182K181B5	E	1	8	5
R1182K281B5	E	2	8	5

Part Number	Product Code			
	①	②	③	④
R1182K121D	F	1	2	D
R1182K131D	F	1	3	D
R1182K141D	F	1	4	D
R1182K151D	F	1	5	D
R1182K161D	F	1	6	D
R1182K171D	F	1	7	D
R1182K181D	F	1	8	D
R1182K191D	F	1	9	D
R1182K201D	F	2	0	D
R1182K211D	F	2	1	D
R1182K221D	F	2	2	D
R1182K231D	F	2	3	D
R1182K241D	F	2	4	D
R1182K251D	F	2	5	D
R1182K261D	F	2	6	D
R1182K271D	F	2	7	D
R1182K281D	F	2	8	D
R1182K291D	F	2	9	D
R1182K301D	F	3	0	D
R1182K311D	F	3	1	D
R1182K321D	F	3	2	D
R1182K331D	F	3	3	D
R1182K341D	F	3	4	D
R1182K351D	F	3	5	D
R1182K361D	F	3	6	D
R1182K371D	F	3	7	D
R1182K381D	F	3	8	D
R1182K391D	F	3	9	D
R1182K401D	F	4	0	D
R1182K121D5	F	1	2	5
R1182K181D5	F	1	8	5
R1182K281D5	F	2	8	5

R1182N SERIES MARK SPECIFICATION

- **SOT-23-5 (SC-74A)**



①, ②, ③ : Product Code (refer to Part Number vs. Product Code)

④, ⑤ : Lot Number

- **Part Number vs. Product Code**

Part Number	Product Code		
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R1182N131B	0	1	D
R1182N141B	0	1	E
R1182N151B	0	1	F
R1182N161B	0	1	G
R1182N171B	0	1	H
R1182N181B	0	1	J
R1182N191B	0	1	K
R1182N201B	0	2	A
R1182N211B	0	2	B
R1182N221B	0	2	C
R1182N231B	0	2	D
R1182N241B	0	2	E
R1182N251B	0	2	F
R1182N261B	0	2	G
R1182N271B	0	2	H
R1182N281B	0	2	J
R1182N291B	0	2	K
R1182N301B	0	3	A
R1182N311B	0	3	B
R1182N321B	0	3	C
R1182N331B	0	3	D
R1182N341B	0	3	E
R1182N351B	0	3	F
R1182N361B	0	3	G
R1182N371B	0	3	H
R1182N381B	0	3	J
R1182N391B	0	3	K
R1182N401B	0	3	L
R1182N121B5	0	3	M
R1182N181B5	0	3	N
R1182N291B5	0	3	P

Part Number	Product Code		
	①	②	③
R1182N121D	1	1	C
R1182N131D	1	1	D
R1182N141D	1	1	E
R1182N151D	1	1	F
R1182N161D	1	1	G
R1182N171D	1	1	H
R1182N181D	1	1	J
R1182N191D	1	1	K
R1182N201D	1	2	A
R1182N211D	1	2	B
R1182N221D	1	2	C
R1182N231D	1	2	D
R1182N241D	1	2	E
R1182N251D	1	2	F
R1182N261D	1	2	G
R1182N271D	1	2	H
R1182N281D	1	2	J
R1182N291D	1	2	K
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R1182N311D	1	3	B
R1182N321D	1	3	C
R1182N331D	1	3	D
R1182N341D	1	3	E
R1182N351D	1	3	F
R1182N361D	1	3	G
R1182N371D	1	3	H
R1182N381D	1	3	J
R1182N391D	1	3	K
R1182N401D	1	3	L
R1182N121D5	1	3	M
R1182N181D5	1	3	N
R1182N291D5	1	3	P