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## Seamless Low Supply Current 150mA LDO REGULATOR

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NO.EA-133-071207

### 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 R1182x Series has low dropout voltage caused by built in low on resistance transistor. Further, the consumption current of IC itself is Typ. 3.0 $\mu$ A 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 DFN(PLP)1616-6, high density mounting of the ICs on boards is possible.

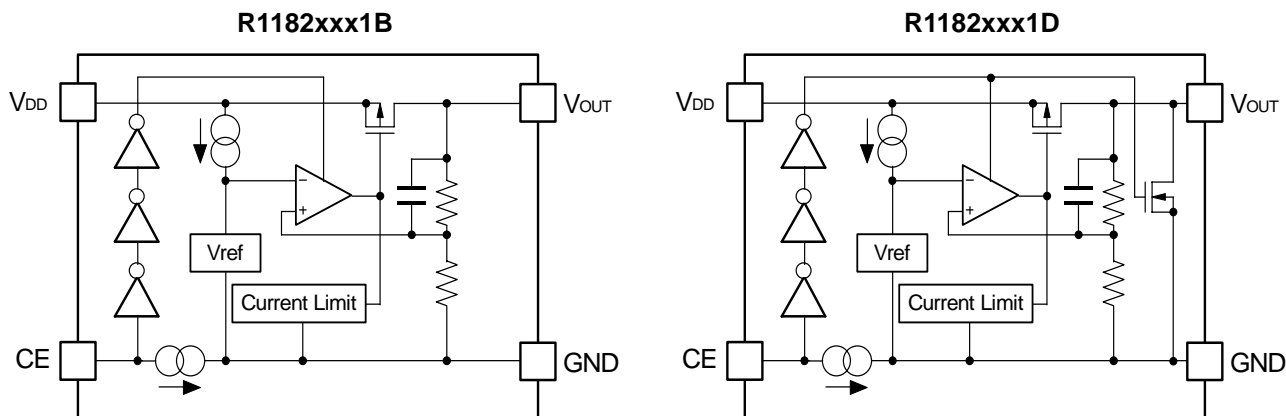
### FEATURES

- Supply Current ..... Typ. 3 $\mu$ A (Except the current through CE pull-down circuit)
- Standby Current ..... Typ. 0.1 $\mu$ A
- Input Voltage Range ..... 1.5V to 6.0V
- Output Voltage ..... 1.2V to 4.0V
- Dropout Voltage ..... Typ. 0.23V ( $I_{OUT}=150\text{mA}$ , 3.0V Output type)
- Output Voltage Accuracy..... $\pm 1.0\%$  ( $V_{OUT}>1.5\text{V}$ )  
 $\pm 15\text{mV}$  ( $V_{OUT} \leq 1.5\text{V}$ )
- Temperature-Drift Coefficient of Output Voltage .... Typ.  $\pm 100\text{ppm}/^\circ\text{C}$
- Line Regulation ..... Typ. 0.1%/V
- Packages ..... SOT-23-5, DFN(PLP)1616-6
- Built-in Fold Back Protection Circuit ..... Typ. 50mA (Current at short mode)
- Ceramic capacitors are recommended to be used with this IC (0.1 $\mu$ F 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



## 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:

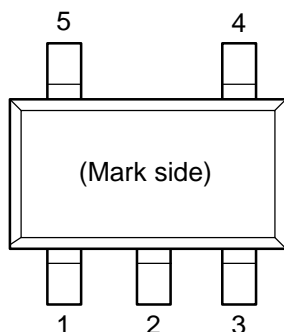
R1182xxx1x-xx-x ←Part Number  
 ↑ ↑ ↑ ↑ ↑  
 a b c d e

Code	Contents
a	Designation of Package Type : N: SOT-23-5 K: DFN(PLP)1616-6
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 (DFN(PLP)1616-6)

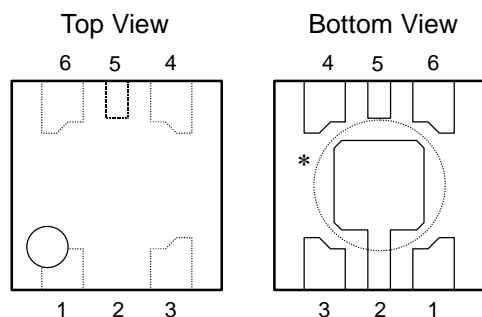
\*) When the mode is into standby with CE signal, auto discharge transistor turns on, and it makes the turn-off speed faster than normal type.

## PIN CONFIGURATIONS

### ● SOT-23-5



### ● DFN(PLP)1616-6




## PIN DESCRIPTIONS

### ● SOT-23-5

Pin No	Symbol	Pin Description
1	GND	Ground Pin
2	V <sub>DD</sub>	Input Pin
3	V <sub>OUT</sub>	Output pin
4	NC	No Connection
5	CE	Chip Enable Pin

### ● DFN(PLP)1616-6

Pin No	Symbol	Pin Description
1	V <sub>DD</sub>	Input Pin
2	GND	Ground Pin
3	CE	Chip Enable Pin
4	NC	No Connection
5	NC	No Connection
6	V <sub>OUT</sub>	Output pin

\* Tab in the  parts have GND level.  
 (They are connected to the back 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 (DFN(PLP)1616-6) *	560	
$T_{opt}$	Operating Temperature Range	-40 to 85	°C
$T_{stg}$	Storage Temperature Range	-55 to 125	°C

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

### ABSOLUTE MAXIMUM RATINGS

Absolute Maximum ratings are threshold limit values that must not be exceeded ever for an instant under any conditions. Moreover, such values for any two items must not be reached simultaneously. Operation above these absolute maximum ratings may cause degradation or permanent damage to the device. These are stress ratings only and do not necessarily imply functional operation below these limits.

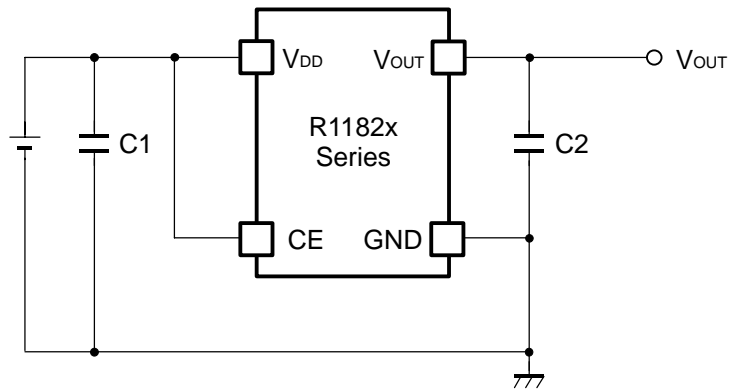
## ELECTRICAL CHARACTERISTICS

### • R1182xxx1B/D

T<sub>opt</sub>=25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit	
V <sub>OUT</sub>	Output Voltage	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V I <sub>OUT</sub> =1mA	V <sub>OUT</sub> > 1.5V	×0.99		×1.01	V
			V <sub>OUT</sub> ≤ 1.5V	-15		+15	mV
I <sub>OUT</sub>	Output Current	V <sub>IN</sub> -V <sub>OUT</sub> =1.0V	150			mA	
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V 1mA ≤ I <sub>OUT</sub> ≤ 150mA		30	80	mV	
V <sub>DIF</sub>	Dropout Voltage	I <sub>OUT</sub> =150mA	1.2 ≤ V <sub>OUT</sub> < 1.3		0.60	0.82	V
			1.3 ≤ V <sub>OUT</sub> < 1.4		0.53	0.75	
			1.4 ≤ V <sub>OUT</sub> < 1.5		0.46	0.67	
			1.5 ≤ V <sub>OUT</sub> < 2.0		0.43	0.60	
			2.0 ≤ V <sub>OUT</sub> < 2.8		0.31	0.40	
			2.8 ≤ V <sub>OUT</sub> < 4.0		0.23	0.29	
			V <sub>OUT</sub> =4.0		0.19	0.23	
I <sub>SS</sub>	Supply Current	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, I <sub>OUT</sub> =0mA		3.0	7.0	μA	
I <sub>standby</sub>	Standby Current	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, V <sub>CE</sub> =GND		0.1	1.0	μA	
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation	Set V <sub>OUT</sub> +0.5V ≤ V <sub>IN</sub> ≤ 6.0V I <sub>OUT</sub> =30mA		0.1	0.3	%/V	
V <sub>IN</sub>	Input Voltage		1.5		6.0	V	
$\frac{\Delta V_{OUT}}{\Delta T_{opt}}$	Output Voltage Temperature Coefficient	I <sub>OUT</sub> =30mA -40°C ≤ T <sub>opt</sub> ≤ 85°C		±100		ppm/°C	
I <sub>lim</sub>	Short Current Limit	V <sub>OUT</sub> =0V		50		mA	
I <sub>PD</sub>	CE Pull-down Current		0.05	0.30	0.55	μA	
V <sub>CEH</sub>	CE Input Voltage "H"		1.0		6.0	V	
V <sub>CEL</sub>	CE Input Voltage "L"		0		0.4	V	
en	Output Noise	BW=10Hz to 100kHz		30		μVrms	
R <sub>LOW</sub>	Nch Tr. On resistance for auto discharge function (Only applied to D Version)	V <sub>CE</sub> =0V		50		Ω	

## TYPICAL APPLICATIONS



(External components)

Output capacitor : Ceramic type  
 Input capacitor : Ceramic type

Output Capacitor: 0.1 $\mu$ F	Kyocera CM05B104K06AB
	Murata GRM155B31C104KA87B
1.0 $\mu$ F	Kyocera CM05X5R105K06AB
	TDK C1005JB0J105K
	Murata GRM155B30J105KE18B

## TECHNICAL NOTES

When using these ICs, consider the following points:

### 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 0.1 $\mu$ F or more capacitor C2 (Ceramic type).

If a tantalum capacitor is used, and its ESR (Equivalent Series Resistance) of C2 is large, the loop oscillation may result. Because of this, select C2 carefully considering its frequency characteristics.

### Mounting on Board

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

Connect the capacitor C1 with a 0.1 $\mu$ F or more between VDD and GND as close as possible.

Set external components, especially the output capacitor C2, as close as possible to the ICs and make wiring as short as possible. (Refer to the typical application)

## TEST CIRCUITS

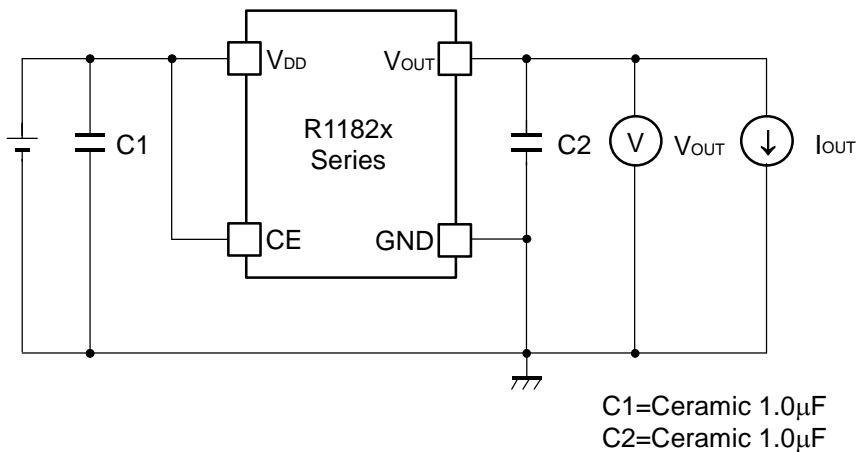


Fig.1 Standard test Circuit

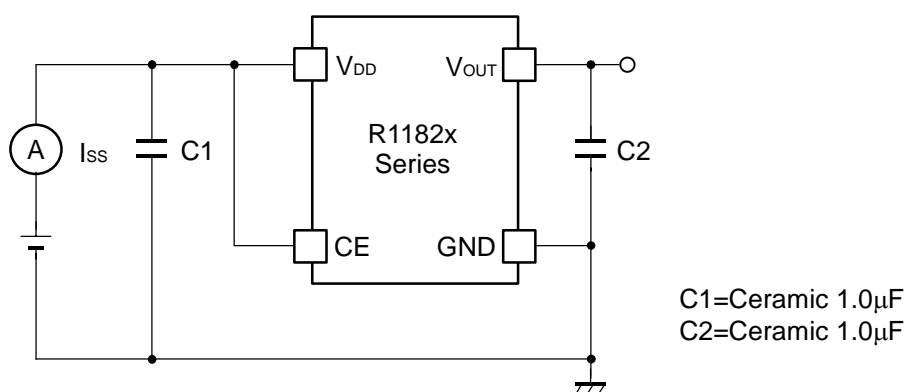


Fig.2 Supply Current Test Circuit

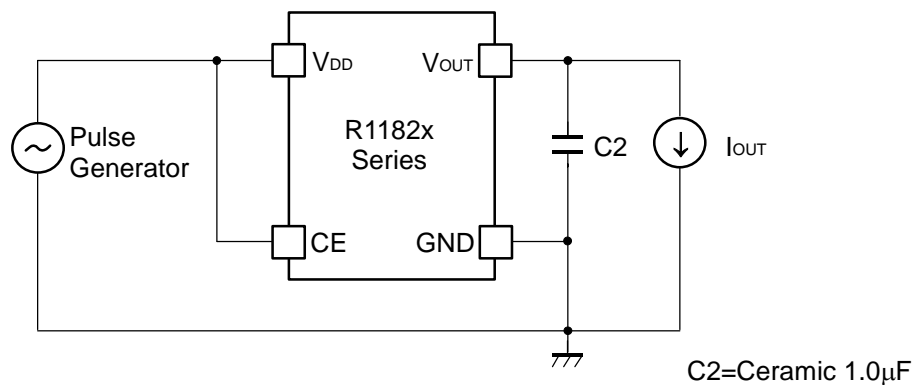
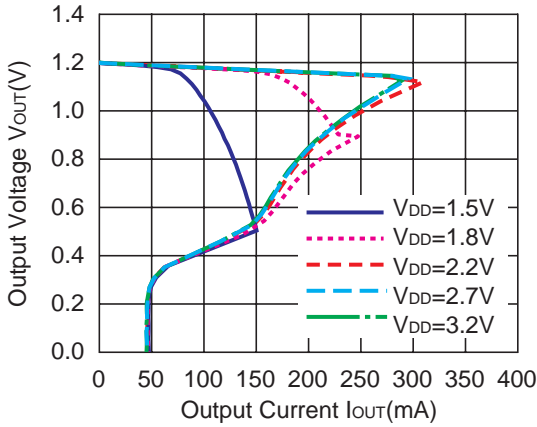


Fig.3 Ripple Rejection, Line Transient Response Test Circuit

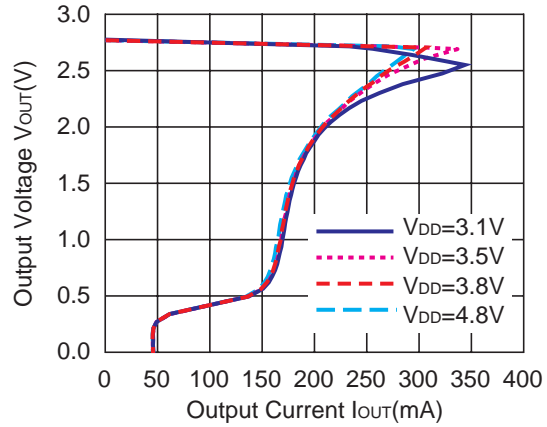
## TYPICAL CHARACTERISTICS

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

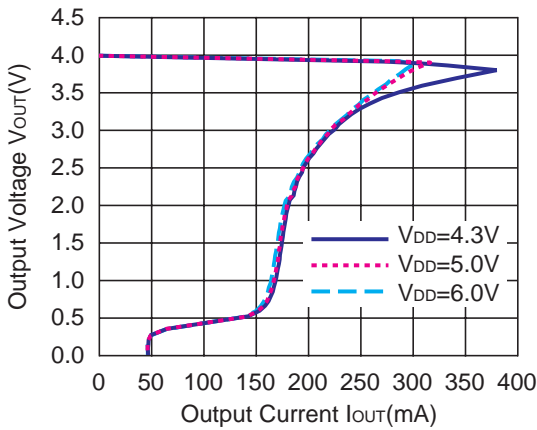
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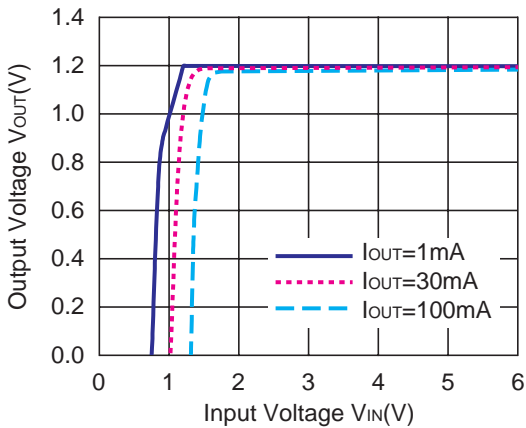


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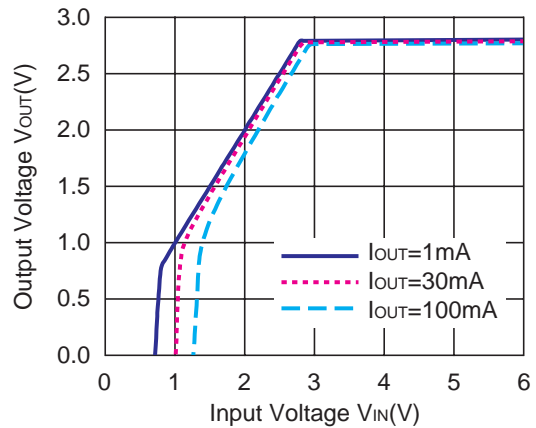


### 2) Output Voltage vs. Input Voltage (Topt=25°C)

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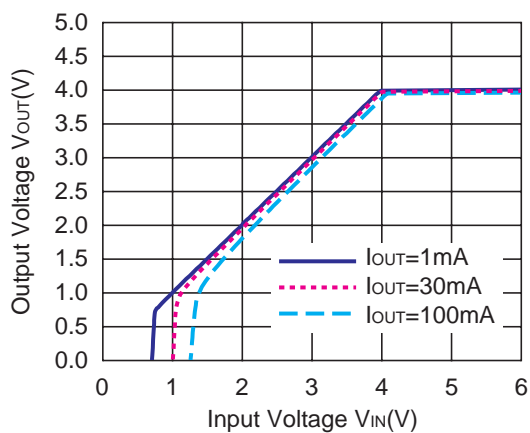


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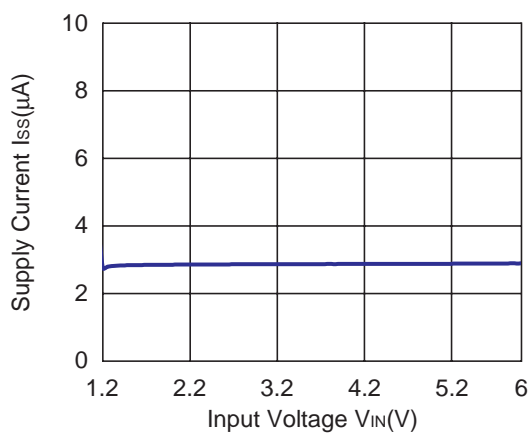


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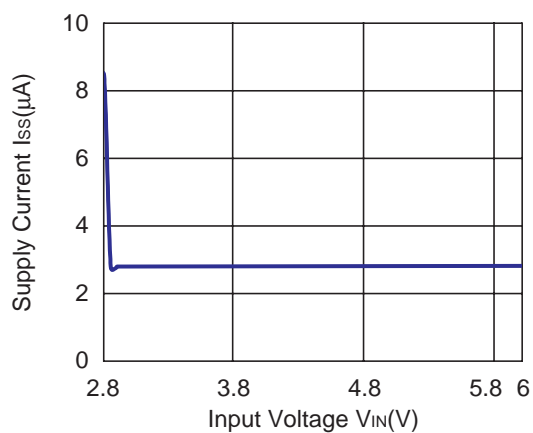


3) Supply Current vs. Input Voltage

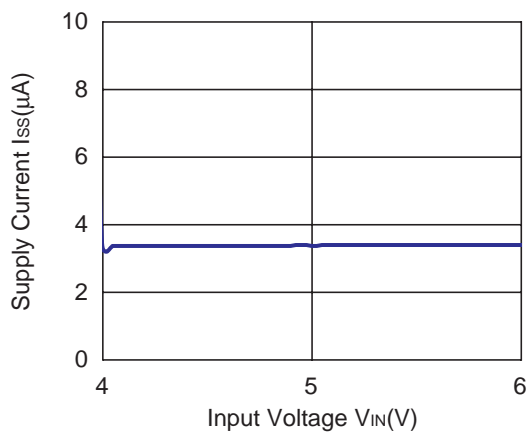
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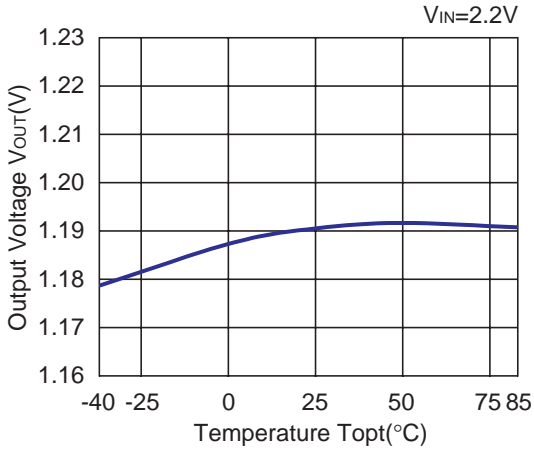


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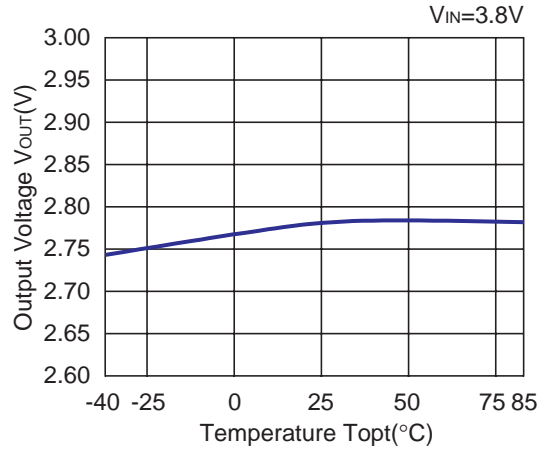


4) Output Voltage vs. Temperature ( $I_{OUT}=30mA$ )

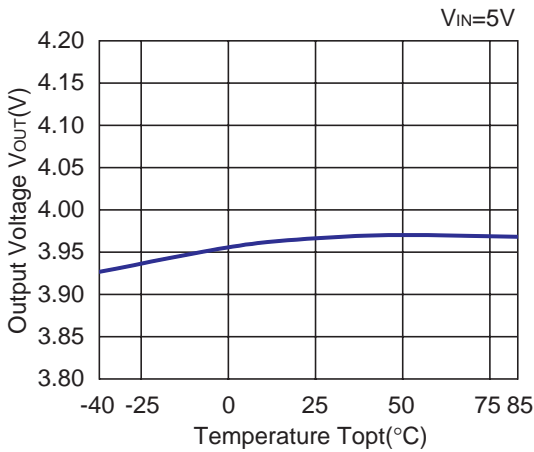
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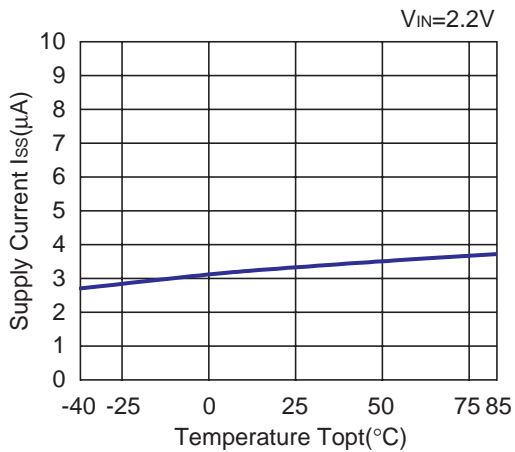


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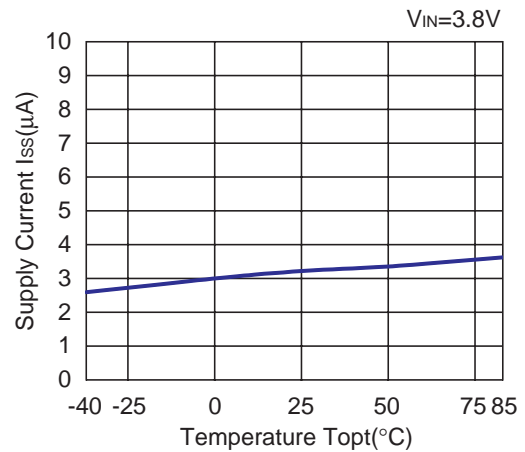


5) Supply Current vs. Temperature ( $T_{opt}=25^{\circ}C$ )

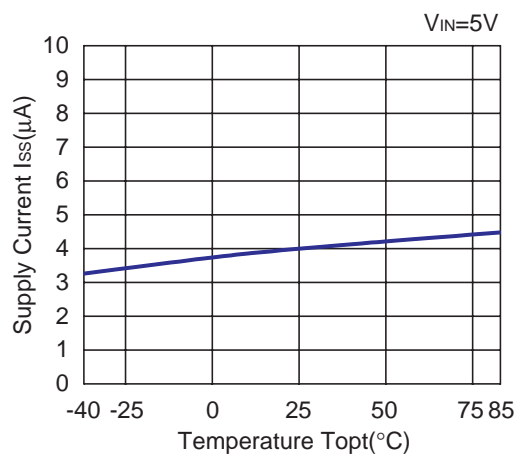
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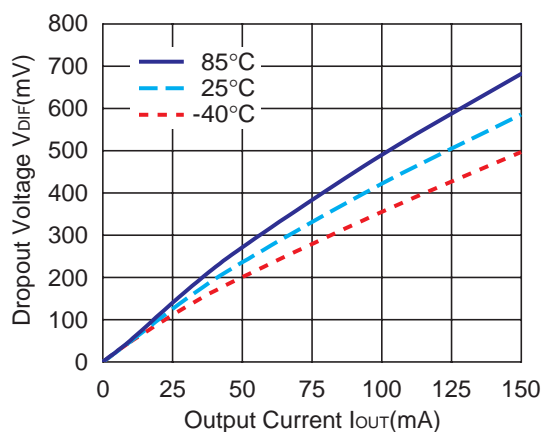


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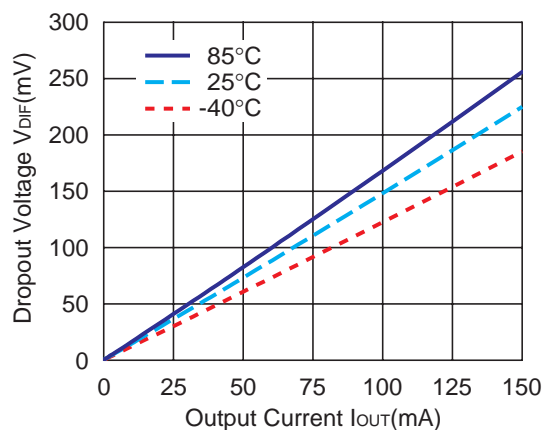


6) Dropout Voltage vs. Output Current

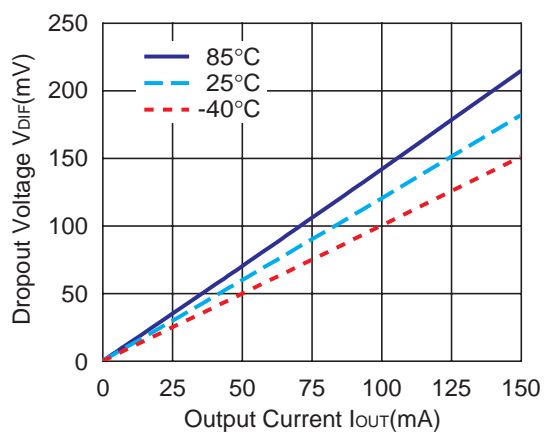
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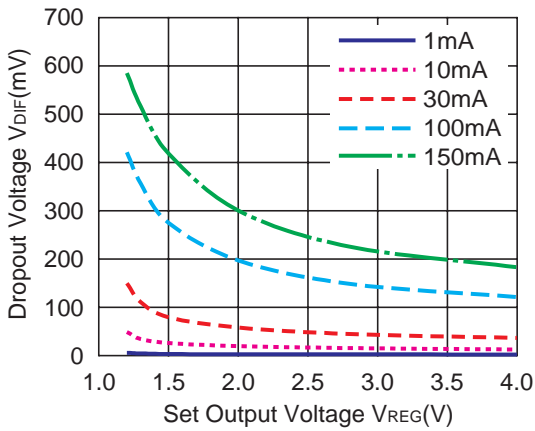
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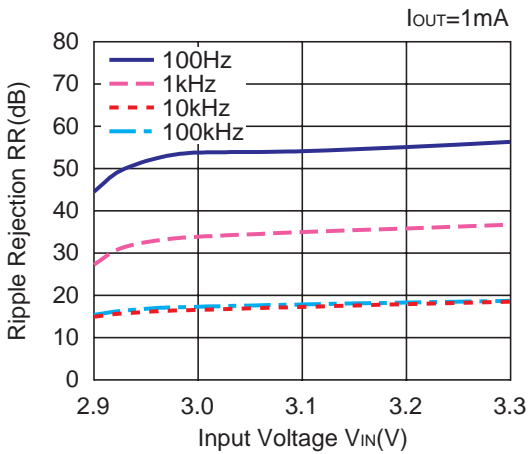


7) Dropout Voltage vs. Set Output Voltage ( $T_{opt}=25^{\circ}C$ )

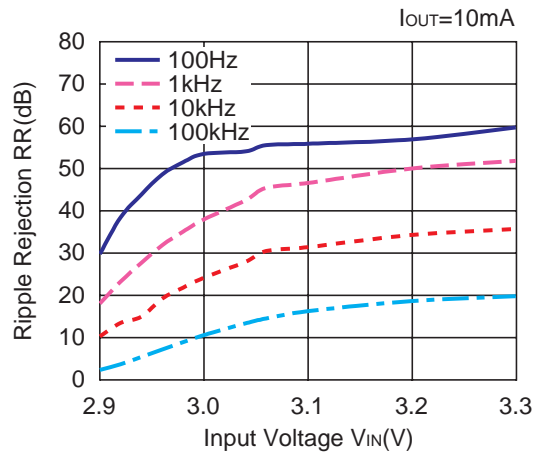


8) Ripple Rejection vs. Input Bias Voltage (Ripple=0.2Vp-p)

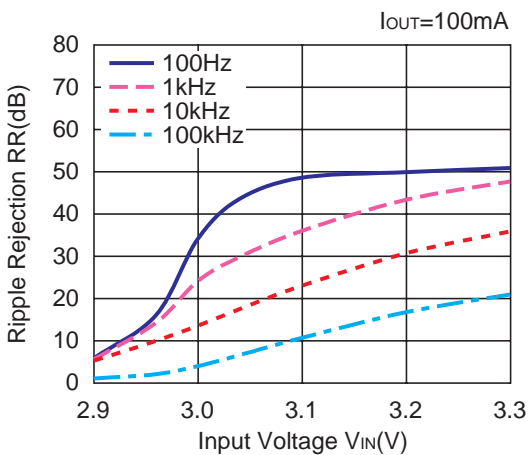
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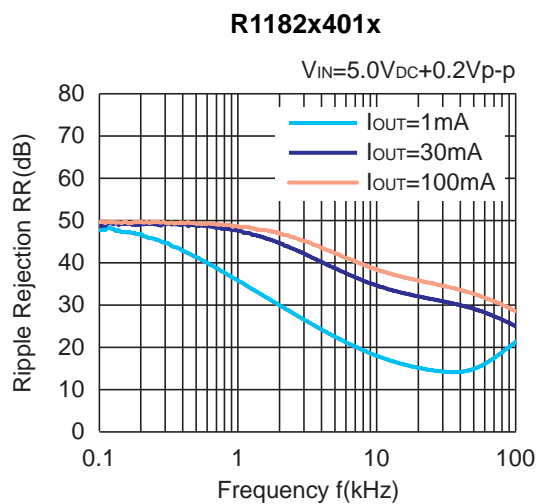
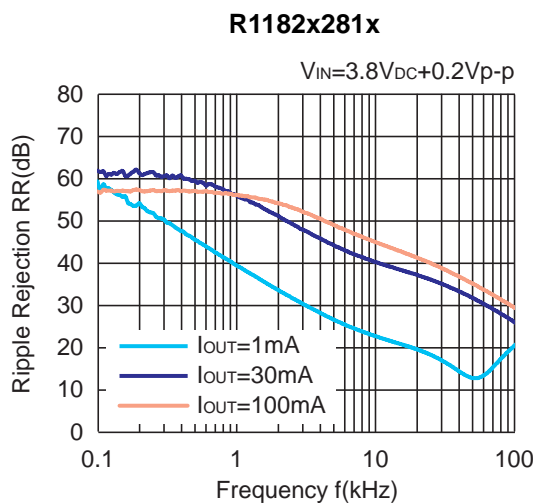
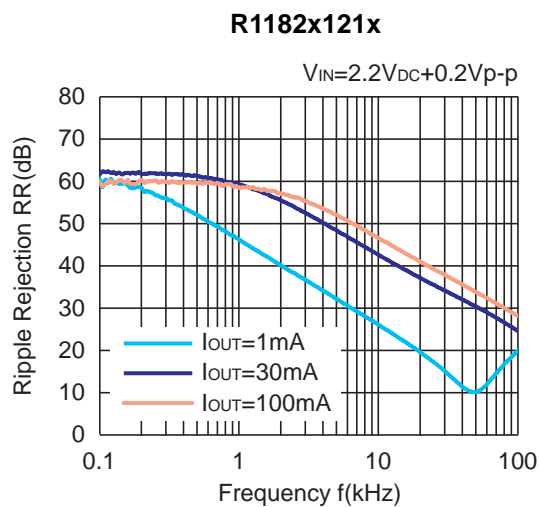
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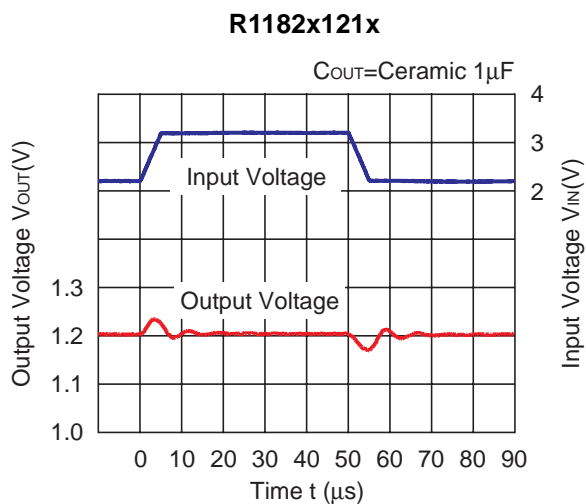
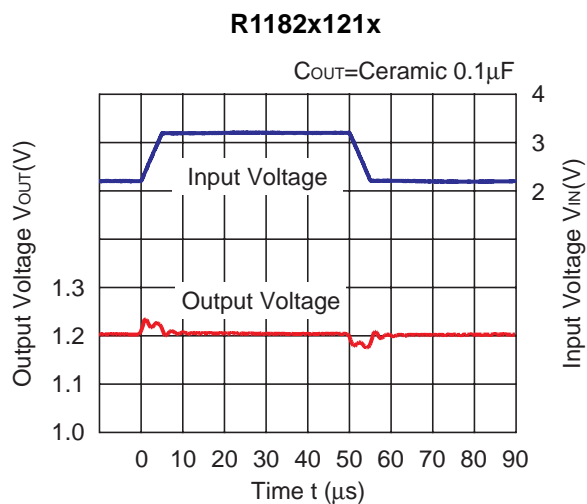
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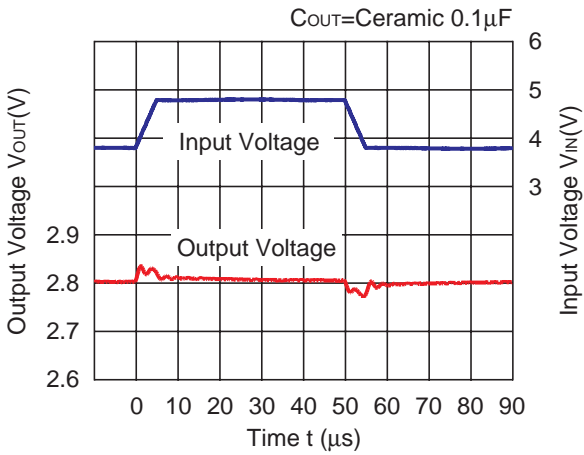
9) Ripple Rejection vs. Frequency ( $C_{OUT}$ =ceramic $0.1\mu F$ )



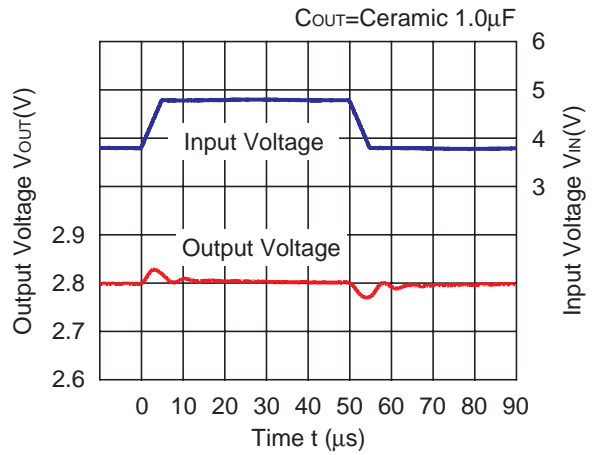
10) Input Transient Response ( $t_r=t_f=5\mu s$ ,  $I_{OUT}=30mA$ )



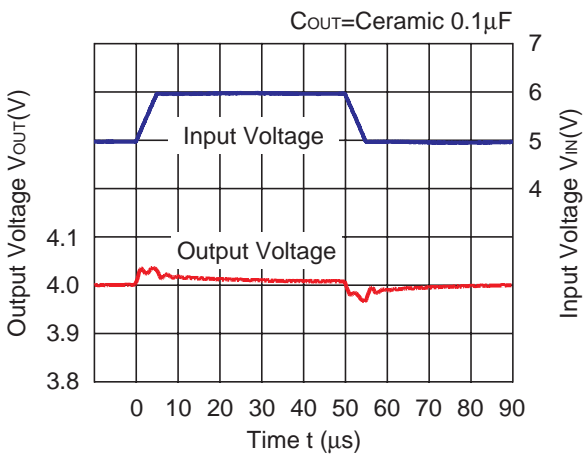
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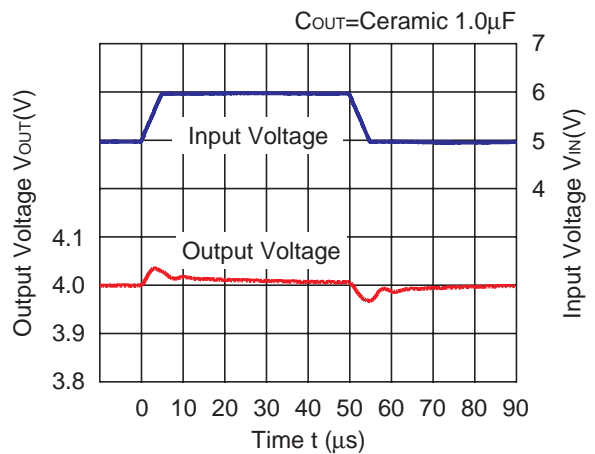
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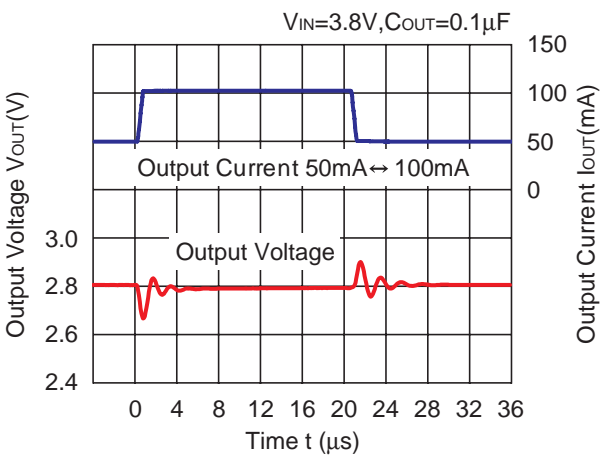


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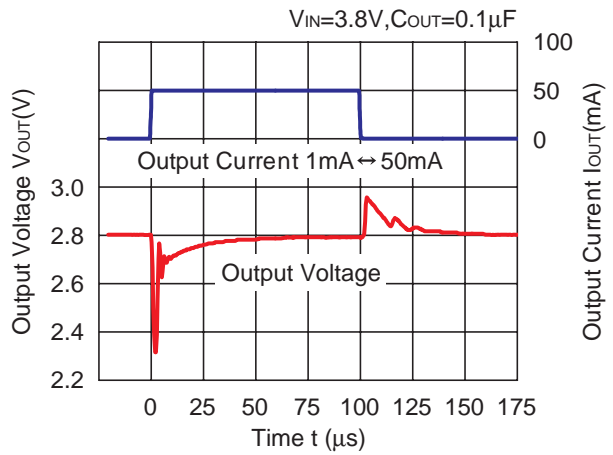


11) Load Transient Response ( $t_r=t_f=0.5\mu s$ ,  $C_{IN}$ =Ceramic 0.1 $\mu F$ )

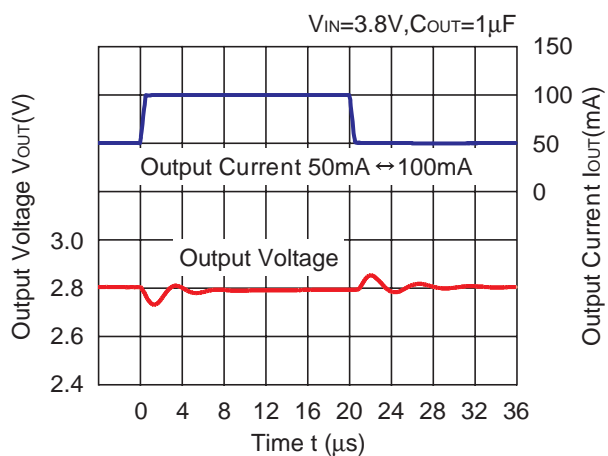
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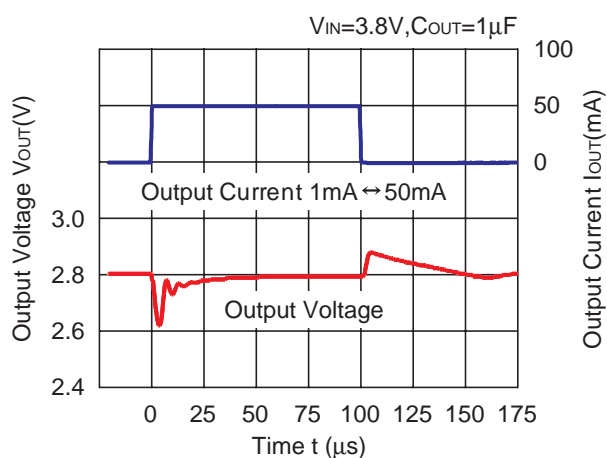
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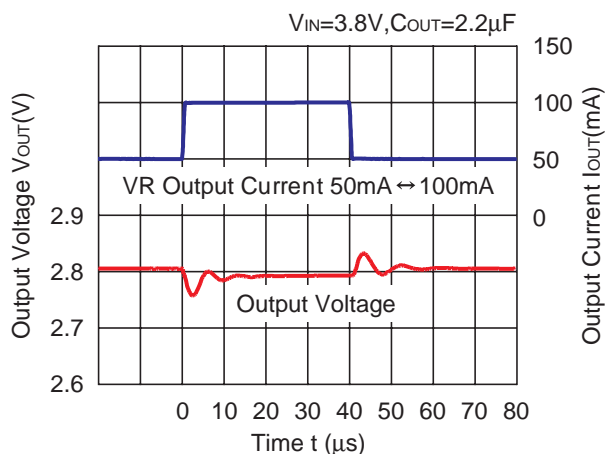
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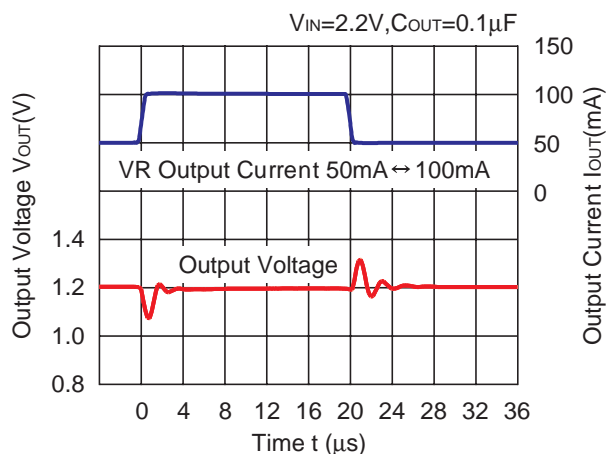
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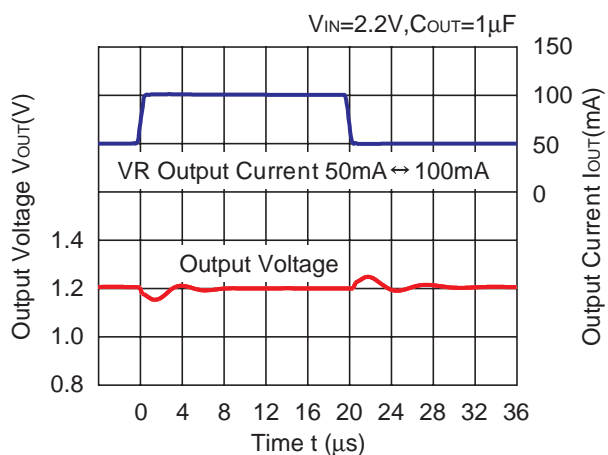
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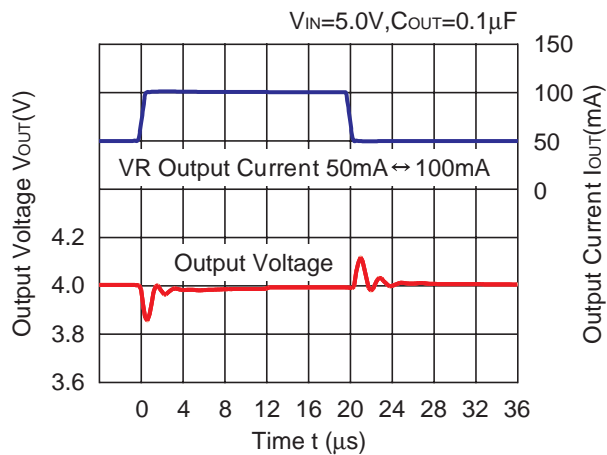
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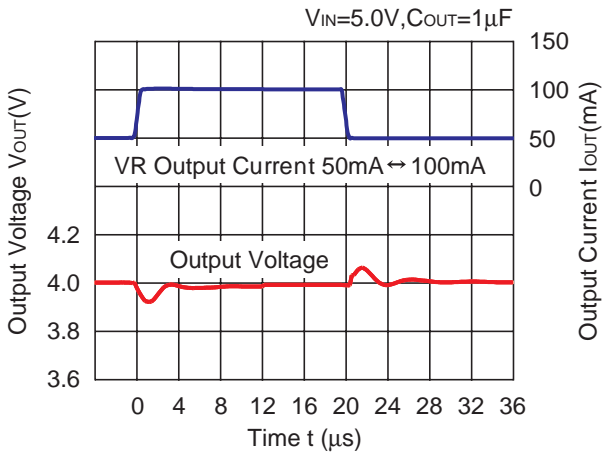
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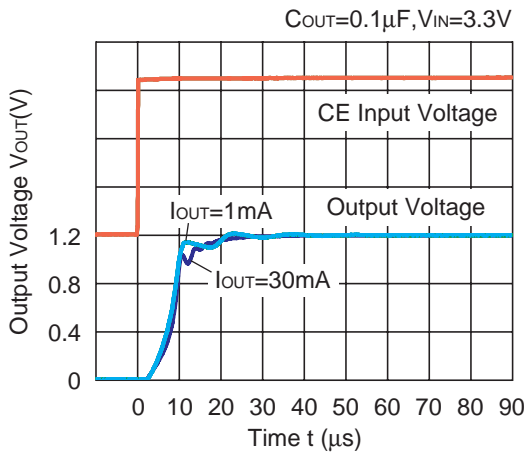


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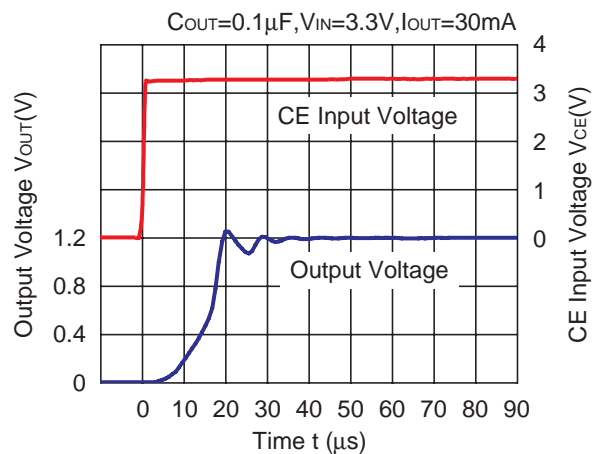


**12) Turn on speed by CE pin ( $C_{IN}$ =Ceramic 0.1 $\mu F$ )**

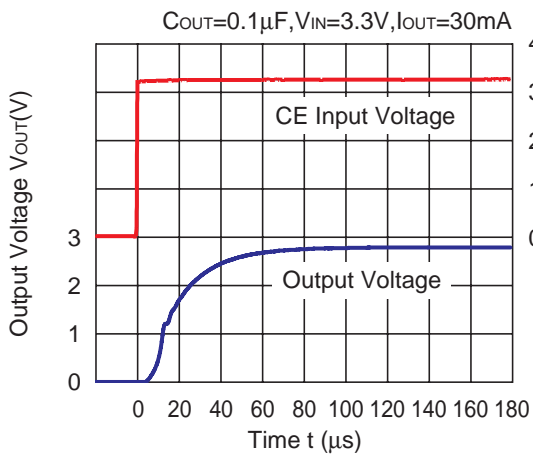
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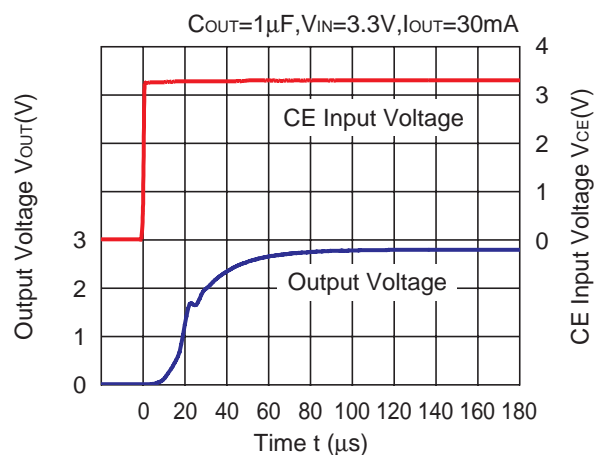
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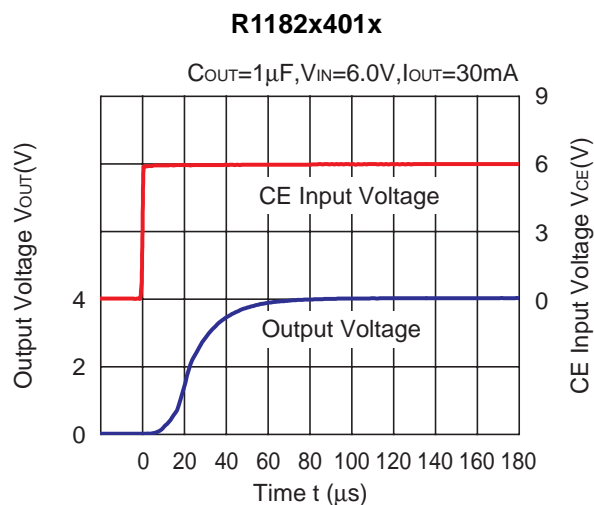
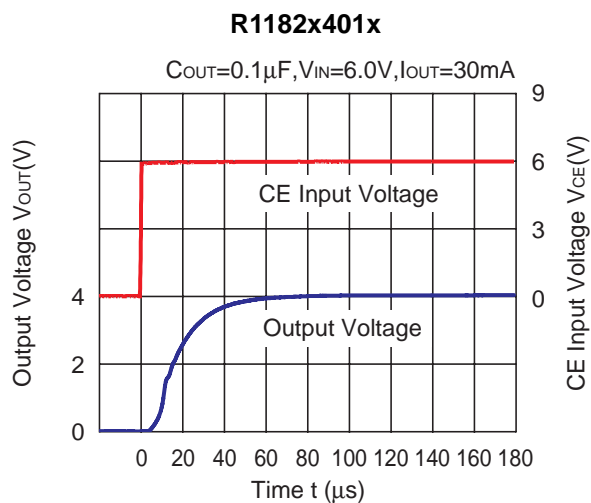
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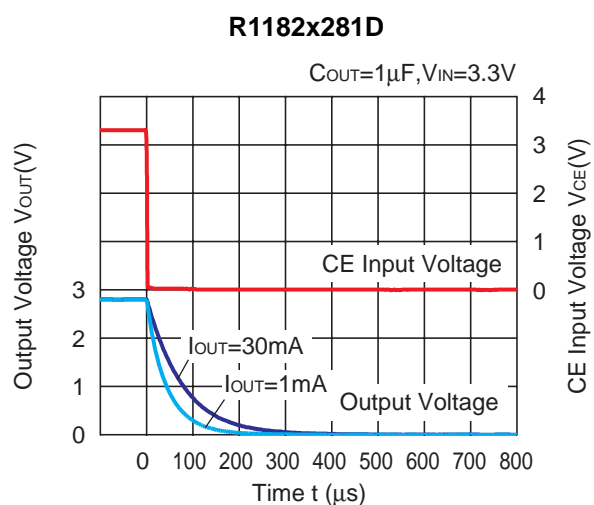
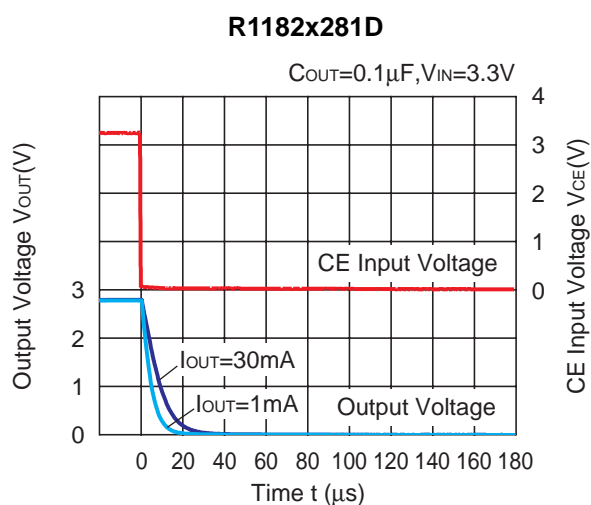
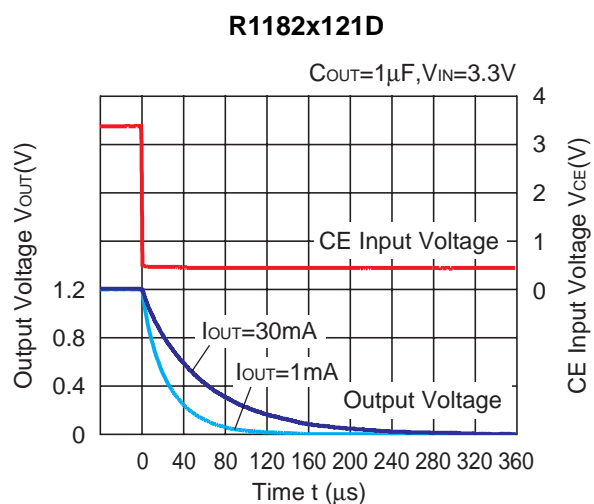
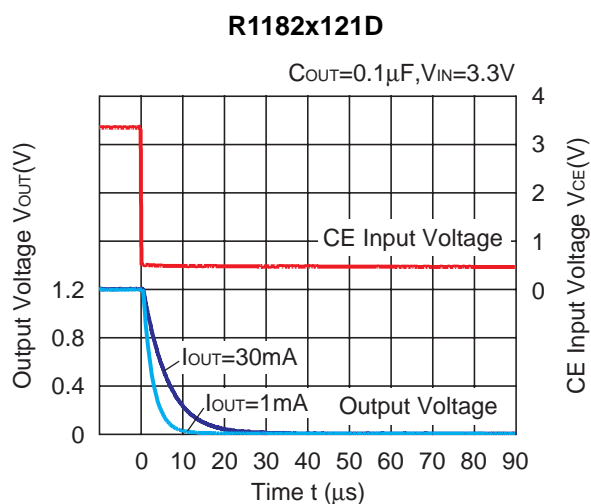
**R1182x281x**





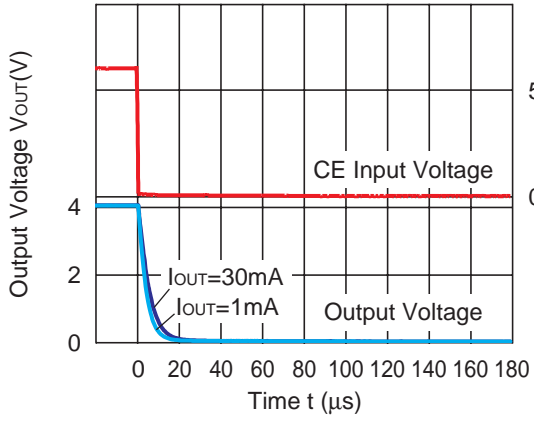


**13) Turn-off Speed by CE pin ( $C_{IN}$ =Ceramic  $0.1\mu F$ ) (D version)**



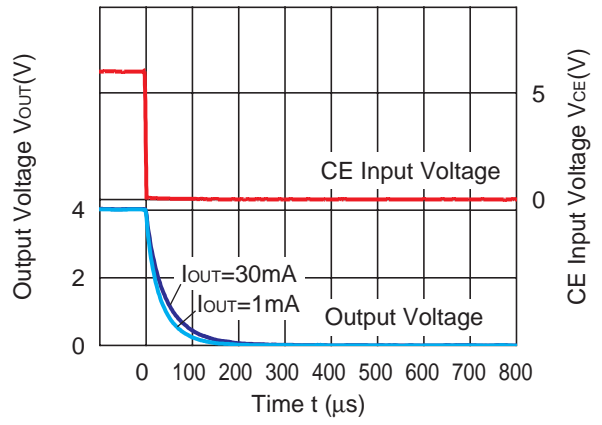
R1182x401D

$C_{OUT}=0.1\mu F, V_{IN}=6.0V$



R1182x401D

$C_{OUT}=1\mu F, V_{IN}=6.0V$





### POWER DISSIPATION (PLP(DFN)1616-6)

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:

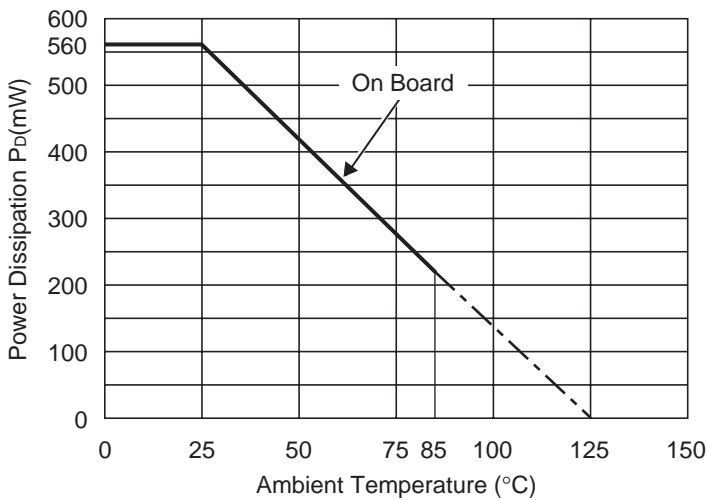
(DFN(PLP)1616-6 is a reference value calculated from the DFN(PLP)1820-6 package.)

Measurement Conditions

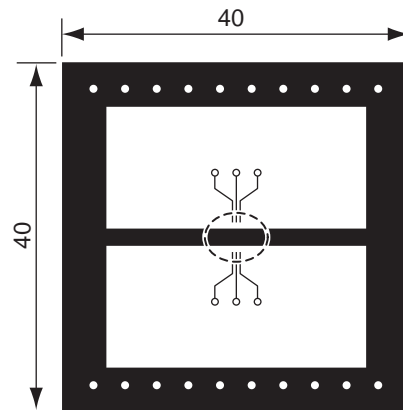
	Standard Land Pattern
Environment	Mounting on Board (Wind velocity=0m/s)
Board Material	Glass cloth epoxy plastic (Double sided)
Board Dimensions	40mm × 40mm × 1.6mm
Copper Ratio	Top side : Approx. 50% , Back side : Approx. 50%
Through-hole	φ0.54mm × 30pcs

Measurement Result (T<sub>opt</sub>=25°C, T<sub>jmax</sub>=125°C)

	Standard Land Pattern
Power Dissipation	560mW
Thermal Resistance	$\theta_{ja}=(125-25^\circ\text{C})/0.56\text{W}=179^\circ\text{C/W}$



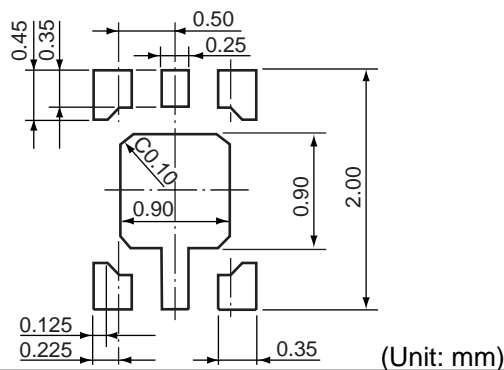
Power Dissipation



Measurement Board Pattern

○ IC Mount Area Unit : mm

### RECOMMENDED LAND PATTERN





### 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.)

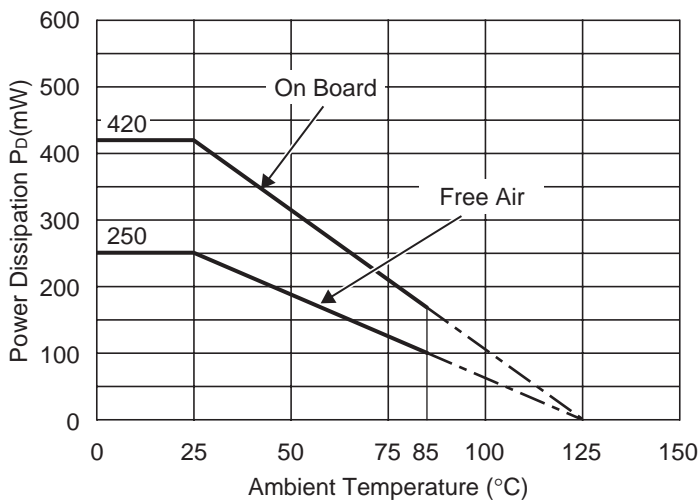
Measurement Conditions

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

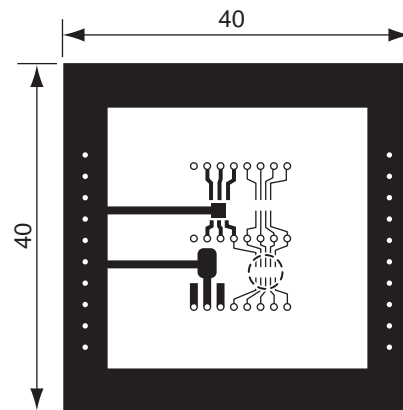
Measurement Result

( $T_{opt}=25^{\circ}C$ ,  $T_{jmax}=125^{\circ}C$ )

	Standard Land Pattern	Free Air
Power Dissipation	420mW	250mW
Thermal Resistance	$\theta_{ja}=(125-25^{\circ}C)/0.42W=238^{\circ}C/W$	400 $^{\circ}C/W$



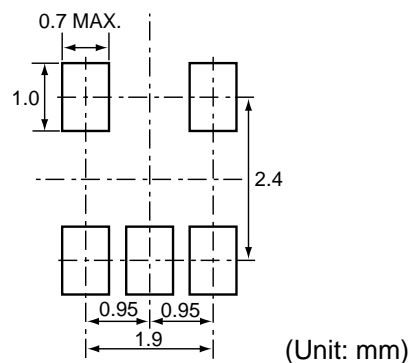
Power Dissipation



Measurement Board Pattern

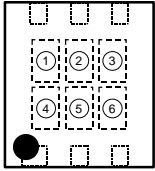
○ IC Mount Area Unit : mm

### RECOMMENDED LAND PATTERN



## R1182K SERIES MARK SPECIFICATION

### • DFN(PLP)1616-6



①~④ : Product Code (refer to Part Number vs. Product Code)

⑤, ⑥ : Lot Number

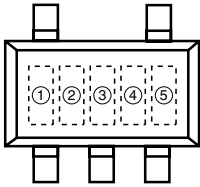
### • Part Number vs. Product Code

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		
	①	②	③
R1182N121B	0	1	C
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
R1182N301D	1	3	A
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