



1. General Description

AP1158 is an active filter IC for noise in the low frequency band in the various audio systems, and the like. It's possible to use AP1158 than a noise filter of discrete composition (RC Filter, LC Filter) that the noise filter is composed of a saving mounting area and low drop-out voltage.

It is available to use as low I/O voltage/low noise regulator. (Need external reference voltage.)

The AP1158 has a built-in thermal shutdown protection circuit, and is possible to provide two types of package, the AP1158ADSXX is the SOT23-5 package and the AP1158AEUXX is the PLP1822-6 package with Exposed Pad.

2. Features

- Operating Temperature Range -40 to 85°C
- Operating Voltage Range 1.8 to 14V
- Output Current 150mA
- Ripple Rejection 66dB at 1kHz
- Available very low noise application
- Available to use a small ceramic capacitor
- f control (High active)
- Built-in Thermal Shutdown
- Package AP1158ADS : SOT23-5
AP1158AEU : PLP1822-6 (with Exposed Pad)

3. Applications

- RF Power Supplies PLL, VCO, Mixer, LNA
- Low Noise Image Sensor Unit Digital Still Camera
- High Speed/High Precision A-D, D-A, Amplifier Audio Equipment
Medical Equipment
Instrumentation

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5. Block Diagram

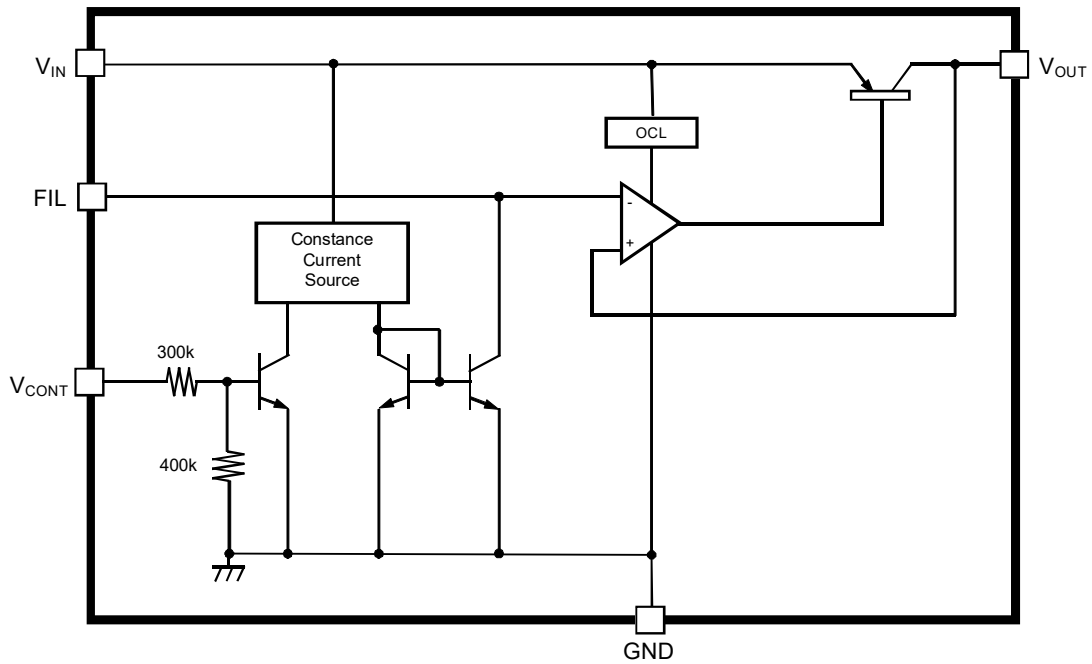


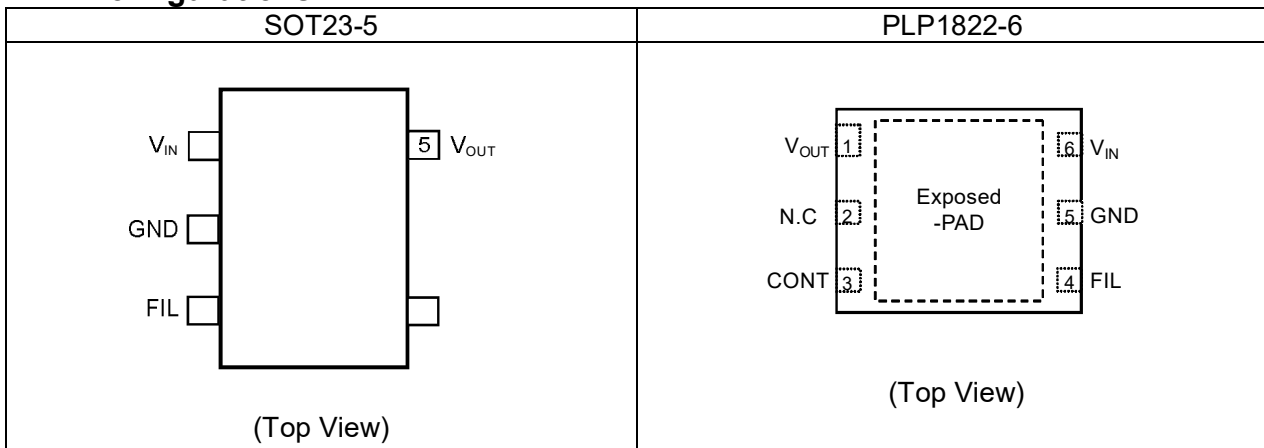
Figure 1. Block Diagram

6. Ordering Guide

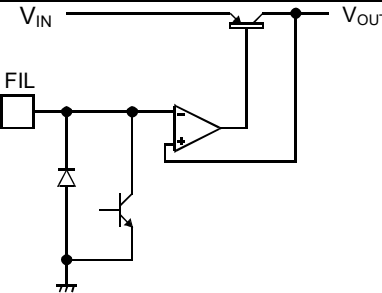
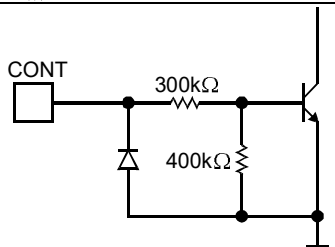
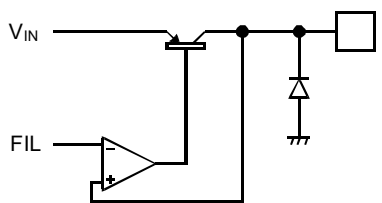
AP1158ADS	Ta = -40 to 85°C	SOT23-5
AP1158AEU	Ta = -40 to 85°C	PLP1822-6

7. Pin Configuration and Functions

■ Pin Configurations



■ Functions

Pin No.		Pin Description	Internal Equivalent Circuit	Description
SOT89-5	PLP1822-6			
1	6	V_{IN}		Input Terminal Connect a $1\mu F$ or more of the capacity between the GND terminal
2	5	GND		GND Terminal
3	4	FIL		Filter Terminal Output voltage setting resistance (R_{FIL}) is connected between V_{in} . Capacitor of the filter (C_{FIL}) is connected between GND.
4	3	CONT		On/Off Control Terminal $V_{CONT} > 1.8V$: ON $V_{CONT} < 0.4V$: OFF The pull-down resistor ($500k\Omega$) is built-in.
5	1	V_{OUT}		Output Terminal Connect a $1\mu F$ or more of the capacity between the GND terminal
-	2	N.C		No Connection Terminal
-	Exposed Pad	-		Ground Terminal Heat dissipation pad Exposed Pad must be connected to GND.

8. Absolute Maximum Ratings

Parameter	Symbol	min	max	Unit	Condition	
Supply Voltage	$V_{CC(MAX)}$	-0.4	16	V		
Reverse Bias Voltage	$V_{REV(MAX)}$	-0.4	8	V	$V_{OUT}-V_{IN}$	
FIL Terminal Voltage	$V_{FIL(MAX)}$	-0.4	16	V		
V_{CONT} Terminal Voltage	$V_{CONT(MAX)}$	-0.4	16	V		
Junction Temperature	T_j	-	150	°C		
Storage Temperature Range	T_{STG}	-55	150	°C		
Power Dissipation	SOT23-5	P_D	-	500	mW	(Note 1)
	PLP1822-6		-	1500	mW	(Note 1)

Note 1. Package thermal resistance(θ_{JA})
 If the temperature exceeds 25°C, be sure to derate at [Figure 2](#).
 SOT23-5 : $\theta_{JA} = 250^\circ\text{C/W}$
 PLP1822-6 : $\theta_{JA} = 83^\circ\text{C/W}$

WARNING: The maximum ratings are the absolute limitation values with the possibility of the IC breakage. When the operation exceeds this standard quality cannot be guaranteed.

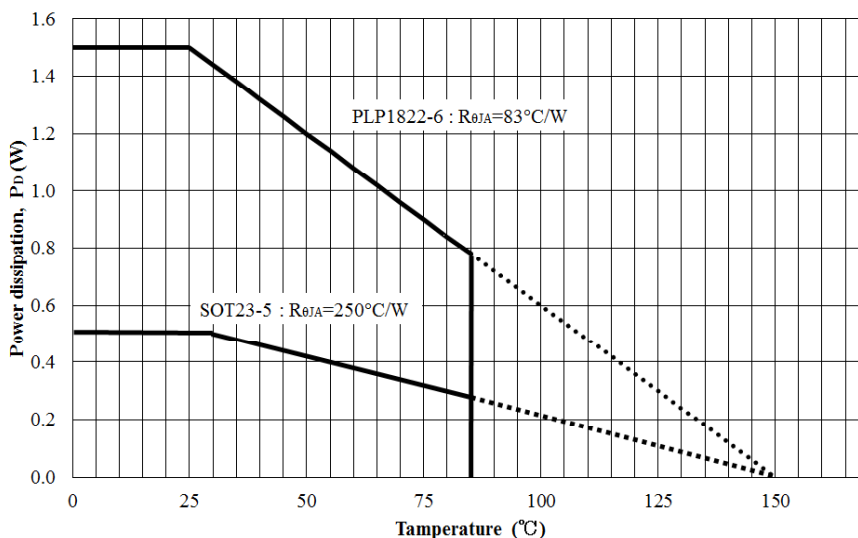


Figure 2. Maximum Power Dissipation

9. Recommended Operating Conditions

Parameter	Symbol	min	typ	max	Unit	Condition
Operating Temperature Range	T_a	-40	-	85	°C	
Operating Voltage Range	VOP	2.1	-	14	V	

10. Electrical Characteristic

■ Electrical Characteristics of Ta=Tj=25°C

The parameters with min or max values will be guaranteed at Ta=Tj=25°C.

($V_{IN}=2.5V$, $V_{CONT}=2V$, $R_{FIL}=390k\Omega$, $C_{IN}=1\mu F$, $C_{FIL}=4.7\mu F$, $C_L=1\mu F$, unless otherwise specified.)

Parameter	Symbol	Condition	min	typ	max	Unit
Quiescent Current	I_Q	$I_{OUT}=0mA$	-	65	100	μA
Standby Current	$I_{STANDBY}$	$V_{IN}=8V$, $V_{CONT}=0V$	-	0.1	100	nA
Output Current	I_{OUT}		-	-	150	mA
Maximum Output Current (Note 2) (Note 5)	$I_{OUT(MAX)}$	$V_{OUT}=V_{OUT(TYP)}\times 0.9$	-	360	-	mA
Load Regulation	LoaReg	$I_{OUT}=1mA$ to $100mA$	-	6	20	mV
Reverse Bias Current	I_{REV}	$V_{IN}=0V$, $V_{CONT}=0V$, $V_{OUT}=8V$	-	0.1	100	nA
Filter Terminal Sink Current	I_{SINK}	FIL terminal voltage = $V_{IN} - 0.3V$	0.5	0.6	0.72	μA
Error Amp. off-set Voltage	V_{ERROR}	$I_{OUT}=30mA$	20	40	60	mV
Control Terminal (CONT)						
Control Terminal Current	I_{CONT}	$V_{CONT}=2.0V$	-	4.5	8.0	μA
Control Terminal Voltage	V_{CONT}	V_{OUT} ON state	1.8	-	-	V
		V_{OUT} OFF state	-	-	0.4	V
Reference Value						
Ripple Rejection (Note 3)	R.R.	$I_{OUT}=30mA$ Ripple Noise = $200mV_{p-p}(@1kHz)$	-	66	-	dB
Output Noise (Note 4) (Note 5)	-	at 1kHz	-	60	-	nV/ \sqrt{Hz}

Note 2. The maximum current value is limited to the allowable power consumption.

Note 3. The ripple rejection depends on the value and the characteristic of I/O voltage difference (set by R_{FIL}) and capacitor (C_{FIL}). Please consider the tolerance of resistor and capacitor.

Note 4. At the condition of no ripple noise. The noise is generated from the IC due to semiconductor integrated circuit.

Note 5. Parameters with only typical values are for reference only.

■ Electrical Characteristics of Ta=-40°C to 85°C

The parameters with min or max values will be guaranteed at Ta=-40°C to 85°C.

($V_{IN}=2.5V$, $V_{CONT}=2V$, $R_{FIL}=390k\Omega$, $C_{IN}=1\mu F$, $C_{FIL}=4.7\mu F$, $C_L=1\mu F$ unless otherwise specified.)

Parameter	Symbol	Condition	min	typ	max	Unit
Quiescent Current	I_Q	$I_{OUT}=0mA$	-	65	120	μA
Standby Current	$I_{STANDBY}$	$V_{IN}=8V$, $V_{CONT}=0V$	-	0.1	500	nA
Output Current	I_{OUT}		-	-	150	mA
Maximum Output Current (Note 6) (Note 9)	$I_{OUT(MAX)}$	$V_{OUT}=V_{OUT(TYP)}\times 0.9$	-	360	-	mA
Load Regulation	LoaReg	$I_{OUT} = 1mA$ to 100mA	-	6	55	mV
Reverse Bias Current	I_{REV}	$V_{IN}=0V$, $V_{CONT}=0V$, $V_{OUT}=8V$	-	0.1	2000	nA
Filter Terminal Sink Current	I_{SINK}	FIL terminal voltage = $V_{IN} - 0.3V$	0.4	0.6	0.84	μA
Error Amp. off-set Voltage	V_{ERROR}	$I_{OUT}=30mA$	-30	40	110	mV
Control Terminal (CONT)						
Control Terminal Current	I_{CONT}	$V_{CONT}=2.0V$	-	4.5	10	μA
Control Terminal Voltage	V_{CONT}	V_{OUT} ON state	1.8	-	-	V
		V_{OUT} OFF state	-	-	0.4	V
Reference Value						
Ripple Rejection (Note 7)	R.R.	$I_{OUT}=30mA$ Ripple Noise =200mV _{p-p} (@1kHz)	40	66	-	dB
Output Noise (Note 8) (Note 9)	-	at 1kHz	-	60	-	nV/ \sqrt{Hz}

Note 6. The maximum current value is limited to the allowable power consumption.

Note 7. The ripple rejection depends on the value and the characteristic of I/O voltage difference (set by R_{FIL}) and capacitor (C_{FIL}). Please consider the tolerance of resistor and capacitor.

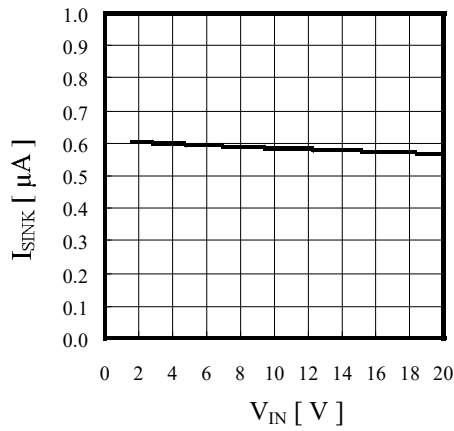
Note 8. At the condition of no ripple noise. The noise is generated from the IC due to semiconductor integrated circuit.

Note 9. Parameters with only typical values are for reference only.

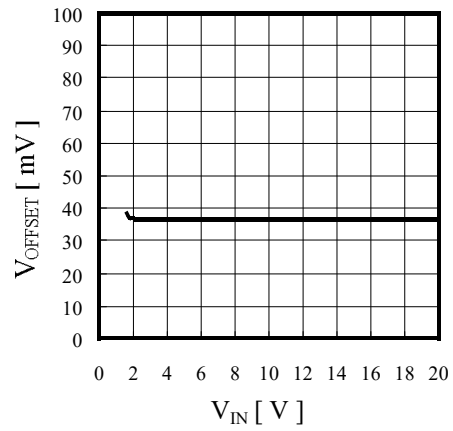
11. Description

11.1 DC Characteristics

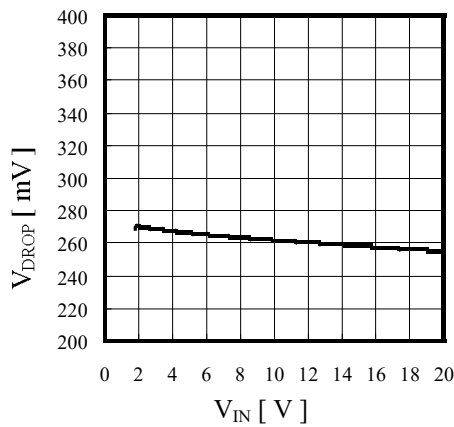
■ Filter Terminal Sink Current



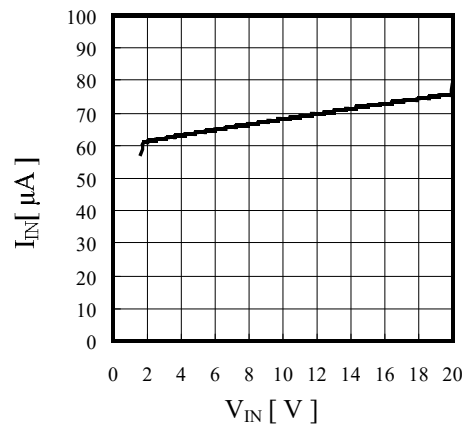
■ Error Amp. off-set Voltage



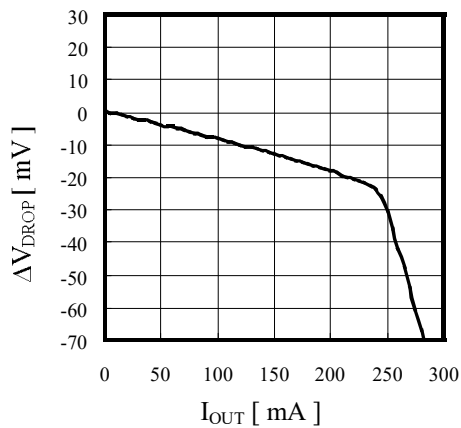
■ Dropout Voltage



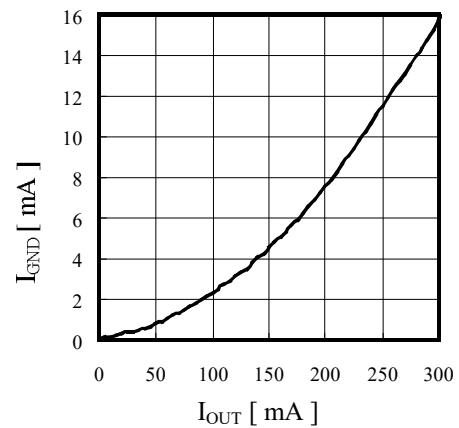
■ Quiescent Current ($I_{OUT}=0mA$)



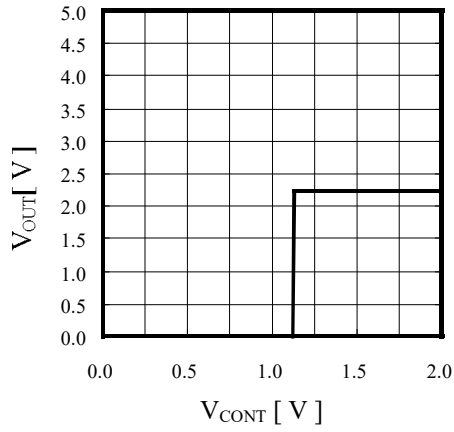
■ Load Regulation



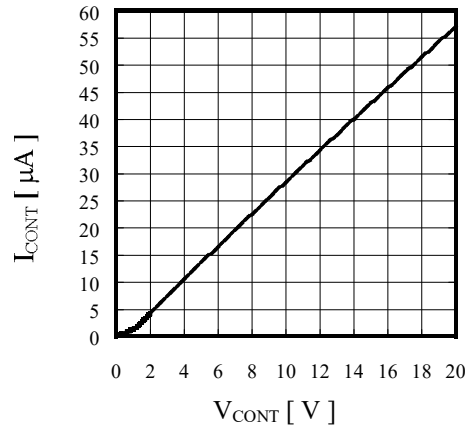
■ GND Pin Current



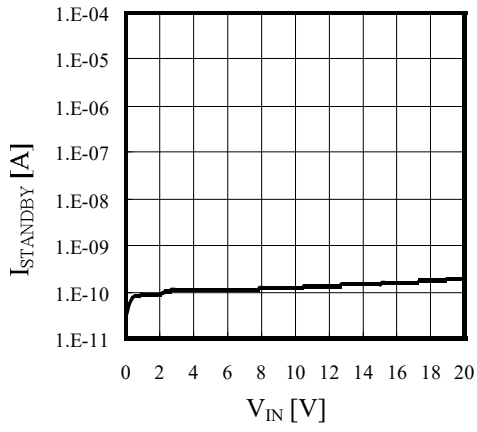
■ V_{OUT} ON-Point



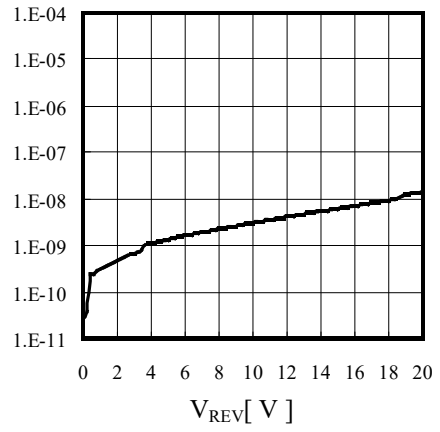
■ CONT Current vs CONT Voltage



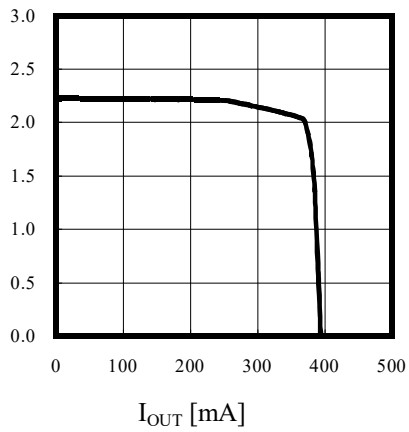
■ Standby Current



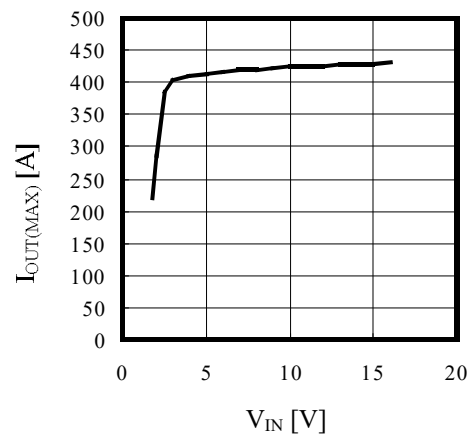
■ Reverse bias Current



■ Maximum Output Current

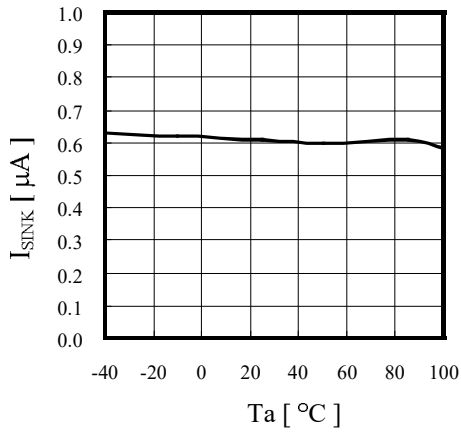


■ Maximum Output Current (V_{IN})

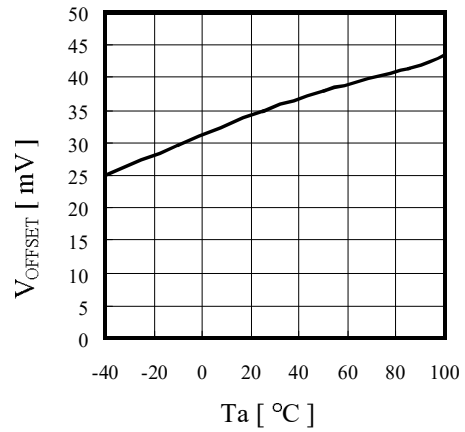


11.2 DC Temperature Characteristics

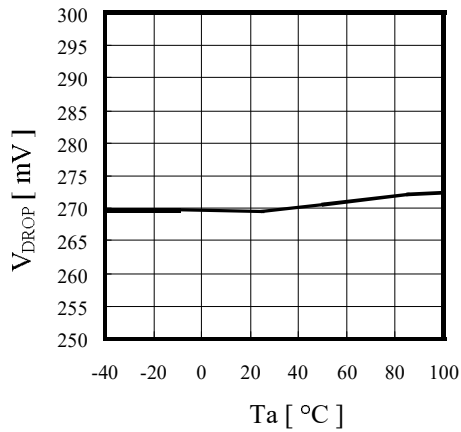
■ Filter Terminal Sink Current



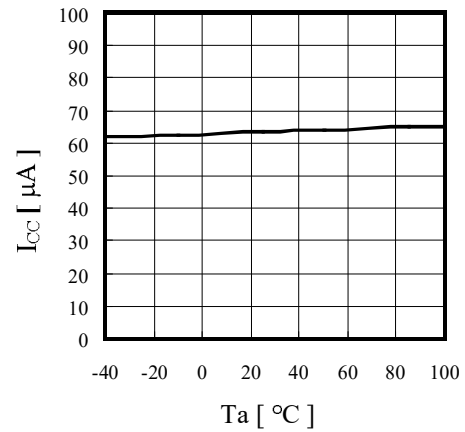
■ Error Amp. off-set Voltage



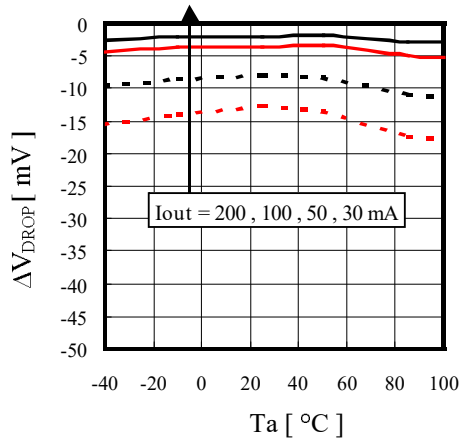
■ Dropout Voltage



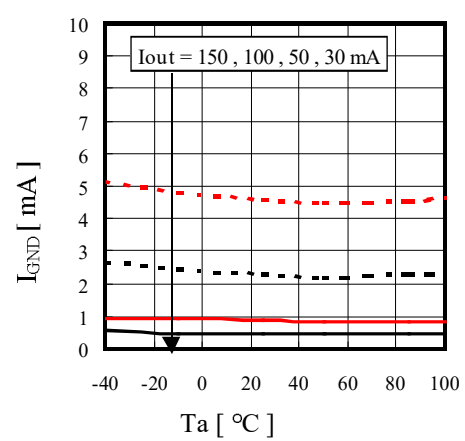
■ Quiescent Current ($I_{OUT}=0mA$)



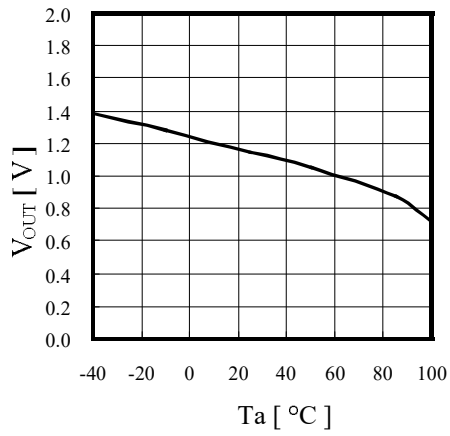
■ Load Regulation



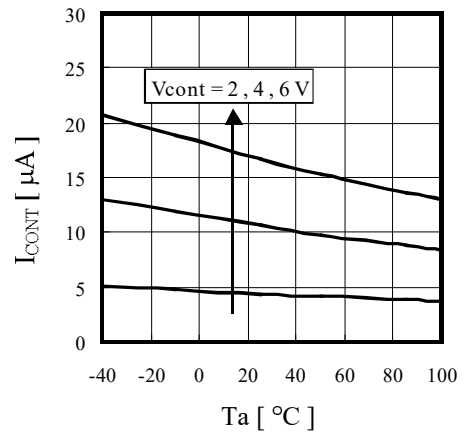
■ GND Pin Current



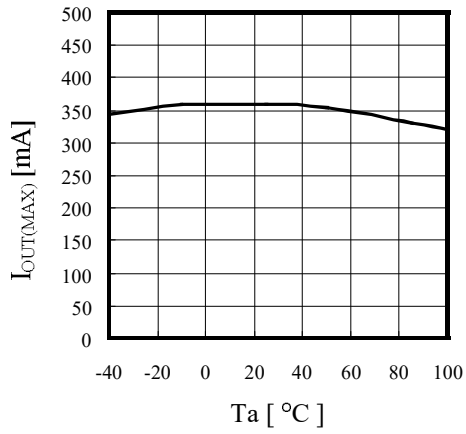
■ V_{OUT} ON-Point



■ CONT Current vs CONT Voltage



■ Maximum Output Current

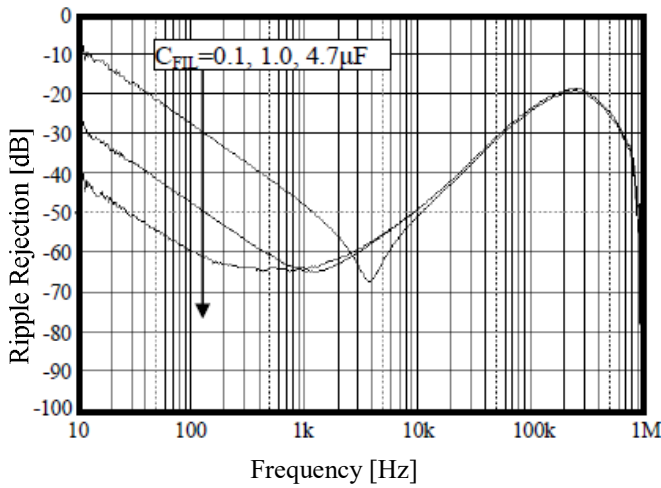


11.3 AC Characteristics

•Ripple Rejection

Ripple rejection characteristics are dependent on the characteristics of the capacitor which is connected to the FIL terminal, to the capacitance value. Since it varies greatly in the capacitor and the PCB of FIL terminal for the ripple rejection characteristics of more than 50kHz, please check in the operating state, if necessary.

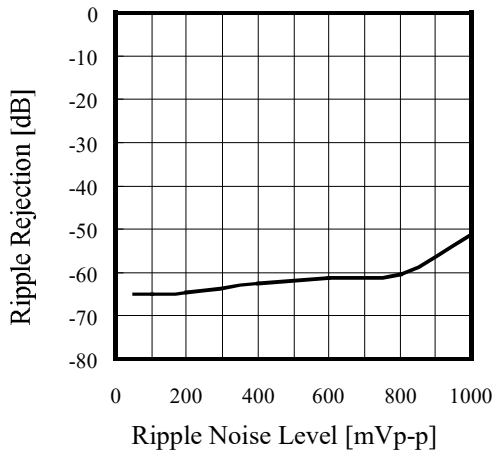
■ $C_{FIL}=0.1\mu F, 1.0\mu F, 4.7\mu F$



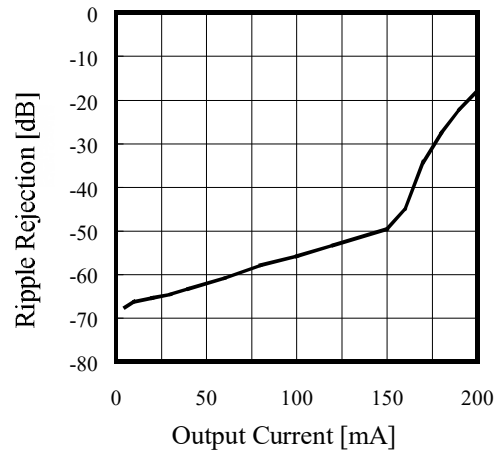
Common conditions are shown as follows:

$V_{IN}=2.5V$
 $V_{OUT}=3.0V$
 $I_{OUT}=10mA$
 Ripple Noise=200mV_{P-P}
 $f=100Hz$ to 1MHz
 $R_{FIL}=390k\Omega$,
 $C_{FIL}=4.7\mu F$

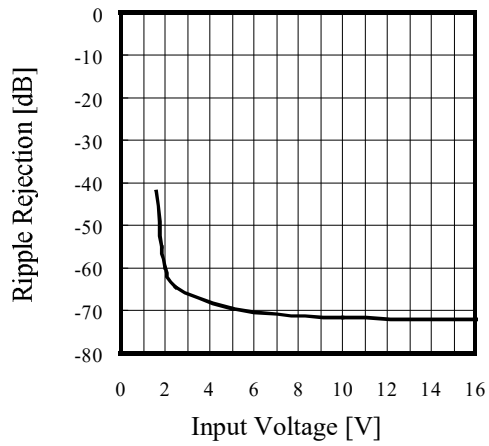
■ Ripple Rejection vs. Ripple Noise (Freq.=1kHz)



■ Ripple Rejection vs. Output Current (Freq.=1kHz)



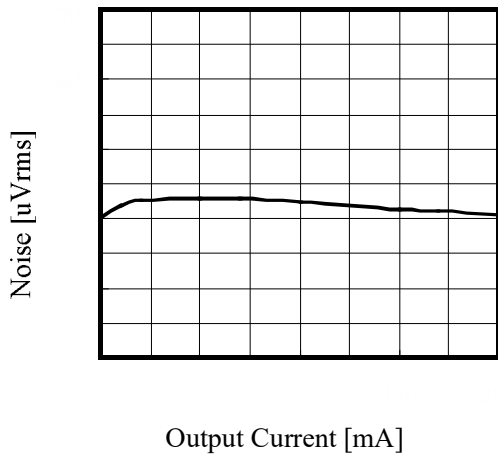
■ Ripple Rejection vs. Input Voltage (Freq.=1kHz)



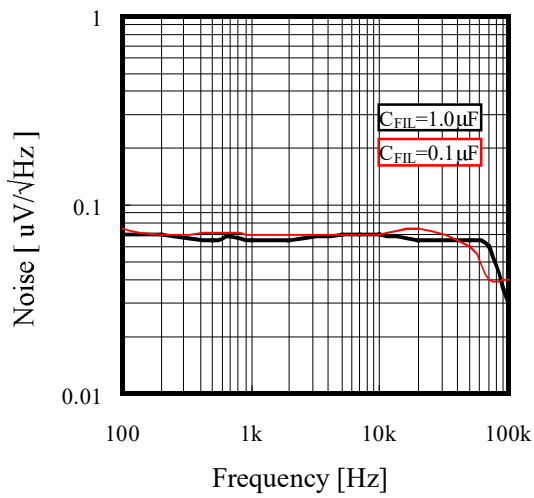
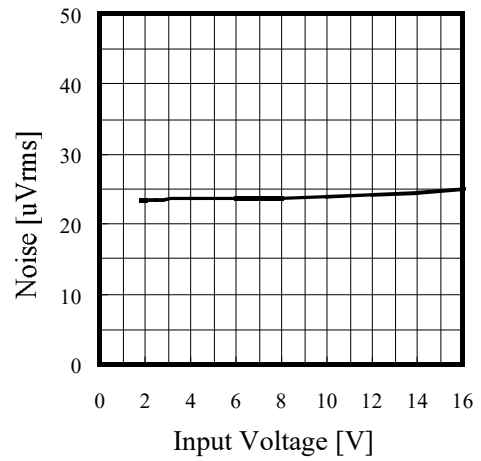
• Output Noise

It is more effective if it increases the C_{NP} than to increase the C_L is the case that require low noise. C_{NP} capacity is recommended 0.1 μ F to 1.0 μ F.

■ Output Noise vs. Output Current



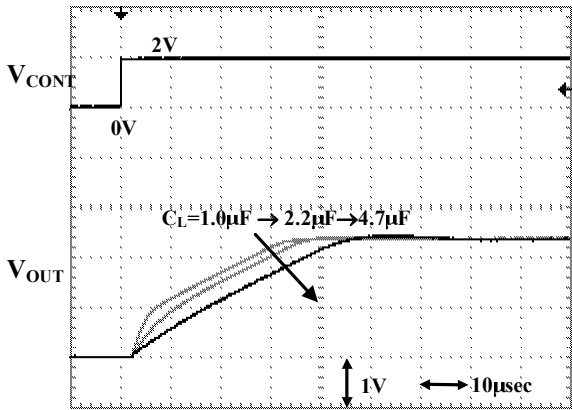
■ Output Noise vs. Input Current



• On/Off Transient

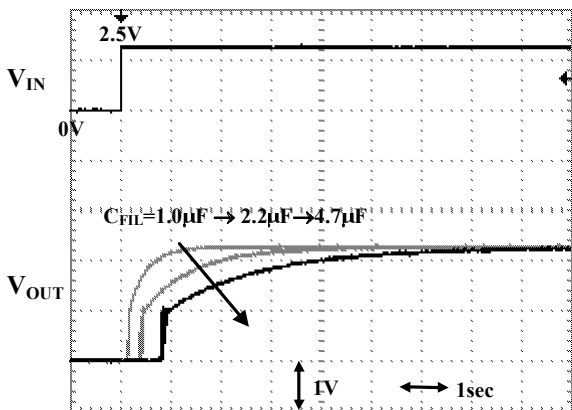
The rise time of the IC will be slow and C_L , C_{FIL} is large. Rise time is dependent C_L , on the C_{FIL} , fall time is dependent on the C_L .

■ On/Off control transient response



$C_{IN}=1\mu F$, $C_{FIL}=4.7\mu F$, $R_{FIL}=390k\Omega$, $V_{IN}=2.5V$,
 $I_{OUT}=10mA$
 C_L variable

■ Input transient response



$C_{IN}=1\mu F$, $C_L=1.0\mu F$, $R_{FIL}=390k\Omega$, $V_{IN}=2.5V$,
 $I_{OUT}=10mA$
 C_{FIL} variable

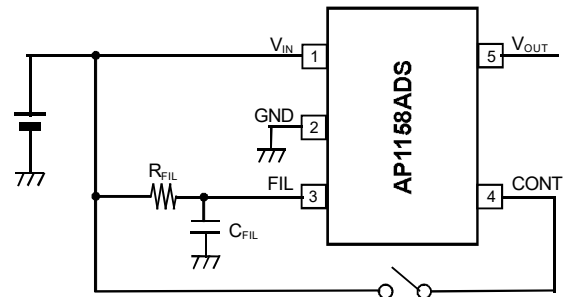


Figure 3. On/Off control by CONT terminal

V_{OUT} operates at high-speed when CONT pin is controlled with the input voltage added to V_{IN} pin. In this case, the on/off time of the V_{OUT} does not depend on the time constant of the filter.

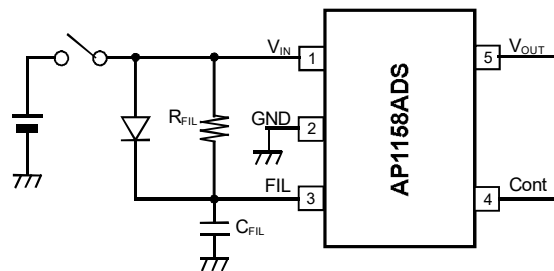


Figure 4. On/Off control by V_{IN} terminal

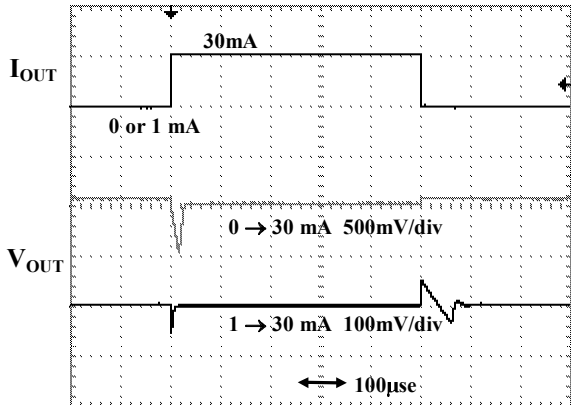
It takes long time to charge C_{FIL} when V_{in} is controlled directly. Please reduce the time constant of the filter to make the rise time early. Therefore, it is necessary to reduce the C_{FIL} . Moreover, the rise time becomes early by connecting diode parallel with R_{FIL} . Voltage drop is $V_F \times 1/2$ of the diode. Charge time of C_{FIL} is given by the following formula.

$$t = 5 \times C_{FIL} \times R_{FIL} [\text{sec}]$$

•Load Transient

IC can improve the load change to keep some flow of load current. When there is a fast large current change, please increase the load side capacitor. It can reduce the voltage fluctuation.

■ $I_{OUT}=0\text{mA} \leftrightarrow 30\text{mA}$, $1\text{mA} \leftrightarrow 30\text{mA}$



11.4 About stable operation

AP1158 is required for input and output capacitors in order to maintain the loop stability.

•Input Capacitor (C_{IN})

The input capacitor is necessary when the battery is discharged, the power supply impedance increases, or the line distance to the power supply is long. This capacitor might be necessary on each individual IC even if two or more regulator ICs are used. It is not possible to determine this indiscriminately. Please confirm the stability while mounted.

The recommended value is $C_{IN} = 1.0\mu\text{F}$.

•Output Capacitor (C_L)

Please select the output capacitor that equivalent series resistance (ESR) in the stable operation area. Please refer to [Figure 5](#) mentioned below and select the capacitor of the best characteristic.

Either ceramic or tantalum capacitor can be used for output terminal. Please choose the capacitor with $0.22\mu\text{F}$ or more and the equivalent series resistance 6Ω or less. The capacitance and the equivalent series resistance have tolerance that depends on the product and the maker.

Generally, a ceramic capacitor has both temperature characteristic and voltage characteristic. Please consider both characteristics when selecting the part. Please select a capacitance value that stable operation in the working voltage range. Capacitors, all temperatures are expected within the system, in the full voltage range, IC does not must be a minimum value or more of the rating to stable operation.

The recommended value is $C_L = 1.0\mu\text{F}$.

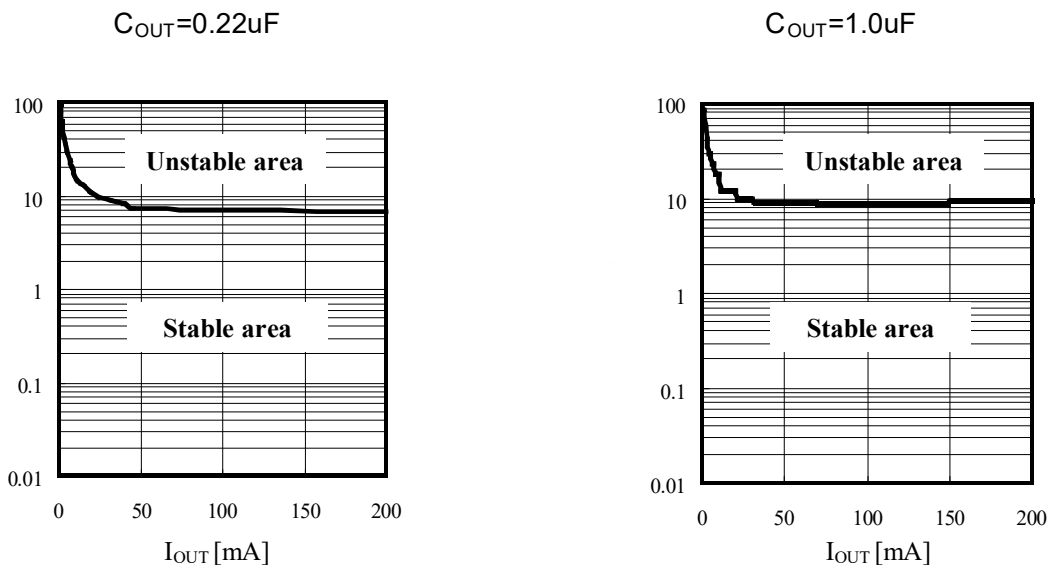


Figure 5. Stable operation area vs. voltage, current, and ESR

11.5 On/Off Control

Control terminal is active High. Control terminal is based on GND. When connected to GND, Input current is zero. (Operation stops)

If the load current is 0 (the load impedance very high), the C_{OUT} electric charge remains. Therefore, if you on/off the ripple filter IC at the same time with the load, the electric charge of the C_{OUT} remains, and quick response application will be available. In case not using on/off control, please connect this terminal to V_{in}.

The control current decreases when resistance is connected in series. Series resistance around 300kΩ and pull-down resistor are built in this terminal. Therefore, when series resistance is connected, the control current will decrease though the control voltage may swerves to high side. There is no hysteresis in this terminal. Please apply High or Low level surely otherwise noise level will increase.

Table 1. Control terminal voltage and operating state

Control terminal voltage (V _{CONT})	Status
V _{CONT} > 1.8V	ON
V _{CONT} < 0.4V	OFF

11.6 Filter Terminal

Noise and ripple rejection characteristics will vary by FIL terminal capacity. Ripple rejection characteristics of the higher capacity of C_{FIL} large low frequency region improves. Standard value is C_{NP} = 4.7μF. Please increase the C_{FIL} in the output noise and ripple rejection is important design. IC does not break even by increasing the capacitor. Switching speed of the On / Off will change by the FIL terminal capacity. Switching speed will be slow and a large capacity.

11.7 Notes on output terminal (V_{OUT}) to GND short-circuit evaluation

The resonance phenomenon due to stick to the output terminal C_L (C component) and the short-circuit line (L component), the output terminal will become a negative potential. Output terminal parasitic transistor operates in the IC enters the minus side, leads to the worst case burning for packages that latch-up phenomenon occurs in the IC (white smoke) or damage.

The resonance phenomenon appears remarkably In the ESR value is small ceramic capacitors and the like of the capacitor. As a measure of this phenomenon, we can to reduce the resonance phenomenon to be short-circuited by connecting the short-circuit line and the series in more than 2Ω resistance. This allows you to prevent latch-up phenomenon in the IC.

In large tantalum and electrolytic capacitor of ESR, it generally influence of there resonance

phenomenon ESR value is greater than or equal to 2Ω is reduced. Also, if a constraint or the like on your set can not be performed the measures as described above, please insert a schottky diode between GND terminal and the output terminal. This parasitic transistor in the internal IC will not work. A result, you can avoid the latch-up because the parasitic transistor does not work.

11.8 Thermal Resistance and Power Dissipation

• How to determine the thermal resistance when mounted on PCB

The thermal resistance when mounted is expressed as follows:

$$T_j = \theta_{JA} \times P_D + 25$$

T_j of AP1158 is set around 150°C . P_D is the value when the thermal sensor is activated. If the ambient temperature is 25°C , then:

$$150 = \theta_{JA} \times P_D + 25$$

$$\theta_{JA} \times P_D + 25 = 150$$

$$\theta_{JA} \times P_D = 125$$

$$\theta_{JA} = \frac{125}{P_D} (^\circ\text{C}/\text{W})$$

• Simple method to calculate Power Dissipation(P_D)

Mount the IC on the print circuit board. P_D will be $V_{IN} \times I_{IN}$ when the short circuit on the output side of the IC. The output terminal short-circuited with GND to measure gradually the input current gradually increase the input voltage. Increase gradually to 10V position the input voltage. Initial input current value is the maximum instantaneous output current value, but gradually decreased due to the temperature rise of the chip, it will eventually become a thermal equilibrium state (natural air cooling). This is calculated by using the input current value and the input voltage value when became constant.

$$P_D (\text{mW}) \cong V_{in}(\text{V}) \times I_{in}(\text{mA})$$

• Maximum available current at the maximum temperature

Available at the time the highest operating temperature current, you can ask in the graph of Figure 8.

Than DP_D value obtained from the graph of Figure 6, the maximum available current at the time of the maximum temperature can be calculated by the following equation.

$$I_{out} \cong \left\{ DP_D \div (V_{in,MAX} - V_{out}) \right\}$$

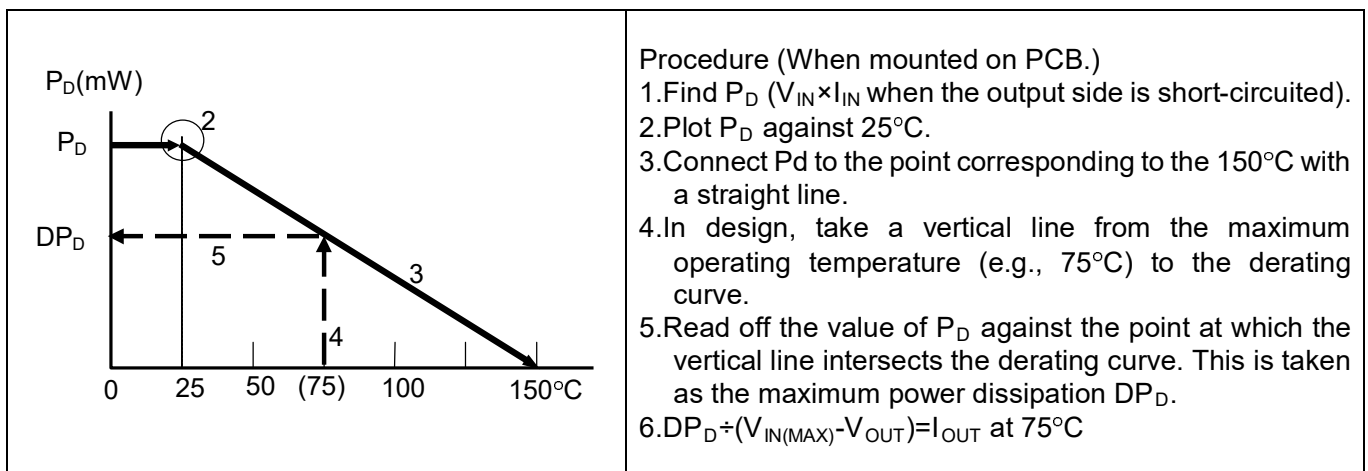


Figure 6. The simple method to calculate P_D

11.9 The ability of a built-in power transistor and setting of VDROD

Figure 7 shows the ability of a built-in power transistor. When input-output voltage drop of AP1158 is set to 300mV, it can supply an output current of 250mA at the maximum.

But this is a current value when the input voltage does not have the ripple noise. When the input voltage has the ripple noise, it cannot supply the output current value more. When the input voltage has the ripple noise to show it in Figure 8, it can supply an output current only to 150mA at the maximum.

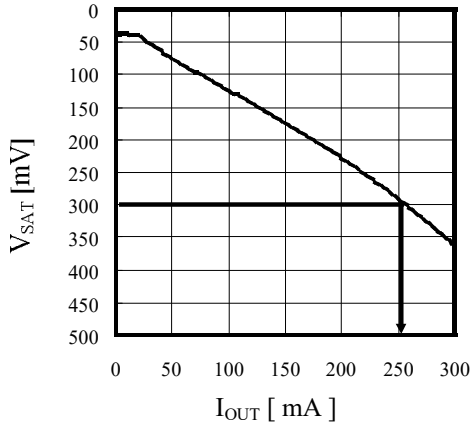


Figure 7. The ability of a built-in power transistor

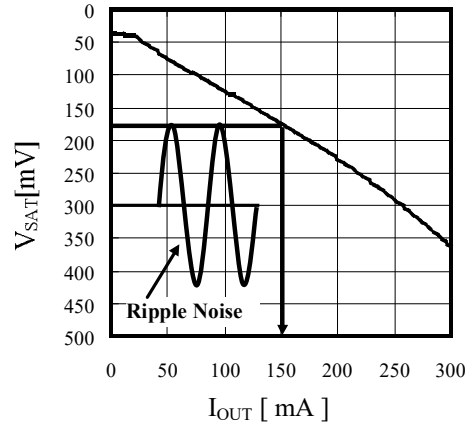


Figure 8. When the input voltage has the ripple noise

If there is little output current to use, it lowers a value of R_{FIL} and can reduce input-output voltage drop. Figure 9 shows relations of R_{FIL} and V_{DROD} . When it reduces input-output voltage drop, Load Regulation deteriorates to show it in Figure 10.

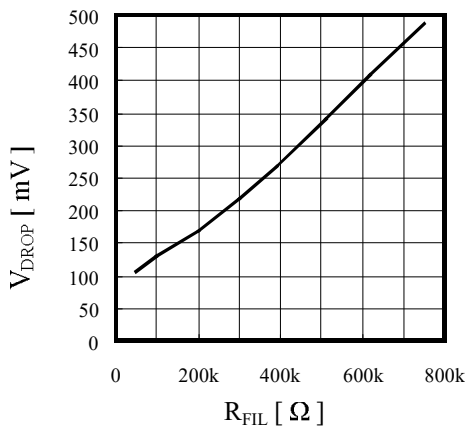


Figure 9. V_{DROD} vs R_{FIL} ($I_{OUT}=5mA$)

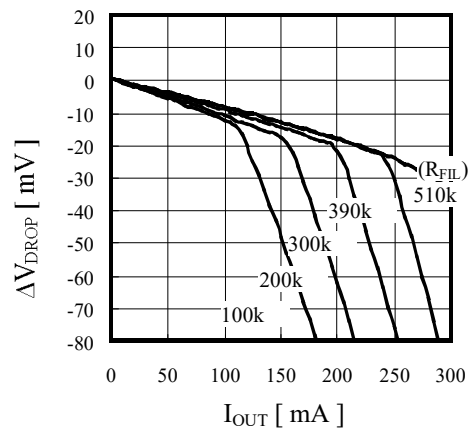


Figure 10. Load Regulation (R_{FIL})

11.10 Application Examples

•Low ripple and low noise system output

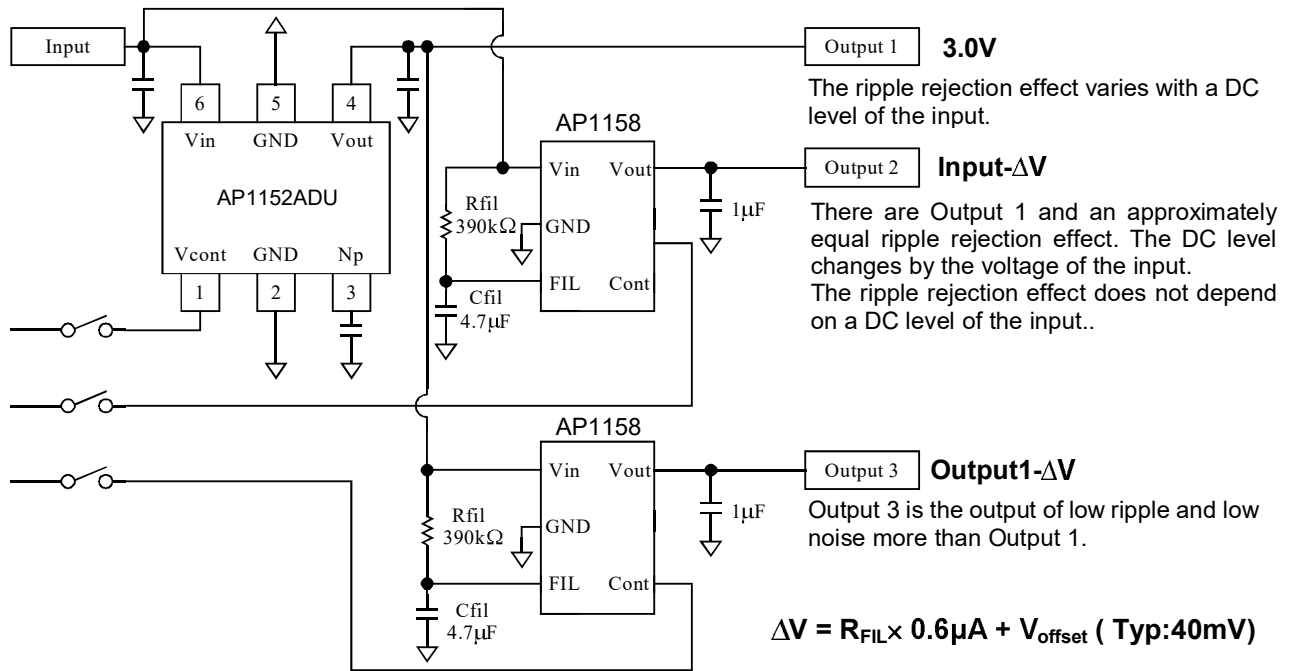


Figure 11. Low ripple and low noise system

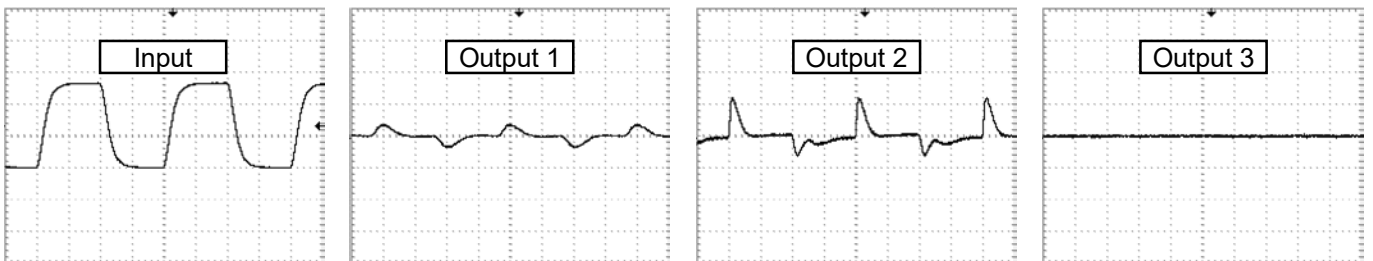


Figure 12. Input Voltage : 3.55V + Ripple Noise

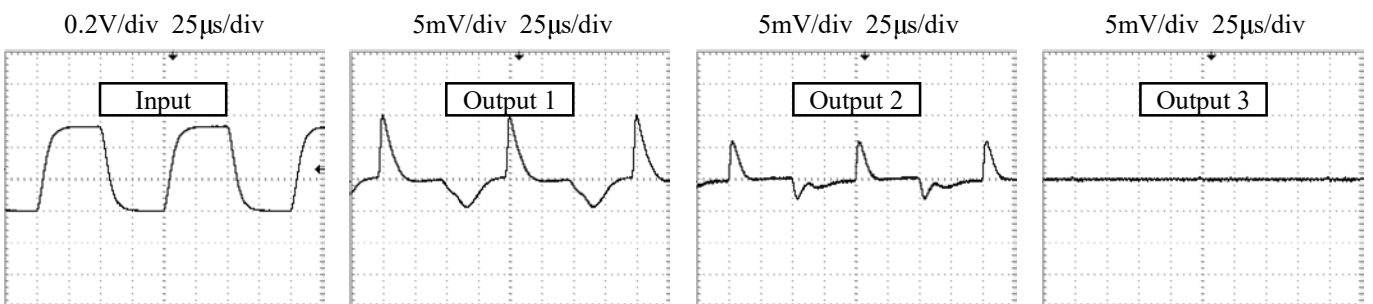


Figure 13. Input Voltage : 3.35V + Ripple Noise

•Reduction of the DC-DC converter output ripple noise

Ripple noise of the DC-DC converter is rejected by connecting AP1158 to the output of the DC-DC converter.

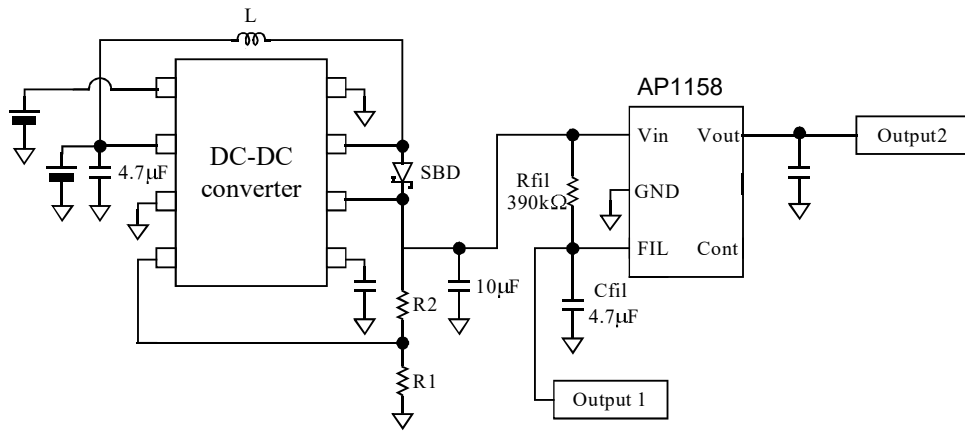


Figure 14. Reduction of the DC-DC converter output ripple noise

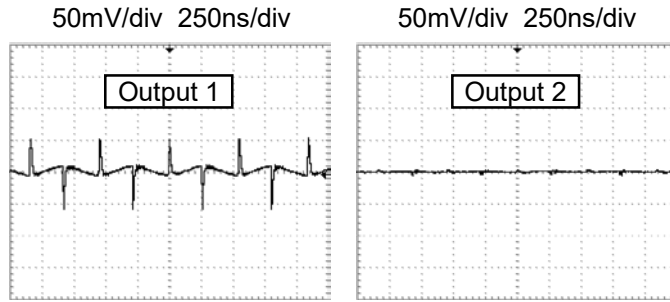


Figure 15. Output ripple noise

12. Definition of term

■ Characteristics

Each characteristic will be measured in a short period not to be influenced by joint temperature (Tj).

• Output Current (I_{OUT})

Normal output current that can be used. And a range of overheat protection does not operation.

• Maximum Output Current ($I_{OUT(MAX)}$)

The rated output current is specified under the condition when the output voltage drops 10% the value specified with $I_{OUT}=5\text{mA}$. The input voltage is set at $V_{OUT(TYP)}+1\text{V}$ and the current is pulsed to minimize temperature effect.

• Reverse Bias Current (I_{REV})

It is an electric current, which flows from the V_{OUT} pin to the IC. The measurement condition is as follows.

$$V_{IN}=0\text{V}, V_{CONT}=0\text{V}, V_{REV}(V_{OUT})=8\text{V}$$

• Input-Output Voltage Drop (V_{DROP})

V_{DROP} is set by R_{FIL} . It is necessary to set V_{DROP} large when there is a margin between the input voltage and output voltage, or the ripple noise is large. Please fix the V_{DROP} according to ripple noise, maximum output current and operating voltage. The V_{DROP} is calculated as follows.

$$V_{DROP}=R_{FIL} \times 0.6\mu\text{A} + V_{OFFSET} \text{ (typ:40mV)}$$

• Sink Current of FIL Terminal

The sink current of the FIL terminal is $0.6\mu\text{A}$ (typ).

$$V_{DROP} = \{(\text{Sink Current}) \times (R_{FIL})\} + (\text{Offset voltage})$$

Ripple rejection ratio largely depends on this value.

$$\text{Standard value: } R_{FIL} = 390\text{k}\Omega \text{ (} V_{DROP}=270\text{mV) , } V_{DROP} \text{ (mV)} = R_{FIL} \text{ (k}\Omega) \times 0.6\mu\text{A} + 40\text{mV}$$

• Ripple Rejection Ratio (R.R.)

Ripple rejection is the ability of the IC to attenuate the ripple content of the input voltage at the output. It is specified with the input voltage with AC voltage (condition: 1) overlapped with DC voltage (condition: 2)

$$\text{Condition 1 : } 200\text{mV}_{p-p}, f=1\text{kHz}$$

$$\text{Condition 2 : } V_{IN}=2.5\text{V}$$

The measurement condition is as follows.

$$C_{IN}=0.1\mu\text{F}, C_{OUT}=1\mu\text{F}, C_{FIL}=4.7\mu\text{F}, R_{FIL}=390\text{k}\Omega \text{ (} V_{DROP}=270\text{mV) , } V_{IN}: \text{DC}=2.5\text{V}, \text{AC}=200\text{mV}_{p-p} \text{ (at } f=1\text{kHz)}$$

It is necessary to enlarge R_{FIL} and C_{FIL} to improve the ripple rejection ratio at the low frequency range. The ripple rejection depends on the set V_{DROP} and the characteristics of the capacitor. Please consider the tolerance of resistor and capacitor. Please adjust the value of R_{FIL} (=390k Ω) and C_{FIL} (=4.7 μF) depends on application.

• Standby Current ($I_{STANDBY}$)

Input current through the output voltage at the control terminal voltage when the OFF mode.

■ Protections

• Over Current Protection

The over current sensor protects the device when there is excessive output current. It also protects the device if the output is accidentally connected to ground.

13. Recommended External Circuit

■ Recommended External Circuit

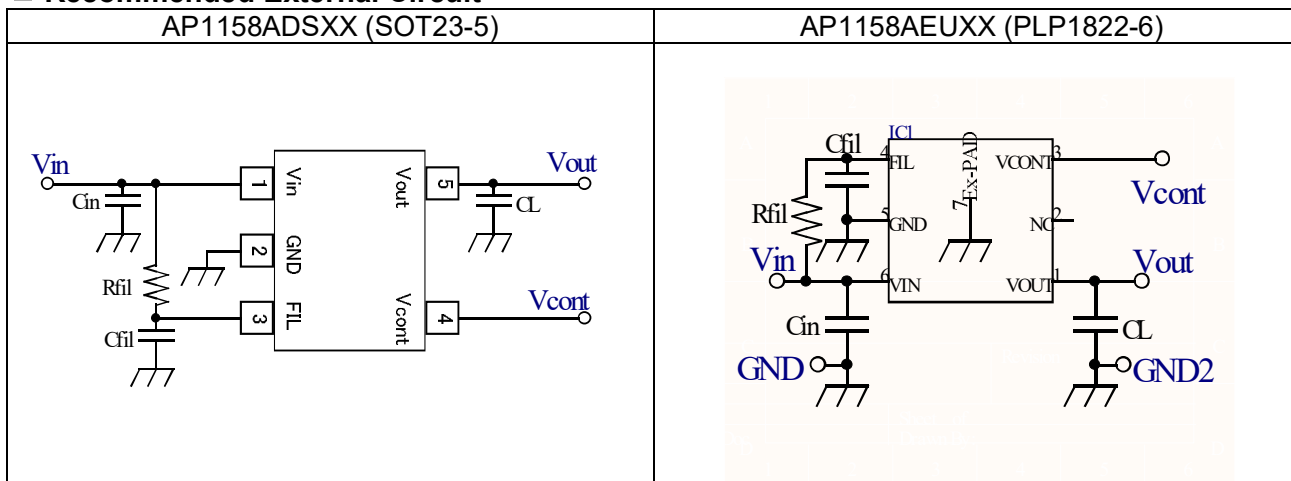


Figure 16. External connection circuit example

Table 2. Recommended external components example

Parts	min	typ	max	UNIT	Remarks
C_{IN}	-	1.0	-	μF	
C_L	-	1.0	-	μF	
C_{FIL}	-	4.7	-	μF	
R_{FIL}	-	390	-	Ω	Setting at $V_{DROP}=274mV$

Note 10. The above table of values is the recommended example. Please apply the optimal value on the check prior to the time of your on your board.

■ Recommended Layout

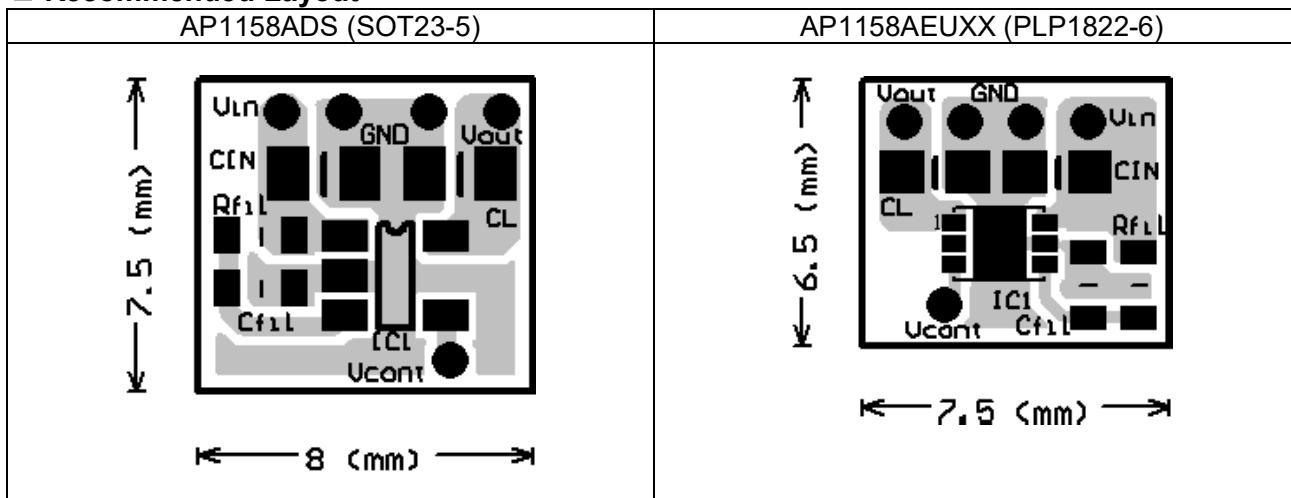


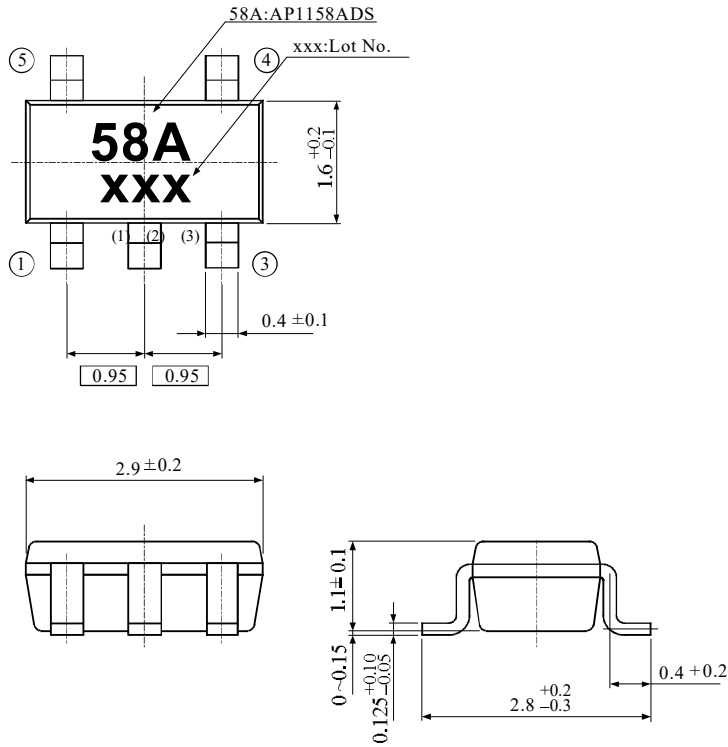
Figure 17. Layout pattern example

- ① Place the input capacitor C_{IN} as close as possible to the V_{IN} and GND.
- ② Place the output capacitor C_L as close as possible to the V_{OUT} and GND.
- ③ PCB wiring, so as to strengthen the GND area.
- ④ PLP1822-6 of Exposed-Pad has become a shared with the ground of the IC. Please connect to the PCB ground always. Vias (heat dissipation hole) is an effective heat dissipation to the PCB of each layer.

14. Package

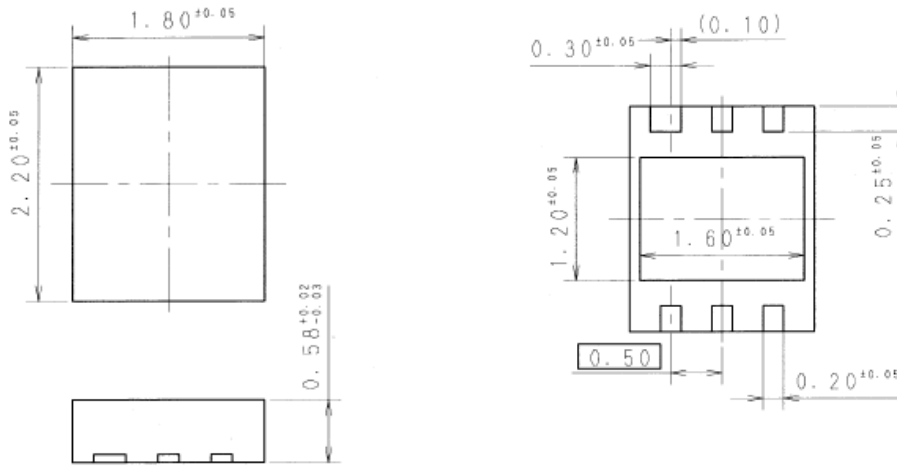
■ Outline Dimensions

• SOT23-5

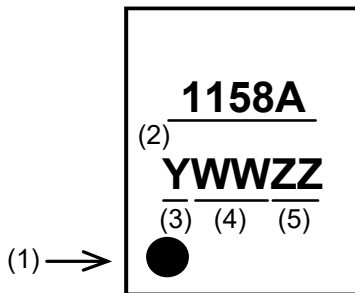


Unit : mm

• PLP1822-6



Unit : mm



- (1) 1pin Indication
- (2) Market No.
- (3) Year code (last 1 digit)
- (4) Week code
- (5) Management code

15. Revise History

Date (YY/MM/DD)	Revision	Page	Contents
15/5/26	00	-	First edition
17/3/24	01	-	Completely revised as PLP1822-6 package is added

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