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## 3-MODE 150mA LDO REGULATOR

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NO.EA-110-0512

### OUTLINE

The R1162x Series consist of CMOS-based voltage regulator ICs with high output voltage accuracy and low supply current. Each of these voltage regulator ICs consists of a voltage reference unit, an error amplifier, resistors for setting output voltage, a current limit circuit, and so on. The output voltage is internally fixed with high accuracy.

These ICs perform with the chip enable function and realize a standby mode with ultra low supply current. To prevent the destruction by over current, the current limit circuit is included. The R1162x Series have 3-mode. One is standby mode with CE or standby control pin. Other two modes are realized with ECO pin™. Fast Transient Mode (FT mode) and Low Power Mode (LP mode) are alternative with ECO pin™. Consumption current is reduced at Low Power Mode compared with Fast Transient Mode. The output voltage is maintained between FT mode and LP mode.

Since the packages for these ICs are SOT-23-5 and SON1612-6 packages, high density mounting of the ICs on boards is possible.

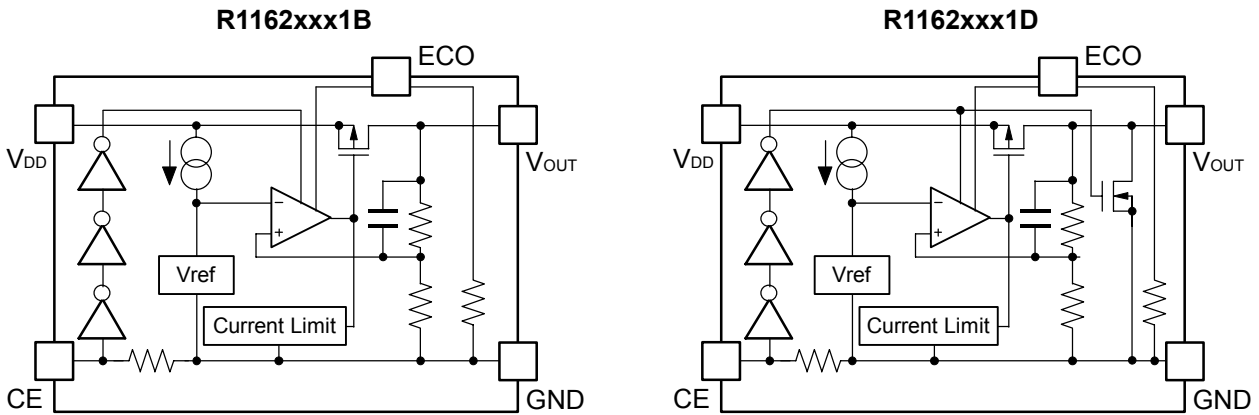
### FEATURES

- Ultra-Low Supply Current..... Typ. 5.5μA (Low Power Mode),  
Typ. 70μA (Fast Transient Mode)
- Standby Mode ..... Typ. 0.1μA
- Low Dropout Voltage..... Typ. 0.25V (I<sub>OUT</sub>=150mA Output Voltage=3.0V Type)
- High Ripple Rejection ..... Typ. 70dB (f=1kHz, FT Mode)  
Typ. 60dB (f=10kHz, FT Mode)
- Low Temperature-Drift Coefficient of Output Voltage Typ. ±100ppm/°C
- Excellent Line Regulation ..... Typ. 0.02%/V
- High Output Voltage Accuracy ..... ±2.0%(±3.0% at LP Mode)
- Small Package ..... SOT-23-5 (Super Mini-mold), SON1612-6
- Output Voltage ..... Stepwise setting with a step of 0.1V  
in the range of 1.5V to 4.0V is possible
- Built-in fold-back protection circuit ..... Typ. 40mA (Current at short mode)
- Performs with Ceramic Capacitors ..... C<sub>IN</sub>=1.0μF, C<sub>OUT</sub>=0.47μF

### APPLICATIONS

- Precision Voltage References.
- Power source for electrical appliances such as cameras, VCRs and hand-held communication equipment.
- Power source for battery-powered equipment.

## BLOCK DIAGRAM



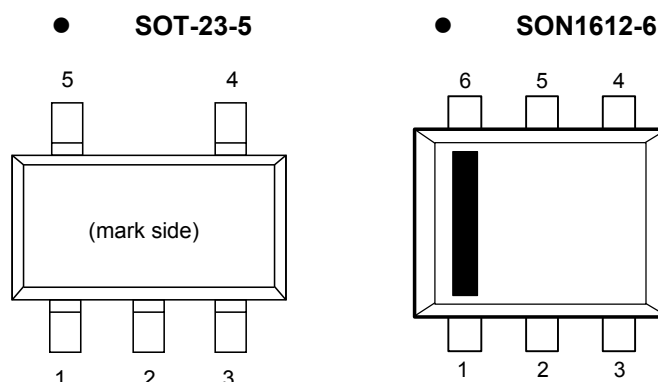
## SELECTION GUIDE

The output voltage, function of auto-discharge, package, and the packing type for the ICs can be selected at the user's request. The selection can be available by designating the part number as shown below;

R1162xxx1x-xx ←Part Number  
 ↑ ↑ ↑ ↑  
 a b c d

Code	Contents
a	Designation of Package Type : N:SOT-23-5 (Mini-mold) D:SON1612-6
b	Setting Output Voltage ( $V_{OUT}$ ) : Stepwise setting with a step of 0.1V in the range of 1.5V to 4.0V is possible. Exceptions: 1.85V=R1162x181x5, 2.85V=R1162x281x5
c	Designation of Chip Enable Option : B: "H" active type. D: "H" active type. With auto discharge function
d	Designation of Taping Type : Refer to Taping Specifications;TR type is the standard direction.

## PIN CONFIGURATIONS



## PIN DESCRIPTIONS

### • R1116N (SOT-23-5)

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

### • R1116D (SON1612-6)

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

## ABSOLUTE MAXIMUM RATINGS

Symbol	Item	Rating	Unit
V <sub>IN</sub>	Input Voltage	6.5	V
V <sub>ECO</sub>	Input Voltage (ECO Pin)	-0.3 to 6.5	V
V <sub>CE</sub>	Input Voltage ( $\overline{CE}$ / CE Pin)	-0.3 to 6.5	V
V <sub>OUT</sub>	Output Voltage	-0.3 to V <sub>IN</sub> +0.3	V
I <sub>OUT</sub>	Output Current	180	mA
P <sub>D</sub>	Power Dissipation (SOT-23-5)* <sup>1</sup>	420	mW
	Power Dissipation (SON1612-6)* <sup>1</sup>	500	MW
T <sub>opt</sub>	Operating Temperature Range	-40 ~ 85	°C
T <sub>stg</sub>	Storage Temperature Range	-55 ~ 125	°C

\*1 For Power Dissipation, please refer to PACKAGE INFORMATION to be described.

## ELECTRICAL CHARACTERISTICS

## • R1162xxx1B/D

T<sub>opt</sub>=25°C

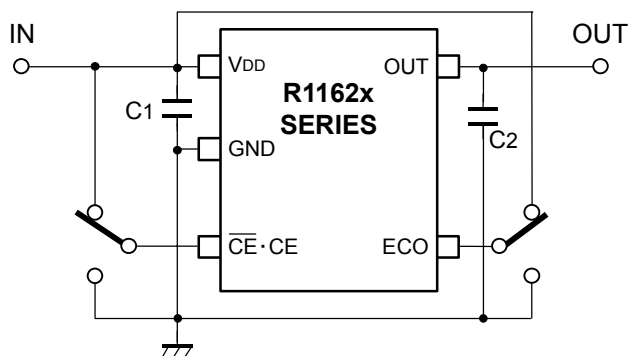
Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V <sub>OUT</sub>	Output Voltage	V <sub>IN</sub> = Set V <sub>OUT</sub> +1V V <sub>ECO</sub> = V <sub>IN</sub> 1mA ≤ I <sub>OUT</sub> ≤ 30mA <sup>Note 1</sup>	V <sub>OUT</sub> ×0.98		V <sub>OUT</sub> ×1.02	V
		V <sub>IN</sub> = Set V <sub>OUT</sub> + 1V V <sub>ECO</sub> =GND 1mA ≤ I <sub>OUT</sub> ≤ 30mA <sup>Note 2</sup>	V <sub>OUT</sub> ×0.97		V <sub>OUT</sub> ×1.03	V
ΔV <sub>OUT</sub>	Output Voltage Deviation between FT Mode and LP Mode	V <sub>IN</sub> = Set V <sub>OUT</sub> +1V, I <sub>OUT</sub> =30mA V <sub>OUT</sub> ≤ 2.0V	-1.2	0.0	1.2	%
		V <sub>OUT</sub> ≥ 2.0V	(-24)	0.0	(24)	mV
I <sub>OUT</sub>	Output Current	V <sub>IN</sub> - V <sub>OUT</sub> = 1.0V	150			mA
ΔV <sub>OUT</sub> / ΔI <sub>OUT</sub>	Load Regulation(FT Mode)	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, V <sub>ECO</sub> =V <sub>IN</sub> 1mA ≤ I <sub>OUT</sub> ≤ 150mA		20	40	mV
	Load Regulation(LP Mode)	V <sub>IN</sub> = Set V <sub>OUT</sub> +1V, V <sub>ECO</sub> =GND 1mA ≤ I <sub>OUT</sub> ≤ 150mA		20	45	mV
V <sub>DIF</sub>	Dropout Voltage	Refer to the ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE				
I <sub>SS1</sub>	Supply Current(FT Mode)	V <sub>IN</sub> = Set V <sub>OUT</sub> +1V V <sub>ECO</sub> = V <sub>IN</sub> , I <sub>OUT</sub> =0mA		70	100	μA
I <sub>SS2</sub>	Supply Current(LP Mode)	V <sub>IN</sub> = Set V <sub>OUT</sub> +1V V <sub>ECO</sub> = GND, I <sub>OUT</sub> =0mA		5.5	9.0	μA
I <sub>standby</sub>	Supply Current (Standby)	V <sub>IN</sub> = V <sub>CE</sub> = Set V <sub>OUT</sub> +1V		0.1	1.0	μA
ΔV <sub>OUT</sub> / ΔV <sub>IN</sub>	Line Regulation(FT Mode)	Set V <sub>OUT</sub> +0.5V ≤ V <sub>IN</sub> ≤ 6.0V I <sub>OUT</sub> = 30mA, V <sub>ECO</sub> = V <sub>IN</sub> V <sub>OUT</sub> ≤ 1.6V: 2.2V ≤ V <sub>IN</sub> ≤ 6.0V		0.02	0.10	%/V
	Line Regulation(LP Mode)	Set V <sub>OUT</sub> + 0.5V ≤ V <sub>IN</sub> ≤ 6.0V I <sub>OUT</sub> = 30mA, V <sub>ECO</sub> = GND V <sub>OUT</sub> ≤ 1.6V: 2.2V ≤ V <sub>IN</sub> ≤ 6.0V		0.05	0.20	%/V
RR	Ripple Rejection(FT Mode)	f = 1kHz f = 10kHz, Ripple 0.2Vp-p V <sub>IN</sub> = Set V <sub>OUT</sub> + 1V I <sub>OUT</sub> = 30mA, V <sub>ECO</sub> = V <sub>IN</sub>		70 60		dB
V <sub>IN</sub>	Input Voltage		2.0		6.0	V
ΔV <sub>OUT</sub> / ΔT <sub>opt</sub>	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		40		mA
I <sub>PD</sub>	CE Pull-down Constant Current			0.3	0.6	μA
R <sub>PD</sub>	ECO Pull-down Resistance		2	5	30	MΩ
V <sub>CEH</sub>	CE, ECO Input Voltage "H"		1.0		6.0	V
V <sub>CEL</sub>	CE, ECO Input Voltage "L"		0.00		0.35	V
e <sub>n</sub>	Output Noise (Fast Mode)	BW = 10Hz to 100kHz		30		μVrms
e <sub>n</sub>	Output Noise (Low Power Mode)	BW = 10Hz to 100kHz		40		μVrms
R <sub>LOW</sub>	Nch On resistance for auto-discharge (Applied to D version)	V <sub>CE</sub> =0V		60		Ω

## ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE

T<sub>opt</sub> = 25°C

Output Voltage V <sub>OUT</sub> (V)	Dropout Voltage (mV)				
	Condition	V <sub>DIF</sub> (ECO=H)		V <sub>DIF</sub> (ECO=L)	
		Typ.	Max.	Typ.	Max.
1.5 ≤ V <sub>OUT</sub> ≤ 1.6	I <sub>OUT</sub> = 150mA	400	680	420	680
1.6 ≤ V <sub>OUT</sub> ≤ 1.7		380	550	390	550
1.7 ≤ V <sub>OUT</sub> ≤ 1.8		350	520	370	520
1.8 ≤ V <sub>OUT</sub> ≤ 2.0		340	490	350	490
2.0 ≤ V <sub>OUT</sub> ≤ 2.8		290	425	300	430
2.8 ≤ V <sub>OUT</sub> ≤ 4.0		250	350	250	350

## TYPICAL APPLICATION



(External Components)

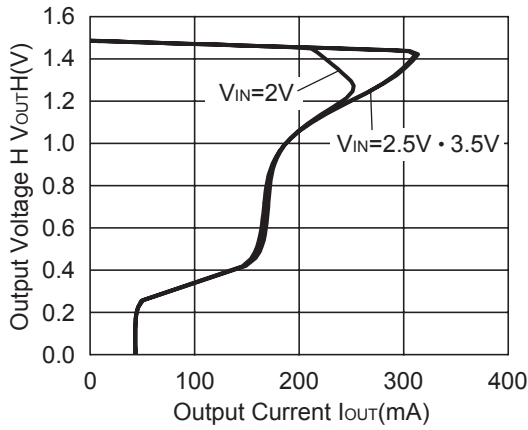
C<sub>2</sub> Ceramic 0.47μF Ex. Murata GRM40B474K  
Kyocera CM105B474K

C<sub>1</sub> Ceramic 1.0μF

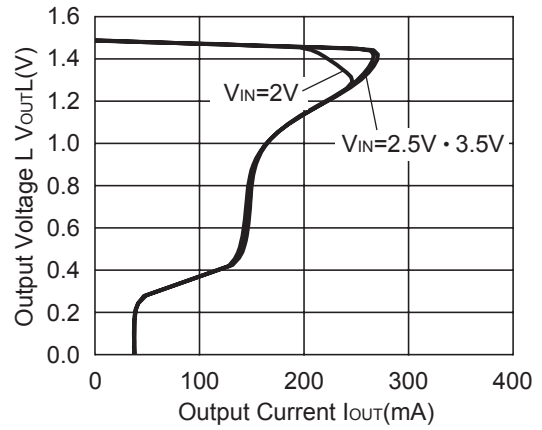
**TYPICAL CHARACTERISTICS** Unless otherwise provided, capacitors are ceramic type.

**1) Output Voltage vs. Output Current**

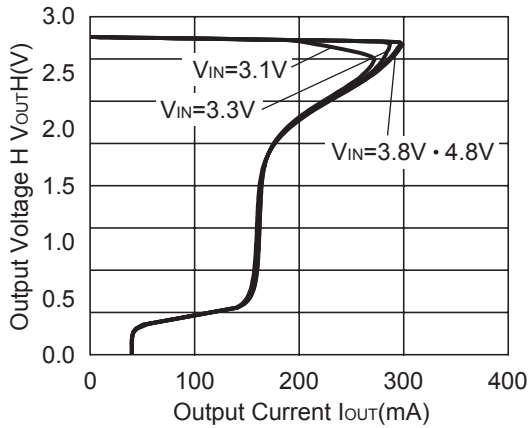
**R1162x15x (ECO=H)**



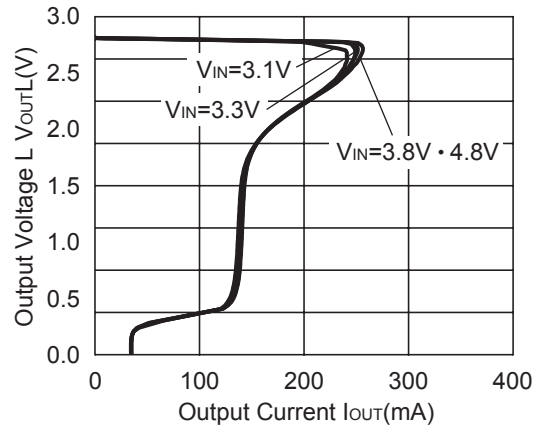
**R1162x15x (ECO=L)**



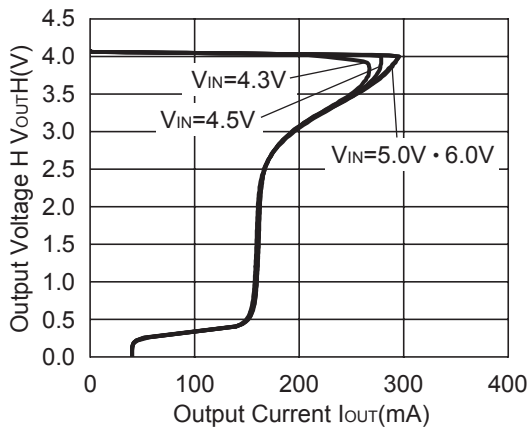
**R1162x28x (ECO=H)**



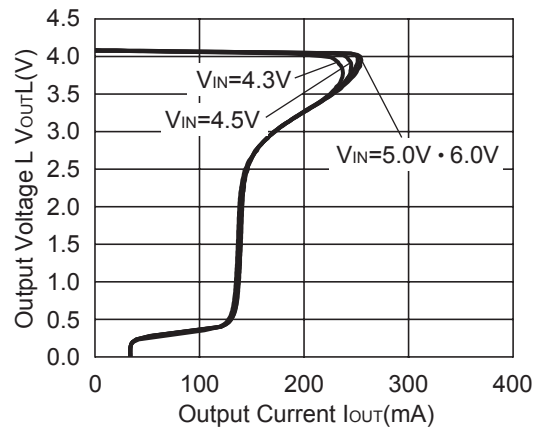
**R1162x28x (ECO=L)**



**R1162x40x (ECO=H)**

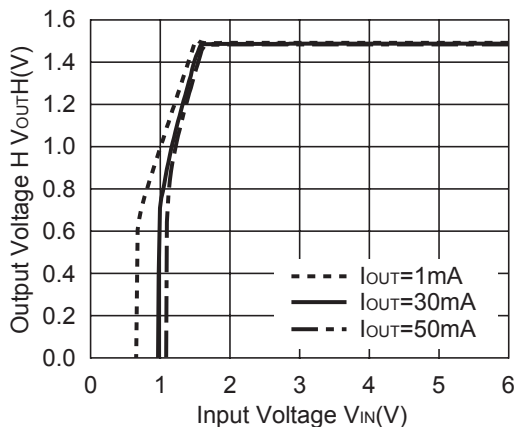


**R1162x40x (ECO=L)**

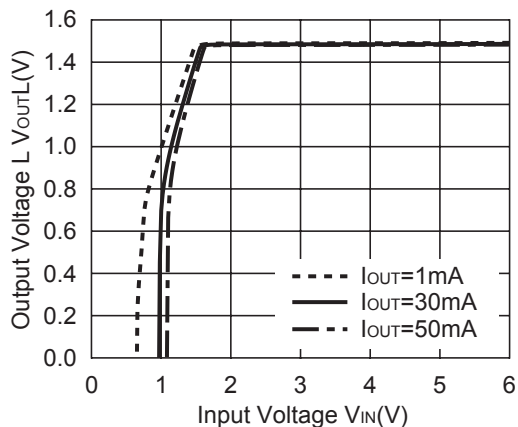


2) Output Voltage vs. Input Voltage

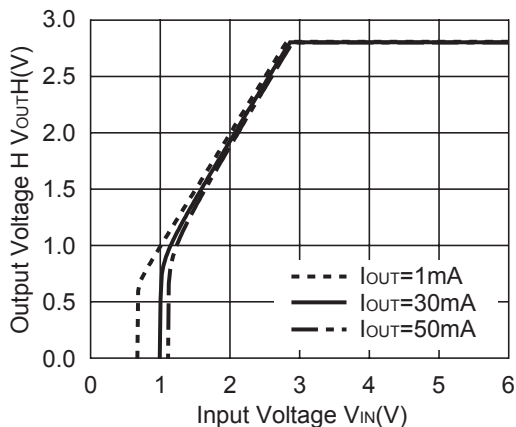
R1162x15x (ECO=H)



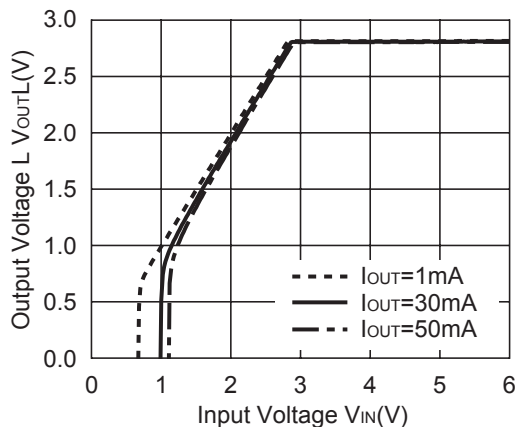
R1162x15x (ECO=L)



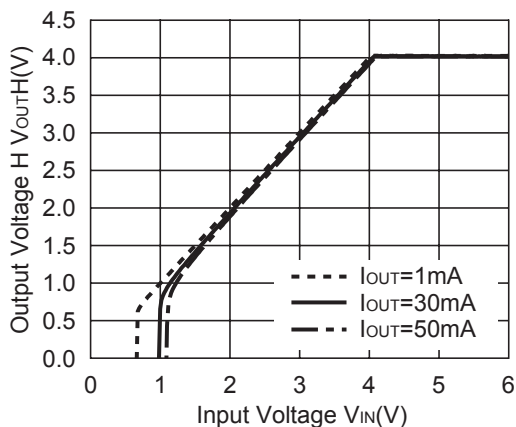
R1162x28x (ECO=H)



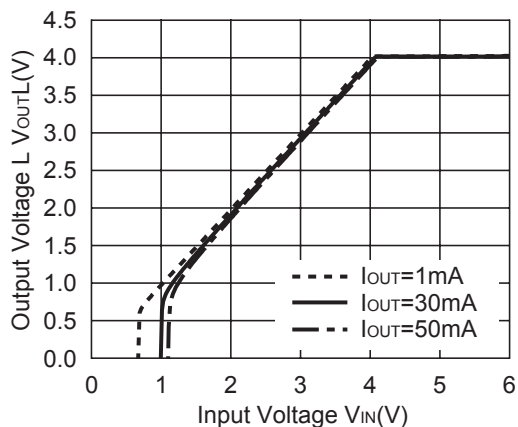
R1162x28x (ECO=L)



R1162x40x (ECO=H)

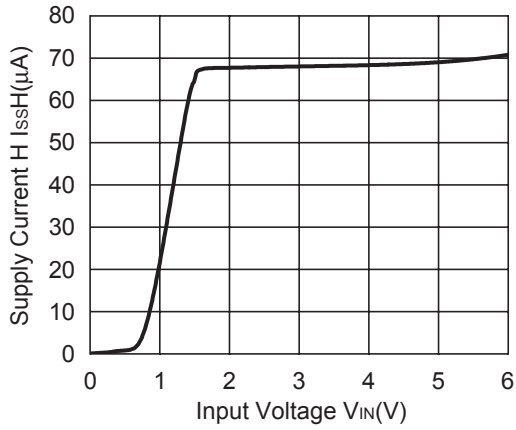


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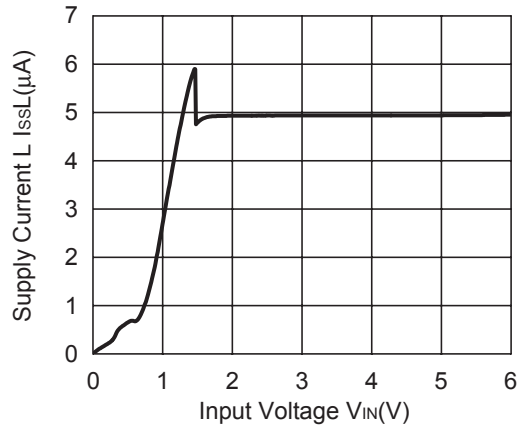


3) Supply Current vs. Input Voltage

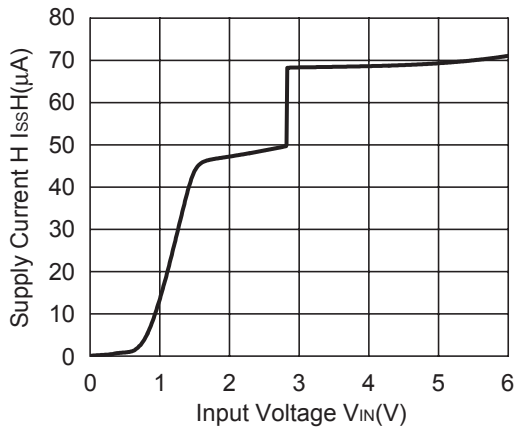
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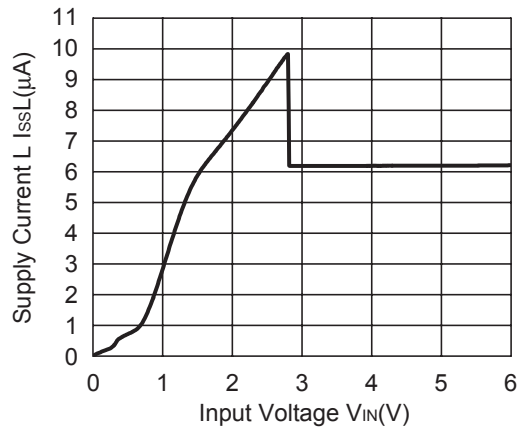
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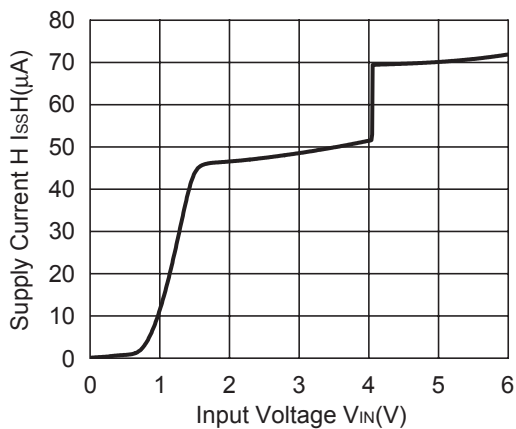
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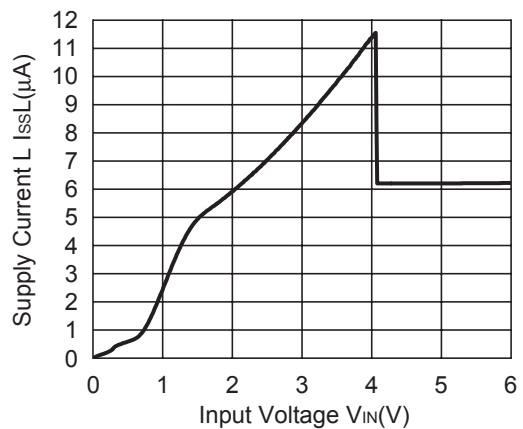
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R1162x40x (ECO=H)



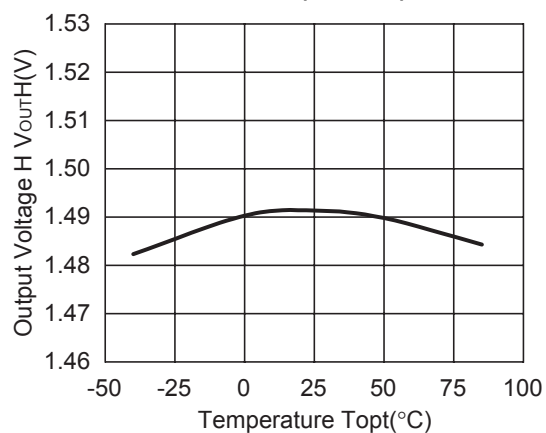
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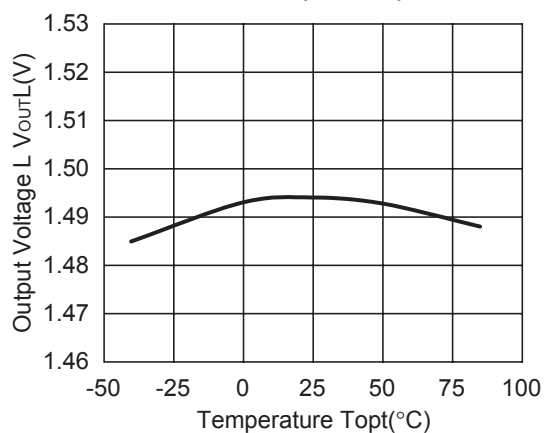


## 4) Output Voltage vs. Temperature

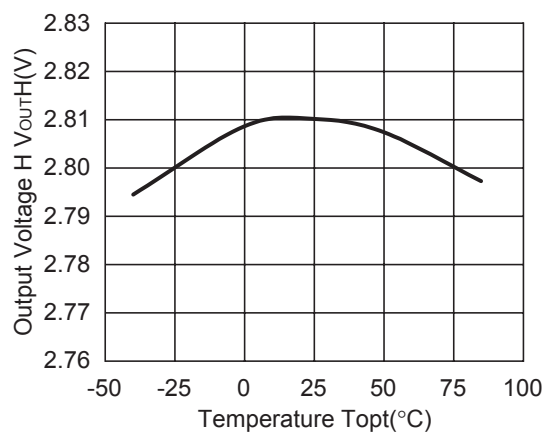
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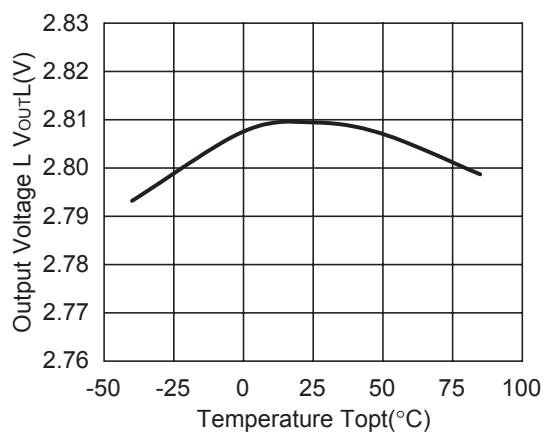
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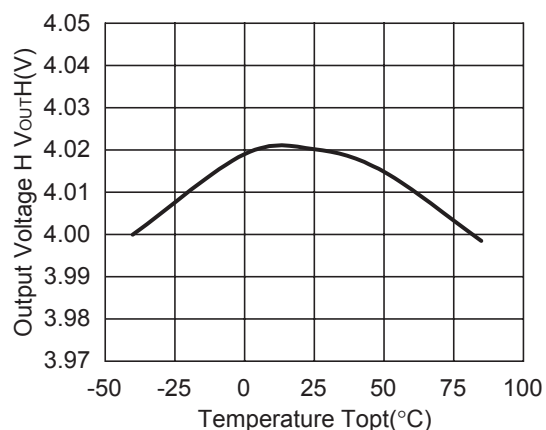
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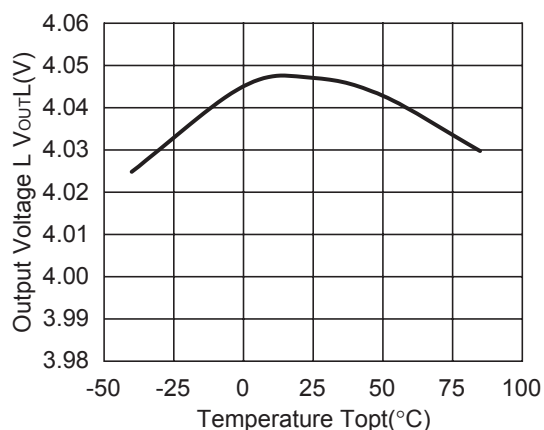
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R1162x40x (ECO=H)

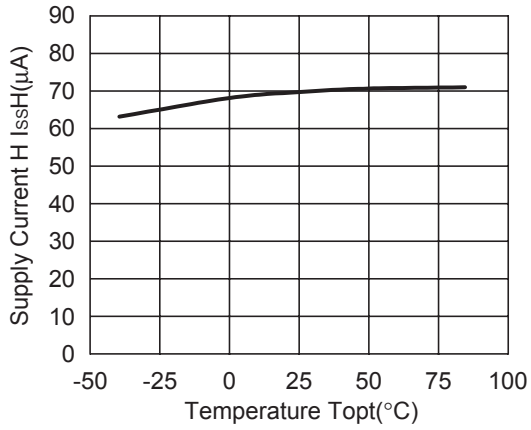


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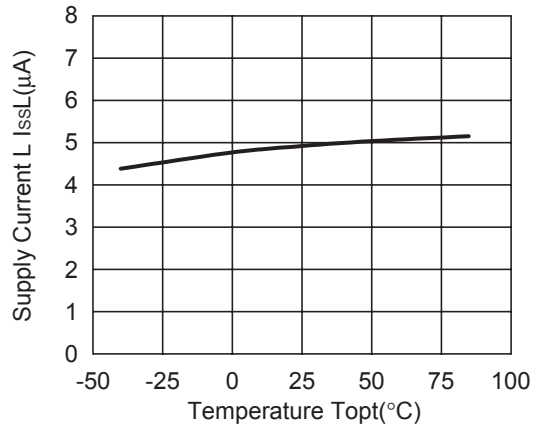


5) Supply Current vs. Temperature

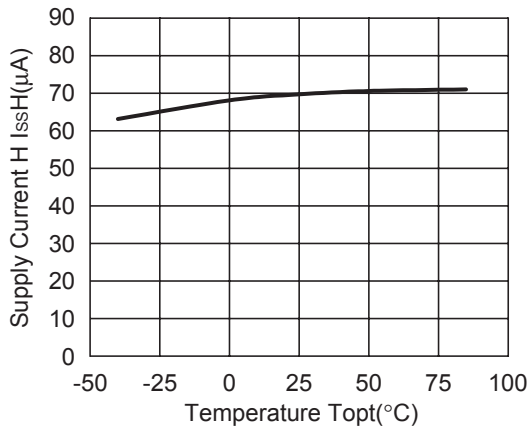
R1162x15x (ECO=H)



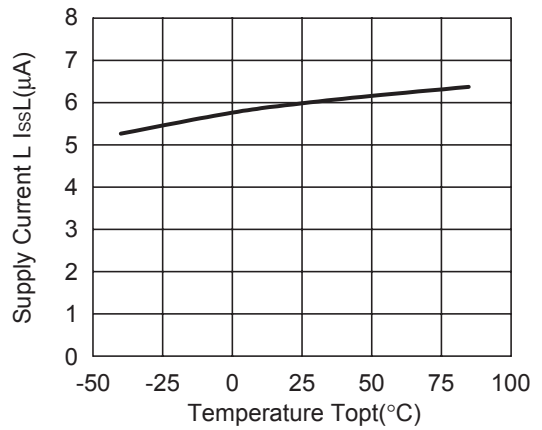
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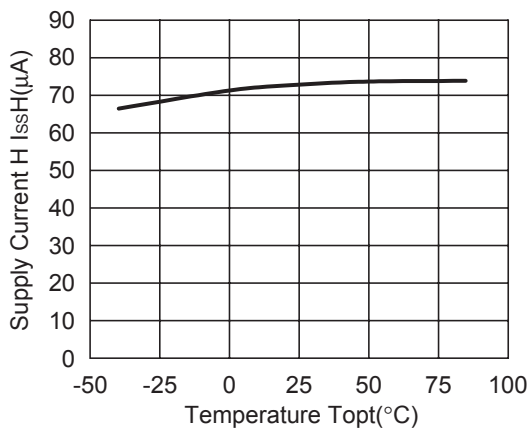
R1162x28x (ECO=H)



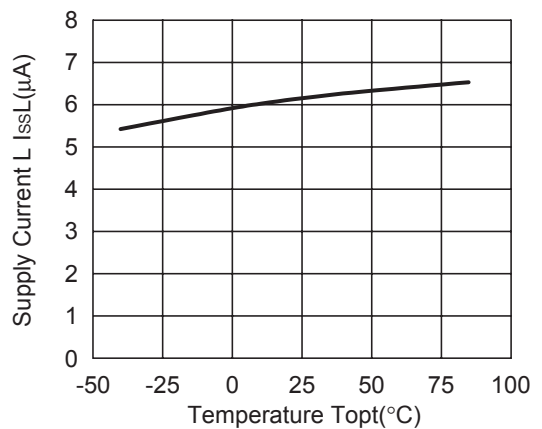
R1162x28x (ECO=L)



R1162x40x (ECO=H)

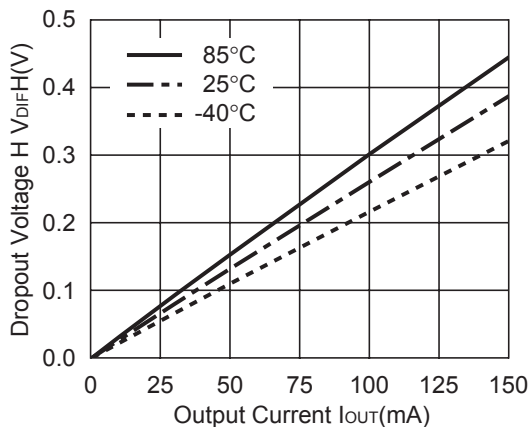


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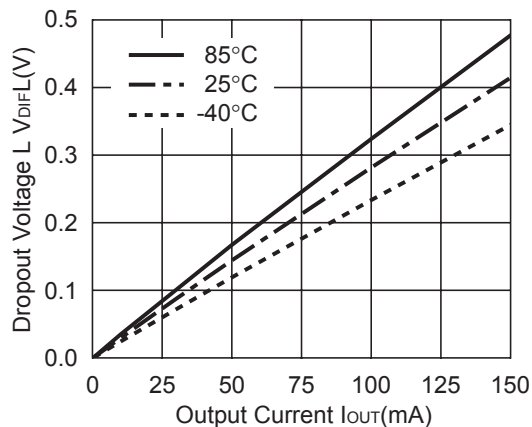


## 6) Dropout Voltage vs. Output Current

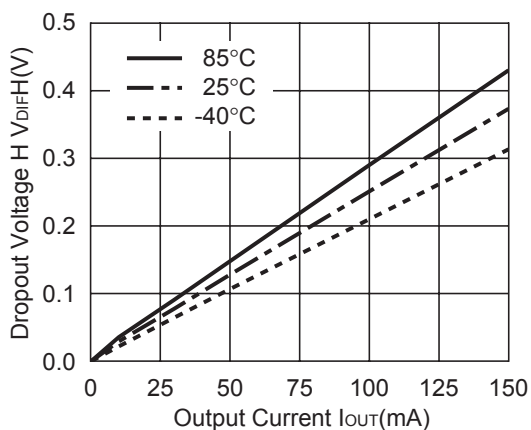
R1162x15x (ECO=H)



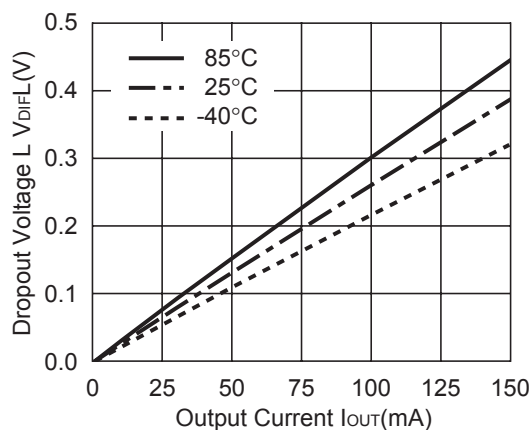
R1162x15x (ECO=L)



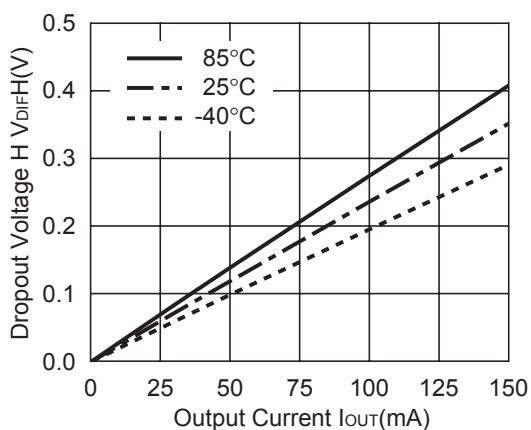
R1162x16x (ECO=H)



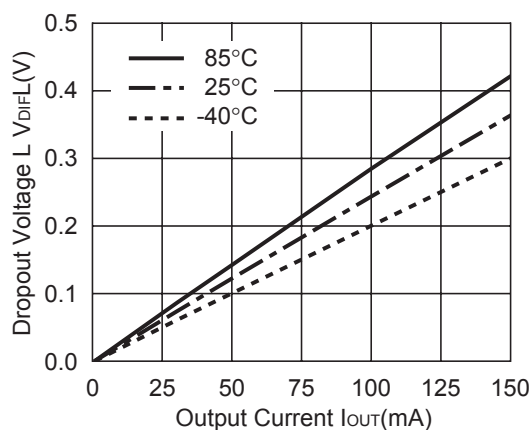
R1162x16x (ECO=L)

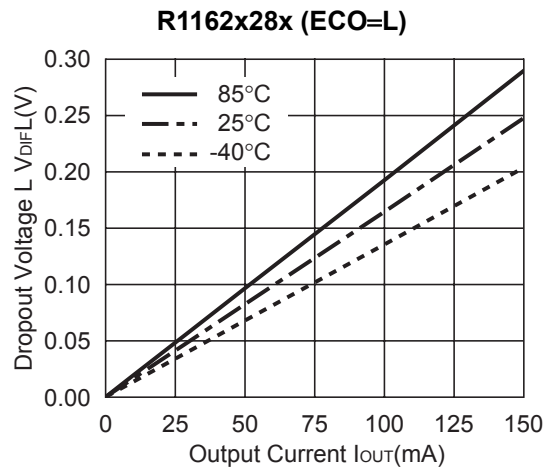
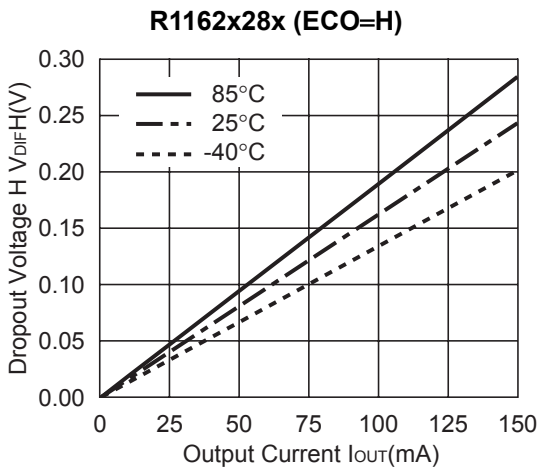
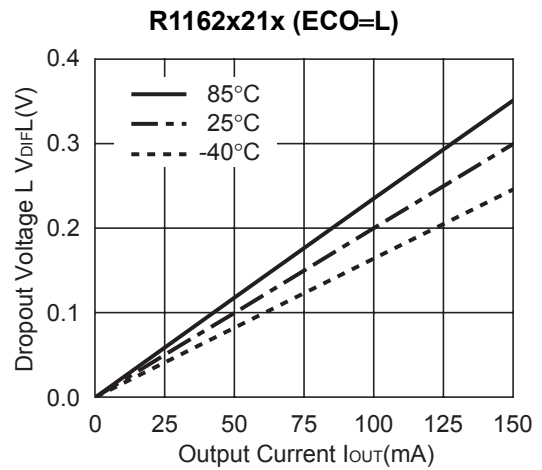
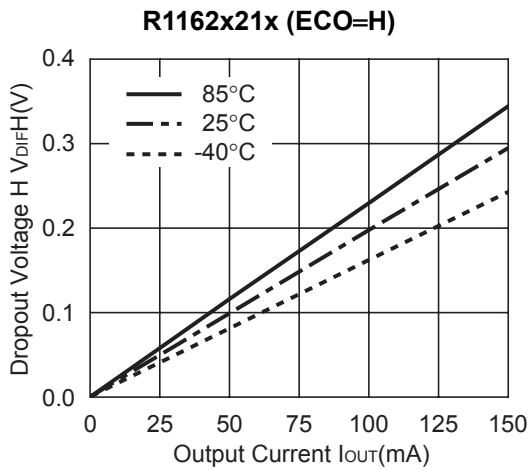
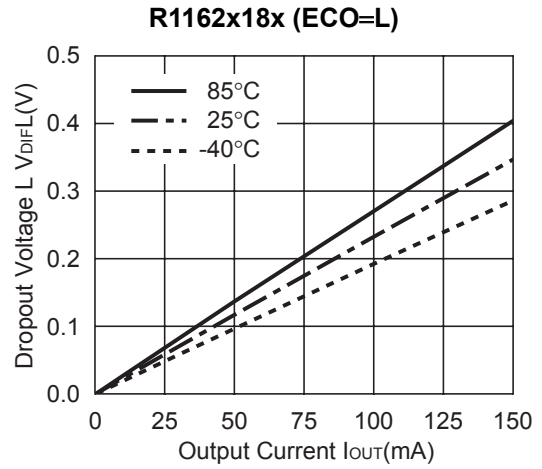
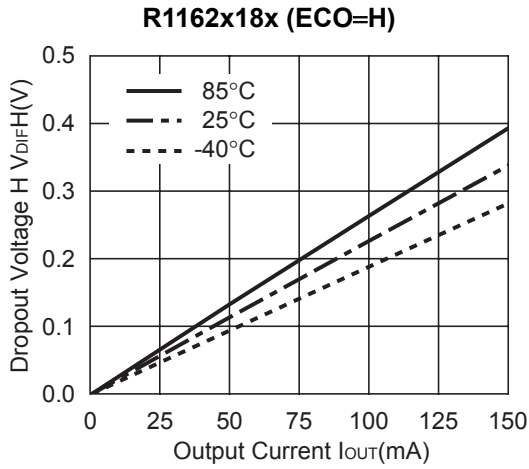


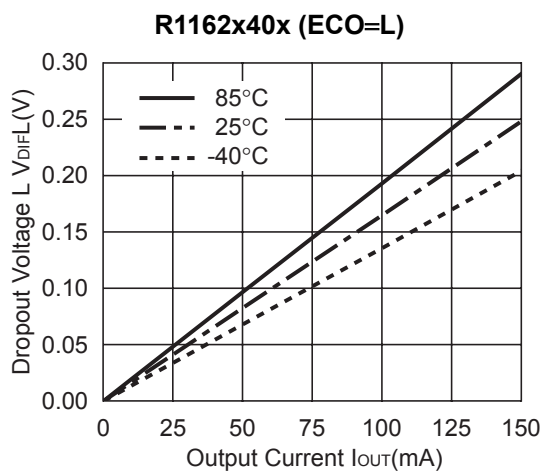
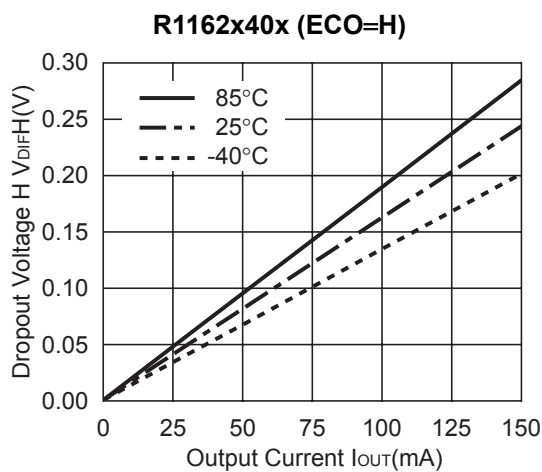
R1162x17x (ECO=H)



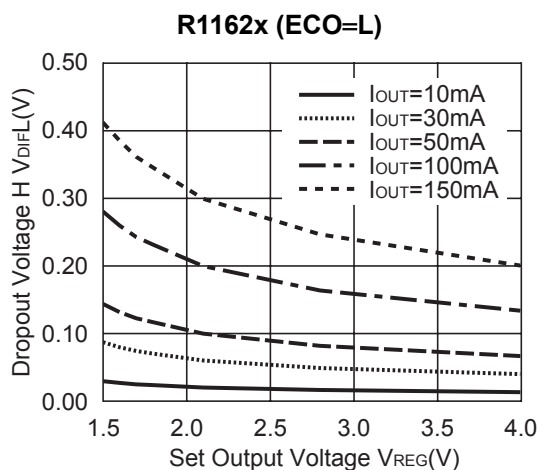
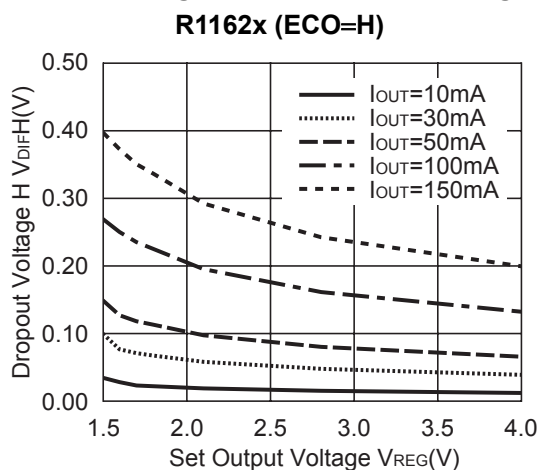
R1162x17x (ECO=L)



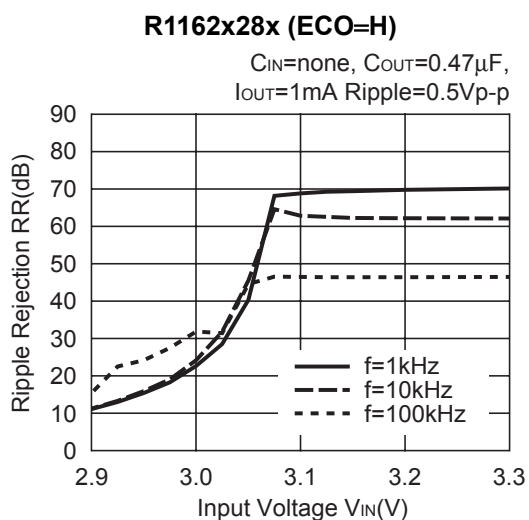
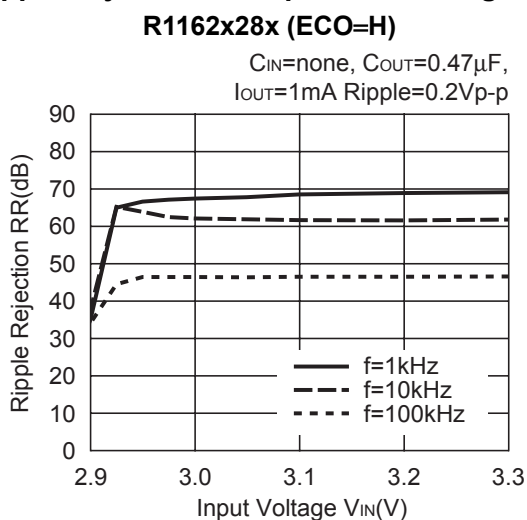




**7) Dropout Voltage vs. Set Output Voltage**

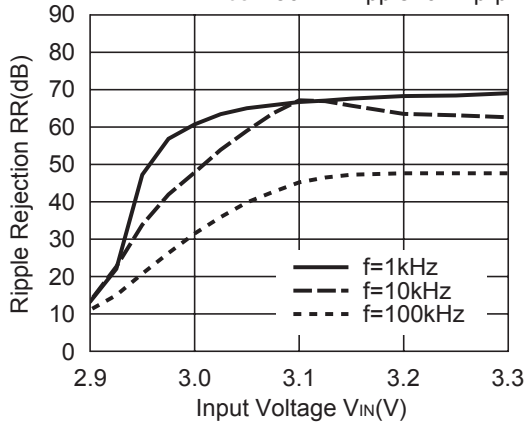


**8) Ripple Rejection vs. Input Bias Voltage**



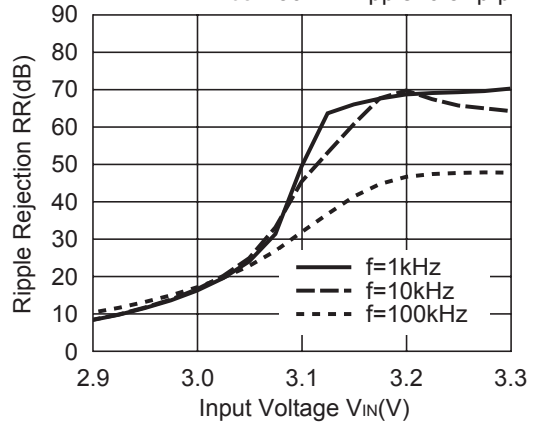
**R1162x28x (ECO=H)**

$C_{IN}$ =none,  $C_{OUT}$ =0.47 $\mu$ F,  
 $I_{OUT}$ =30mA Ripple=0.2Vp-p



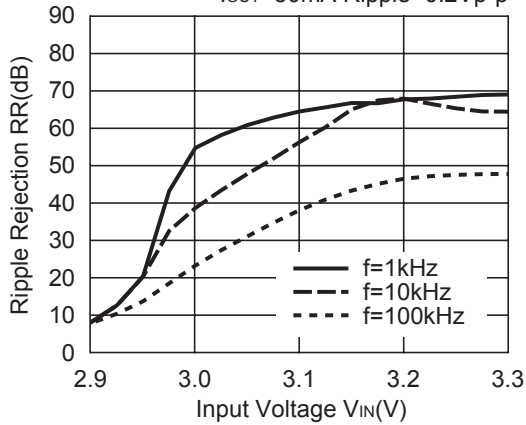
**R1162x28x (ECO=H)**

$C_{IN}$ =none,  $C_{OUT}$ =0.47 $\mu$ F,  
 $I_{OUT}$ =30mA Ripple=0.5Vp-p



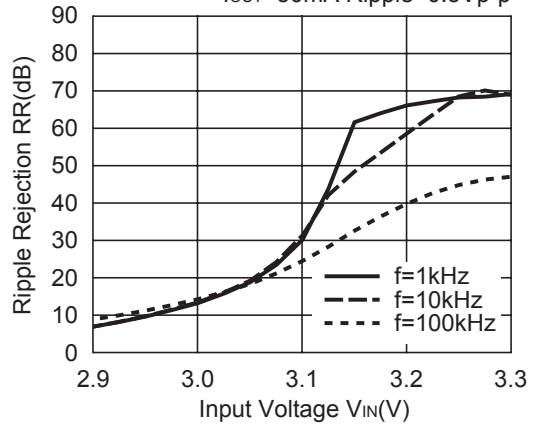
**R1162x28x (ECO=H)**

$C_{IN}$ =none,  $C_{OUT}$ =0.47 $\mu$ F,  
 $I_{OUT}$ =50mA Ripple=0.2Vp-p



**R1162x28x (ECO=H)**

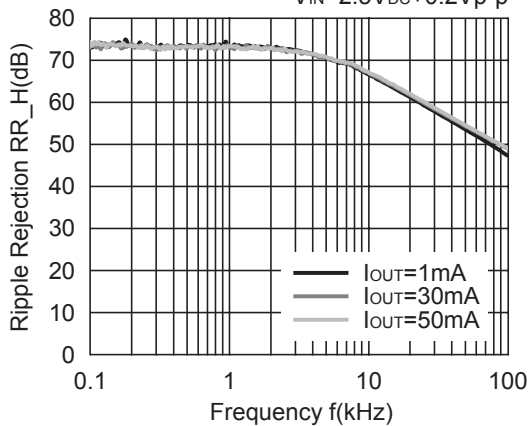
$C_{IN}$ =none,  $C_{OUT}$ =0.47 $\mu$ F,  
 $I_{OUT}$ =50mA Ripple=0.5Vp-p



**9) Ripple Rejection vs. Frequency**

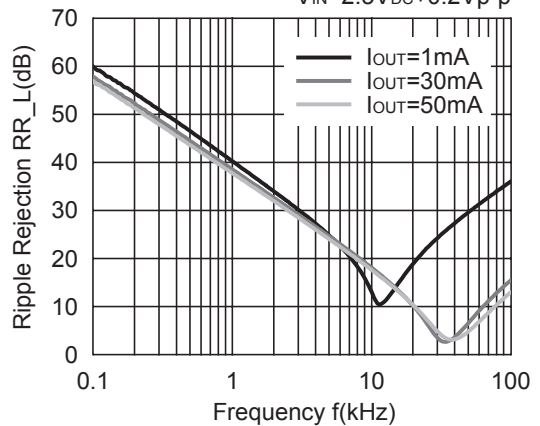
**R1162x15x (ECO=H)**

$C_{IN}$ =none,  $C_{OUT}$ =0.47 $\mu$ F,  
 $V_{IN}$ =2.5VDC+0.2Vp-p



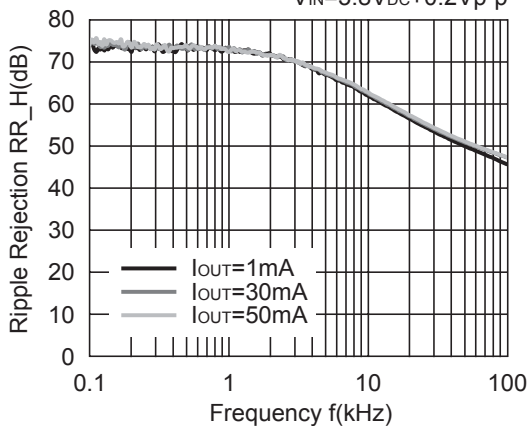
**R1162x15x (ECO=L)**

$C_{IN}$ =none,  $C_{OUT}$ =0.47 $\mu$ F,  
 $V_{IN}$ =2.5VDC+0.2Vp-p



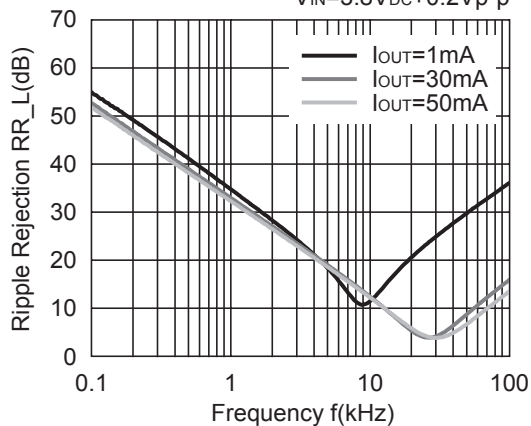
**R1162x28x (ECO=H)**

$C_{IN}$ =none,  $C_{OUT}$ =0.47 $\mu$ F,  
 $V_{IN}$ =3.8V<sub>DC</sub>+0.2V<sub>p-p</sub>



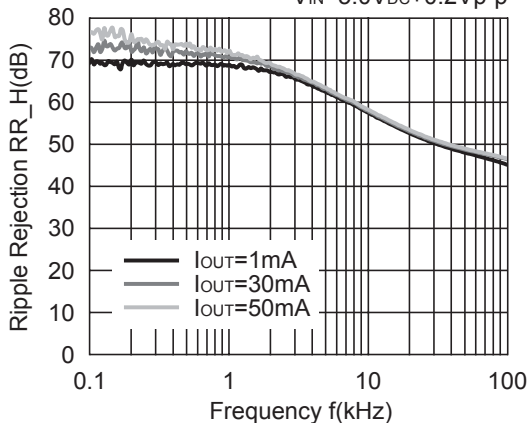
**R1162x28x (ECO=L)**

$C_{IN}$ =none,  $C_{OUT}$ =0.47 $\mu$ F,  
 $V_{IN}$ =3.8V<sub>DC</sub>+0.2V<sub>p-p</sub>



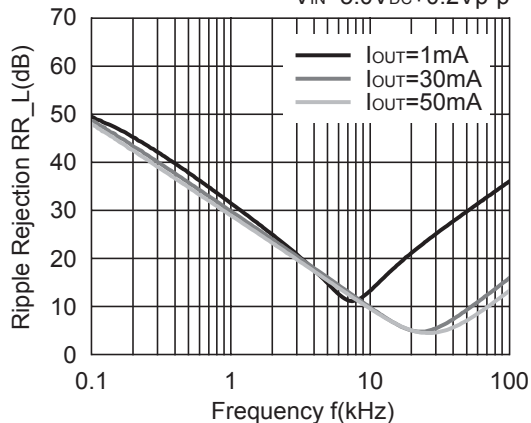
**R1162x40x (ECO=H)**

$C_{IN}$ =none,  $C_{OUT}$ =0.47 $\mu$ F,  
 $V_{IN}$ =5.0V<sub>DC</sub>+0.2V<sub>p-p</sub>



**R1162x40x (ECO=L)**

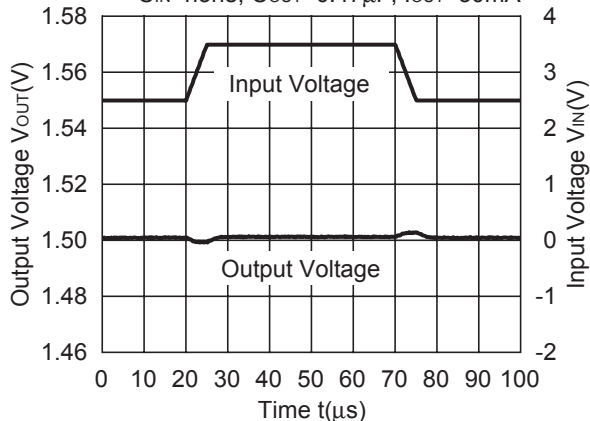
$C_{IN}$ =none,  $C_{OUT}$ =0.47 $\mu$ F,  
 $V_{IN}$ =5.0V<sub>DC</sub>+0.2V<sub>p-p</sub>



**10) Input Transient Response**

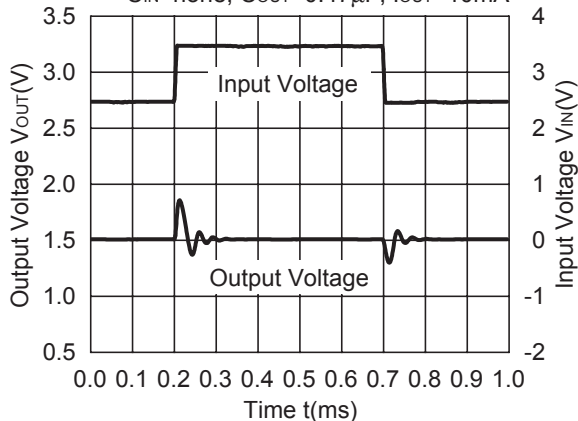
**R1162x15x (ECO=H)**

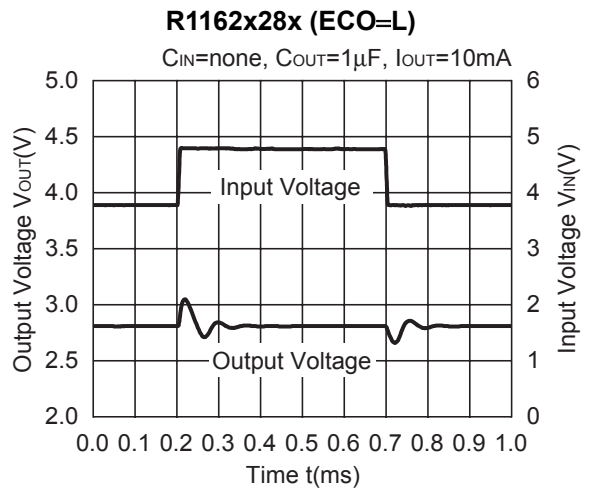
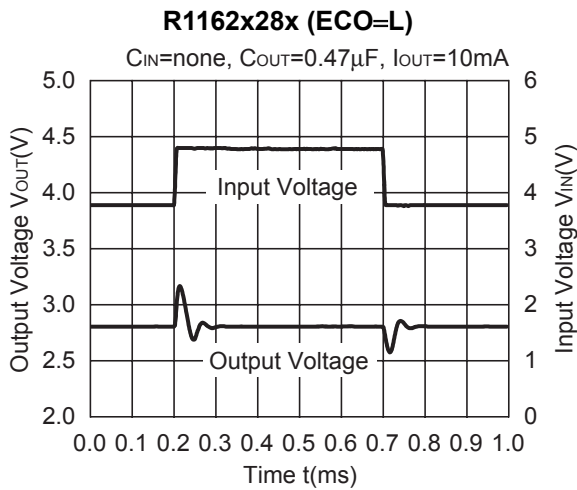
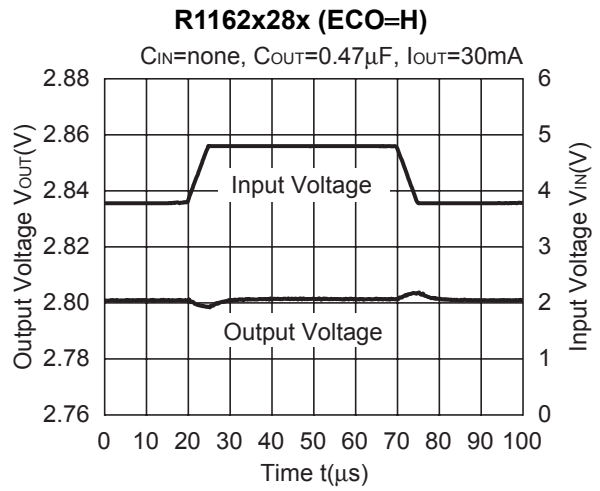
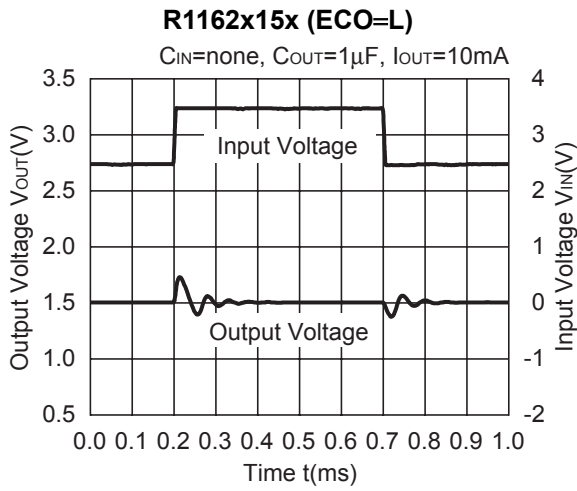
$C_{IN}$ =none,  $C_{OUT}$ =0.47 $\mu$ F,  $I_{OUT}$ =30mA



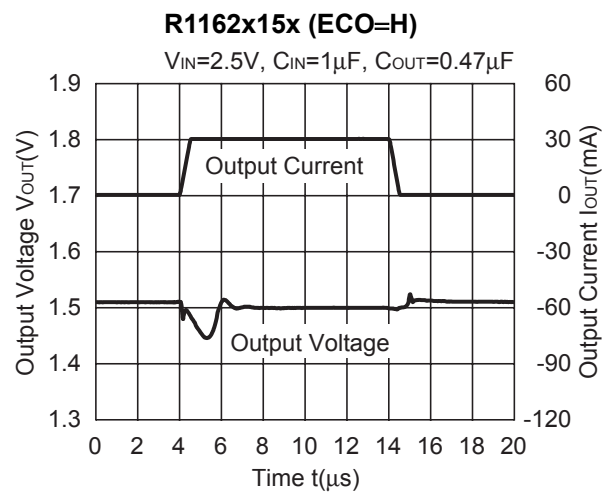
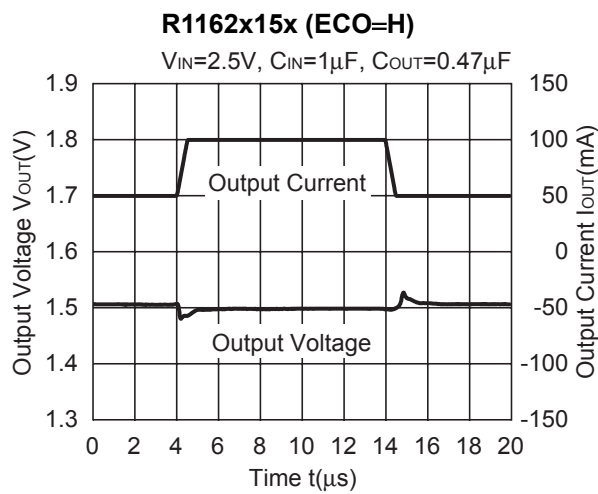
**R1162x15x (ECO=L)**

$C_{IN}$ =none,  $C_{OUT}$ =0.47 $\mu$ F,  $I_{OUT}$ =10mA

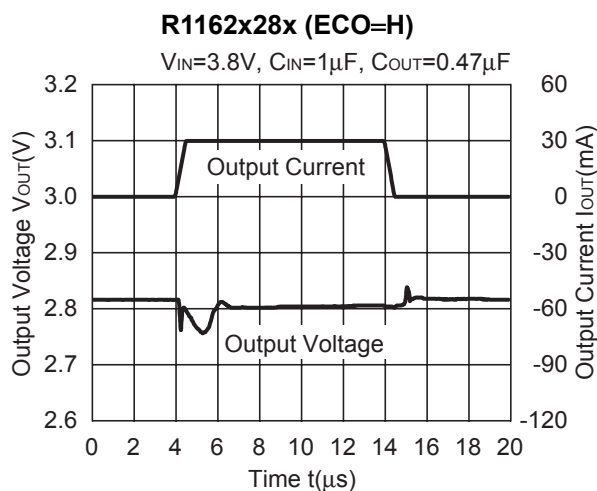
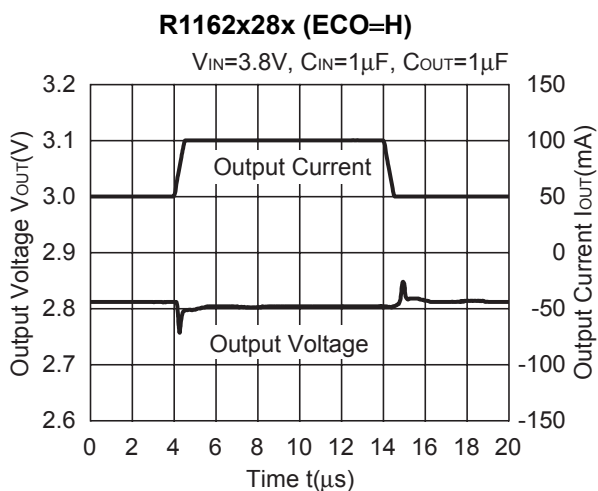
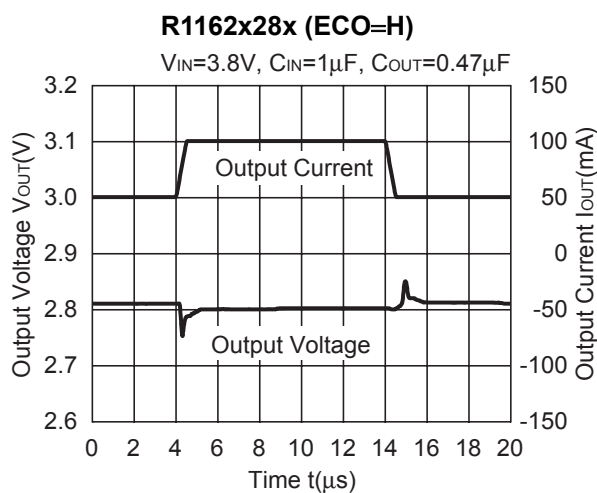
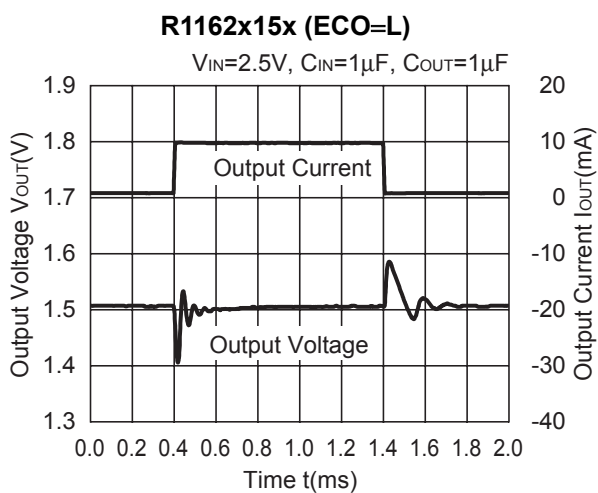
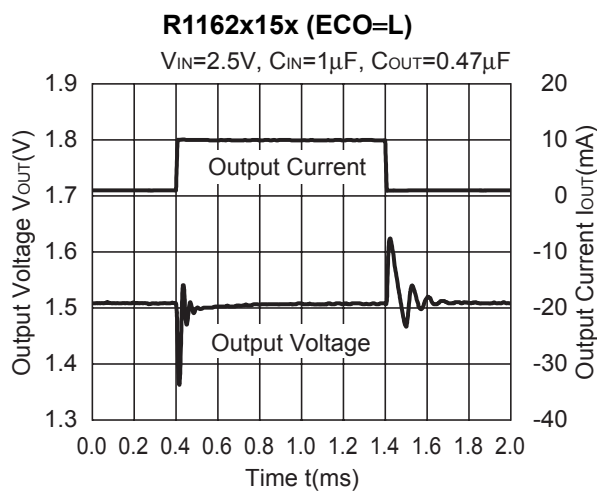
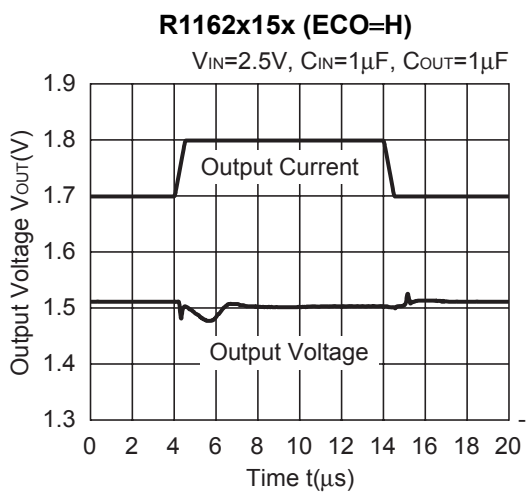


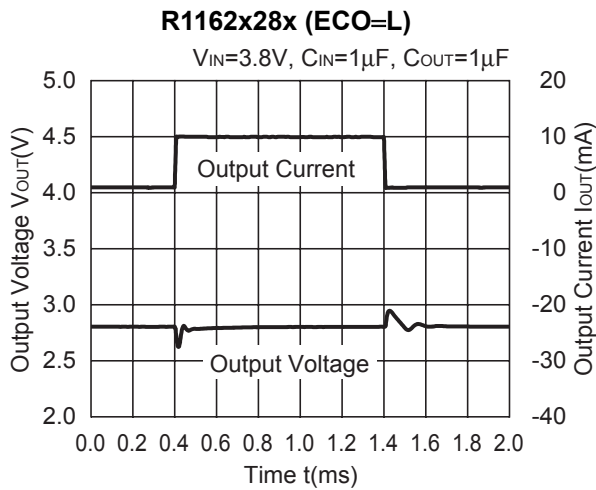
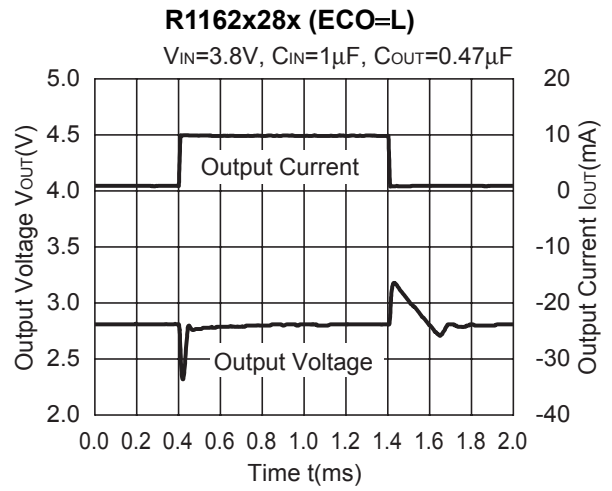
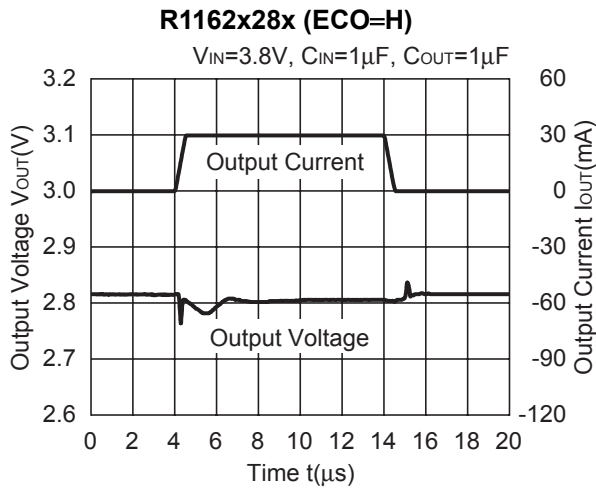


**11) Load Transient Response**

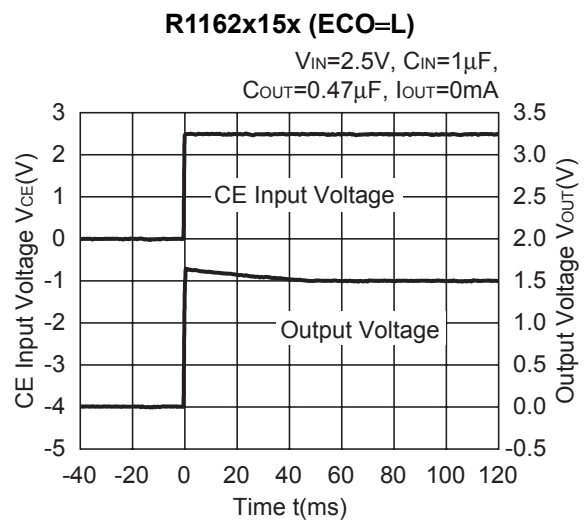
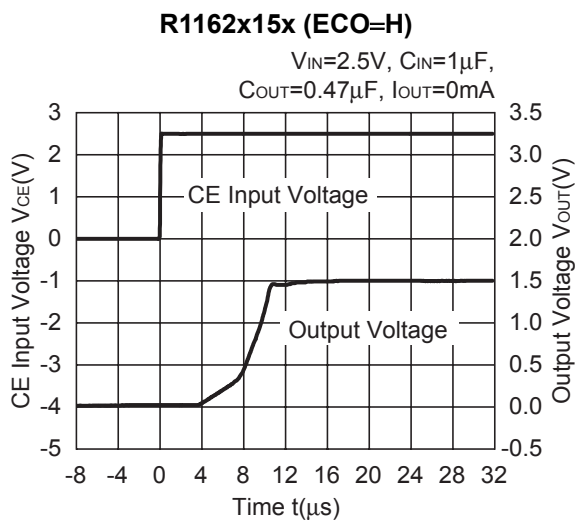






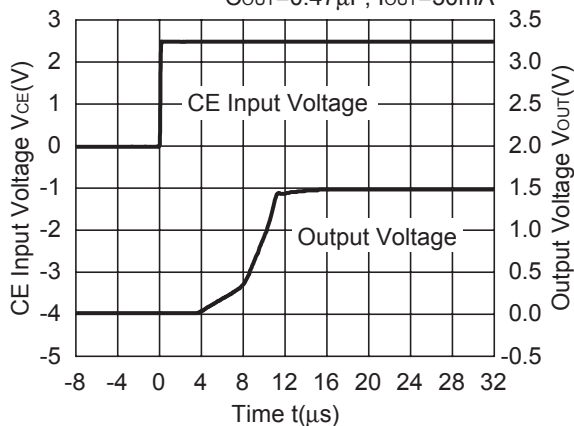


12) Turn on speed with CE pin



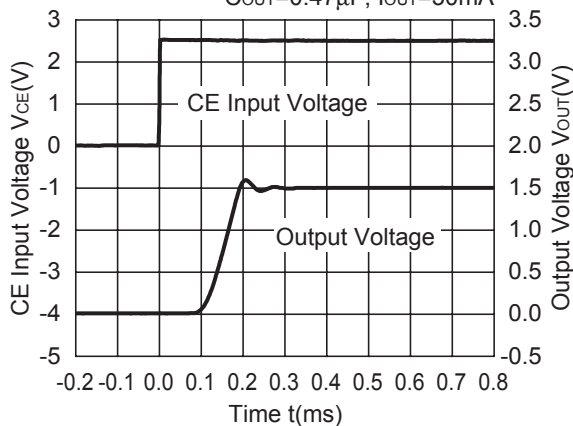
**R1162x15x (ECO=H)**

$V_{IN}=2.5V$ ,  $C_{IN}=1\mu F$ ,  
 $C_{OUT}=0.47\mu F$ ,  $I_{OUT}=30mA$



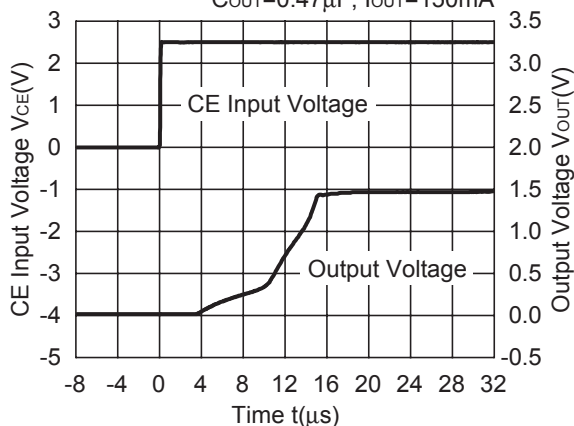
**R1162x15x (ECO=L)**

$V_{IN}=2.5V$ ,  $C_{IN}=1\mu F$ ,  
 $C_{OUT}=0.47\mu F$ ,  $I_{OUT}=30mA$



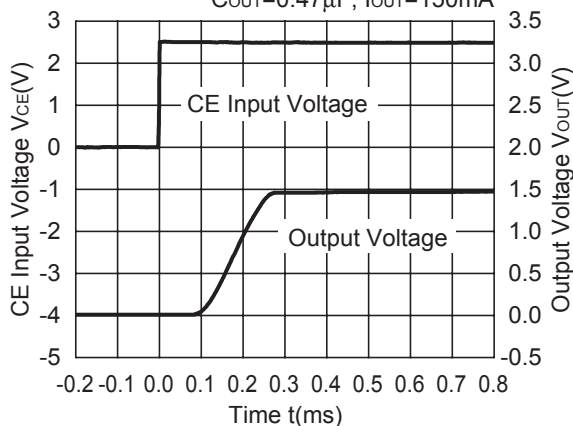
**R1162x15x (ECO=H)**

$V_{IN}=2.5V$ ,  $C_{IN}=1\mu F$ ,  
 $C_{OUT}=0.47\mu F$ ,  $I_{OUT}=150mA$



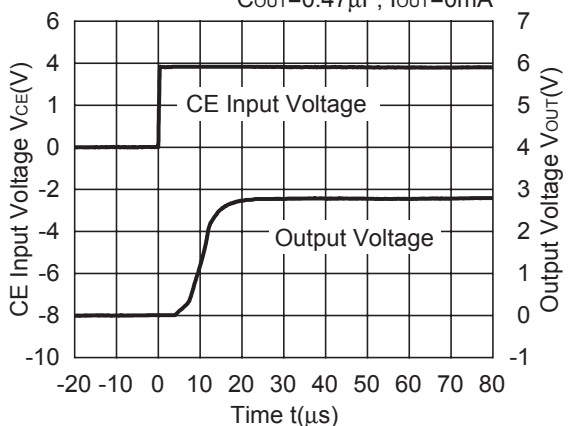
**R1162x15x (ECO=L)**

$V_{IN}=2.5V$ ,  $C_{IN}=1\mu F$ ,  
 $C_{OUT}=0.47\mu F$ ,  $I_{OUT}=150mA$



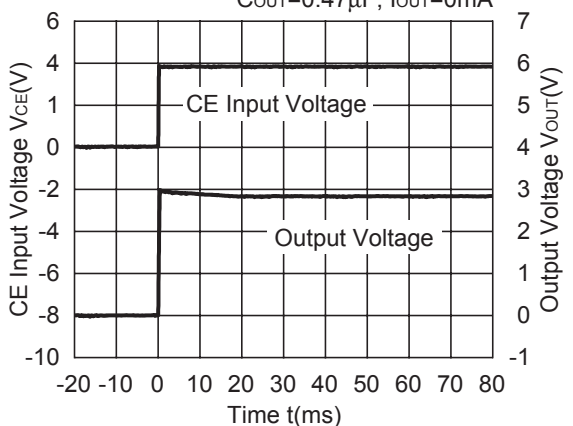
**R1162x28x (ECO=H)**

$V_{IN}=3.8V$ ,  $C_{IN}=1\mu F$ ,  
 $C_{OUT}=0.47\mu F$ ,  $I_{OUT}=0mA$



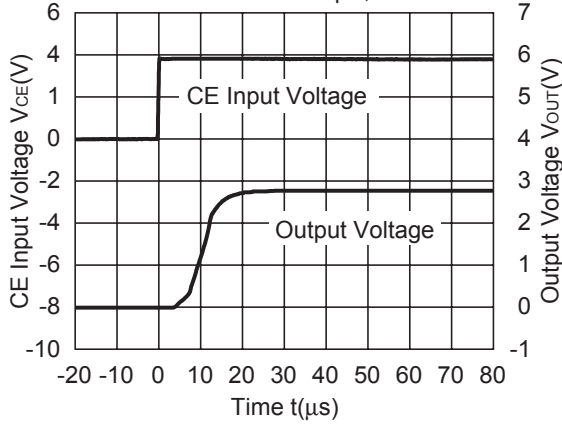
**R1162x28x (ECO=L)**

$V_{IN}=3.8V$ ,  $C_{IN}=1\mu F$ ,  
 $C_{OUT}=0.47\mu F$ ,  $I_{OUT}=0mA$



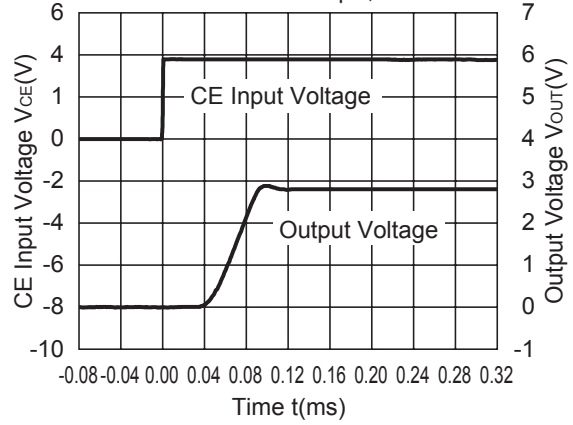
**R1162x28x (ECO=H)**

$V_{IN}=3.8V$ ,  $C_{IN}=1\mu F$ ,  
 $C_{OUT}=0.47\mu F$ ,  $I_{OUT}=30mA$



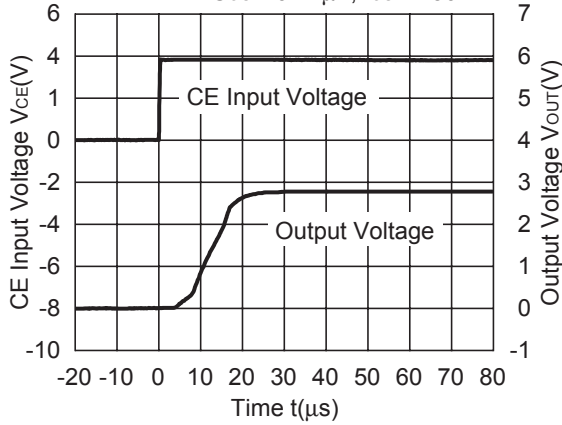
**R1162x28x (ECO=L)**

$V_{IN}=3.8V$ ,  $C_{IN}=1\mu F$ ,  
 $C_{OUT}=0.47\mu F$ ,  $I_{OUT}=30mA$



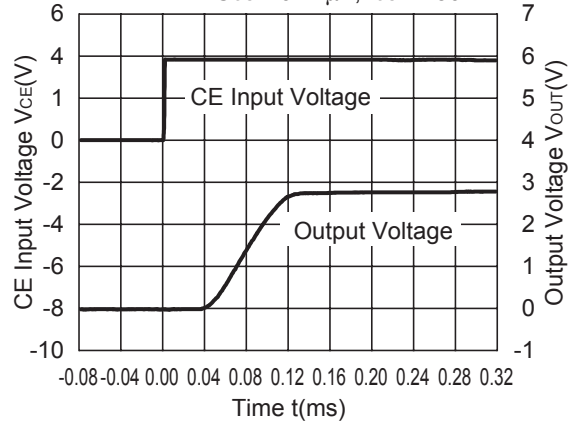
**R1162x28x (ECO=H)**

$V_{IN}=3.8V$ ,  $C_{IN}=1\mu F$ ,  
 $C_{OUT}=0.47\mu F$ ,  $I_{OUT}=150mA$



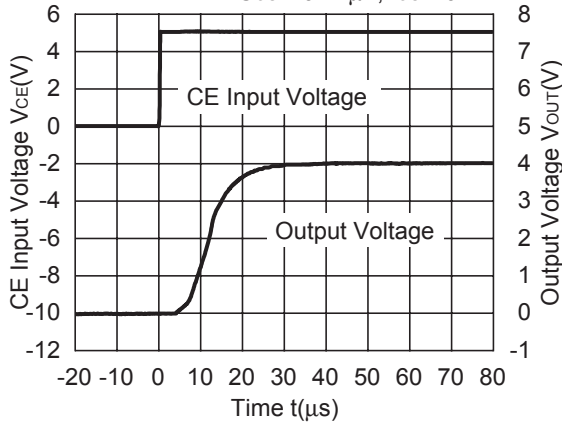
**R1162x28x (ECO=L)**

$V_{IN}=3.8V$ ,  $C_{IN}=1\mu F$ ,  
 $C_{OUT}=0.47\mu F$ ,  $I_{OUT}=150mA$



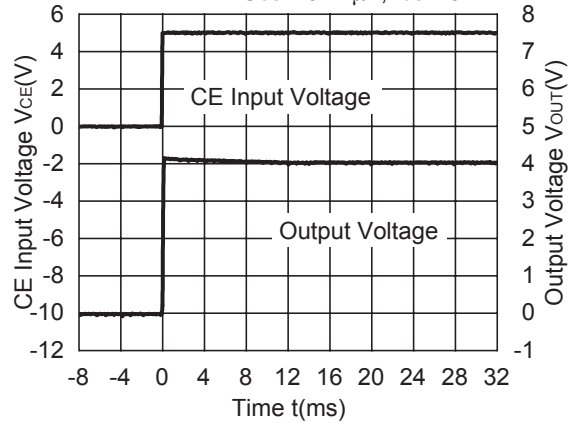
**R1162x40x (ECO=H)**

$V_{IN}=5.0V$ ,  $C_{IN}=1\mu F$ ,  
 $C_{OUT}=0.47\mu F$ ,  $I_{OUT}=0mA$



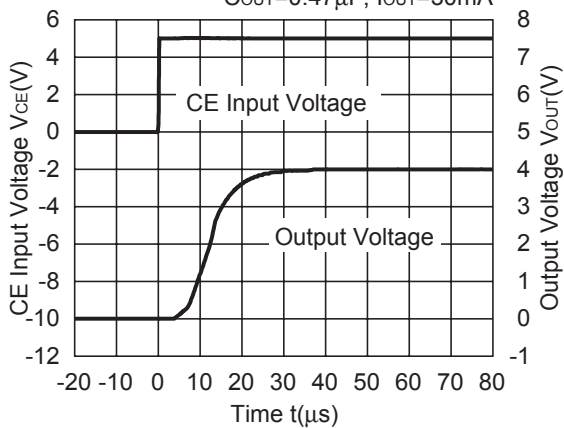
**R1162x40x (ECO=L)**

$V_{IN}=5.0V$ ,  $C_{IN}=1\mu F$ ,  
 $C_{OUT}=0.47\mu F$ ,  $I_{OUT}=0mA$



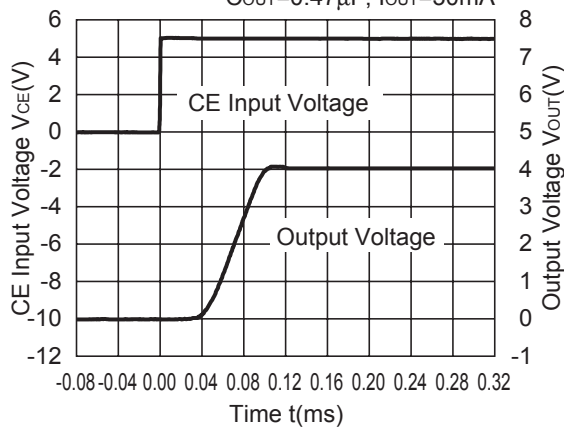
**R1162x40x (ECO=H)**

$V_{IN}=5.0V$ ,  $C_{IN}=1\mu F$ ,  
 $C_{OUT}=0.47\mu F$ ,  $I_{OUT}=30mA$



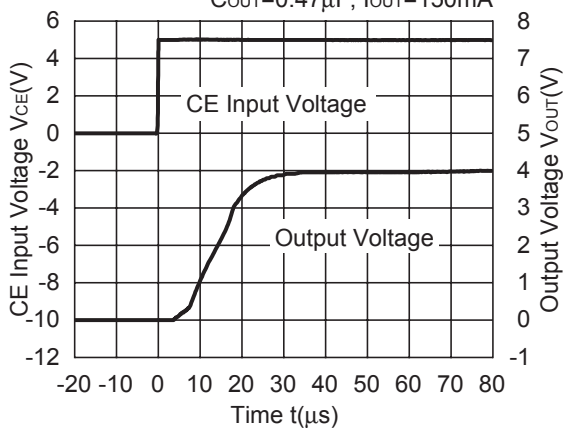
**R1162x40x (ECO=L)**

$V_{IN}=5.0V$ ,  $C_{IN}=1\mu F$ ,  
 $C_{OUT}=0.47\mu F$ ,  $I_{OUT}=30mA$



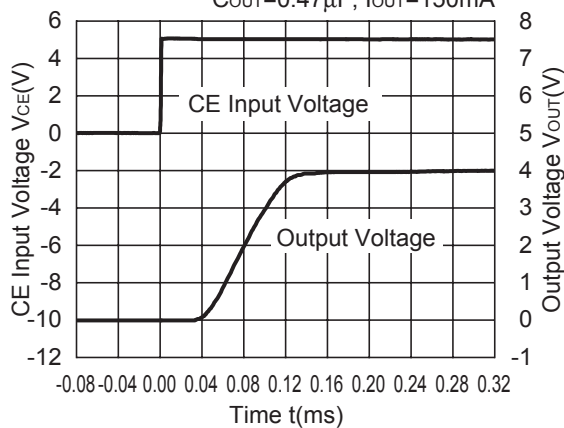
**R1162x40x (ECO=H)**

$V_{IN}=5.0V$ ,  $C_{IN}=1\mu F$ ,  
 $C_{OUT}=0.47\mu F$ ,  $I_{OUT}=150mA$



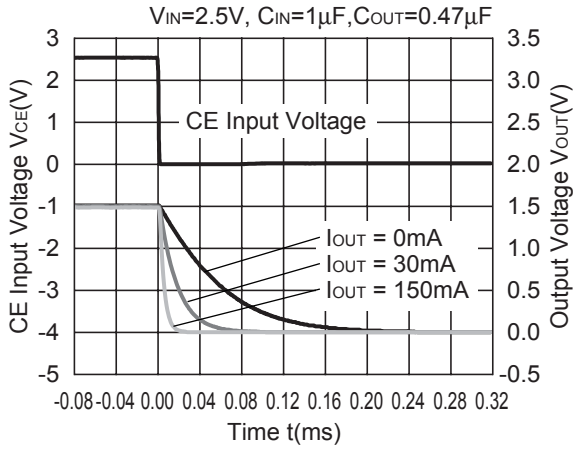
**R1162x40x (ECO=L)**

$V_{IN}=5.0V$ ,  $C_{IN}=1\mu F$ ,  
 $C_{OUT}=0.47\mu F$ ,  $I_{OUT}=150mA$

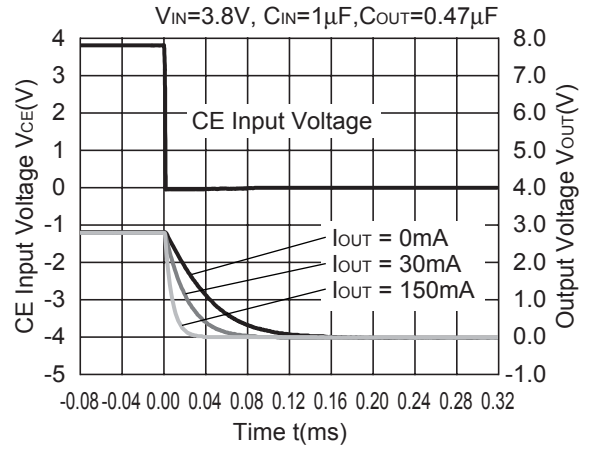


13) Turn off speed with CE pin

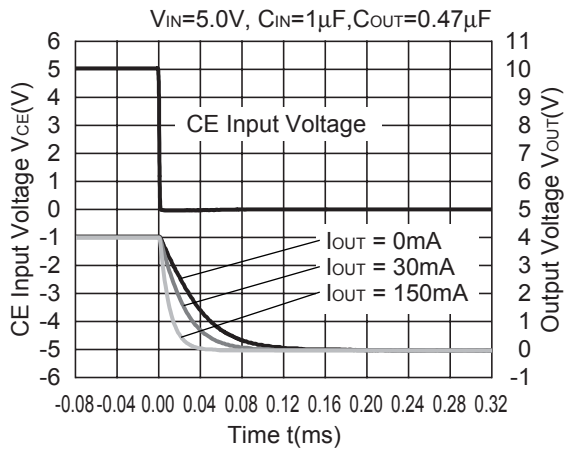
**R1162x15xD**



**R1162x28xD**



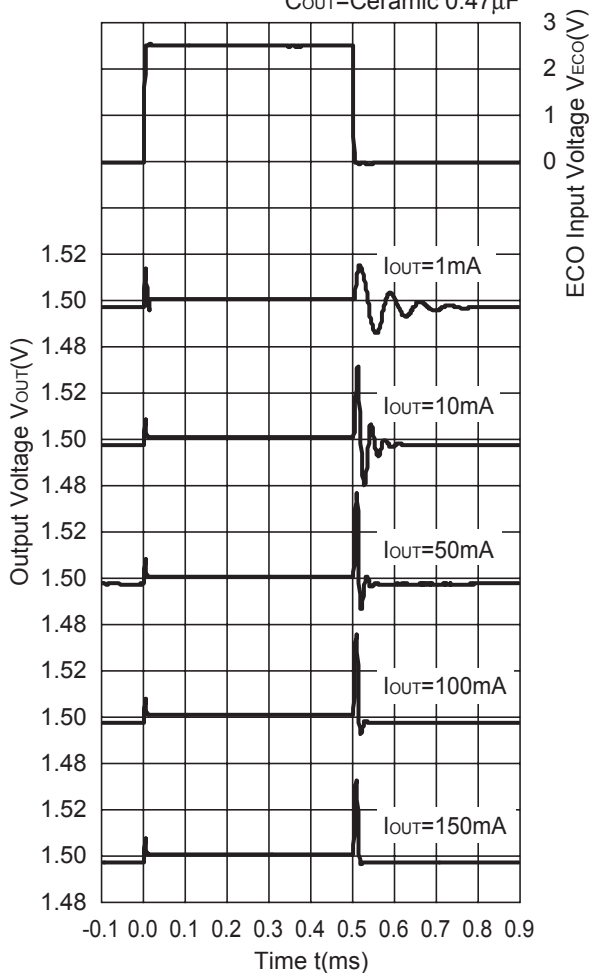
**R1162x40xD**



14) Output Voltage at Mode alternative point

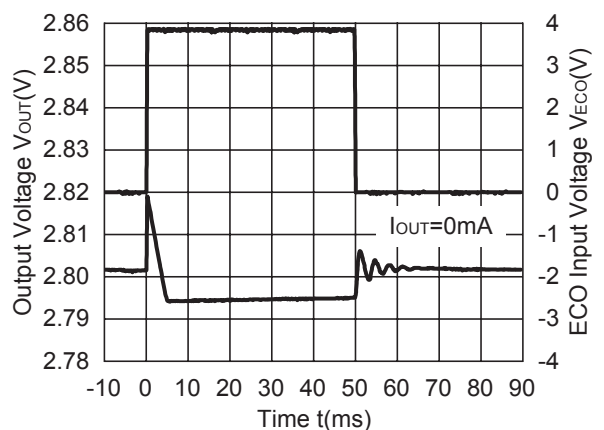
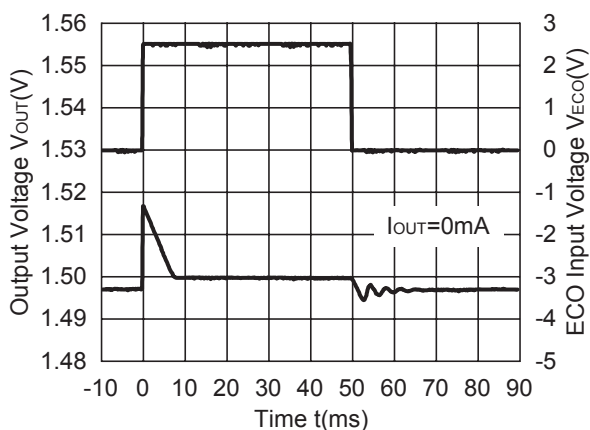
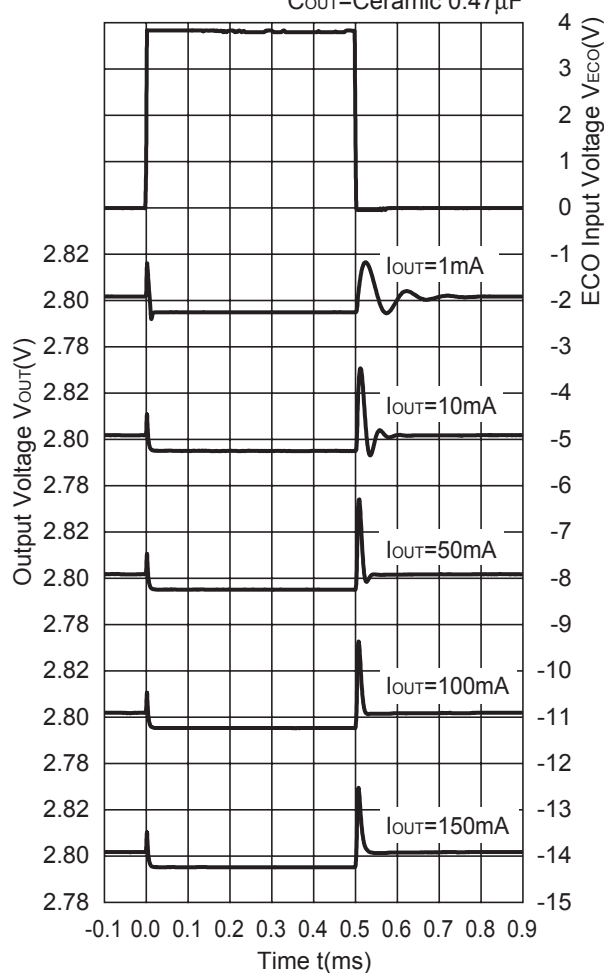
**R1162x15x**

$V_{IN}=2.5V$ ,  $C_{IN}$ =Ceramic  $1.0\mu F$ ,  
 $C_{OUT}$ =Ceramic  $0.47\mu F$

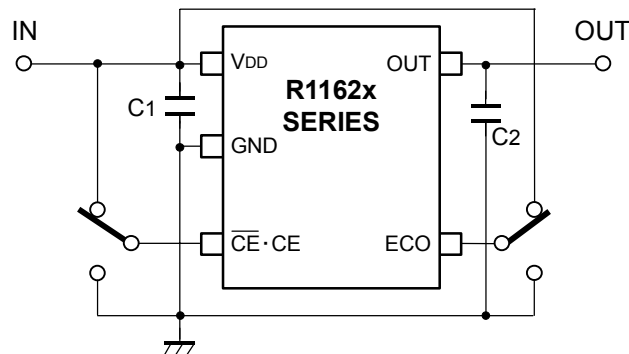


**R1162x28x**

$V_{IN}=3.8V$ ,  $C_{IN}$ =Ceramic  $1.0\mu F$ ,  
 $C_{OUT}$ =Ceramic  $0.47\mu F$



## TECHNICAL NOTES



(External Components)

C<sub>2</sub> Ceramic 0.47 $\mu$ F Ex. Murata GRM40B474K  
Kyocera CM105B474K

C<sub>1</sub> Ceramic 1.0 $\mu$ F

When using these ICs, consider the following points:

### 1. Mounting on PCB

Make V<sub>DD</sub> and GND lines sufficient. If their impedance is high, noise pickup or unstable operation may result. Connect a capacitor with as much as 1.0 $\mu$ F capacitor between V<sub>DD</sub> and GND pin 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.

### 2. 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 0.47 $\mu$ F or more capacitor C<sub>OUT</sub> with good frequency characteristics and ESR (Equivalent Series Resistance).

If you use a tantalum type capacitor and ESR value of the capacitor is large, output might be unstable. Evaluate your circuit with considering frequency characteristics.

Depending on the capacitor size, manufacturer, and part number, the bias characteristics and temperature characteristics are different. Evaluate the circuit with actual using capacitors.



## ESR vs. Output Current

When using these ICs, consider the following points:

In these ICs, phase compensation is made for securing stable operation even if the load current is varied.

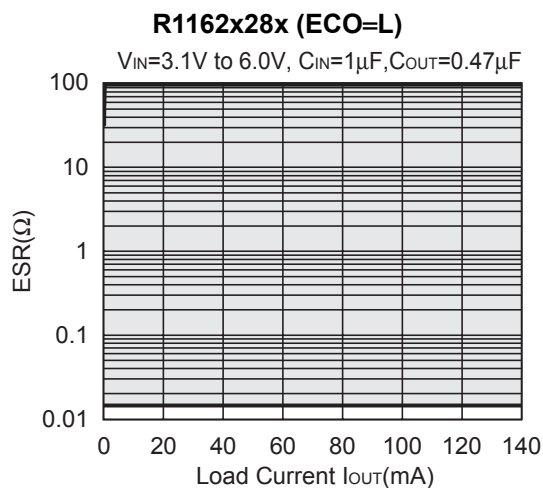
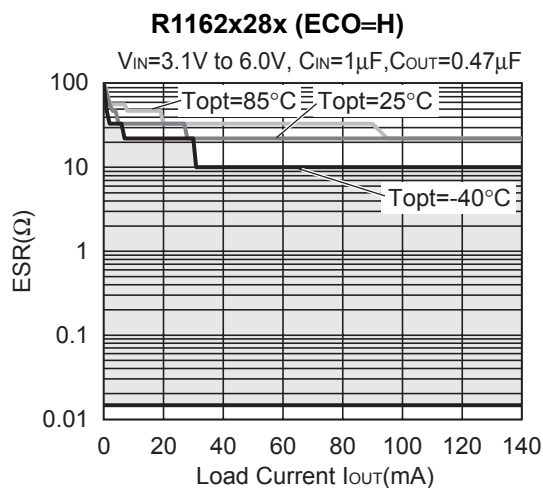
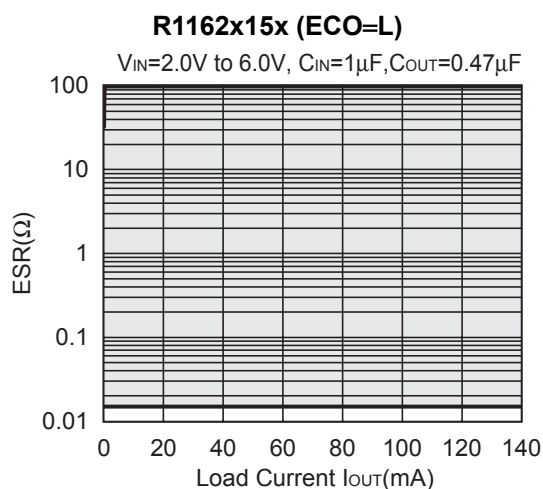
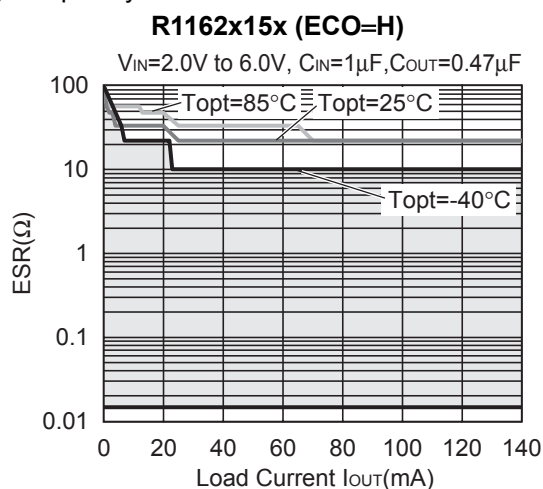
For this purpose, be sure to use a capacitor  $C_{OUT}$  with good frequency characteristics and ESR (Equivalent Series Resistance) in the range described as follows:

The relations between  $I_{OUT}$  (Output Current) and ESR of Output Capacitor are shown below.

The conditions when the white noise level is under  $40\mu V$  (Avg.) are marked as the hatched area in the graph.

<Test conditions>

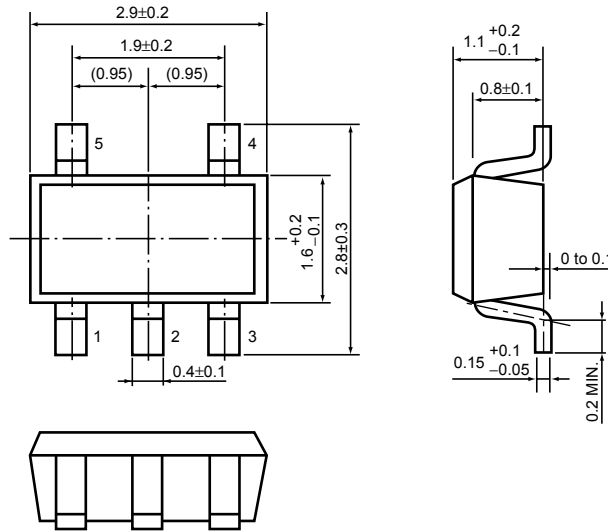
(1) Frequency band: 10Hz to 2MHz



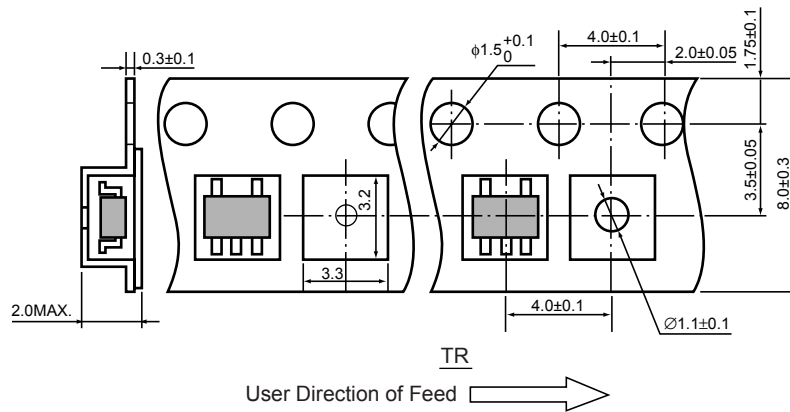
- SOT-23-5 (SC-74A)

Unit: mm

PACKAGE DIMENSIONS

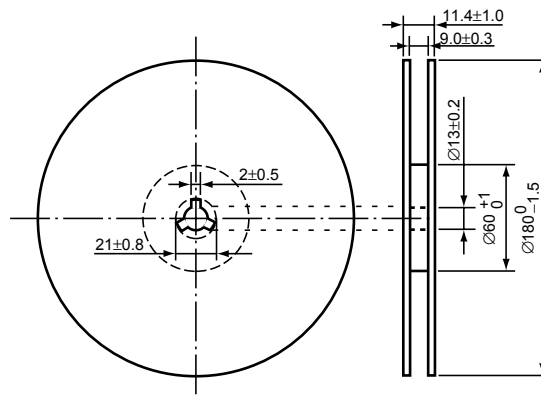


TAPING SPECIFICATION



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.)

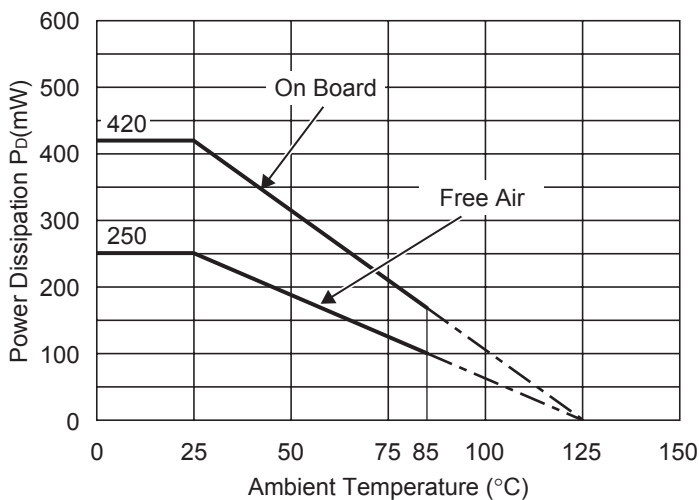
Measurement Conditions

	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

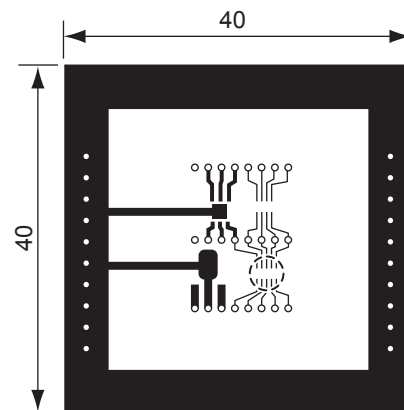
Measurement Result

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

	Standard Land Pattern	Free Air
Power Dissipation	420mW	250mW
Thermal Resistance	$\theta_{ja}=(125-25^{\circ}C)/0.42W=263^{\circ}C/W$	400 $^{\circ}C/W$



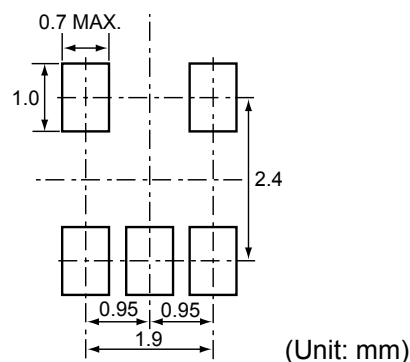
Power Dissipation



Measurement Board Pattern

○ IC Mount Area Unit : mm

### RECOMMENDED LAND PATTERN





### Power Dissipation (SON1612-6)

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:

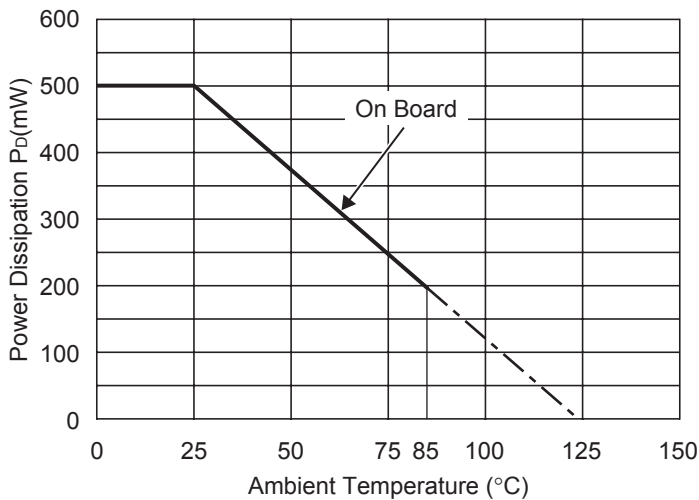
Measurement Conditions

	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 × 24pcs

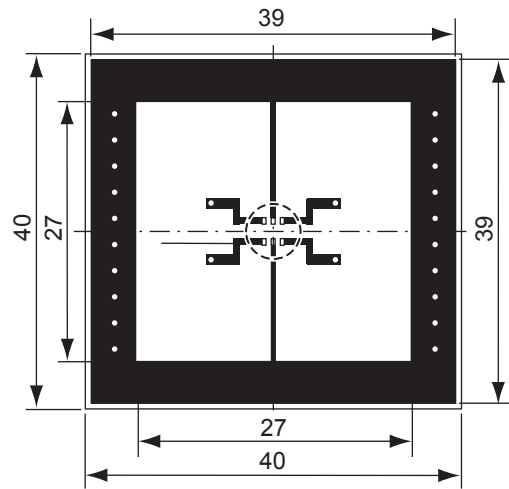
Measurement Result

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

	Standard Land Pattern
Power Dissipation	500mW
Thermal Resistance	$\theta_{ja}=(125-25^{\circ}C)/0.5W=200^{\circ}C/W$



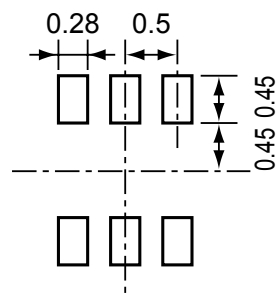
Power Dissipation



Measurement Board Pattern

○ IC Mount Area Unit : mm

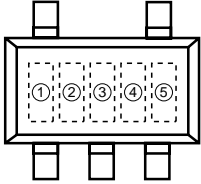
### RECOMMENDED LAND PATTERN



(Unit: mm)

## R1162N SERIES MARK SPECIFICATION

### • SOT-23-5 (SC-74A)



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

④, ⑤ : Lot Number

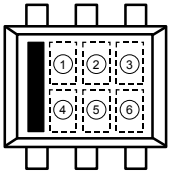
### • Part Number vs. Product Code

Part Number	Product Code		
	①	②	③
R1162N151B	S	1	5
R1162N161B	S	1	6
R1162N171B	S	1	7
R1162N181B	S	1	8
R1162N191B	S	1	9
R1162N201B	S	2	0
R1162N211B	S	2	1
R1162N221B	S	2	2
R1162N231B	S	2	3
R1162N241B	S	2	4
R1162N251B	S	2	5
R1162N261B	S	2	6
R1162N271B	S	2	7
R1162N281B	S	2	8
R1162N291B	S	2	9
R1162N301B	S	3	0
R1162N311B	S	3	1
R1162N321B	S	3	2
R1162N331B	S	3	3
R1162N341B	S	3	4
R1162N351B	S	3	5
R1162N361B	S	3	6
R1162N371B	S	3	7
R1162N381B	S	3	8
R1162N391B	S	3	9
R1162N401B	S	4	0
R1162N181D5	S	4	1
R1162N281D5	S	4	2

Part Number	Product Code		
	①	②	③
R1162N151D	T	1	5
R1162N161D	T	1	6
R1162N171D	T	1	7
R1162N181D	T	1	8
R1162N191D	T	1	9
R1162N201D	T	2	0
R1162N211D	T	2	1
R1162N221D	T	2	2
R1162N231D	T	2	3
R1162N241D	T	2	4
R1162N251D	T	2	5
R1162N261D	T	2	6
R1162N271D	T	2	7
R1162N281D	T	2	8
R1162N291D	T	2	9
R1162N301D	T	3	0
R1162N311D	T	3	1
R1162N321D	T	3	2
R1162N331D	T	3	3
R1162N341D	T	3	4
R1162N351D	T	3	5
R1162N361D	T	3	6
R1162N371D	T	3	7
R1162N381D	T	3	8
R1162N391D	T	3	9
R1162N401D	T	4	0
R1162N181D5	T	4	1
R1162N281D5	T	4	2

**R1162D SERIES MARK SPECIFICATION**

● SON1612-6



① to 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
R1162D151B	H	1	5	B
R1162D161B	H	1	6	B
R1162D171B	H	1	7	B
R1162D181B	H	1	8	B
R1162D191B	H	1	9	B
R1162D201B	H	2	0	B
R1162D211B	H	2	1	B
R1162D221B	H	2	2	B
R1162D231B	H	2	3	B
R1162D241B	H	2	4	B
R1162D251B	H	2	5	B
R1162D261B	H	2	6	B
R1162D271B	H	2	7	B
R1162D281B	H	2	8	B
R1162D291B	H	2	9	B
R1162D301B	H	3	0	B
R1162D311B	H	3	1	B
R1162D321B	H	3	2	B
R1162D331B	H	3	3	B
R1162D341B	H	3	4	B
R1162D351B	H	3	5	B
R1162D361B	H	3	6	B
R1162D371B	H	3	7	B
R1162D381B	H	3	8	B
R1162D391B	H	3	9	B
R1162D401B	H	4	0	B
R1162D181B5	H	4	1	B
R1162D281B5	H	4	2	B

Part Number	Product Code			
	①	②	③	④
R1162D151D	H	1	5	D
R1162D161D	H	1	6	D
R1162D171D	H	1	7	D
R1162D181D	H	1	8	D
R1162D191D	H	1	9	D
R1162D201D	H	2	0	D
R1162D211D	H	2	1	D
R1162D221D	H	2	2	D
R1162D231D	H	2	3	D
R1162D241D	H	2	4	D
R1162D251D	H	2	5	D
R1162D261D	H	2	6	D
R1162D271D	H	2	7	D
R1162D281D	H	2	8	D
R1162D291D	H	2	9	D
R1162D301D	H	3	0	D
R1162D311D	H	3	1	D
R1162D321D	H	3	2	D
R1162D331D	H	3	3	D
R1162D341D	H	3	4	D
R1162D351D	H	3	5	D
R1162D361D	H	3	6	D
R1162D371D	H	3	7	D
R1162D381D	H	3	8	D
R1162D391D	H	3	9	D
R1162D401D	H	4	0	D
R1162D181D5	H	4	1	D
R1162D281D5	H	4	2	D

Part Number	Product Code			
	①	②	③	④
R1162D281E5	H	4	1	E