APPLICATION MANUAL

2CH CMOS LDO REGULATOR IC
TK632xxB/F

CONTENTS

TOKO

2CH CMOS LDO REGULATOR IC
TK632xxB/F

1. DESCRIPTION

The TK632xxB/F is 2ch CMOS LDO regulator. The packages are the very small 6-bump flip chip and the small and thin SON3024-8.
The IC is designed for portable applications with space requirements, battery powered system and any electronic equipment.
The IC does not require a noise-bypass capacitor.
The IC offers low dropout voltage.
The output voltage is internally fixed from 1.5V to 4.2V.

2. FEATURES

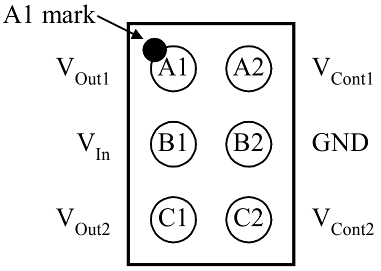
- Very small FC-6
- Small and thin SON3024-8 package
- No noise bypass capacitor required
- Low dropout voltage
- Thermal and over current protection
- High maximum load current
- On/Off control
- High accuracy

3. APPLICATIONS

- Mobile Communication
- Battery Powered System
- Any Electronic Equipment

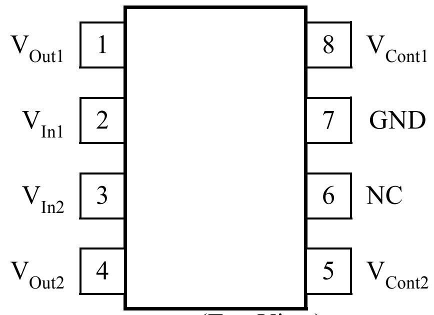
4. PIN CONFIGURATION

- FC-6 (TK632xxB)



(Top View)

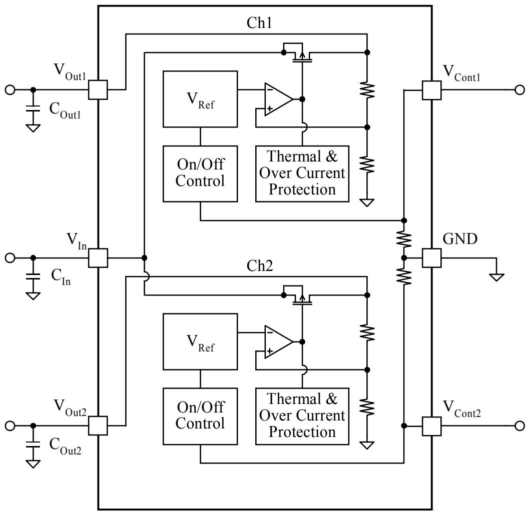
- SON3024-8 (TK632xxF)



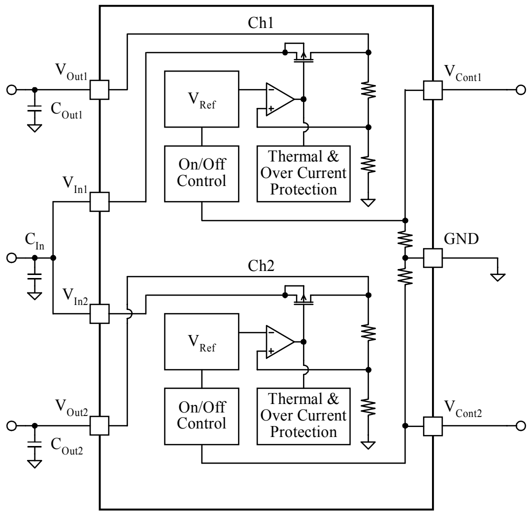
(Top View)

5. BLOCK DIAGRAM

- TK632xxB



- TK632xxF



6. ORDERING INFORMATION

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Voltage Code
(Refer to the following table)

Package Code
B : FC-6
F : SON3024-8 package

Operating Temp. Range Code
C : C Rank(standard) only

Tape/Reel Code
B : Normal type for FC
L : Normal type for plastic packages

Solder Composion Code
- G : Lead Free
brank : Lead Containing

Preferred Product (TK632xxB)

Output Voltage		Voltage Code	Output Voltage		Voltage Code
V_{Out1}	V_{Out2}		V_{Out1}	V_{Out2}	
2.8V	2.8V	01	2.9V	2.9V	03
2.85V	2.85V	02			

Preferred Product (TK632xxF)

Output Voltage		Voltage Code	Output Voltage		Voltage Code
V_{Out1}	V_{Out2}		V_{Out1}	V_{Out2}	
2.8V	2.8V	01	2.5V	2.5V	04
2.85V	2.85V	02	3.0V	3.0V	05
2.9V	2.9V	03	3.3V	3.3V	06

*If you need a voltage other than the value listed in the above table, please contact TOKO.

7. ABSOLUTE MAXIMUM RATINGS

T_a=25°C

Parameter	Symbol	Rating	Units	Conditions
Absolute Maximum Ratings				
Input Voltage	$V_{In,MAX}$	-0.3 ~ 6.0	V	
Output pin Voltage	$V_{Out,MAX}$	-0.3 ~ V_{In}+0.3	V	
Control pin Voltage	$V_{Cont,MAX}$	-0.3 ~ 6.0	V	
Storage Temperature Range	T_{stg}	-55 ~ 150	°C	
Power Dissipation	P_D	600	mW	Internal Limited T_j=150°C *****, When mounted on PCB, FC-6, SON3024-8
Operating Condition				
Operational Temperature Range	T_{OP}	-40 ~ 85	°C	
Operational Voltage Range	V_{OP}	2.0 ~ 6.0	V	

***** P_D must be decreased at rate of 4.8mW/°C (FC-6, SON3024-8) for operation above 25°C.
The maximum ratings are the absolute limitation values with the possibility of damaging the IC.
When the operation exceeds this standard, quality can not be guaranteed.

8. ELECTRICAL CHARACTERISTICS

The parameters with min. or max. values will be guaranteed at $T_a=T_j=25°C$ with test when manufacturing or SQC(Statistical Quality Control) methods. The operation between -40 ~ 85°C is guaranteed when design.

$V_{In}=V_{Out,TYP}+1V$, $V_{Cont}=1.3V$, $T_a=T_j=25°C$

Parameter	Symbol	Value MIN	Value TYP	Value MAX	Units	Conditions
Output Voltage	V_{Out}	**Refer to TABLE 1**			V	$I_{Out}=5mA$
Line Regulation	LinReg	-	0	4	mV	$\Delta V_{In}=1V$
Load Regulation	LoaReg	**Refer to TABLE 1**			mV	$I_{Out}=5mA$ ~ 100mA
		Refer to TABLE 1			mV	$I_{Out}=5mA$ ~ 150mA
Dropout Voltage ***1**	V_{Drop}	**Refer to TABLE 1**			mV	$I_{Out}=100mA$
		Refer to TABLE 1			mV	$I_{Out}=150mA$
Maximum Load Current ***2**	$I_{Out,MAX}$	200	300	-	mA	$V_{Out}=V_{Out,TYP}\times0.9$
Quiescent Current	I_Q	-	80	120	µA	$I_{Out}=0mA$, $V_{Cont1}=V_{In}$, $V_{Cont2}=0V$ or $V_{Cont1}=0V$, $V_{Cont2}=V_{In}$
Standby Current	$I_{Standby}$	-	0.01	0.1	µA	$V_{Cont1}= V_{Cont2}=0V$
GND Pin Current	I_{GND}	-	100	150	µA	$I_{Out}=50mA$, $V_{Cont1}=V_{In}$, $V_{Cont2}=0V$ or $V_{Cont1}=0V$, $V_{Cont2}=V_{In}$
Control Terminal						
Control Current	I_{Cont}	-	1.3	2.6	µA	$V_{Cont1}=1.3V$, $V_{Cont2}=0.0V$ or $V_{Cont1}=0.0V$, $V_{Cont2}=1.3V$
Control Voltage	V_{Cont}	1.3	-	-	V	V_{Out} On state
		-	-	0.25	V	V_{Out} Off state

Reference Value						
Output Voltage / Temp.	V_{Out}/T_a	-	100	-	ppm/°C	$I_{Out}=5mA$
Output Noise Voltage ($V_{Out,TYP}=2.8V$)	V_{Noise}	-	38	-	µVrms	$C_{Out}=1.0\mu F$, $I_{Out}=30mA$, BPF=400Hz~80kHz
Ripple Rejection ($V_{Out,TYP}=2.8V$)	RR	-	68	-	dB	$C_{Out}=1.0\mu F$, $I_{Out}=10mA$, f=1kHz
Rise Time ($V_{Out,TYP}=2.8V$)	t_r	-	30	-	µs	$C_{Out}=1.0\mu F$, V_{Cont} : Pulse Wave (100Hz) , V_{Cont} On → $V_{Out}\times95\%$ point

***1**: For $V_{Out} \leq 2.0V$, no regulations.
***2**: The maximum output current is limited by power dissipation.

General Note
Parameters with only typical values are just reference. (Not guaranteed)
The noise level is dependent on the output voltage, the capacitance and capacitor characteristic.

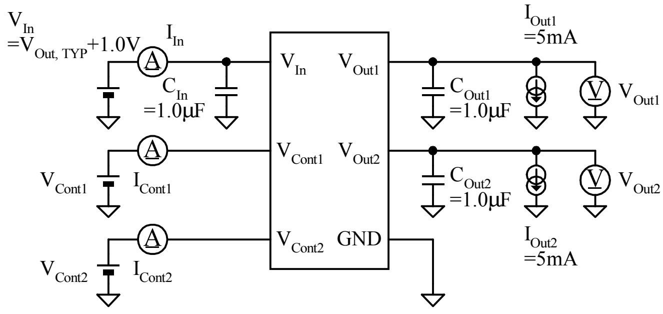
TABLE 1. Preferred Product

Part Number	Ch	Output Voltage			Load Regulation				Dropout Voltage			
					I_{Out}=5 ~ 100mA		I_{Out}=5 ~ 150mA		I_{Out}=100mA		I_{Out}=150mA	
		MIN	TYP	MAX	TYP	MAX	TYP	MAX	TYP	MAX	TYP	MAX
		V	V	V	mV	mV	mV	mV	mV	mV	mV	mV
TK63201B	1	2.740	2.800	2.860	2	8	3	12	85	130	125	190
	2	2.740	2.800	2.860	2	8	3	12	85	130	125	190
TK63202B	1	2.790	2.850	2.910	2	8	3	12	80	125	120	185
	2	2.790	2.850	2.910	2	8	3	12	80	125	120	185
TK63203B	1	2.840	2.900	2.960	2	8	3	12	80	125	120	185
	2	2.840	2.900	2.960	2	8	3	12	80	125	120	185

Part Number	Ch	Output Voltage			Load Regulation				Dropout Voltage			
					I_{Out}=5 ~ 100mA		I_{Out}=5 ~ 150mA		I_{Out}=100mA		I_{Out}=150mA	
		MIN	TYP	MAX	TYP	MAX	TYP	MAX	TYP	MAX	TYP	MAX
		V	V	V	mV	mV	mV	mV	mV	mV	mV	mV
TK63201F	1	2.740	2.800	2.860	5	20	8	32	90	135	135	205
	2	2.740	2.800	2.860	5	20	8	32	90	135	135	205
TK63202F	1	2.790	2.850	2.910	5	20	8	32	90	135	130	200
	2	2.790	2.850	2.910	5	20	8	32	90	135	130	200
TK63203F	1	2.840	2.900	2.960	5	20	8	32	90	135	130	200
	2	2.840	2.900	2.960	5	20	8	32	90	135	130	200
TK63204F	1	2.440	2.500	2.560	5	20	8	32	100	150	150	225
	2	2.440	2.500	2.560	5	20	8	32	100	150	150	225
TK63205F	1	2.940	3.000	3.060	5	20	8	32	85	130	125	195
	2	2.940	3.000	3.060	5	20	8	32	85	130	125	195
TK63206F	1	3.234	3.300	3.366	5	20	8	32	80	125	120	185
	2	3.234	3.300	3.366	5	20	8	32	80	125	120	185

Notice.
Please contact your authorized TOKO representative for voltage availability.

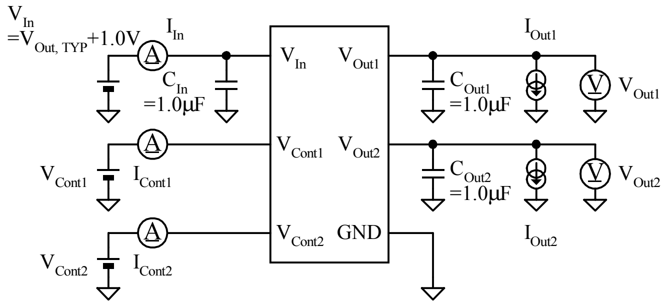
9. TEST CIRCUIT



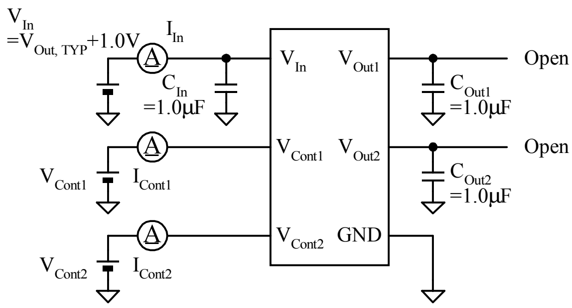
■ Test circuit for electrical characteristic

Notice.

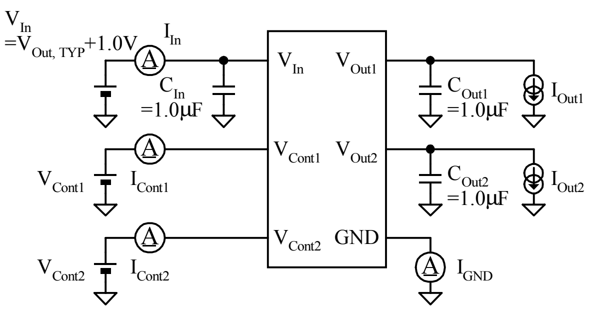
The limit value of electrical characteristics is applied when C_{In}=1.0µF(Tantalum), C_{Out1}=C_{Out2}=1.0µF(Tantalum).
But C_{In}, and C_{Out} can be used both the ceramic and the tantalum capacitor.
TK632xxB : C_{In}=2.2µF, C_{Out1}=C_{Out2}=1.0µF(ceramic) is applicable.
TK632xxF : C_{In}=C_{Out1}=C_{Out2}=1.0µF(ceramic) is applicable.



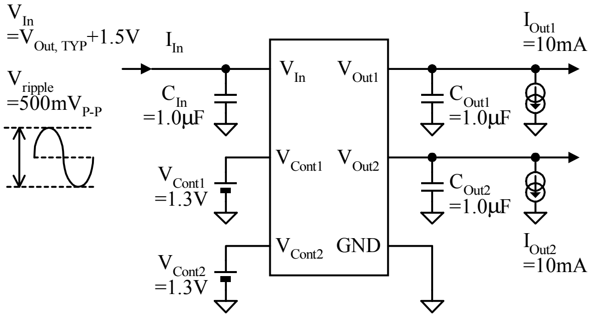
- ■ ΔV_{Out} vs V_{In}
- ■ V_{Drop} vs I_{Out}
- ■ V_{Out} vs I_{Out}
- ■ ΔV_{Out} vs I_{Out}
- ■ V_{Out} vs T_a
- ■ V_{Drop} vs T_a
- ■ $I_{Out,MAX}$ vs T_a
- ■ I_{Cont} vs V_{Cont} , V_{Out} vs V_{Cont}
- ■ I_{Cont} vs T_a
- ■ V_{Cont} vs T_a
- ■ V_{Noise} vs V_{In}
- ■ V_{Noise} vs I_{Out}
- ■ V_{Noise} vs V_{Out}
- ■ V_{Noise} vs Frequency



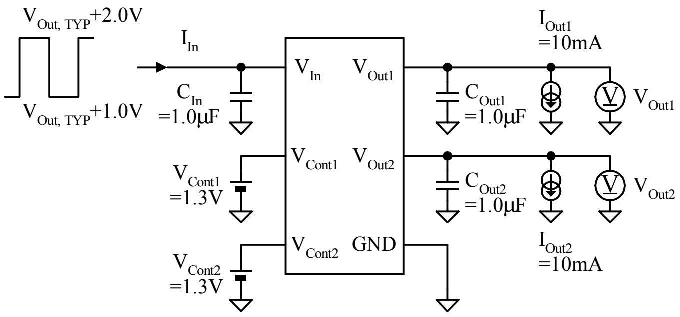
- ■ I_Q vs V_{In}
- ■ $I_{standby}$ vs V_{In}
- ■ I_Q vs T_a



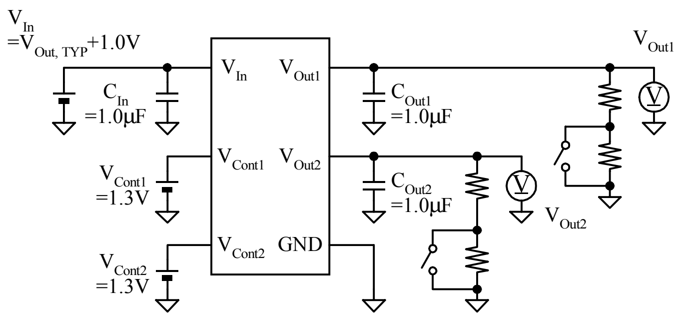
- ■ I_{GND} vs I_{Out}
- ■ I_{GND} vs T_a



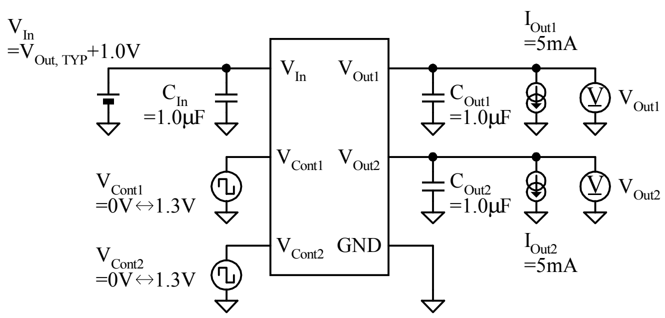
- RR vs V_{In}
- RR vs Frequency
- RR vs Frequency



- Line Transient



- Load Transient
- Crosstalk

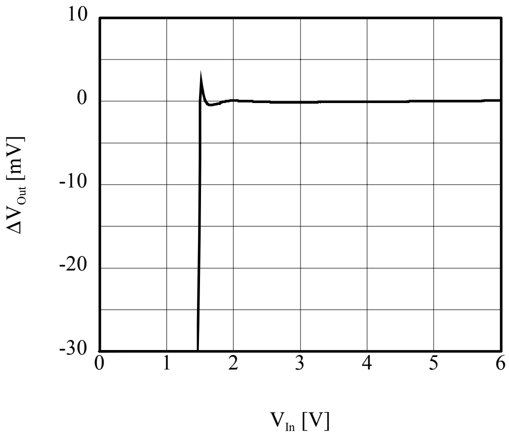


- On/Off Transient

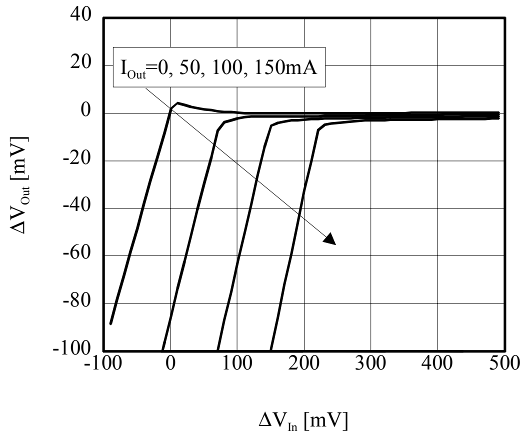
10. TYPICAL CHARACTERISTICS

10-1. DC CHARACTERISTICS

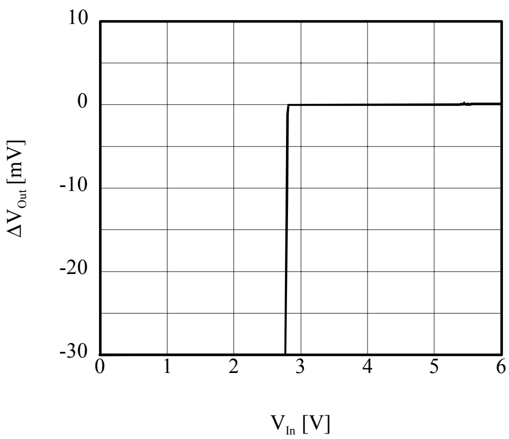
■ ΔV_{Out} vs V_{In} ($V_{Out, TYP}$=1.5V(TK632xxB/F))



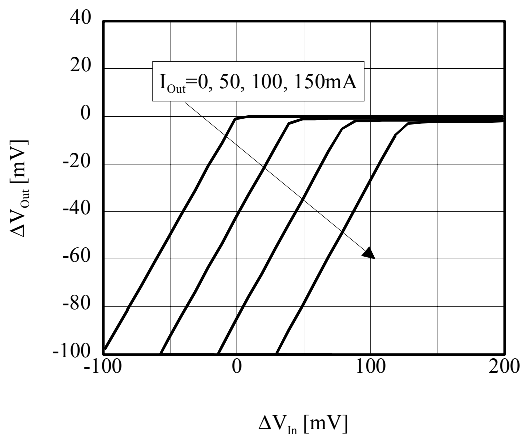
■ ΔV_{Out} vs V_{In} ($V_{Out, TYP}$=1.5V(TK632xxB))



■ ΔV_{Out} vs V_{In} ($V_{Out, TYP}$=2.8V(TK632xxB/F))



■ ΔV_{Out} vs V_{In} ($V_{Out, TYP}$=2.8V(TK632xxB))



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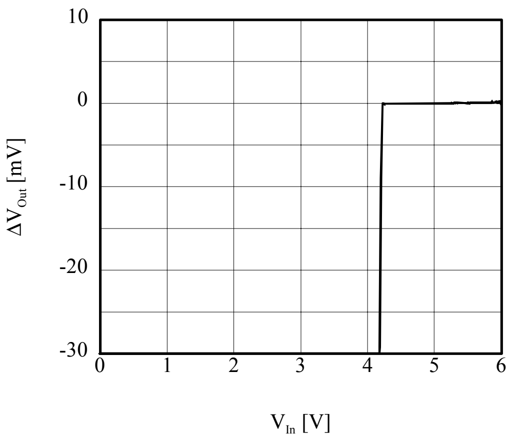
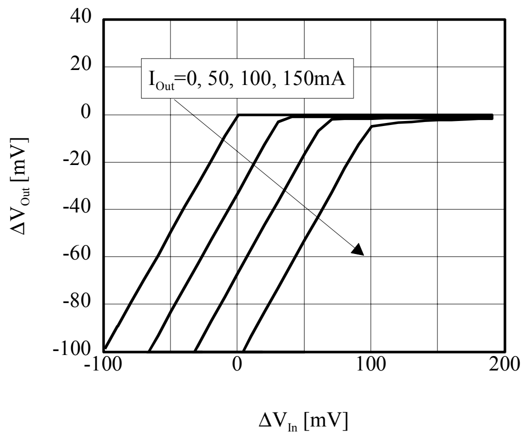


■ ΔV_{Out} vs V_{In} ($V_{Out, TYP}$=4.2V(TK632xxB))



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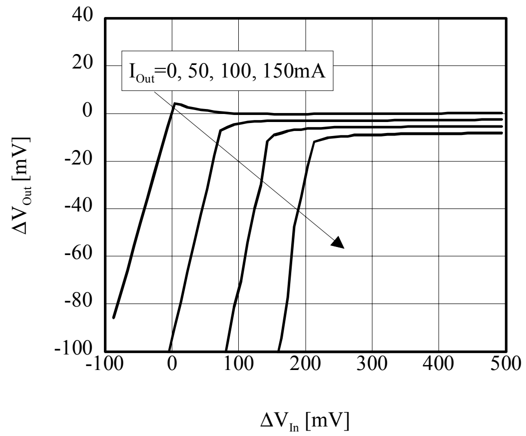
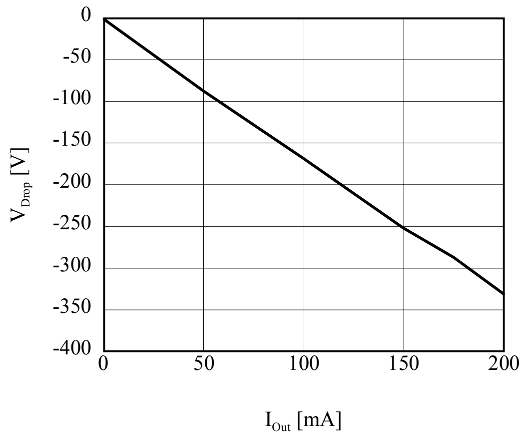
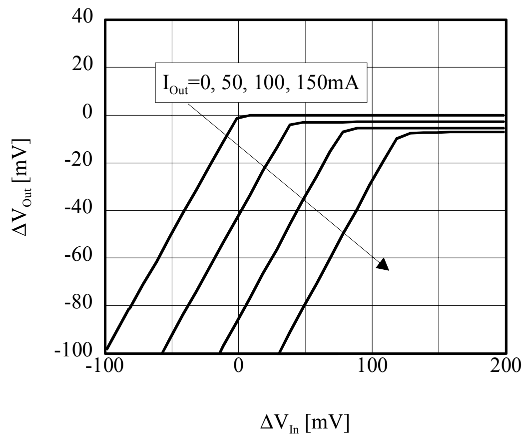


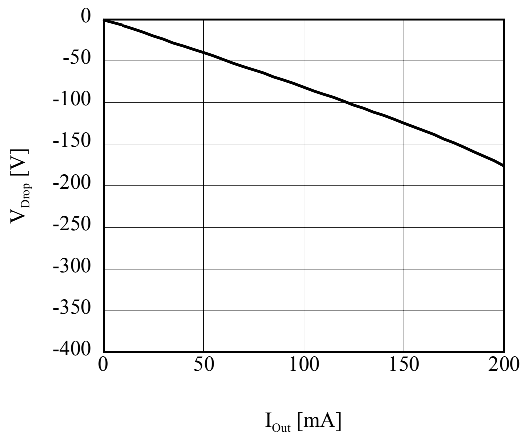
■ V_{Drop} vs I_{Out} ($V_{Out, TYP}$=1.5V(TK632xxB))



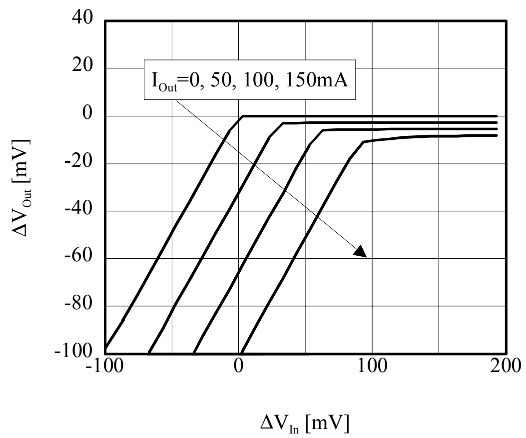
■ ΔV_{Out} vs V_{In} ($V_{Out, TYP}$=2.8V(TK632xxF))



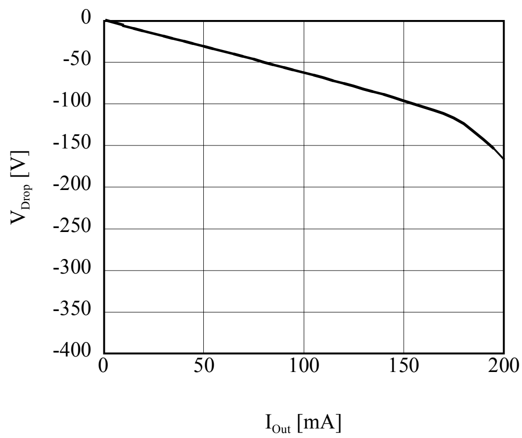
■ V_{Drop} vs I_{Out} ($V_{Out, TYP}$=2.8V(TK632xxB))



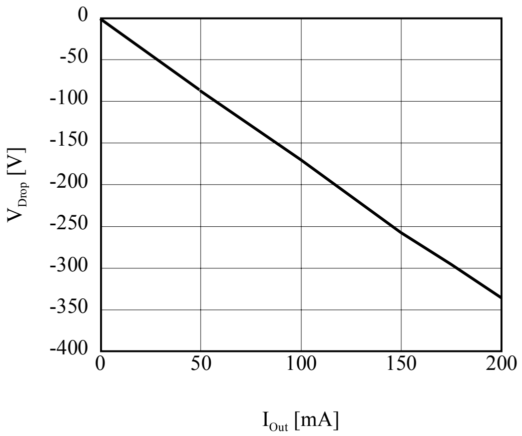
■ ΔV_{Out} vs V_{In} ($V_{Out, TYP}$=4.2V(TK632xxF))



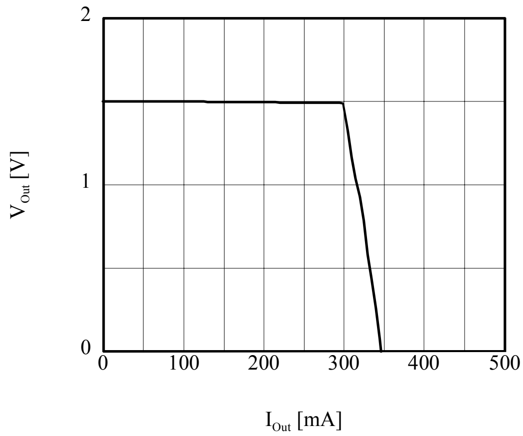
■ V_{Drop} vs I_{Out} ($V_{Out, TYP}$=4.2V(TK632xxB))



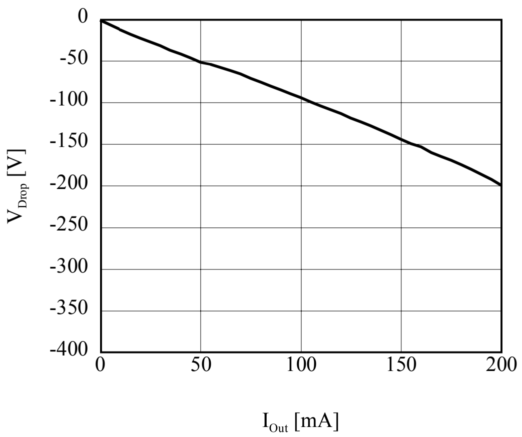
■ V_{Drop} vs I_{Out} ($V_{Out, TYP}$=1.5V(TK632xxF))



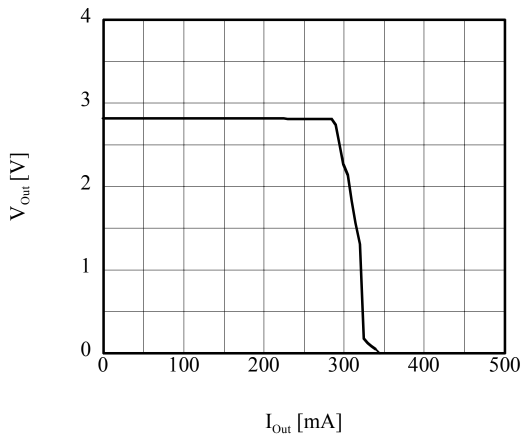
■ V_{Out} vs I_{Out} ($V_{Out, TYP}$=1.5V(TK632xxB/F))



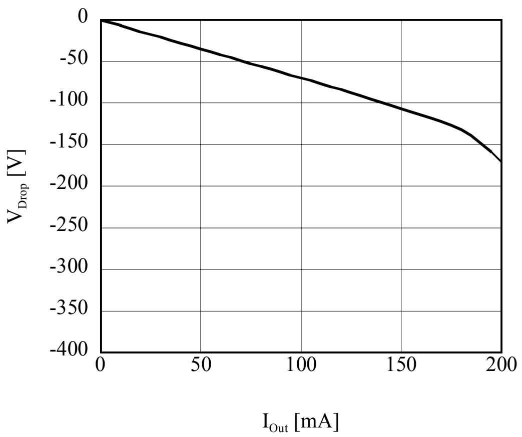
■ V_{Drop} vs I_{Out} ($V_{Out, TYP}$=2.8V(TK632xxF))



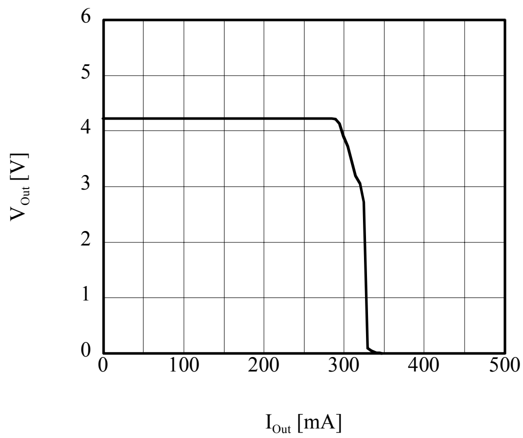
■ V_{Out} vs I_{Out} ($V_{Out, TYP}$=2.8V(TK632xxB/F))



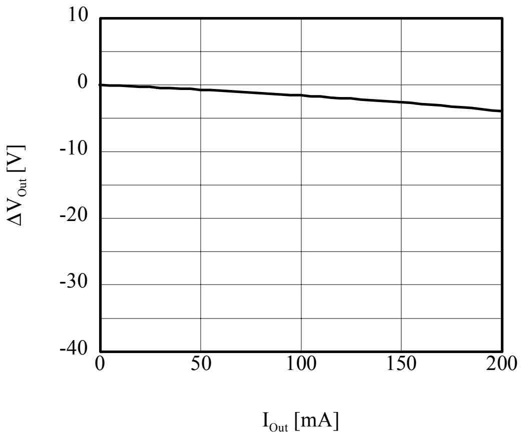
■ V_{Drop} vs I_{Out} ($V_{Out, TYP}$=4.2V(TK632xxF))



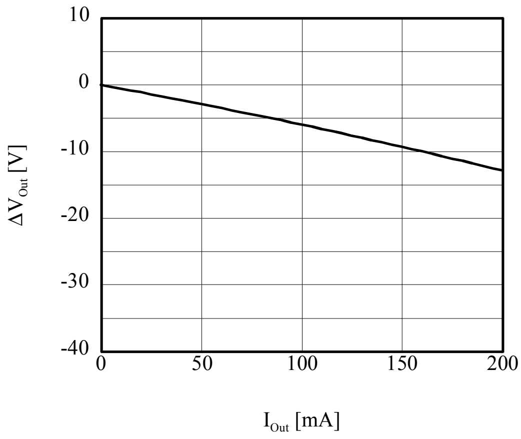
■ V_{Out} vs I_{Out} ($V_{Out, TYP}$=4.2V(TK632xxB/F))



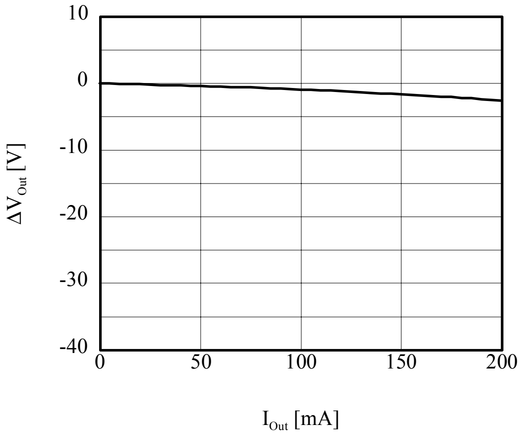
■ ΔV_{Out} vs I_{Out} ($V_{Out,\ TYP}$=1.5V(TK632xxB))



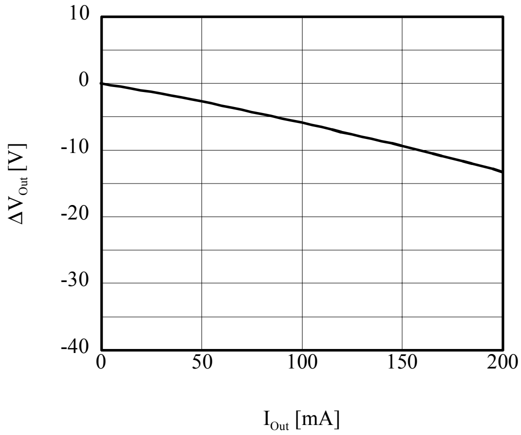
■ ΔV_{Out} vs I_{Out} ($V_{Out,\ TYP}$=1.5V(TK632xxF))



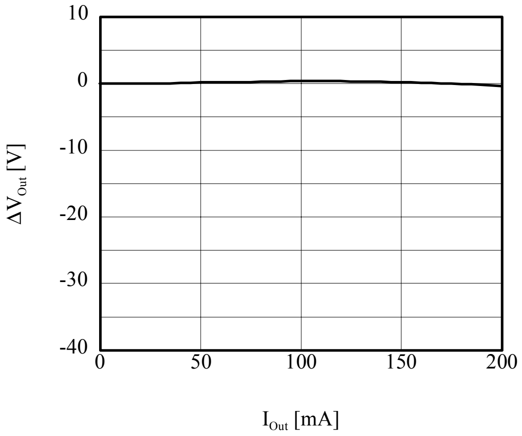
■ ΔV_{Out} vs I_{Out} ($V_{Out,\ TYP}$=2.8V(TK632xxB))



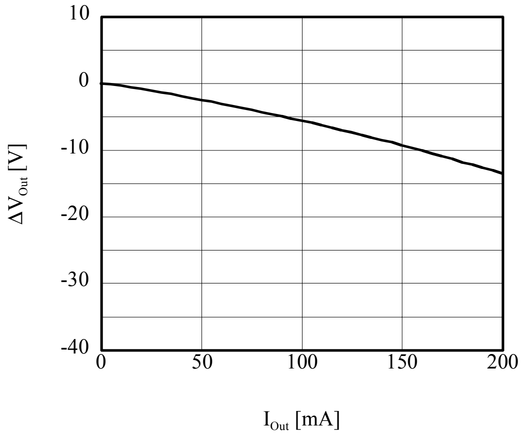
■ ΔV_{Out} vs I_{Out} ($V_{Out,\ TYP}$=2.8V(TK632xxF))



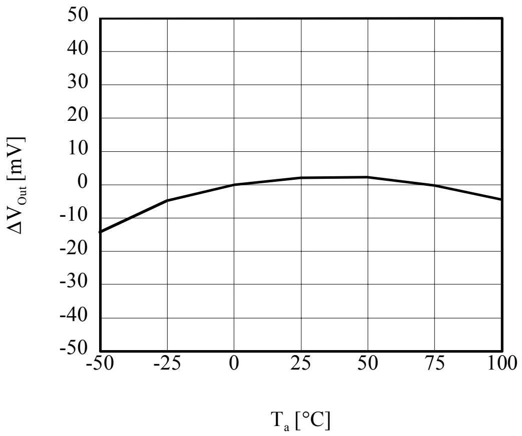
■ ΔV_{Out} vs I_{Out} ($V_{Out,\ TYP}$=4.2V(TK632xxB))



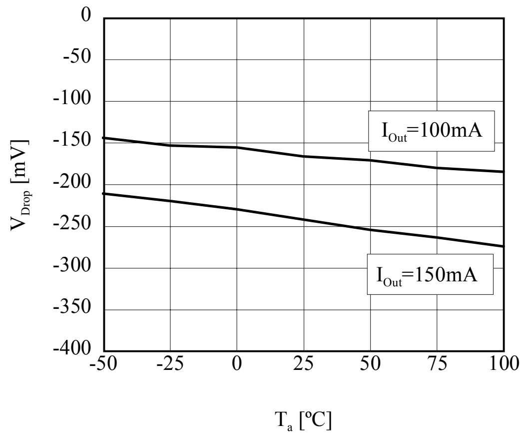
■ ΔV_{Out} vs I_{Out} ($V_{Out,\ TYP}$=4.2V(TK632xxF))



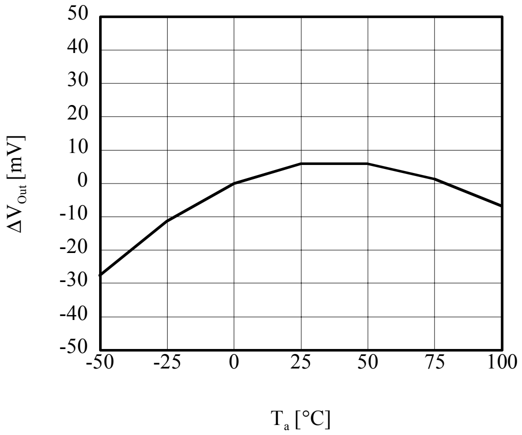
■ V_{Out} vs T_a ($V_{Out, TYP}$=1.5V(TK632xxB/F))



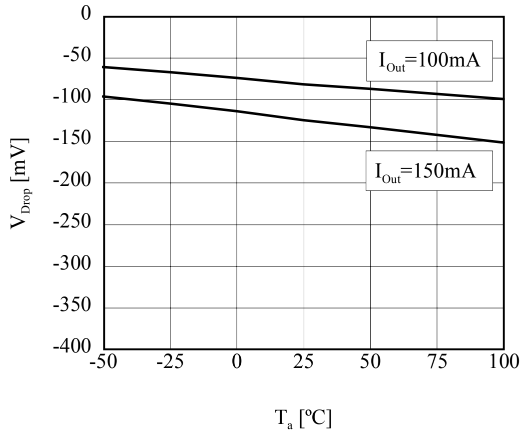
■ V_{Drop} vs T_a ($V_{Out, TYP}$=1.5V(TK632xxB))



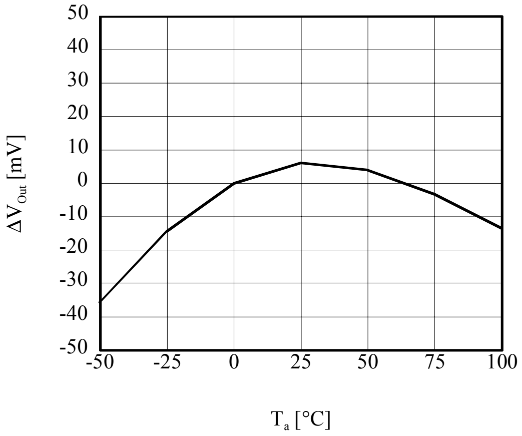
■ V_{Out} vs T_a ($V_{Out, TYP}$=2.8V(TK632xxB/F))



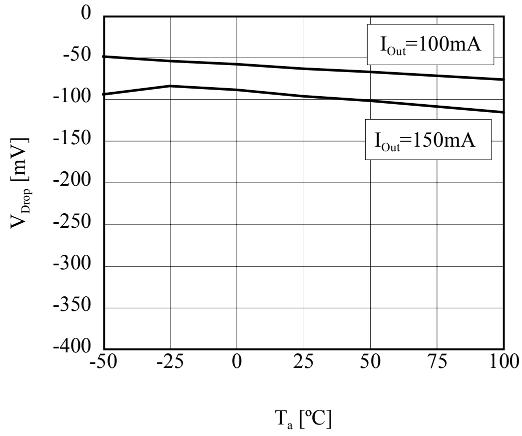
■ V_{Drop} vs T_a ($V_{Out, TYP}$=2.8V(TK632xxB))



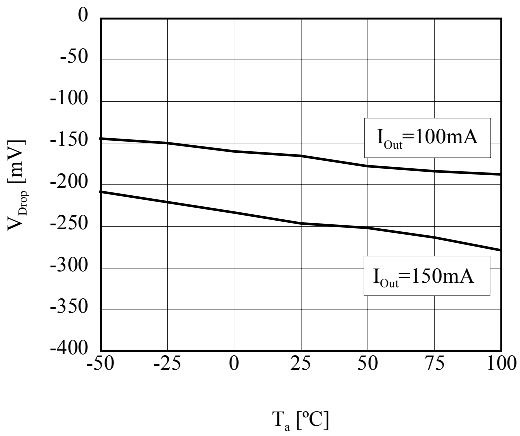
■ V_{Out} vs T_a ($V_{Out, TYP}$=4.2V(TK632xxB/F))



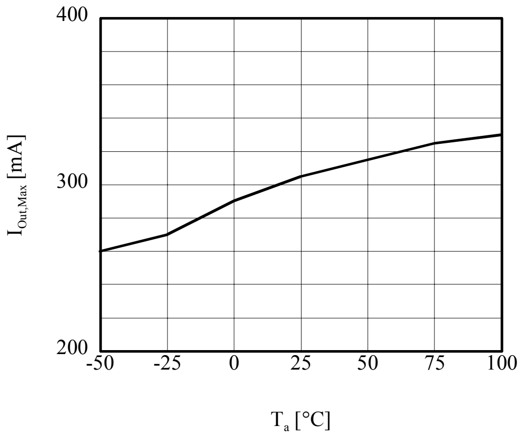
■ V_{Drop} vs T_a ($V_{Out, TYP}$=4.2V(TK632xxB))



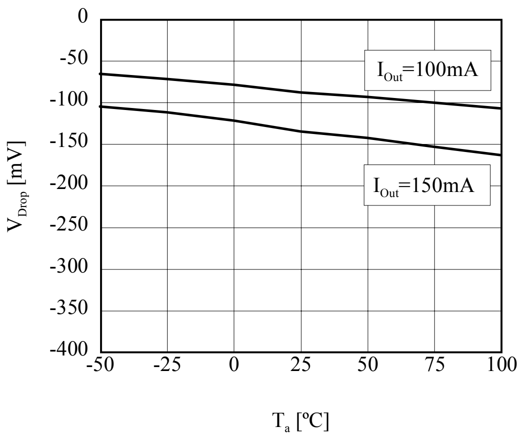
■ V_{Drop} vs T_a ($V_{Out, TYP}$=1.5V(TK632xxF))



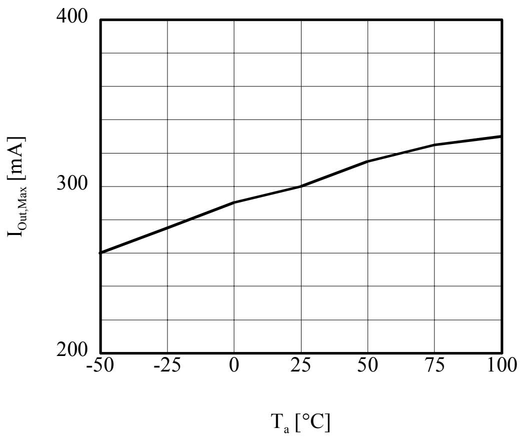
■ $I_{Out,MAX}$ vs T_a ($V_{Out, TYP}$=1.5V(TK632xxB/F))



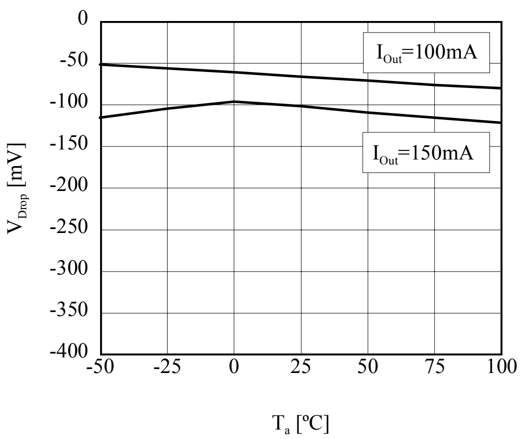
■ V_{Drop} vs T_a ($V_{Out, TYP}$=2.8V(TK632xxF))



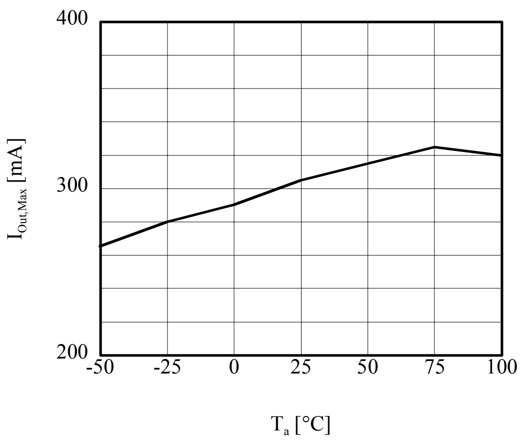
■ $I_{Out,MAX}$ vs T_a ($V_{Out, TYP}$=2.8V(TK632xxB/F))



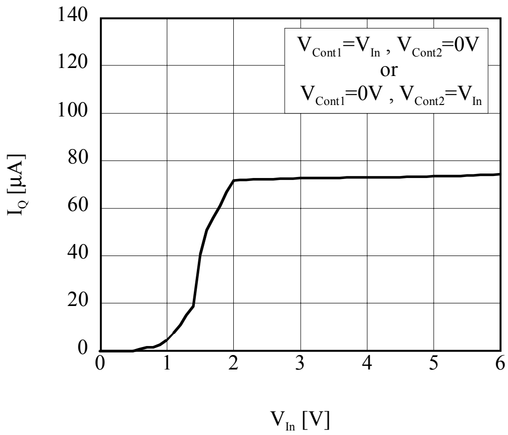
■ V_{Drop} vs T_a ($V_{Out, TYP}$=4.2V(TK632xxF))



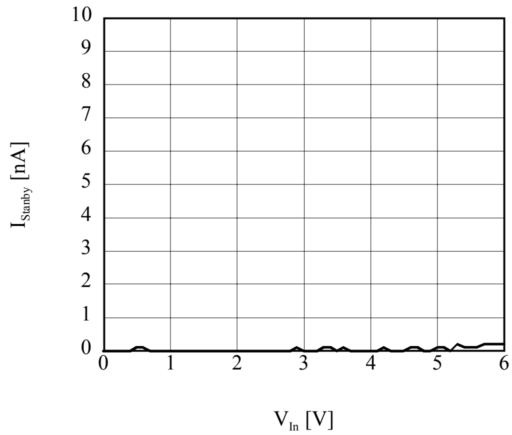
■ $I_{Out,MAX}$ vs T_a ($V_{Out, TYP}$=4.2V(TK632xxB/F))



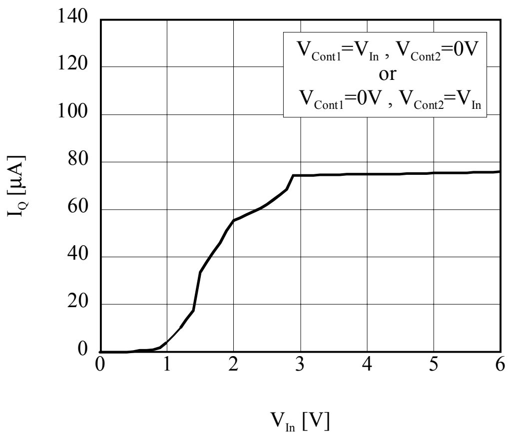
■ I_Q vs V_{In} ($V_{Out, TYP}$=1.5V(TK632xxB/F))



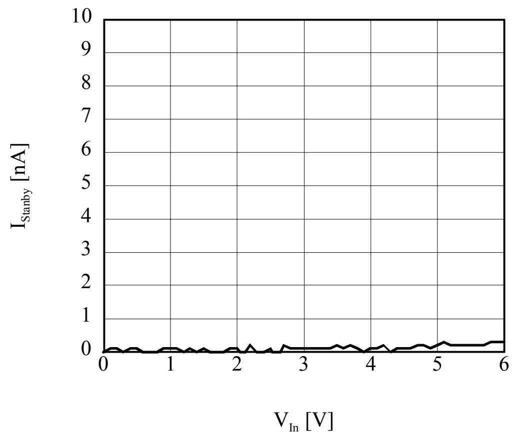
■ $I_{standby}$ vs V_{In} ($V_{Out, TYP}$=1.5V(TK632xxB/F))



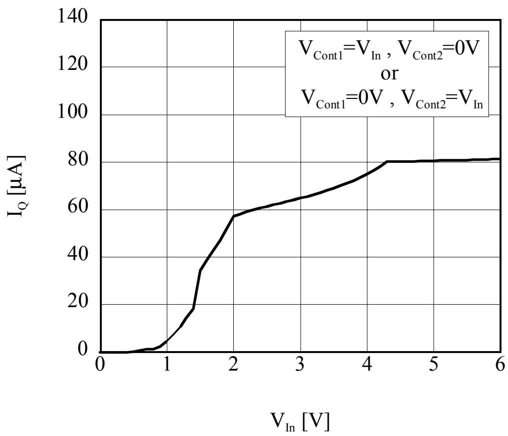
■ I_Q vs V_{In} ($V_{Out, TYP}$=2.8V(TK632xxB/F))



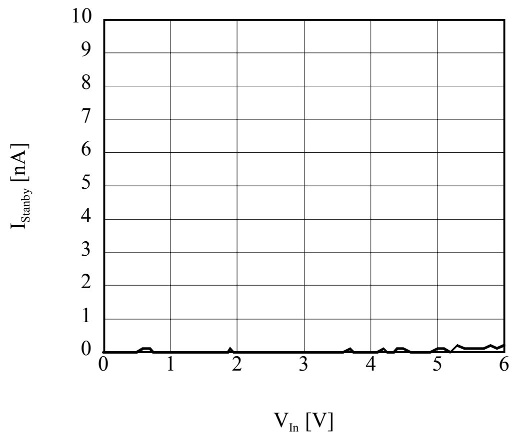
■ $I_{standby}$ vs V_{In} ($V_{Out, TYP}$=2.8V(TK632xxB/F))



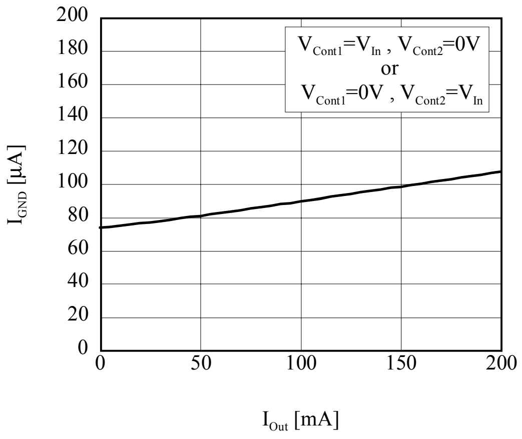
■ I_Q vs V_{In} ($V_{Out, TYP}$=4.2V(TK632xxB/F))



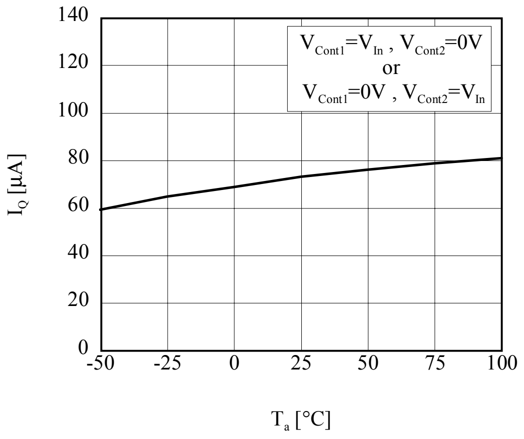
■ $I_{standby}$ vs V_{In} ($V_{Out, TYP}$=4.2V(TK632xxB/F))



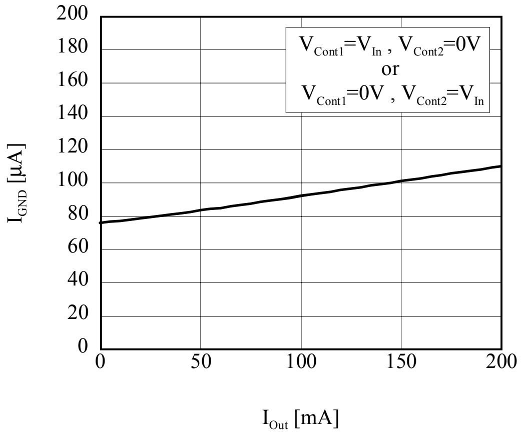
■ I_{GND} vs I_{Out} ($V_{Out, TYP}$=1.5V(TK632xxB/F))



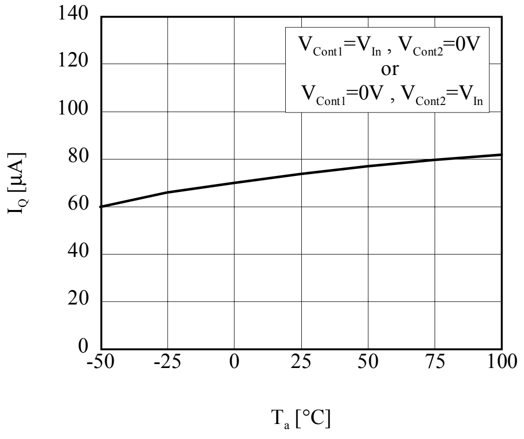
■ I_Q vs T_a ($V_{Out, TYP}$=1.5V(TK632xxB/F))



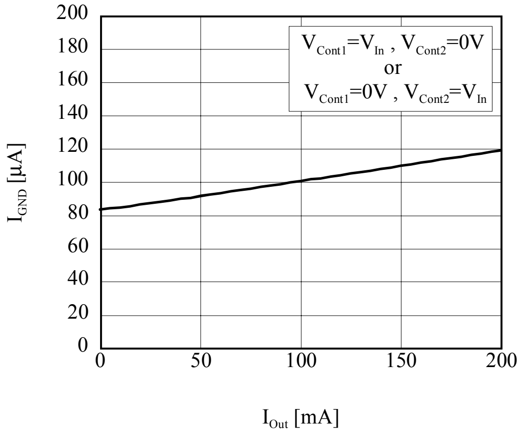
■ I_{GND} vs I_{Out} ($V_{Out, TYP}$=2.8V(TK632xxB/F))



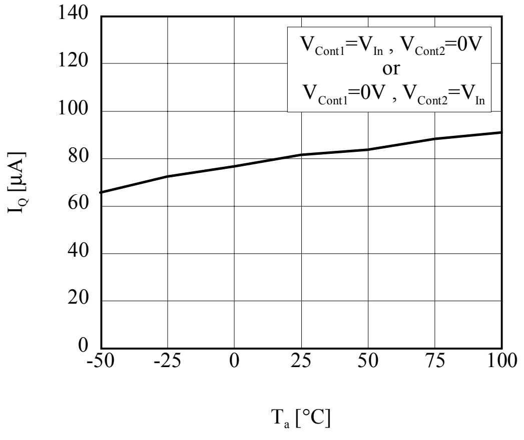
■ I_Q vs T_a ($V_{Out, TYP}$=2.8V(TK632xxB/F))



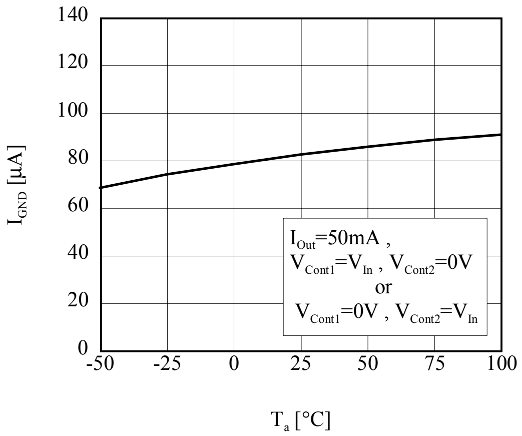
■ I_{GND} vs I_{Out} ($V_{Out, TYP}$=4.2V(TK632xxB/F))



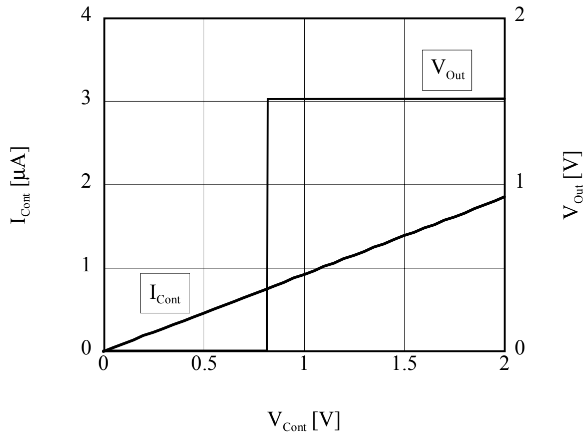
■ I_Q vs T_a ($V_{Out, TYP}$=4.2V(TK632xxB/F))



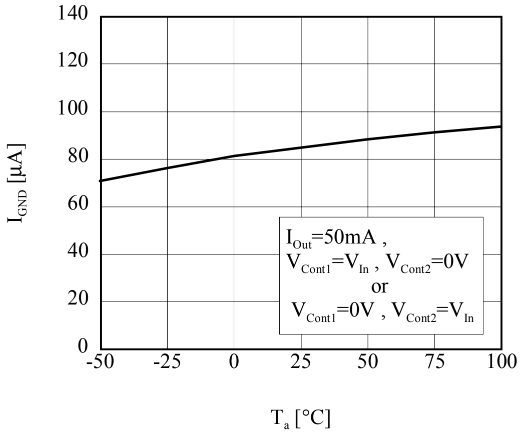
■ I_{GND} vs T_a ($V_{Out, TYP}$=1.5V(TK632xxB/F))



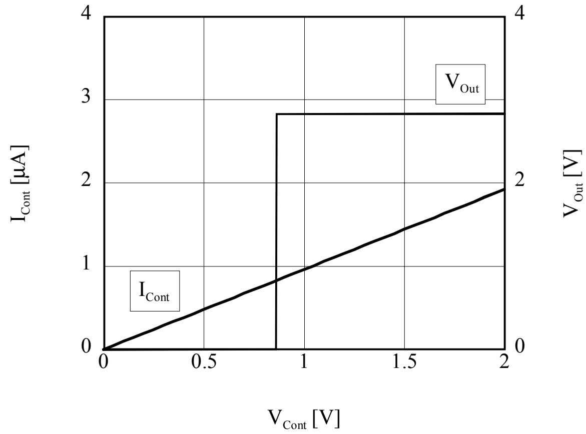
■ I_{Cont}, V_{Out} vs V_{Cont} ($V_{Out, TYP}$=1.5V(TK632xxB/F))



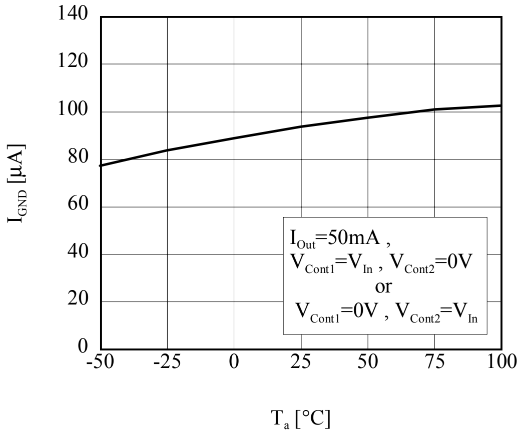
■ I_{GND} vs T_a ($V_{Out, TYP}$=2.8V(TK632xxB/F))



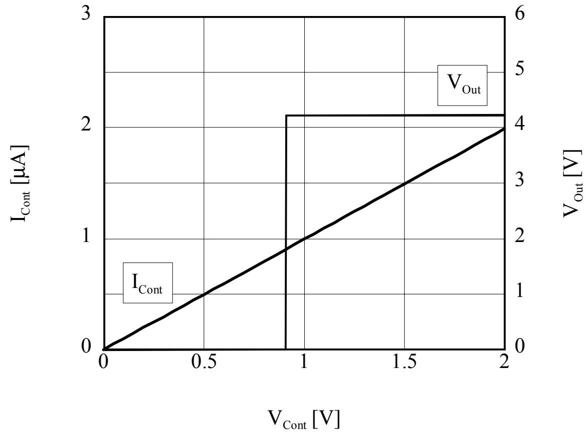
■ I_{Cont}, V_{Out} vs V_{Cont} ($V_{Out, TYP}$=2.8V(TK632xxB/F))



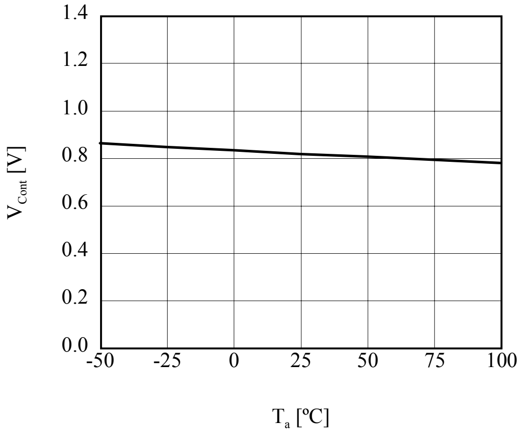
■ I_{GND} vs T_a ($V_{Out, TYP}$=4.2V(TK632xxB/F))



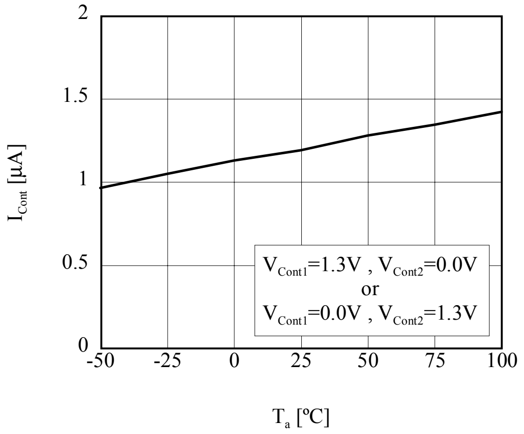
■ I_{Cont}, V_{Out} vs V_{Cont} ($V_{Out, TYP}$=4.2V(TK632xxB/F))



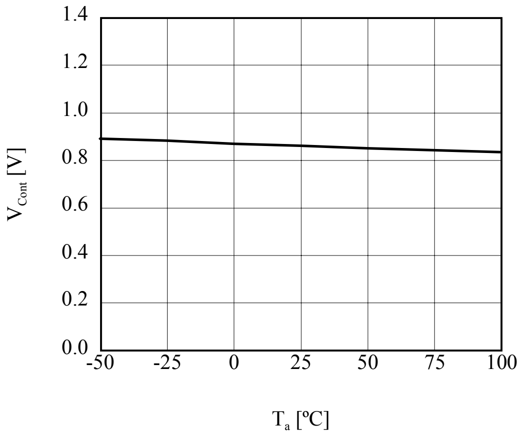
■ V_{Cont} (On/Off point) vs T_a
($V_{Out, TYP}$=1.5V(TK632xxB/F))



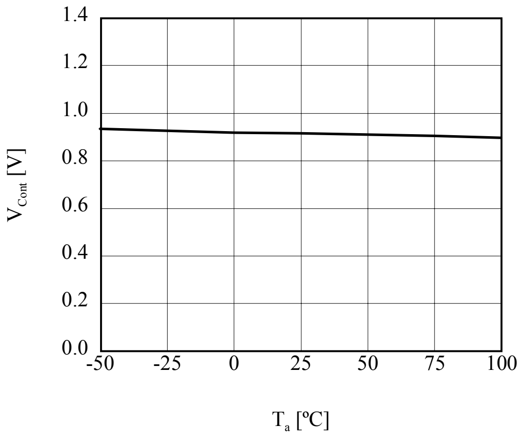
■ I_{Cont} vs T_a(TK632xxB/F)



■ V_{Cont} (On/Off point) vs T_a
($V_{Out, TYP}$=2.8V(TK632xxB/F))



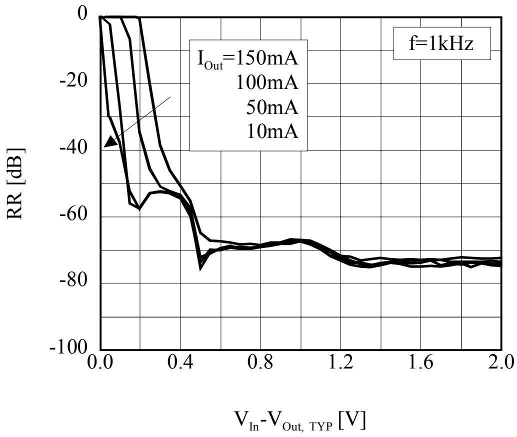
■ V_{Cont} (On/Off point) vs T_a
($V_{Out, TYP}$=4.2V(TK632xxB/F))



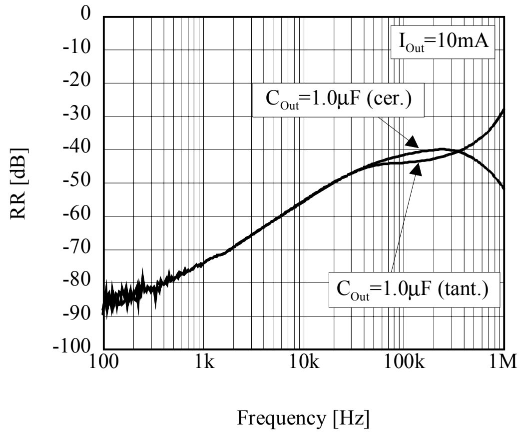
10-2. AC CHARACTERISTICS

Ripple Rejection

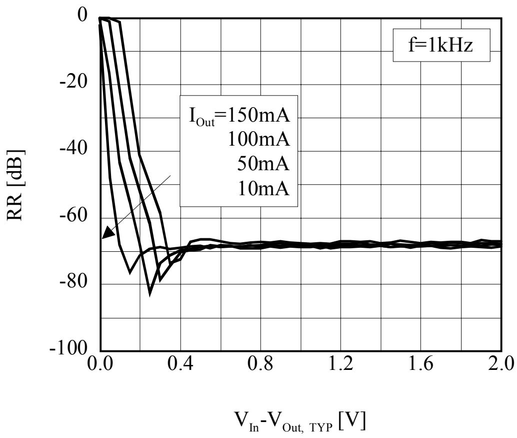
■ RR vs V_{In} ($V_{Out, TYP}$=1.5V(TK632xxB/F))



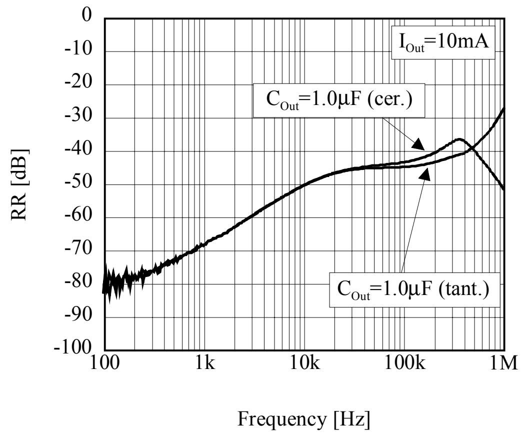
■ RR vs Frequency ($V_{Out, TYP}$=1.5V(TK632xxB/F))



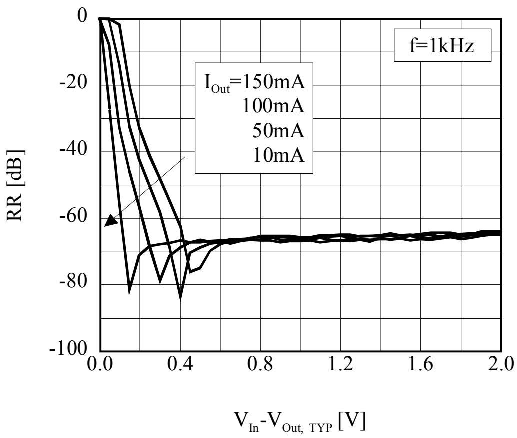
■ RR vs V_{In} ($V_{Out, TYP}$=2.8V(TK632xxB/F))



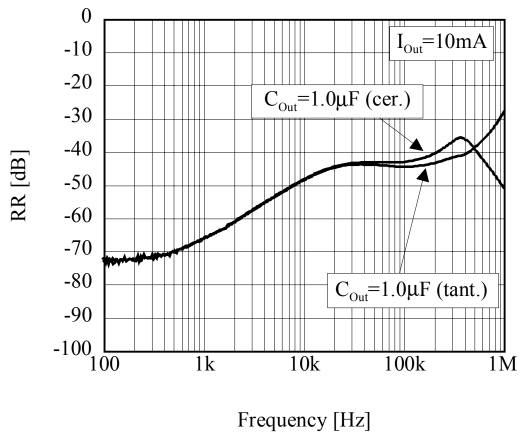
■ RR vs Frequency ($V_{Out, TYP}$=2.8V(TK632xxB/F))



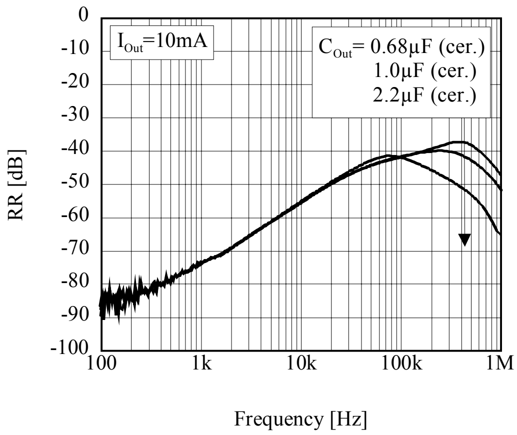
■ RR vs V_{In} ($V_{Out, TYP}$=4.2V(TK632xxB/F))



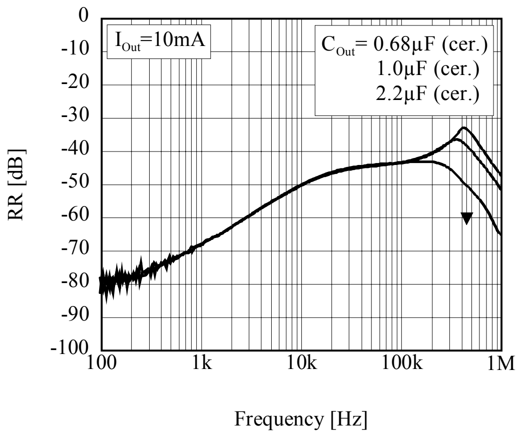
■ RR vs Frequency ($V_{Out, TYP}$=4.2V(TK632xxB/F))



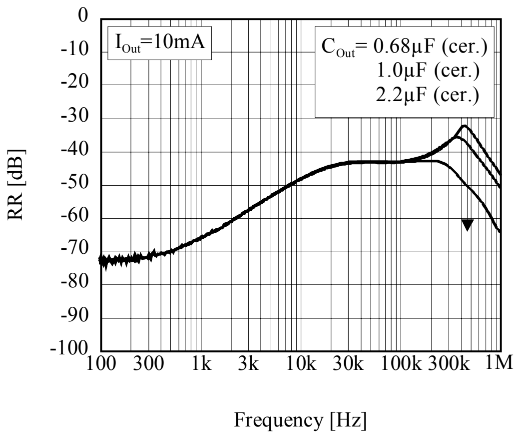
■ RR vs Frequency ($V_{Out, TYP}$=1.5V(TK632xxB/F))



■ RR vs Frequency ($V_{Out, TYP}$=2.8V(TK632xxB/F))



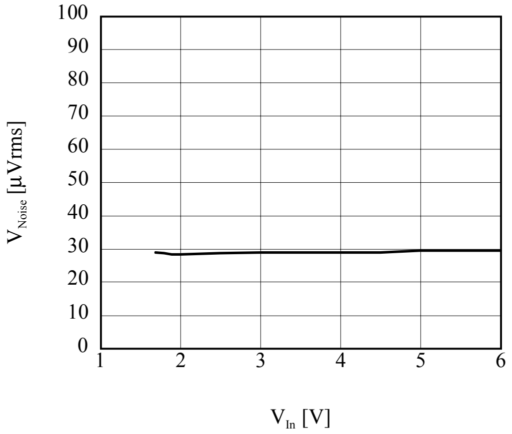
■ RR vs Frequency ($V_{Out, TYP}$=4.2V(TK632xxB/F))



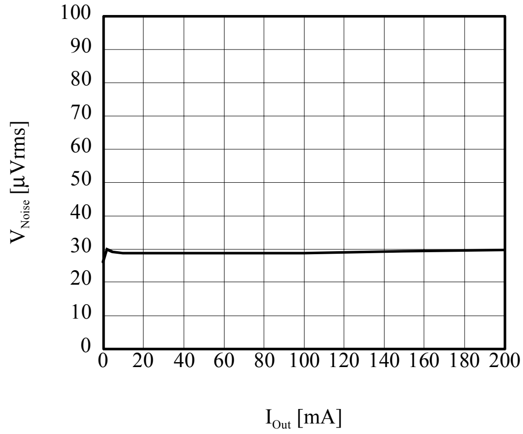
The ripple rejection (R.R) characteristic depends on the characteristic and the capacitance value of the capacitor connected to the output side. The R.R characteristic of 50kHz or more varies greatly with the capacitor on the output side and PCB pattern. If necessary, please confirm stability while operating.

Output Noise Characteristics

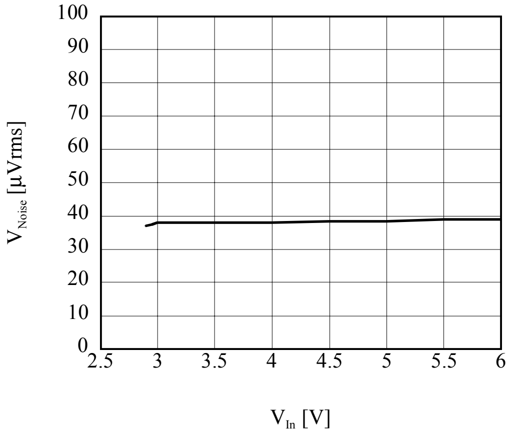
■ V_{Noise} vs V_{In} ($V_{Out, TYP}$=1.5V(TK632xxB/F))



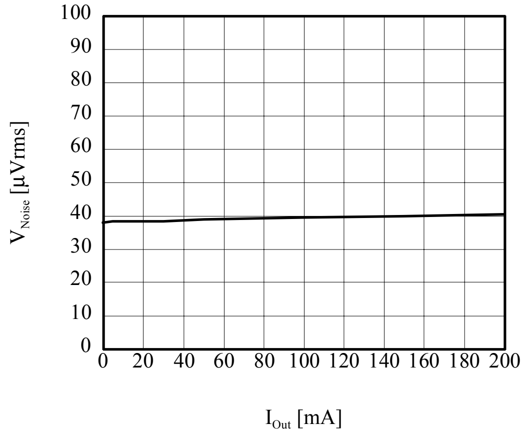
■ V_{Noise} vs I_{Out} ($V_{Out, TYP}$=1.5V(TK632xxB/F))



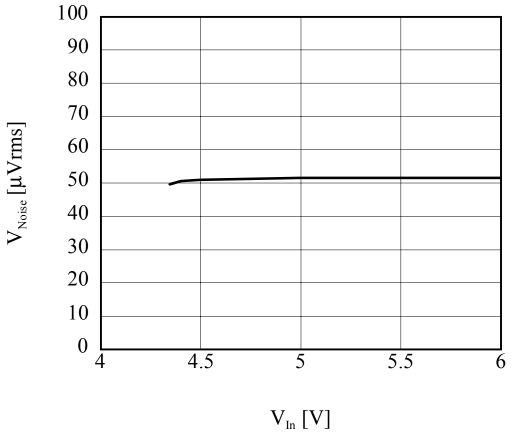
■ V_{Noise} vs V_{In} ($V_{Out, TYP}$=2.8V(TK632xxB/F))



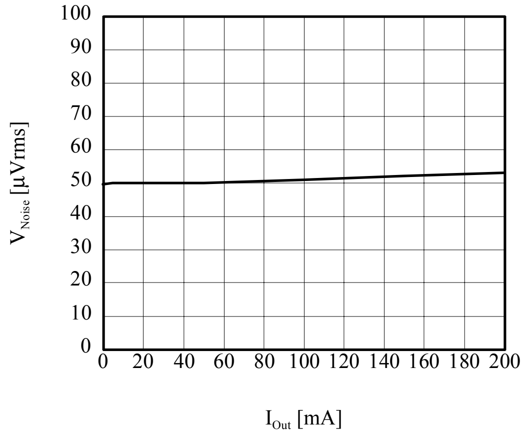
■ V_{Noise} vs I_{Out} ($V_{Out, TYP}$=2.8V(TK632xxB/F))



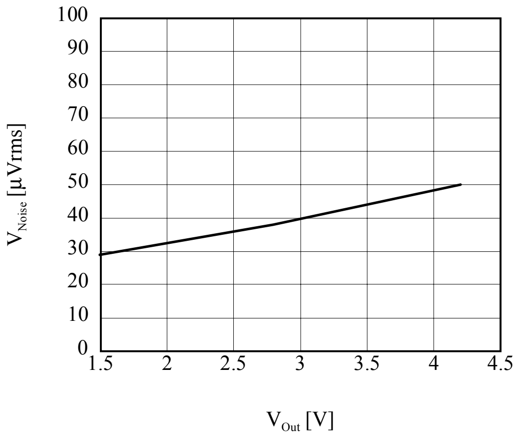
■ V_{Noise} vs V_{In} ($V_{Out, TYP}$=4.2V(TK632xxB/F))



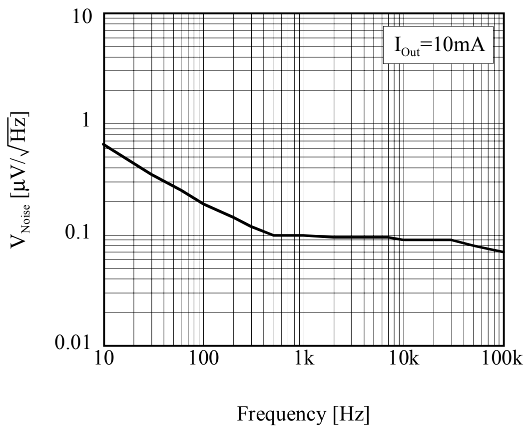
■ V_{Noise} vs I_{Out} ($V_{Out, TYP}$=4.2V(TK632xxB/F))



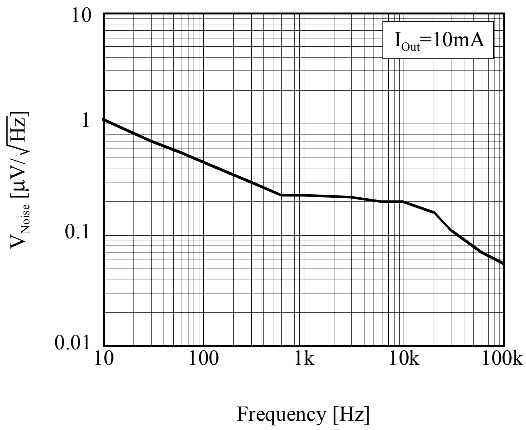
■ V_{Noise} vs V_{Out}(TK632xxB/F)



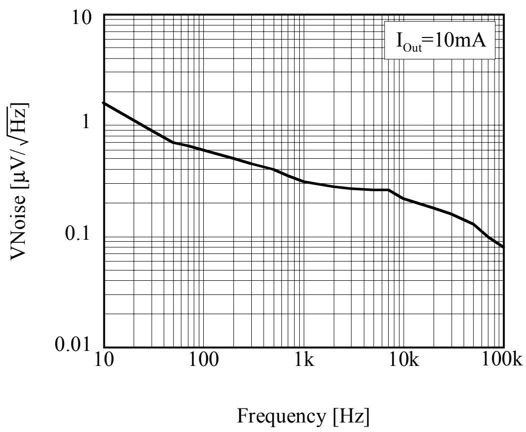
■ V_{Noise} vs Frequency ($V_{Out, TYP}$=1.5V(TK632xxB/F))



■ V_{Noise} vs Frequency ($V_{Out, TYP}$=2.8V(TK632xxB/F))

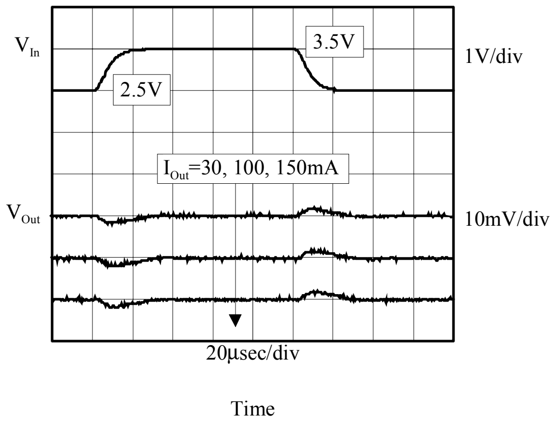


■ V_{Noise} vs Frequency ($V_{Out, TYP}$=4.2V(TK632xxB/F))

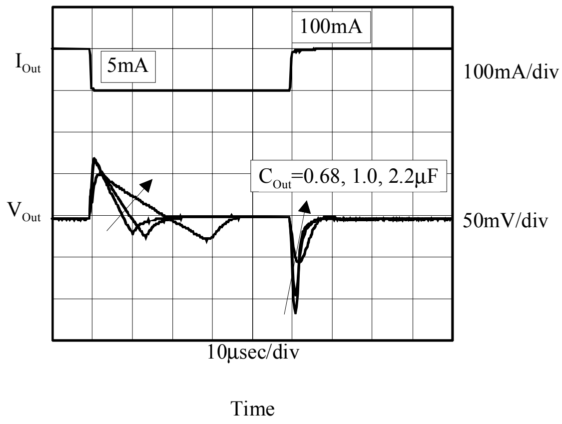


10-3. TRANSIENT CHARACTERISTICS

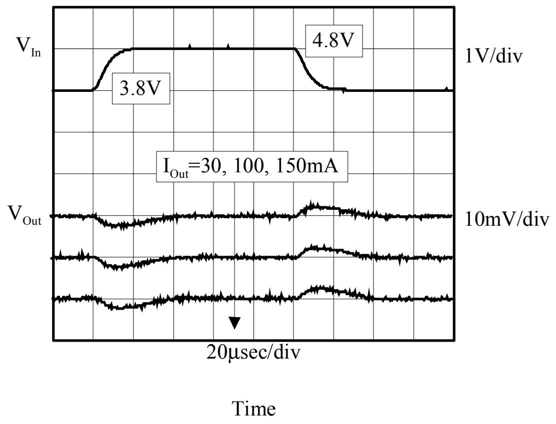
■ Line Transient ($V_{Out,\ TYP}$=1.5V(TK632xxB/F))



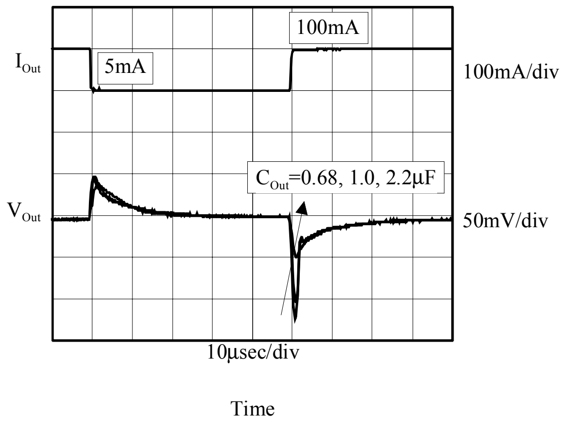
■ Load Transient (I_{Out}=5↔100mA) ($V_{Out,\ TYP}$=1.5V(TK632xxB/F))



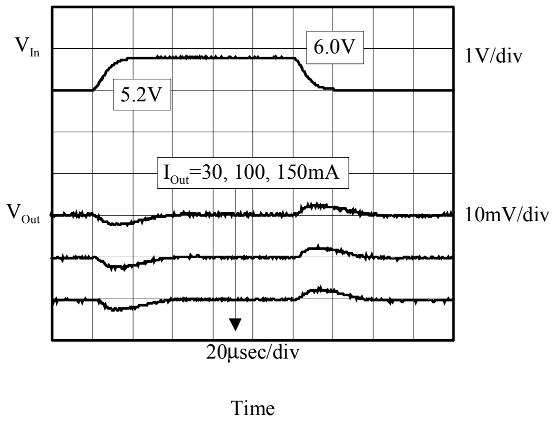
■ Line Transient ($V_{Out,\ TYP}$=2.8V(TK632xxB/F))



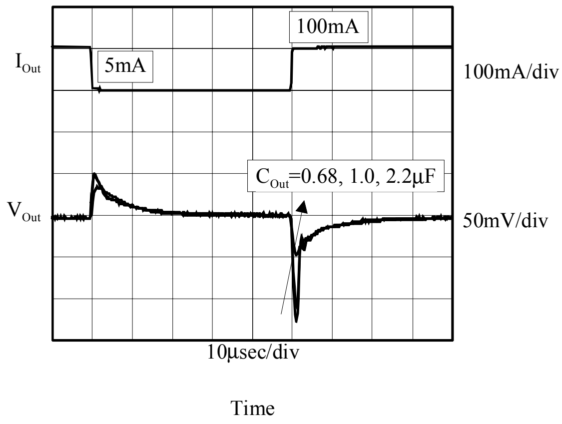
■ Load Transient (I_{Out}=5↔100mA) ($V_{Out,\ TYP}$=2.8V(TK632xxB/F))



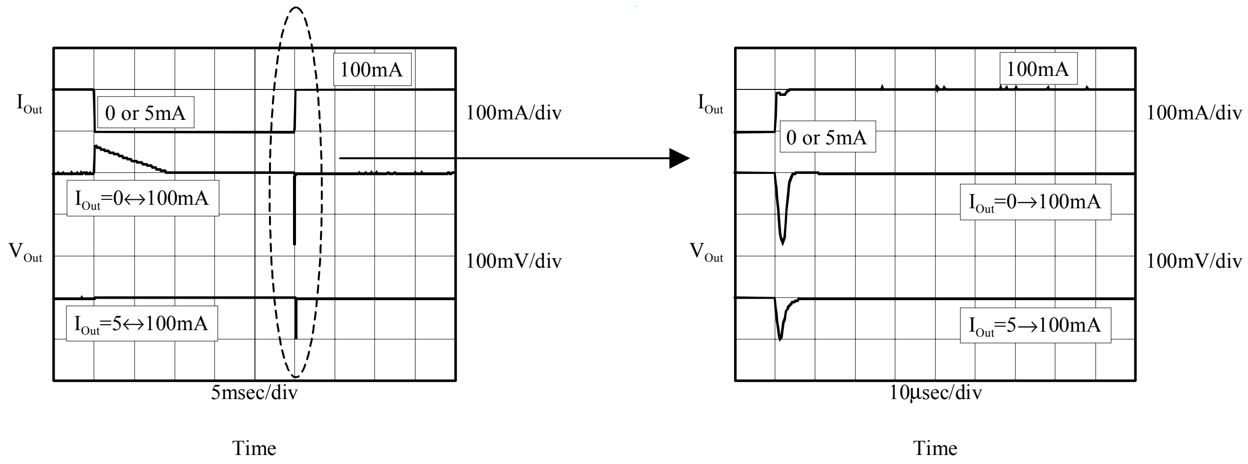
■ Line Transient ($V_{Out,\ TYP}$=4.2V(TK632xxB/F))



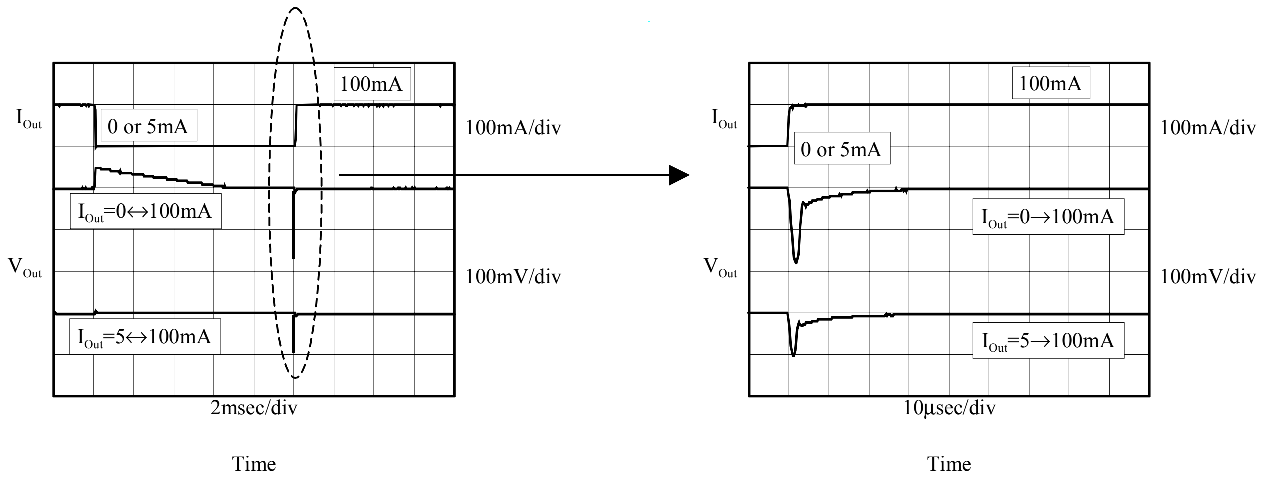
■ Load Transient (I_{Out}=5↔100mA) ($V_{Out,\ TYP}$=4.2V(TK632xxB/F))



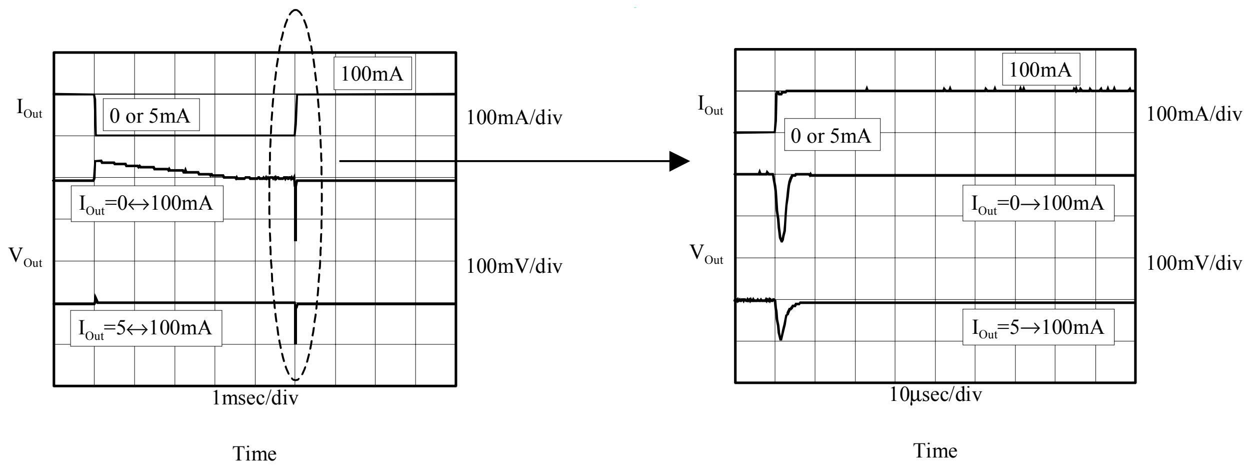
■ Load Transient (I_{Out}=0↔100mA)
($V_{Out, TYP}$=1.5V(TK632xxB/F))



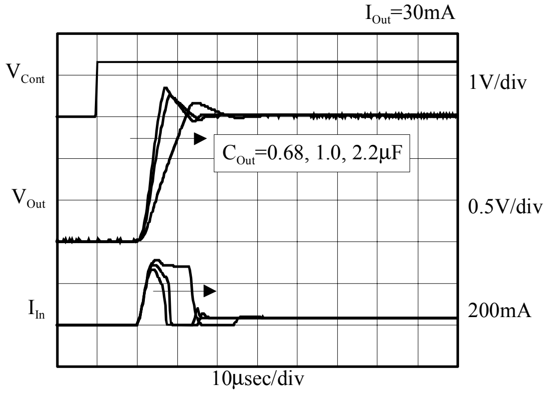
■ Load Transient (I_{Out}=0↔100mA)
($V_{Out, TYP}$=2.8V(TK632xxB/F))



■ Load Transient (I_{Out}=0↔100mA)
($V_{Out, TYP}$=4.2V(TK632xxB/F))

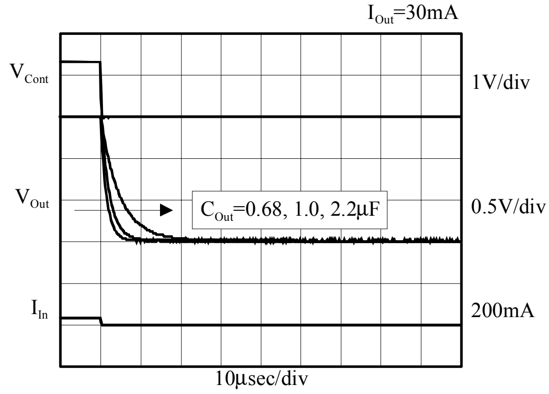


■ On/Off Transient (V_{Cont}=0→1.3V) ($V_{Out, TYP}$=1.5V(TK632xxB/F))



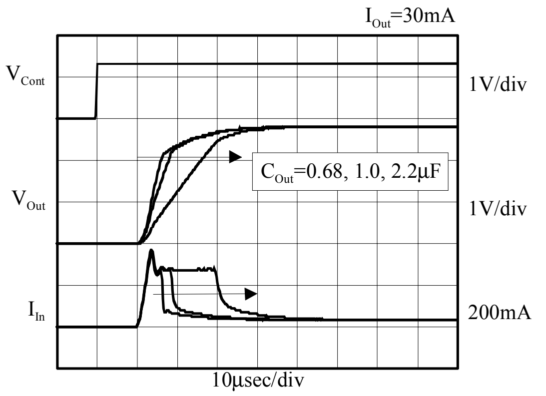
Time

■ On/Off Transient (V_{Cont}=1.3→0V) ($V_{Out, TYP}$=1.5V(TK632xxB/F))



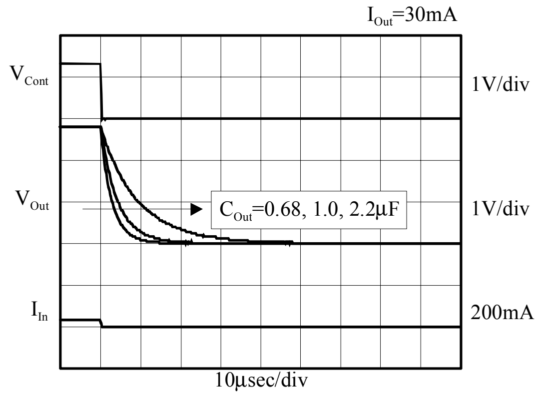
Time

■ On/Off Transient (V_{Cont}=0→1.3V) ($V_{Out, TYP}$=2.8V(TK632xxB/F))



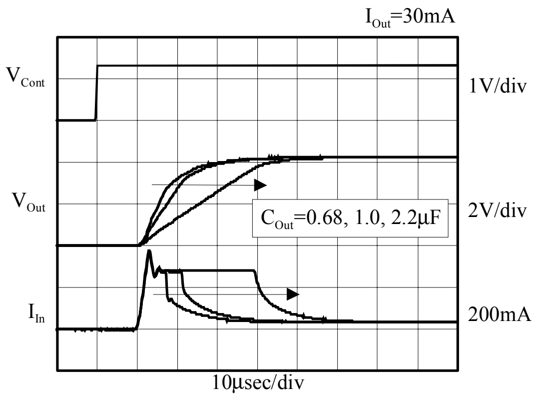
Time

■ On/Off Transient (V_{Cont}=1.3→0V) ($V_{Out, TYP}$=2.8V(TK632xxB/F))



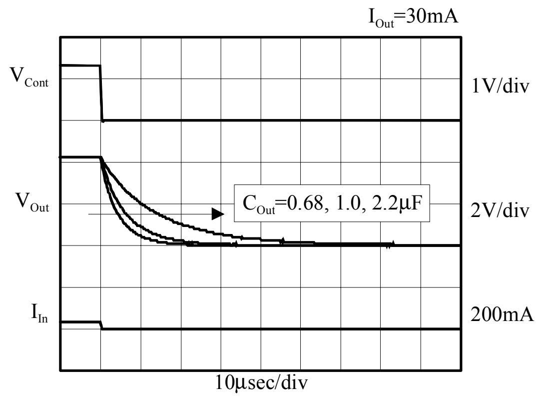
Time

■ On/Off Transient (V_{Cont}=0→1.3V) ($V_{Out, TYP}$=4.2V(TK632xxB/F))



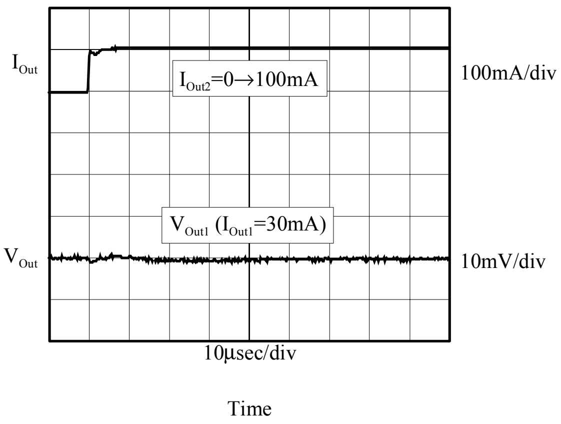
Time

■ On/Off Transient (V_{Cont}=1.3→0V) ($V_{Out, TYP}$=4.2V(TK632xxB/F))

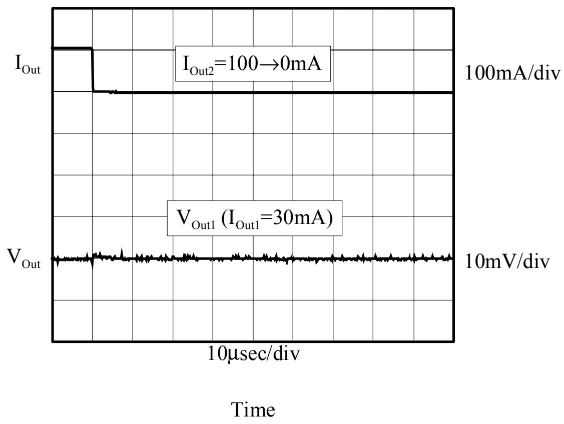


Time

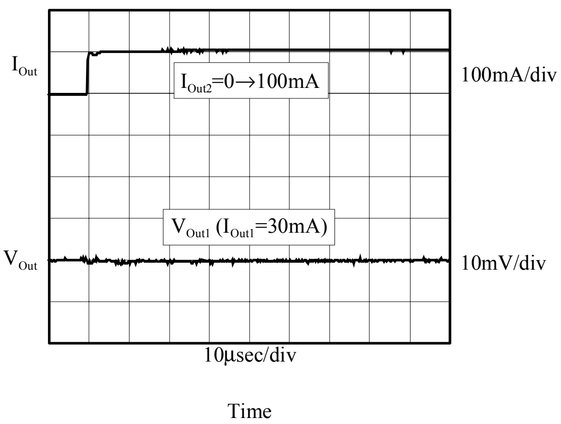
■ Crosstalk ($V_{Out, TYP}$=1.5V(TK632xxB/F))



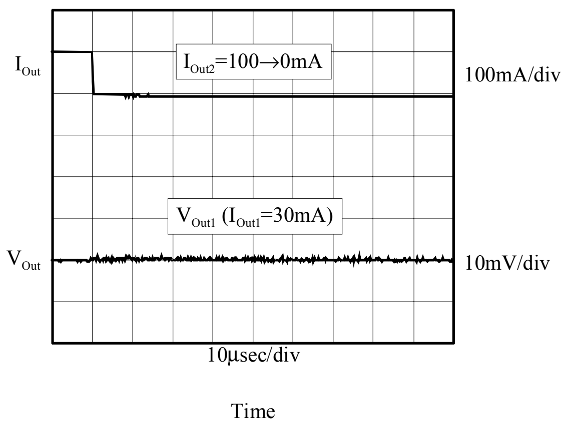
■ Crosstalk ($V_{Out, TYP}$=1.5V(TK632xxB/F))



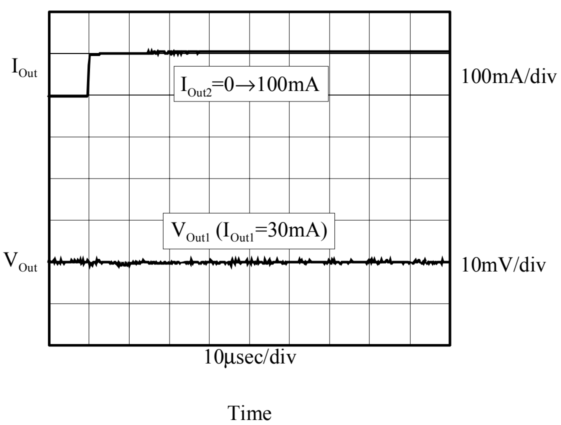
■ Crosstalk ($V_{Out, TYP}$=2.8V(TK632xxB/F))



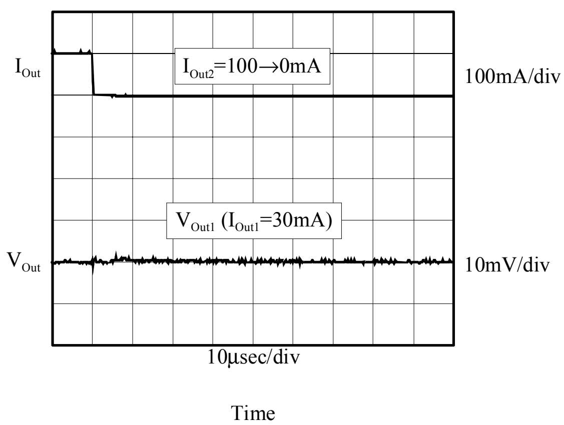
■ Crosstalk ($V_{Out, TYP}$=2.8V(TK632xxB/F))



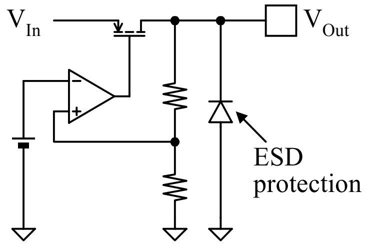
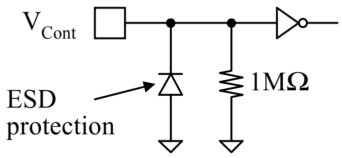
■ Crosstalk ($V_{Out, TYP}$=4.2V(TK632xxB/F))



■ Crosstalk ($V_{Out, TYP}$=4.2V(TK632xxB/F))



11. PIN DESCRIPTION

Pin No. TK632xxB	Pin No. TK632xxF	Pin Description	Internal Equivalent Circuit	Description
A1	1	V_{Out1}		Output Terminal
C1	4	V_{Out2}		
A2	8	V_{Cont1}		On/Off Control Terminal V_{Cont} > 1.3V : On V_{Cont} < 0.25V : Off The pull-down resister (about 1MΩ) is built-in. It is possible the control pin voltage is higher than the input terminal voltage.
C2	5	V_{Cont2}		
B1	2	V_{In1}		Input Terminal It is possible to input the different voltage to each input terminal by the separate power supply (TK632xxF).
	3	V_{In2}		
	6	NC		No Connected
B2	7	GND		GND Terminal

12. APPLICATIONS INFORMATION

12-1. Stability

Linear regulators require input and output capacitors in order to maintain the regulator's loop stability. If a 1.0µF capacitor is connected to the output side, the IC provides stable operation. However, it is recommended to use as large a value capacitor as is practical. The output noise and the ripple noise decrease as the value of the capacitor increases.

A recommended value of the application is as follows.

TK632xxB : C_{In}= 2 .2µF, C_{Out1}=C_{Out2}=1.0µF

TK632xxF : C_{In}= 1.0µF, C_{Out1}=C_{Out2}=1.0µF

It is not possible to determine this indiscriminately. Please confirm the stability in your design.

Fig12-1: Capacitor

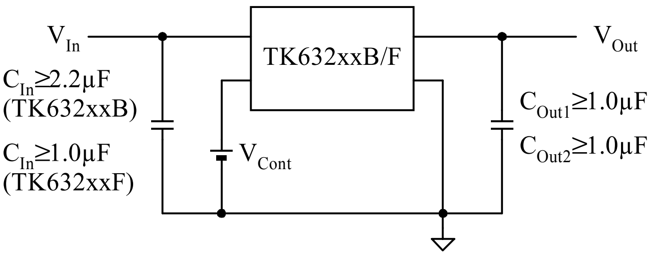


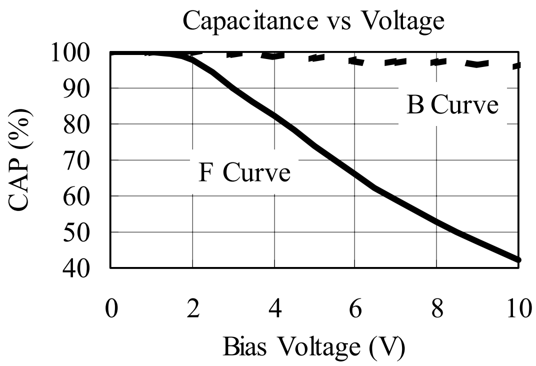
Fig.12-3~12-5 shows the stable operation area of output current and the equivalent series resistance (ESR) with a ceramic capacitor of 1.0µF. ESR of the output capacitor must be in the stable operation area. Please select the best output capacitor according to the voltage and current used. The stability of the regulator improves if a big output side capacitor is used (the stable operation area extends.) Please use as large a capacitance as is practical.

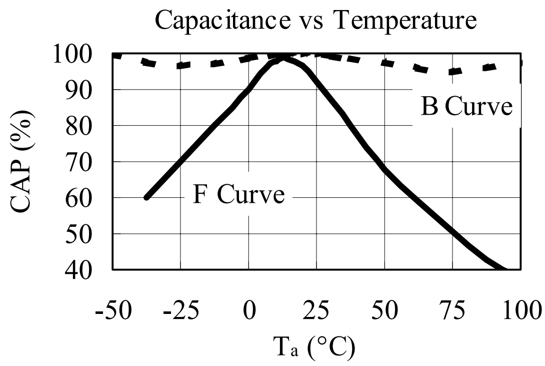
For evaluation

Kyocera : CM05B104K10AB , CM05B224K10AB , CM105B104K16A , CM105B224K16A , CM21B225K10A

Murata : GRM36B104K10 , GRM42B104K10 , GRM39B104K25 , GRM39B224K10 , GRM39B105K6.3

Fig12-2: ex. Ceramic Capacitance vs. Voltage, Temperature





Generally, a ceramic capacitor has both a temperature characteristic and a voltage characteristic. Please consider both characteristics when selecting the part. The B curves are the recommend characteristics.

Fig12-3: TK632xxB Output Current vs Stable Operation Area (C_{In}=2.2µF, C_{Out1}=C_{Out2}=1.0µF)

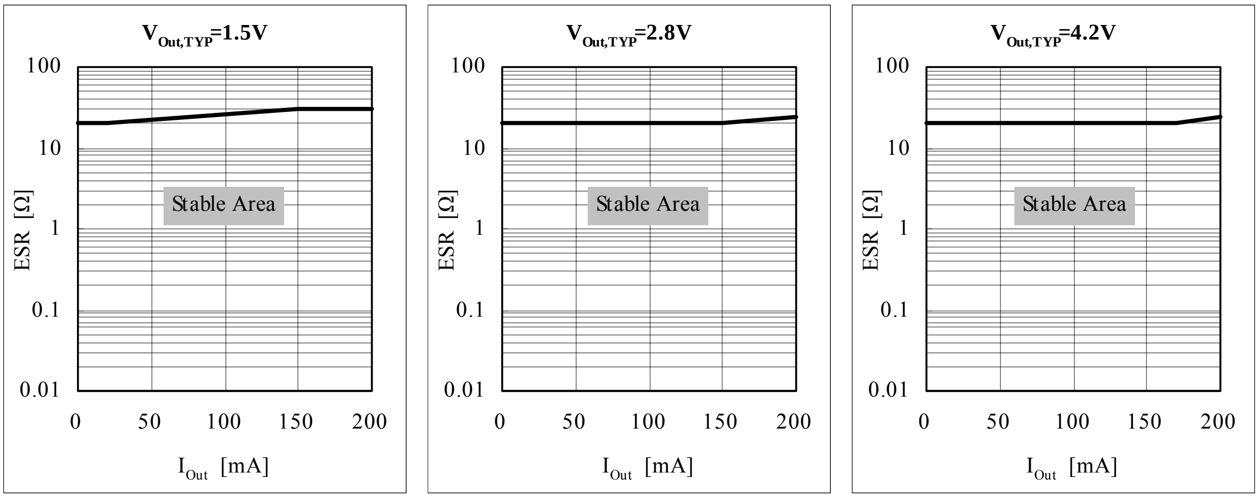


Fig12-4: TK632xxB Output Current vs Stable Operation Area (C_{In}=1.0µF, C_{Out1}=C_{Out2}=1.0µF)

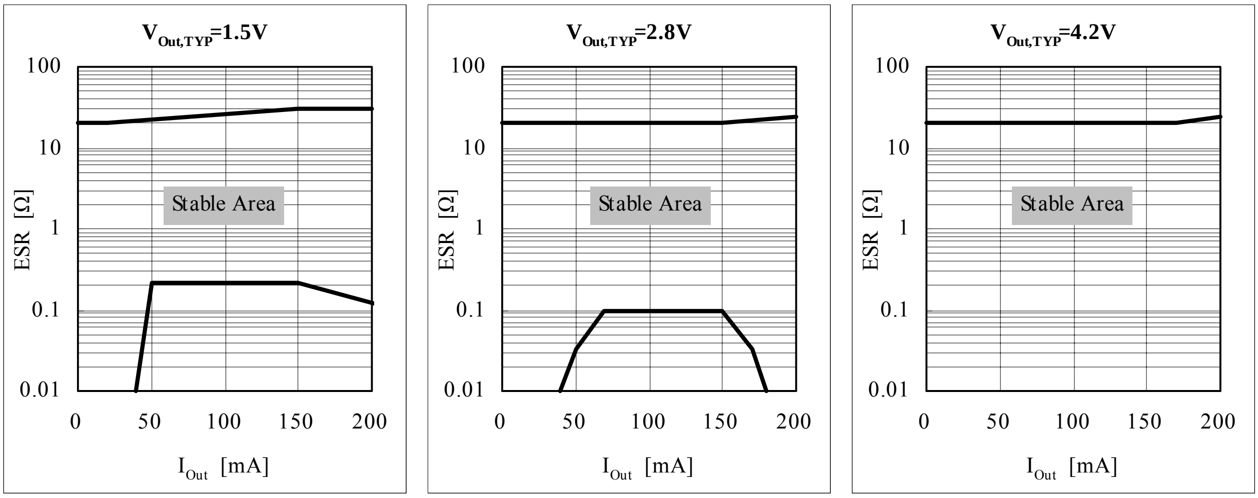
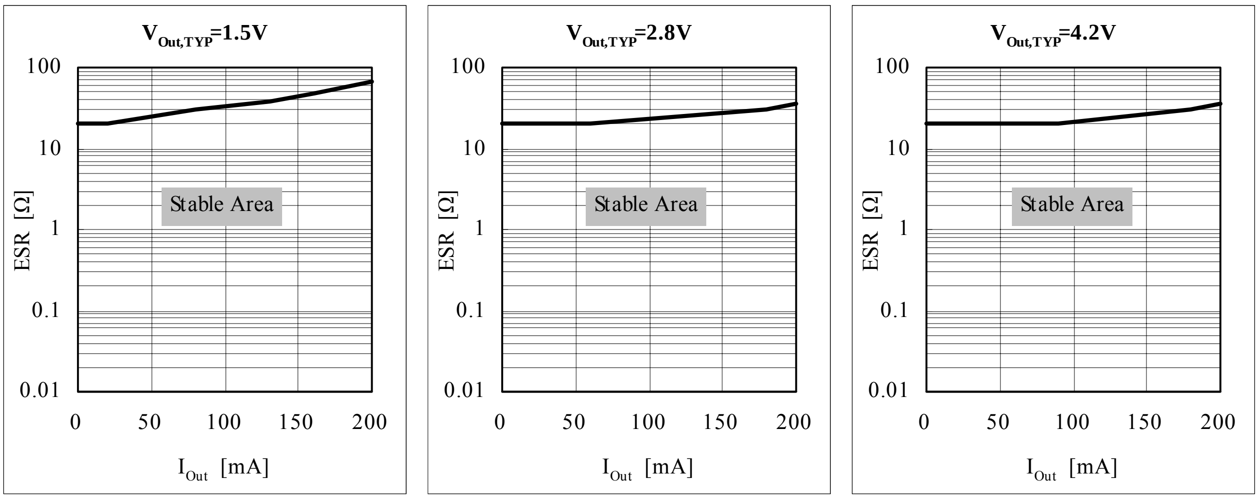
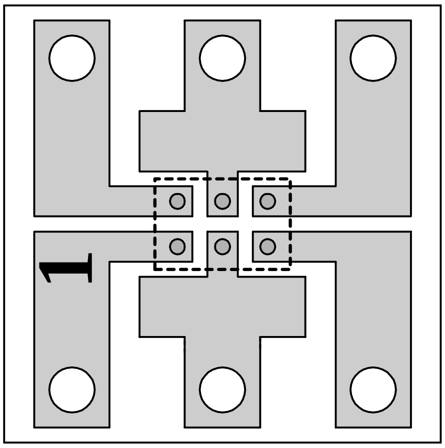


Fig12-5: TK632xxF Output Current vs Stable Operation Area (C_{In}=1.0µF, C_{Out1}=C_{Out2}=1.0µF)



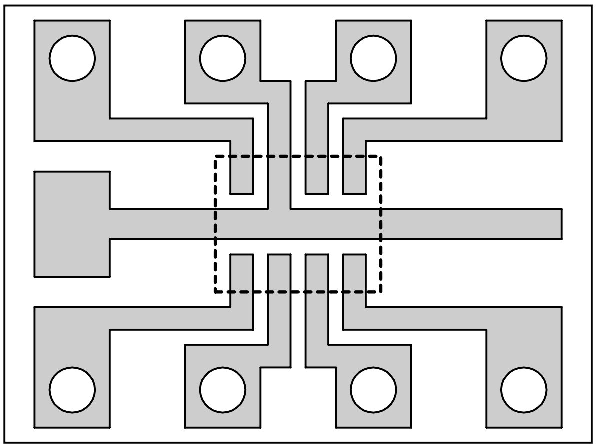
12-2. Layout

Fig12-6: Layout example (TK632xxB)



PCB Material : Glass epoxy
Size : 7mm×8mm×0.8mm

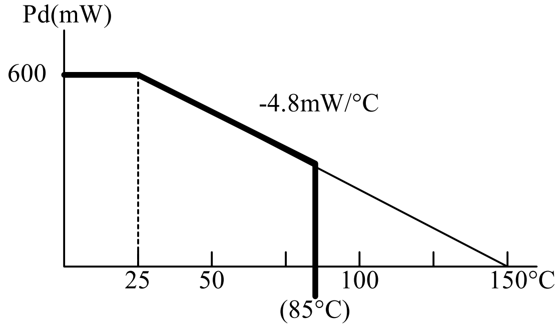
Fig12-7: Layout example (TK632xxF)



PCB Material : Glass epoxy
Size : 6.5mm×10mm×0.8mm

Please do derating with 4.8mW/°C at Pd=600mW and 25°C or more. Thermal resistance (θ_{ja}) is=208°C/W.

Fig12-8: Delating curve



The package loss is limited at the temperature that the internal temperature sensor works (about 150°C). Therefore, the package loss is assumed to be an internal limitation. There is no heat radiation characteristic of the package unit assumed because of its small size. Heat is carried away from the device by being mounted on the PCB. This value is directly effected by the material and the copper pattern etc. of the PCB. The losses are approximately 600mW. Enduring these losses becomes possible in a lot of applications operating at 25°C.

The overheating protection circuit operates when the junction temperature reaches 150°C (this happens when the regulator is disspating excessive power, outside temperature is high, or heat radiation is bad). The output current and the output voltage will drop when the protection circuit operates. However, operation begins again as soon as the output voltage drops and the temperature of the chip decreases.

How to determine the thermal resistance when mounted on PCB

The thermal resistance when mounted is expressed as follows:

$$T_j=\theta_{ja}\times Pd+T_a$$

T_j of IC is set around 150°C. Pd is the value when the thermal sensor is activated.

If the ambient temperature is 25°C, then:

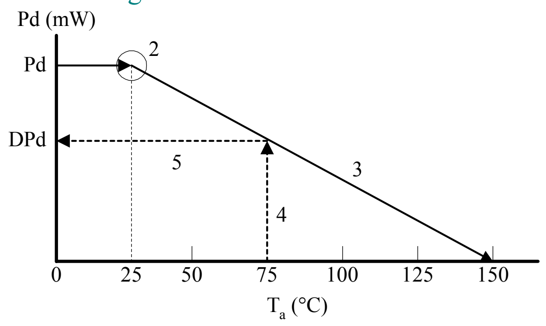
$$150=\theta_{ja}\times Pd+25$$

$$\theta_{ja}=125/Pd\ (°C\ /mW)$$

Pd is easily calculated.

A simple way to determine Pd is to calculate $V_{In}\times I_{In}$ when the output side is shorted. Input current gradually falls as temperature rises. You should use the value when thermal equilibrium is reached. In many cases, heat radiation is good, Pd is 600mW or more.

Fig12-9: How to determine Pd



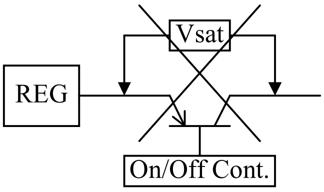
Procedure (When mounted on PCB.)

1. Find Pd ($V_{In} \times I_{In}$ when the output side is short-circuited).
2. Plot Pd against 25°C.
3. Connect Pd to the point corresponding to the 150°C with a straight line.
4. In design, take a vertical line from the maximum operating temperature (e.g., 75°C) to the derating curve.
5. Read off the value of Pd against the point at which the vertical line intersects the derating curve. This is taken as the maximum power dissipation DPd.
6. DPd ÷ ($V_{In,MAX}-V_{Out}$)=I_{Out} (at 75°C)

The maximum output current at the highest operating temperature will be $I_{Out} \cong DPd \div (V_{In,MAX}-V_{Out})$.
Please use the device at low temperature with better radiation. The lower temperature provides better quality.

12-3. On/Off Control

It is recommended to turn the regulator Off when the circuit following the regulator is not operating. A design with little electric power loss can be implemented. We recommend the use of the On/Off control of the regulator without using a high side switch to provide an output from the regulator. A highly accurate output voltage with low voltage drop is obtained.
Because the control current is small, it is possible to control it directly by CMOS logic.



Control Terminal Voltage (V_{Cont})	On/Off State
$V_{Cont} > 1.3V$	On
$V_{Cont} < 0.25V$	Off

12-4. Influence by Light (TK632xxB)

When this IC is exposed to strong light, IC, the electric characteristics change. Please confirm the influence by light in your design.

12-5. Definition of term

Characteristics

♦ Output Voltage (V_{Out})
The output voltage is specified with V_{In}=(V_{OutTYP}+1V) and I_{Out}=5mA.

♦ Maximum Output Current ($I_{Out, MAX}$)
The rated output current is specified under the condition where the output voltage drops 0.9V times the value specified with I_{Out}=5mA. The input voltage is set to V_{OutTYP}+1V and the current is pulsed to minimize temperature effect.

♦ Dropout Voltage (V_{Drop})
The dropout voltage is the difference between the input voltage and the output voltage at which point the regulator starts to fall out of regulation. Below this value, the output voltage will fall as the input voltage is reduced. It is dependent upon the output voltage and the load current and the junction temperature.

♦ Line Regulation (LinReg)
Line regulation is the ability of the regulator to maintain a constant output voltage as the input voltage changes. The line regulation is specified as the input voltage is changed from V_{In}=$V_{Out,TYP}$+1V to V_{In}=6V. It is a pulse measurement to minimize temperature effect.

♦ Load Regulation (LoaReg)
Load regulation is the ability of the regulator to maintain a constant output voltage as the load current changes. It is a pulsed measurement to minimize temperature effects with the input voltage set to V_{In}=$V_{Out,TYP}$+1V. The load regulation is specified under an output current step condition of 5mA to 100mA.

♦ Ripple Rejection (R.R)
Ripple rejection is the ability of the regulator to attenuate the ripple content of the input voltage at the output. It is specified with 500mV_{rms}, 1kHz super-imposed on the input voltage, where V_{In}=$V_{Out,TYP}$+1.5V. Ripple rejection is the ratio of the ripple content of the output vs. input and is expressed in dB.

♦ Standby Current ($I_{Standby}$)
Standby current is the current which flows into the regulator when the output is turned off by the control function (V_{Cont}=0V).

Protections

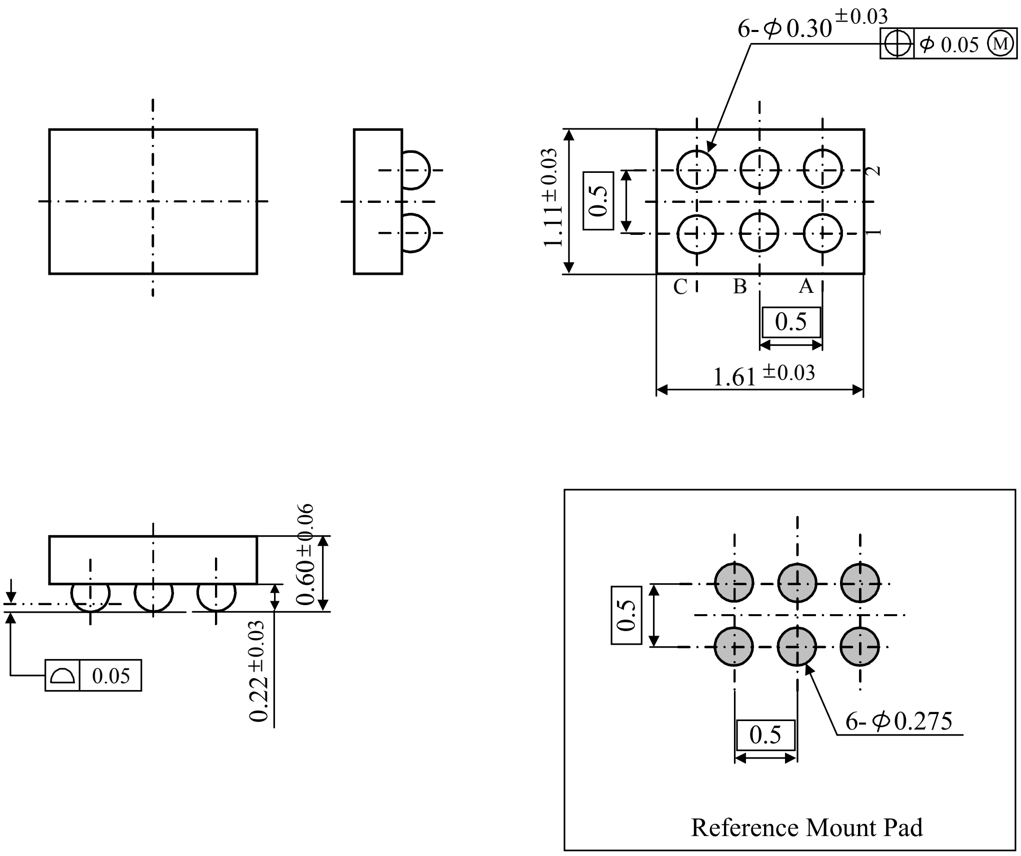
♦ Over Current Sensor
The over current sensor protects the device when there is excessive output current. It also protects the device if the output is accidentally connected to ground. (When external transistor is used, the protection operates at 10mA at the base terminal)

♦ Thermal Sensor
The thermal sensor protects the device in case the junction temperature exceeds the safe value (T_j=150°C). This temperature rise can be caused by external heat, excessive power dissipation caused by large input to output voltage drops, or excessive output current. The regulator will shut off when the temperature exceeds the safe value. As the junction temperatures decrease, the regulator will begin to operate again. Under sustained fault conditions, the regulator output will oscillate as the device turns off then resets. Damage may occur to the device under extreme fault.
Please prevent the loss of the regulator when this protection operates, by reducing the input voltage or providing better heat efficiency.

♦ ESD
MM : 200pF 0Ω 150V or more
HBM : 100pF 1.5kΩ 2000V or more

13. PACKAGE OUTLINE

■ FC-6



Unit : mm

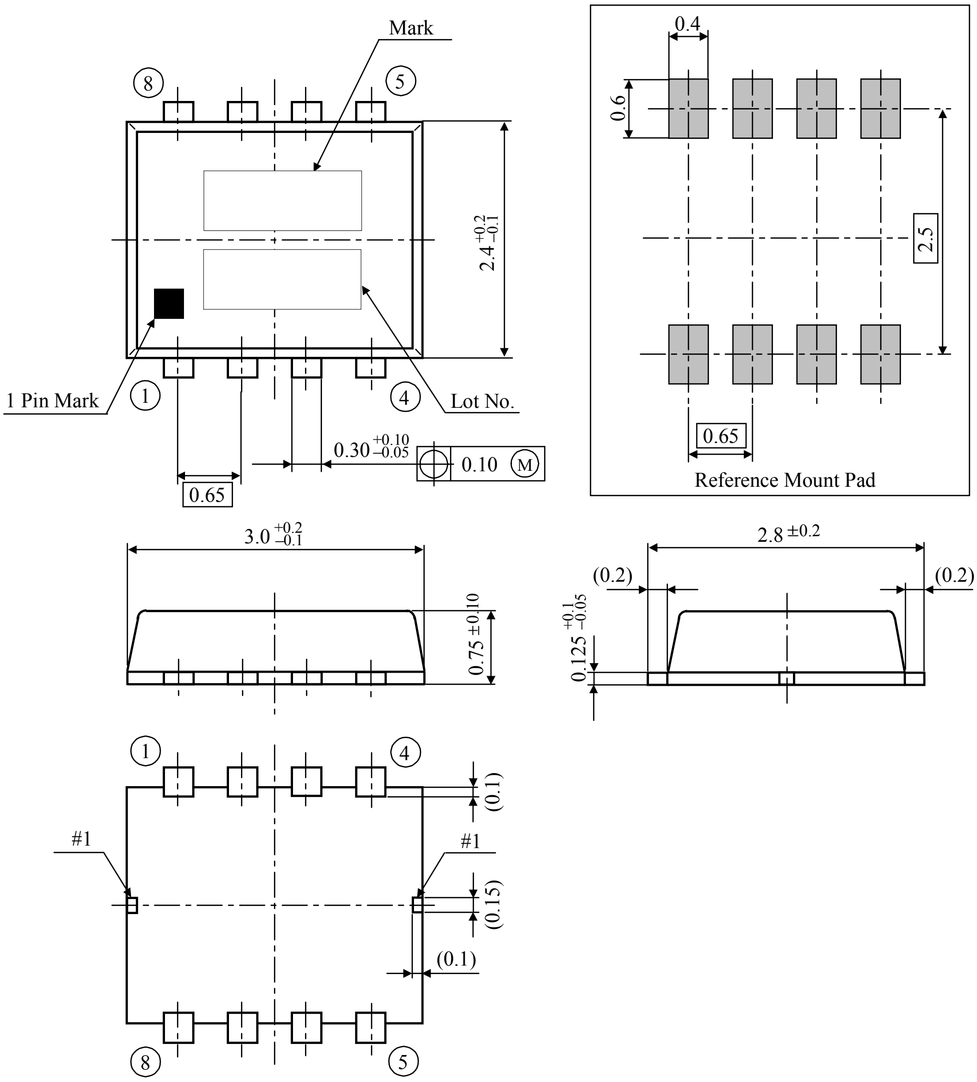
Package Structure and Others

Base Material	: Si	Mark Method	: Laser
Terminal Material	: Solder Bump	Country of Origin	: Japan

Marking

Part Number	Marking Code	Part Number	Marking Code	Part Number	Marking Code
TK63201B	A01	TK63202B	A02	TK63203B	A03

■ SON3024-8



Unit : mm

Package Structure and Others

Package Material	: Epoxy Resin	Mark Method	: Laser
Terminal Material	: Copper Alloy	Country of Origin	: Japan
Terminal Finish	: Solder Plating (5~15µm)	Mass	: 0.015g

Caution in Printed Circuit Board Layout

In addition to the normal pins, this plastic package has exposed metal tabs on two edges.(#1)
These tabs are electrically connected to the internal chip.
Exercise caution when determining package location on PCB layout.
Avoid electrical contact with these tabs from external print traces, adjacent components, etc.

Part Number	Marking Code	Part Number	Marking Code	Part Number	Marking Code
TK63201F	A01	TK63203F	A03	TK63205F	A05
TK63202F	A02	TK63204F	A04	TK63206F	A06

14. NOTES

■ Please be sure that you carefully discuss your planned purchase with our office if you intend to use the products in this application manual under conditions where particularly extreme standards of reliability are required, or if you intend to use products for applications other than those listed in this application manual.

- Power drive products for automobile, ship or aircraft transport systems; steering and navigation systems, emergency signal communications systems, and any system other than those mentioned above which include electronic sensors, measuring, or display devices, and which could cause major damage to life, limb or property if misused or failure to function.
- Medical devices for measuring blood pressure, pulse, etc., treatment units such as coronary pacemakers and heat treatment units, and devices such as artificial organs and artificial limb systems which augment physiological functions.
- Electrical instruments, equipment or systems used in disaster or crime prevention.

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■ None of the ozone depleting substances(ODS) under the Montreal Protocol are used in our manufacturing process.

15. OFFICES

If you need more information on this product and other TOKO products, please contact us.

■ TOKO Inc. Headquarters
1-17, Higashi-yukigaya 2-chome, Ohta-ku, Tokyo,
145-8585, Japan
TEL: +81.3.3727.1161
FAX: +81.3.3727.1176 or +81.3.3727.1169
Web site: http://www.toko.co.jp/

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