UTC LD3870 LINEAR INTEGRATED CIRCUIT

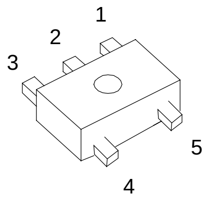
LOW DROPOUT VOLTAGE REGULATOR

DESCRIPTION

The UTC LD3870 is low dropout voltage regulator designed for cellular phone application.

FEATURES

* High Ripple Rejection: 56dB≤RR(DC<f<60kHz)
  66dB typ. (f=100Hz)
  60dB typ. (f=1kHz)
* Output Noise Voltage: Vno=30ＭV , Cp=0.01μF
* Output Current: Io(max)=150mA
* High Precision Output: Vo±2%
* Low Dropout Voltage: △V_{I-O}=0.12V typ.
  (Io=60mA,Vo≥1.8V)
* Input Voltage range: +2~+14V(Vo=1.5V Version)
* ON/OFF Control: Active High
* Output capacitor with 4.7uF ceramic capacitor
* Internal Short Circuit Current Limit
* Internal Thermal Overload Protection



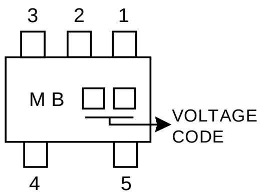
SOT-25

1:CONTROL(Active High) 2:GND
3:NOISE BYPASS 4:V_{OUT} 5: V_{IN}

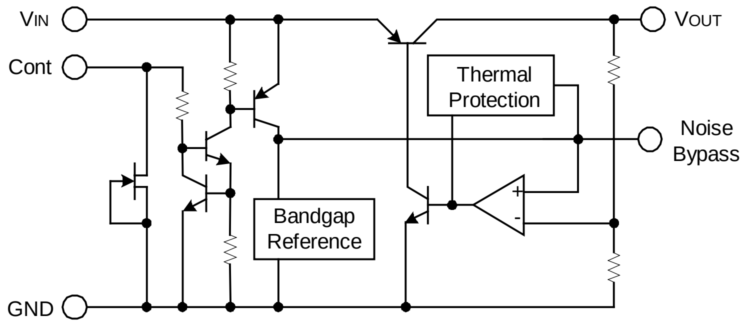
MARKING INFORMATION

PART NUMBER	VOLTAGE	VOLATGE CODE	PART NUMBER	VOLTAGE	VOLATGE CODE
LD3870-1.5V	1.5V	15	LD3870-3.1V	3.1V	31
LD3870-1.8V	1.8V	18	LD370-3.2V	3.2V	32
LD3870-1.9V	1.9V	19	LD3870-3.3V	3.3V	33
LD3870-2.0V	2.0V	20	LD3870-3.4V	3.4V	34
LD3870-2.1V	2.1V	21	LD3870-3.5V	3.5V	35
LD3870-2.3V	2.3V	23	LD3870-3.6V	3.6V	36
LD3870-2.4V	2.4V	24	LD3870-3.8V	3.8V	38
LD3870-2.5V	2.5V	25	LD3870-4.0V	4.0V	40
LD3870-2.6V	2.6V	26	LD3870-4.5V	4.5V	45
LD3870-2.7V	2.7V	27	LD3870-4.6V	4.6V	46
LD3870-2.8V	2.8V	28	LD3870-4.7V	4.7V	47
LD3870-2.85V	2.85V	2J	LD3870-4.8V	4.8V	48
LD3870-2.9V	2.9V	29	LD3870-5.0V	5.0V	50
LD3870-3.0V	3.0V	30			

MARKING



BLOCK DAGRAM



ABSOLUTE MAXIMUM RATINGS (Ta=25℃)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	+14	V
Control Voltage	V_{CONT}	+14(Note 1)	V
Power Dissipation	P_D	200	mW
Operating Temperature	Topr	-40 ~ +85	℃
Storage Temperature	Tstg	-40 ~ +125	℃

Note 1: When input voltage is less than +14V,the absolute maximum control voltage is equal to the input voltage.

ELECTRICAL CHARACTERISTICS (V_{IN}=Vo+1V, C_{IN}=0.1μF, Co=4.7μF, Cp=0.01μF, Ta=25℃)

PARAMETER	SYMBOL	TEST CONDITONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	Io=30mA	-2%		+2%	V
Quiescent Current	I_Q	Io=0mA, expect Icont		200	300	μA
Quiescent Current At Control OFF	$I_{Q(OFF)}$	V_{CONT}=0V			100	nA
Output Current	Io	Vo-0.3V	150	200		mA
Line Regulation	△Vo/△V_{IN}	V_{IN}=Vo+1V ~ Vo+6V, Io=30mA			0.10	%/V
Load Regulation	△Vo/△Io	Io=0 ~ 100mA			0.03	%/mA
Dropout Voltage	△V_{I-O}	Io=60mA		0.12	0.2	V
Ripple Rejection	RR	ein=200mVrms, f=1kHz, Io=10mA, V_{IN}=Vo+2V, Vo=3V Version		60		dB
Average Temperature Coefficient of Output Voltage	△Vo/△Ta	Ta=0~85℃, Io=10mA, Vo=3V Version		0.2		mV/℃
Output Noise Voltage	V_{NO}	f=10Hz ~ 80kHz, Io=10mA, Vo=3V Version		30		μVrms
Control Voltage for ON-state	$V_{CONT(ON)}$		1.6			V
Control Voltage for OFF-state	$V_{CONT(OFF)}$				0.6	V

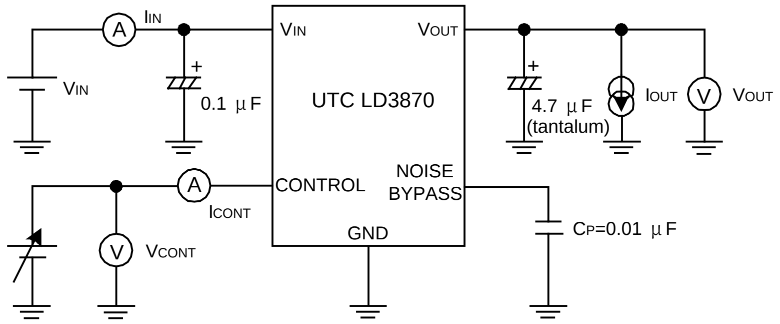
Note 2: The above specification is a common specification for all output voltages.Therefore, it may be different from the individual specification for a specific output voltage.

ELECTRICAL CHARACTERISTICS

(V_O=1.5V Version, V_{IN}=2.4V, C_{IN}=0.1μF, C_O=4.7μF, C_P=0.01μF, Ta=25℃)

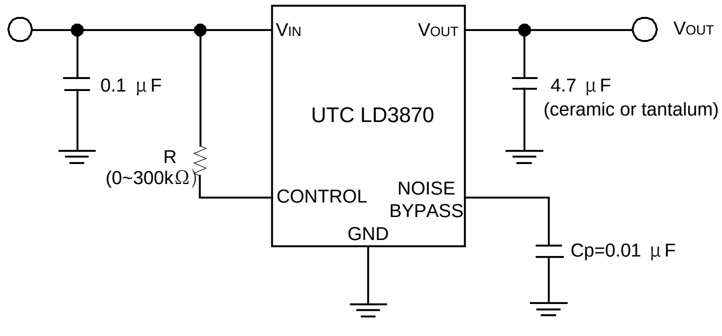
PARAMETER	SYMBOL	TEST CONDITONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_O	I_O=30mA	-2%		+2%	V
Quiescent Current	I_Q	I_O=0mA, expect Icont		200	300	μA
Quiescent Curretn At Control OFF	$I_{Q(OFF)}$	V_{CONT}=0V			100	nA
Output Curretn	I_O	V_O-0.3V	150	200		mA
Line Regulation	$\triangle V_O/\triangle V_{IN}$	V_{IN}=V_O+1V ~ V_O+6V, I_O=30mA			0.10	%/V
Load Regulation	$\triangle V_O/\triangle I_O$	I_O=0 ~ 100mA			0.03	%/mA
Ripple Rejection	RR	ein=200mVrms, f=1kHz, I_O=10mA, V_{IN}=V_O+2V		64		dB
Average Temperature Coefficient of Output Voltage	$\triangle V_O/\triangle Ta$	Ta=0 ~ 85℃, I_O=10mA		0.13		mV/℃
Output Noise Voltage	V_{NO}	f=10Hz ~ 80kHz, I_O=10mA		15		μVrms
Control Voltage for ON-state	$V_{CONT(ON)}$		1.6			V
Control Voltage for OFF-state	$V_{CONT(OFF)}$				0.6	V

TEST CIRCUIT



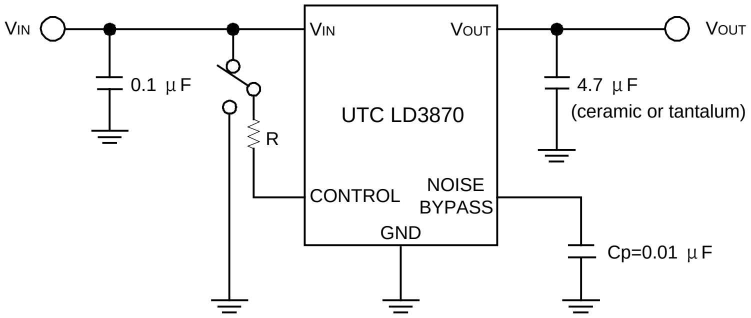
TYPICAL APPLICATON

① In case that ON/OFF Control is not required:



Connect control terminal to V_{IN} terminal
The quiescent current can be reduced by using a resistance “R”. Instead, it increases the minimum operating voltage.
For further information, please refer to Figure ”Output Voltage vs. Control Voltage”.

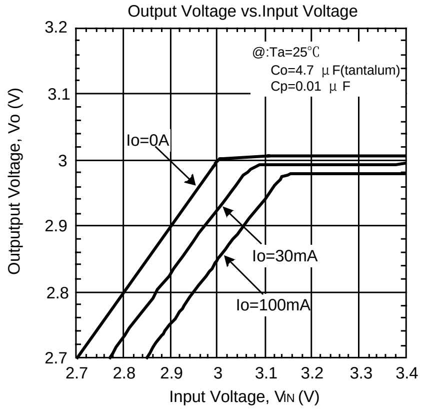
② In use of ON/OFF CONTROL:



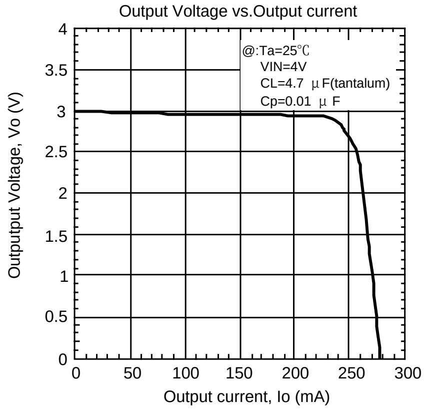
State of control terminal:
* ”H” → Output is enables.
* ”L”or “open” → Output is disabled.
* Noise bypass Capacitance Cp
  Noise bypass capacitance Cp reduces noise generated by hand-gap reference circuit.
  Noise level and ripple rejection will be improved when larger Cp is used.
  Use of smaller Cp value may cause oscillation.
  Use the Cp value of 0.01uF greater to avoid the problem.

TYPICAL CHARACTERISTICS

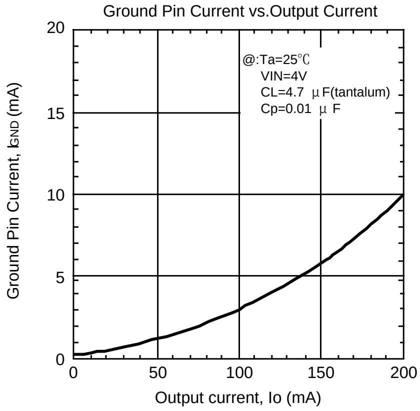
LD3870-3.0V
Output Voltage vs.Input Voltage



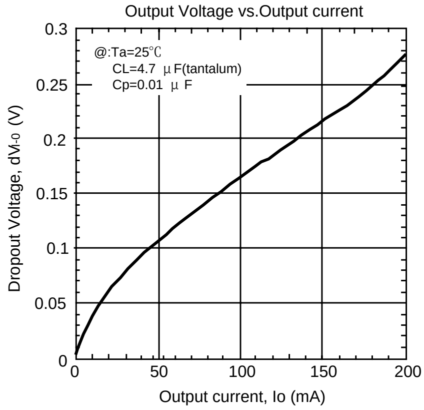
LD3870-3.0V
Output Voltage vs.Output current



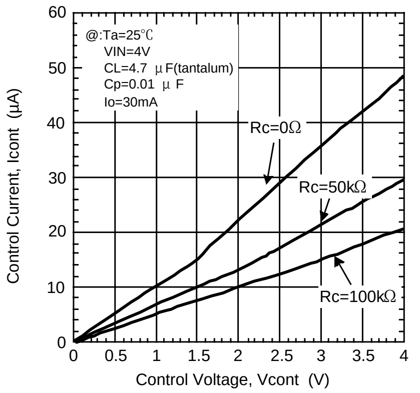
LD3870-3.0V
Ground Pin Current vs.Output Current



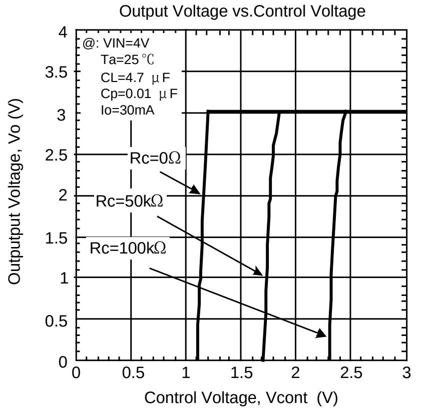
LD3870-3.0V
Output Voltage vs.Output current

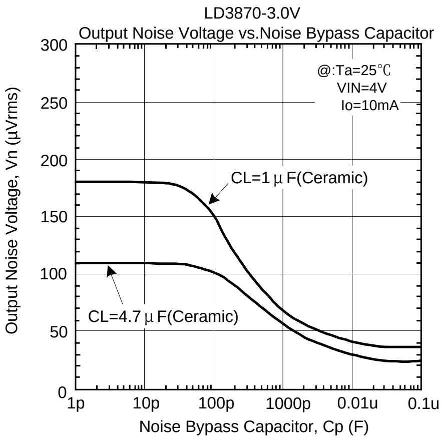


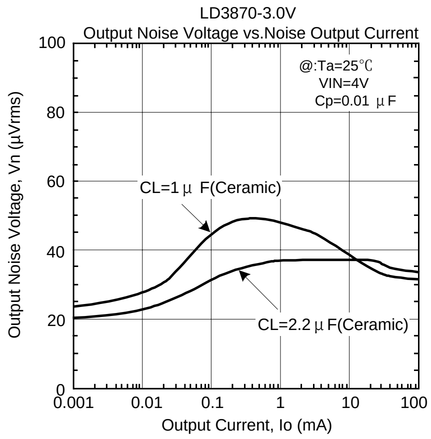
LD3870-3.0V
Control Current vs. Control Voltage

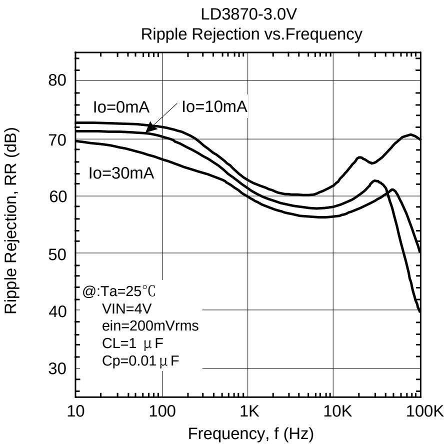


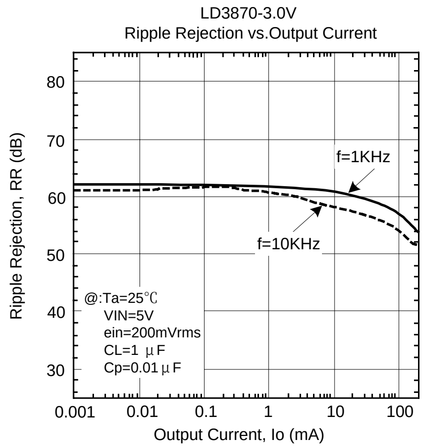
LD3870-3.0V
Output Voltage vs.Control Voltage

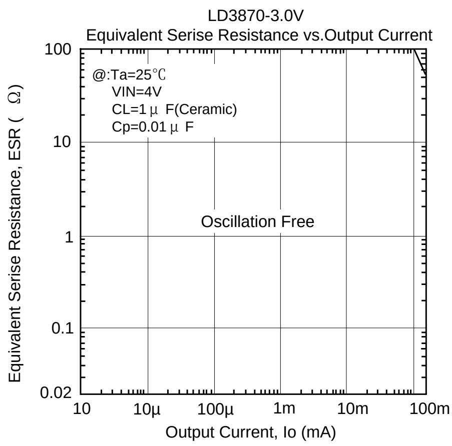


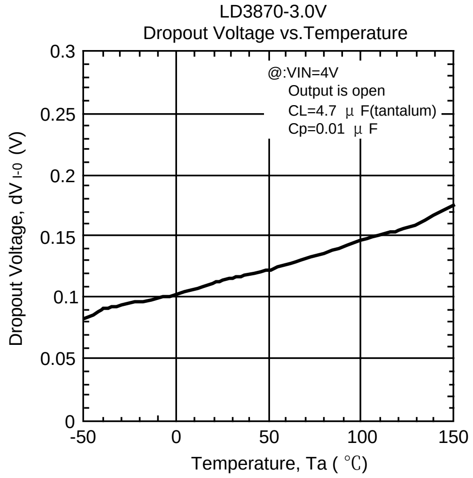

LD3870-3.0V
Output Noise Voltage vs.Noise Bypass Capacitor
@:Ta=25℃
VIN=4V
Io=10mA
CL=1μF(Ceramic)
CL=4.7μF(Ceramic)
Output Noise Voltage, Vn (μVrms)
300
250
200
150
100
50
0
1p
10p
100p
1000p
0.01u
0.1u
Noise Bypass Capacitor, Cp (F)

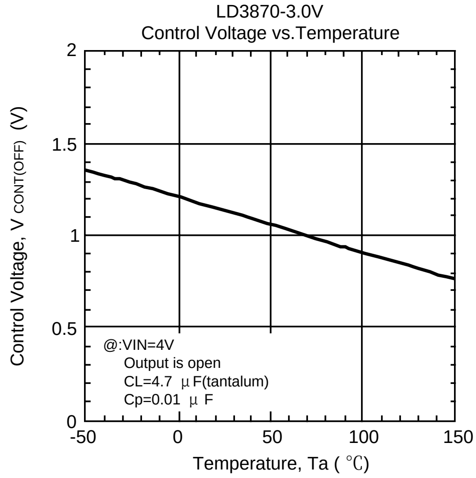

LD3870-3.0V
Output Noise Voltage vs.Noise Output Current
@:Ta=25℃
VIN=4V
Cp=0.01 μF
CL=1μ F(Ceramic)
CL=2.2μF(Ceramic)
Output Noise Voltage, Vn (μVrms)
100
80
60
40
20
0
0.001
0.01
0.1
1
10
100
Output Current, Io (mA)

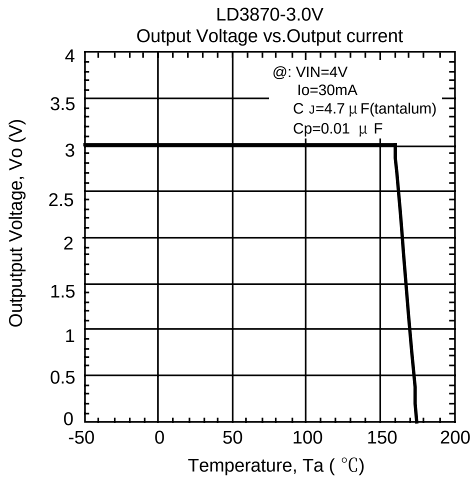

LD3870-3.0V
Ripple Rejection vs.Frequency
Io=0mA
Io=10mA
Io=30mA
@:Ta=25℃
VIN=4V
ein=200mVrms
CL=1 μF
Cp=0.01μF
Ripple Rejection, RR (dB)
80
70
60
50
40
30
10
100
1K
10K
100K
Frequency, f (Hz)

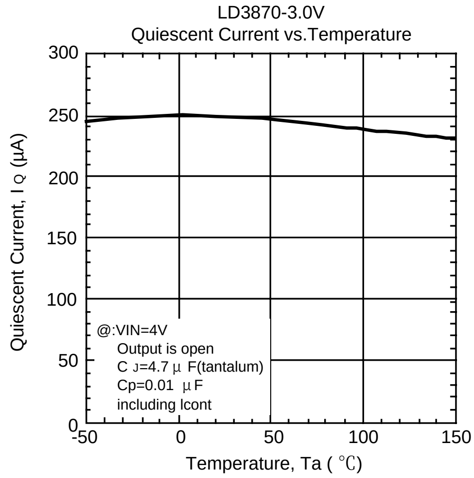

LD3870-3.0V
Ripple Rejection vs.Output Current
f=1KHz
f=10KHz
@:Ta=25℃
VIN=5V
ein=200mVrms
CL=1 μF
Cp=0.01μF
Ripple Rejection, RR (dB)
80
70
60
50
40
30
0.001
0.01
0.1
1
10
100
Output Current, Io (mA)


LD3870-3.0V
Equivalent Serise Resistance vs.Output Current
@:Ta=25℃
VIN=4V
CL=1μ F(Ceramic)
Cp=0.01μ F
Oscillation Free
Equivalent Serise Resistance, ESR (Ω)
100
10
1
0.1
0.02
10
10μ
100μ
1m
10m
100m
Output Current, Io (mA)


LD3870-3.0V
Dropout Voltage vs.Temperature
@:VIN=4V
Output is open
CL=4.7 μ F(tantalum)
Cp=0.01 μ F
Dropout Voltage, dV I-O (V)
Temperature, Ta (℃)


LD3870-3.0V
Control Voltage vs.Temperature
@:VIN=4V
Output is open
CL=4.7 μ F(tantalum)
Cp=0.01 μ F
Control Voltage, V CONT(OFF) (V)
Temperature, Ta (℃)


LD3870-3.0V
Output Voltage vs.Output current
@: VIN=4V
Io=30mA
C J=4.7 μ F(tantalum)
Cp=0.01 μ F
Outputput Voltage, Vo (V)
Temperature, Ta (℃)


LD3870-3.0V
Quiescent Current vs.Temperature
@:VIN=4V
Output is open
C J=4.7 μ F(tantalum)
Cp=0.01 μ F
including Icont
Quiescent Current, I Q (μA)
Temperature, Ta (℃)