



LD1985

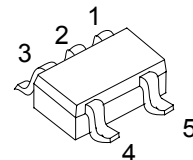
LINEAR INTEGRATED CIRCUIT

VERY LOW DROP AND LOW NOISE VOLTAGE REGULATOR LOW ESR CAP. COMPATIBLE, WITH INHIBIT FUNCTION

DESCRIPTION

The UTC LD1985 is a 150mA fixed output voltage regulator with ultra low drop voltage and the low quiescent current. It is specially designed for low noise, low power applications and in battery powered systems, such as Cell phones, palmtop laptop computer, PDAs, DSC.

The quiescent current in sleep mode is less than 1 μ A when INHIBIT pin is pulled low. Due to Shutdown Logic Control Function is available on pin 3 (TTL compatible), when the device is used as local regulator, it is possible to put a part of the board in standby, decreasing the total power consumption Besides, an external capacitor, C_{BYP}=10nF, connected between bypass pin and GND could reduce the noise to 30 μ Vrms.



SOT-25

*Pb-free plating product number: LD1985L

FEATURES

- *Very low dropout voltage (280mV at 150mA and 7mV at 1mA load)
- *Very low quiescent current (2mA typ. at 150mA load and 80 μ A at no load)
- *Output current up to 150mA
- *Logic controlled electronic shutdown
- *Output voltage of 1.5, 1.8, 2.5, 2.8, 2.85, 3, 3.1, 3.2, 3.3, 3.5, 3.6, 3.8, 4, 4.7, 5.0V
- *Internal current and thermal limit
- * $\pm 1\%$ tolerance version is available.(at 25)
- *Low output noise voltage 30 μ Vrms

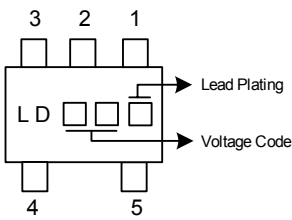
ORDERING INFORMATION

Order Number		Package	Packing
Normal	Lead Free Plating		
LD1985-xx-AF5-R	LD1985L-xx-AF5-R	SOT-25	Tape Reel

Note: xx: Output Voltage, refer to Marking Information.

LD1985L-xx-AF5-R (1)Packing Type (2)Package Type (3)Output Voltage Code (4)Lead Plating		(1) R: Tape Reel (2) AF5: SOT-25 (3) xx: refer to Marking Information (4) L: Lead Free Plating, Blank: Pb/Sn
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MARKING INFORMATION

PACKAGE	VOLTAGE CODE		MARKING
SOT-25	15:1.5V	33:3.3V	
	18:1.8V	35:3.5V	
	25:2.5V	36:3.6V	
	28:2.8V	38:3.8V	
	2J:2.85V	40:4.0V	
	30:3.0V	47:4.7V	
	31:3.1V	50:5.0V	
	32:3.2V		

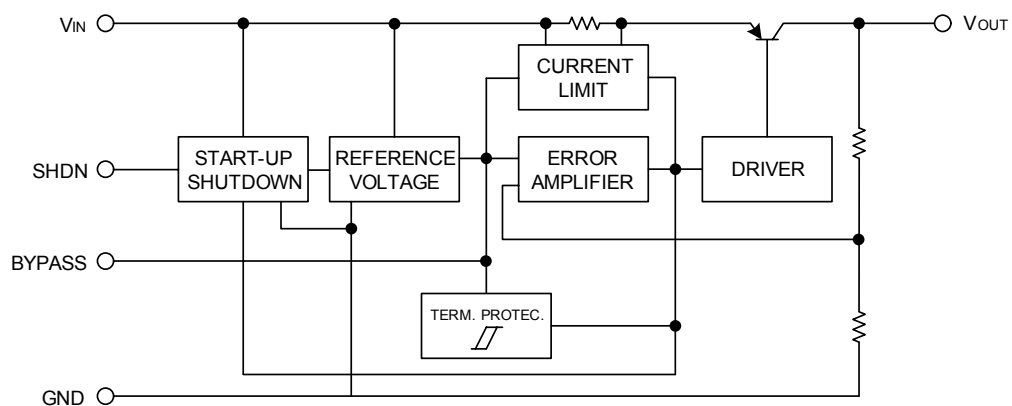
PIN DESCRIPTION

PIN NO.	PIN NAME	FUNCTION
1	V _{IN}	Input
2	GND	Ground
3	INHIBIT	Control switch ON/OFF. Inhibit is not internally pulled-up; it cannot be left floating. Disable the device when connected to GND or to a positive voltage less than 0.18V
4	Bypass	Bypass Pin: Capacitor to be connected to GND in order to improve the thermal noise performances.
5	V _{OUT}	Output

THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Thermal Resistance Junction-Case	θ_{JC}	81	/W

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS (Ta=25 °C)

PARAMETER	SYMBOL	RATINGS	UNIT
DC Input Voltage	V_{IN}	7	V
INHIBIT Input Voltage	V_{INH}	7	V
Output Current	I_{OUT}	Internally limited	
Power Dissipation	P_D	Internally limited	
Operating Junction Temperature	T_{OPR}	-20~+125	
Storage Temperature	T_{STG}	-40~+150	

Note 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. The device is guaranteed to meet performance specification within 0 ~+70 °C operating temperature range and assured by design from -20 ~+125 °C

■ ELECTRICAL CHARACTERISTICS

($T_J=25^\circ\text{C}$, $V_{IN}=V_{OUT}+1\text{V}$, $I_{OUT}=1\text{mA}$, $V_{SHDN}=2\text{V}$, $C_{IN}=1\mu\text{F}$, $C_{OUT}=1\mu\text{F}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Operating Input Voltage	$V_{IN(OPR)}$		2.5		7.0	V
Output Voltage	V_{OUT}	$V_{IN}=2.5\text{V}$	1.0%	1.485	1.5	1.515
			1.5%	1.477		
		$I_{OUT}=1 \sim 150\text{mA}$	1.0%	1.462		1.538
			1.5%	1.455		
		$I_{OUT}=1 \sim 150\text{mA}$, $T_J=-20 \sim 125$	1.0%	1.447		1.553
			1.5%	1.440		
Output Voltage	V_{OUT}	$V_{IN}=2.8\text{V}$	1.0%	1.782	1.8	1.818
			1.5%	1.773		
		$I_{OUT}=1 \sim 150\text{mA}$	1.0%	1.755		1.845
			1.5%	1.746		
		$I_{OUT}=1 \sim 150\text{mA}$, $T_J=-20 \sim 125$	1.0%	1.737		1.863
			1.5%	1.728		
Output Voltage	V_{OUT}	$V_{IN}=3.5\text{V}$	1.0%	2.475	2.5	2.525
			1.5%	2.4625		
		$I_{OUT}=1 \sim 150\text{mA}$	1.0%	2.4375		2.5625
			1.5%	2.425		
		$I_{OUT}=1 \sim 150\text{mA}$, $T_J=-20 \sim 125$	1.0%	2.4125		2.5875
			1.5%	2.4		
Output Voltage	V_{OUT}	$V_{IN}=3.8\text{V}$	1.0%	2.772	2.8	2.828
			1.5%	2.758		
		$I_{OUT}=1 \sim 150\text{mA}$	1.0%	2.730		2.870
			1.5%	2.716		
		$I_{OUT}=1 \sim 150\text{mA}$, $T_J=-20 \sim 125$	1.0%	2.702		2.898
			1.5%	2.688		
Output Voltage	V_{OUT}	$V_{IN}=3.85\text{V}$	1.0%	2.821	2.85	2.879
			1.5%	2.807		
		$I_{OUT}=1 \sim 150\text{mA}$	1.0%	2.778		2.921
			1.5%	2.764		
		$I_{OUT}=1 \sim 150\text{mA}$, $T_J=-20 \sim 125$	1.0%	2.750		2.950
			1.5%	2.736		
Output Voltage	V_{OUT}	$V_{IN}=4.0\text{V}$	1.0%	2.970	3.0	3.030
			1.5%	2.955		
		$I_{OUT}=1 \sim 150\text{mA}$	1.0%	2.925		3.075
			1.5%	2.91		
		$I_{OUT}=1 \sim 150\text{mA}$, $T_J=-20 \sim 125$	1.0%	2.895		3.105
			1.5%	2.88		

■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$V_{IN}=4.1V$	1.0%	3.069	3.1	V
			1.5%	3.0535		
		$I_{OUT}=1 \sim 150mA$	1.0%	3.022		V
			1.5%	3.007		
		$I_{OUT} = 1 \sim 150mA, T_J=-20 \sim 125$	1.0%	2.9915		V
			1.5%	2.976		
Output Voltage	V_{OUT}	$V_{IN}=4.2V$	1.0%	3.168	3.2	V
			1.5%	3.152		
		$I_{OUT}=1 \sim 150mA$	1.0%	3.120		V
			1.5%	3.104		
		$I_{OUT} = 1 \sim 150mA, T_J=-20 \sim 125$	1.0%	3.088		V
			1.5%	3.072		
Output Voltage	V_{OUT}	$V_{IN}=4.3V$	1.0%	3.267	3.3	V
			1.5%	3.2505		
		$I_{OUT}=1 \sim 150mA$	1.0%	3.2175		V
			1.5%	3.201		
		$I_{OUT} = 1 \sim 150mA, T_J=-20 \sim 125$	1.0%	3.1845		V
			1.5%	3.168		
Output Voltage	V_{OUT}	$V_{IN}=4.5V$	1.0%	3.465	3.5	V
			1.5%	3.447		
		$I_{OUT}=1 \sim 150mA$	1.0%	3.412		V
			1.5%	3.395		
		$I_{OUT} = 1 \sim 150mA, T_J=-20 \sim 125$	1.0%	3.377		V
			1.5%	3.360		
Output Voltage	V_{OUT}	$V_{IN}=4.6V$	1.0%	3.564	3.6	V
			1.5%	3.546		
		$I_{OUT}=1 \sim 150mA$	1.0%	3.510		V
			1.5%	3.492		
		$I_{OUT} = 1 \sim 150mA, T_J=-20 \sim 125$	1.0%	3.474		V
			1.5%	3.456		
Output Voltage	V_{OUT}	$V_{IN}=4.8V$	1.0%	3.762	3.8	V
			1.5%	3.743		
		$I_{OUT}=1 \sim 150mA$	1.0%	3.705		V
			1.5%	3.686		
		$I_{OUT} = 1 \sim 150mA, T_J=-20 \sim 125$	1.0%	3.667		V
			1.5%	3.648		
Output Voltage	V_{OUT}	$V_{IN}=5.0V$	1.0%	3.96	4.0	V
			1.5%	3.94		
		$I_{OUT}=1 \sim 150mA$	1.0%	3.9		V
			1.5%	3.88		
		$I_{OUT} = 1 \sim 150mA, T_J=-20 \sim 125$	1.0%	3.86		V
			1.5%	3.84		
Output Voltage	V_{OUT}	$V_{IN}=5.7V$	1.0%	4.653	4.7	V
			1.5%	4.6295		
		$I_{OUT}=1 \sim 150mA$	1.0%	4.582		V
			1.5%	4.559		
		$I_{OUT} = 1 \sim 150mA, T_J=-20 \sim 125$	1.0%	4.5355		V
			1.5%	4.512		

■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Output Voltage	V _{OUT}	V _{IN} =6.0V	1.0%	4.95	5.0	5.05	V
			1.5%	4.925		5.075	
		I _{OUT} =1 ~ 150mA	1.0%	4.875		5.125	V
			1.5%	4.85		5.15	
		I _{OUT} =1 ~ 150mA, T _J =-20 ~ 125	1.0%	4.825		5.175	V
			1.5%	4.8		5.2	
Short Circuit Current	I _{sc}	R _L =0			400		mA
Line Regulation	Vo/ V _i	V _{IN} =Vo+1V ~ 7V, I _{OUT} =1mA			0.003	0.014	%/V _{IN}
		V _{IN} =Vo+1V ~ 7V, I _{OUT} =1mA, T _J =-20 ~ 125				0.032	%/ V _{IN}
Dropout Voltage	V _D	I _{OUT} =0			1	3	mV
		I _{OUT} =0, T _J =-20 ~ 125				5	mV
		I _{OUT} =1mA			7	10	mV
		I _{OUT} =1mA, T _J =-20 ~ 125				15	mV
		I _{OUT} =10mA			40	60	mV
		I _{OUT} =10mA, T _J =-20 ~ 125				90	mV
		I _{OUT} =50mA			120	150	mV
		I _{OUT} =50mA, T _J =-20 ~ 125				225	mV
		I _{OUT} =150mA			280	350	mV
		I _{OUT} =150mA, T _J =-20 ~ 125				575	mV
Quiescent Current	I _Q	I _{OUT} =0			80	100	μA
		I _{OUT} =0, T _J =-20 ~ 125				150	μA
		I _{OUT} =1mA			100	150	μA
		I _{OUT} =1mA, T _J =-20 ~ 125				200	μA
		I _{OUT} =10mA			200	300	μA
		I _{OUT} =10mA, T _J =-20 ~ 125				400	μA
		I _{OUT} =50mA			600	900	μA
		I _{OUT} =50mA, T _J =-20 ~ 125				1200	μA
		I _{OUT} =150mA			2000	3000	μA
		I _{OUT} =150mA, T _J =-20 ~ 125				4000	μA
		OFF mode V _{INH} <0.18V			0		μA
		OFF mode V _{INH} <0.18V, T _J =-20 ~ 125				2	μA
Supply Voltage Rejection	SVR	C _{BYP} =0.01μF, Co=10μF, f=1KHz			45		dB
Control Input Logic Low	V _{IL}	T _J =-20 ~ 125				0.15	V
Control Input Logic High	V _{IH}	T _J =-20 ~ 125		2			V
Control Input Current	I _{INH}	T _J =-20 ~ 125 , V _{SHDN} =5V			5	15	μA
		T _J =-20 ~ 125 , V _{SHDN} =0V			0	-1	μA
Output Noise Voltage	eN	B=300Hz ~ 50KHz, C _{BYP} =0.01μF, Co=10μF			30		μV

■ APPLICATION INFORMATION

EXTERNAL CAPACITORS

An external capacitor for regulator stability is required. This capacitor must be selected to meet the requirements of minimum capacitance and equivalent series resistance. It is recommended to solder input and output capacitors as close as possible to the relative pins.

INPUT CAPACITOR

A $1\mu\text{F}$ input capacitor (ceramic, tantalum or film capacitors can be used) is required with the UTC LD1985 (amount of capacitance can be increased without limit). This capacitor must be located a distance less than 0.5" from the input pin of the device and returned to a clean analog ground.

OUTPUT CAPACITOR

The output capacitor must meet both the requirement for minimum amount of capacitance and E.S.R. (equivalent series resistance) value. The output capacitor must maintain its ESR in the stable region over the full operating temperature to assure stability. Also, capacitor tolerance and variation with temperature must be considered to assure the minimum amount of capacitance is provided over time. Due to the different loop gain and the stability improves for higher output versions, if low E.S.R. ceramic type is used, the recommended minimum output capacitor value are is $1\mu\text{F}$ for output voltages equal or major than 3.8V, $2.2\mu\text{F}$ for V_{OUT} going from 1.8~3.3V, and $3.3\mu\text{F}$ for the other versions. However, if an output capacitor lower than the suggestion, it's possible to make stable the regulator adding a resistor in series to the capacitor. This capacitor should be located not more than 0.5" from the output pin of the device and returned to a clean analog ground.

INHIBIT INPUT OPERATION

The inhibit pin can be used to turn OFF the regulator when pulled low, so drastically reducing the current consumption down to less than $1\mu\text{A}$. When the inhibit feature is not used, this pin must be tied to V_{IN} to keep the regulator output ON over time. To assure proper operation, the signal source used to drive the inhibit pin must be able to swing above and below the specified thresholds listed in the electrical characteristics section under V_{IH} , V_{IL} . Any slew rate can be used to drive the inhibit.

REVERSE CURRENT

The power transistor used in the UTC LD1985 has not an inherent diode connected between the regulator input and output. If the output is forced above the input, no current will flow from the output to the input across the series pass transistor. When a V_{REV} voltage is applied on the output, the reverse current measured flows to the GND across the two feedback resistors. This current typical value is $160\mu\text{A}$. R1 and R2 resistors are implanted type; and typical values are respectively $42.6\text{K}\Omega$ and $51.15\text{K}\Omega$.

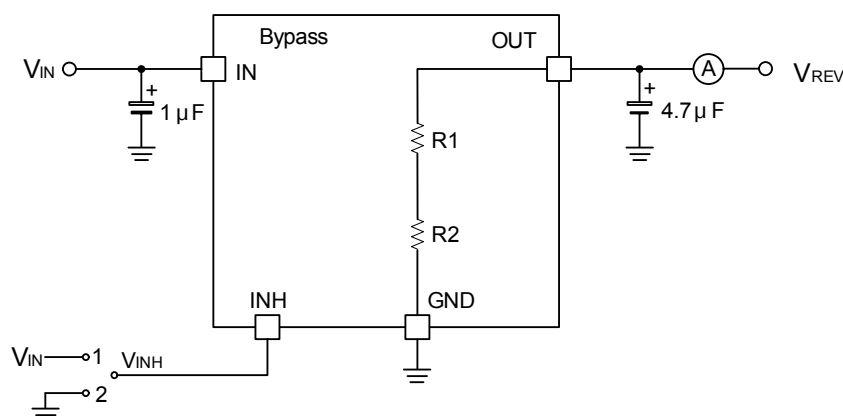
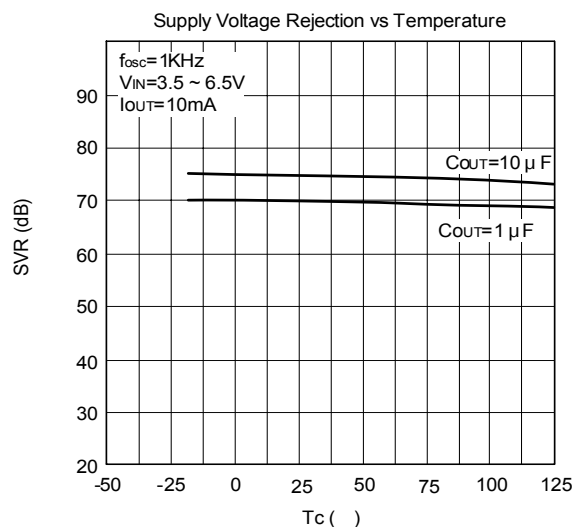
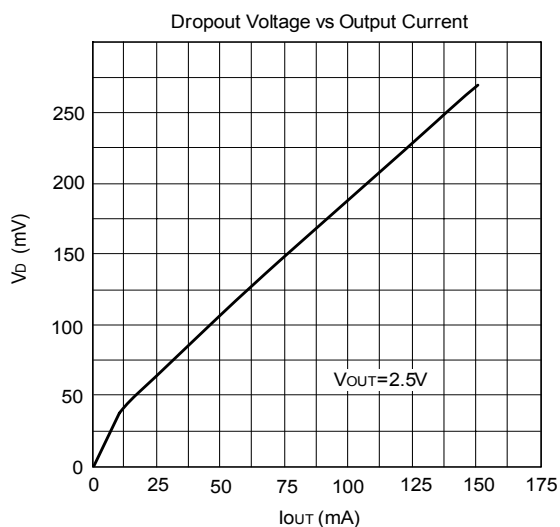
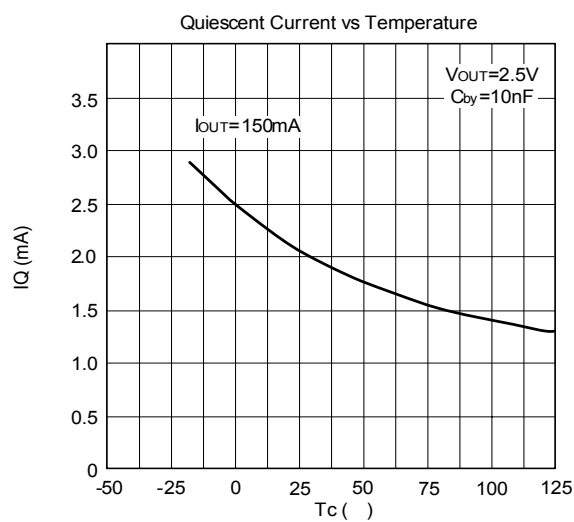
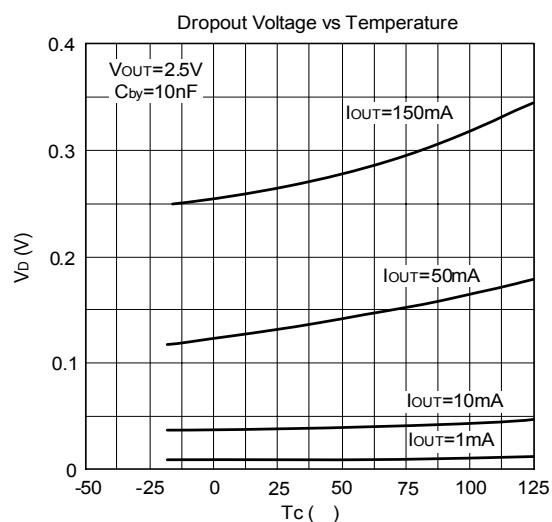
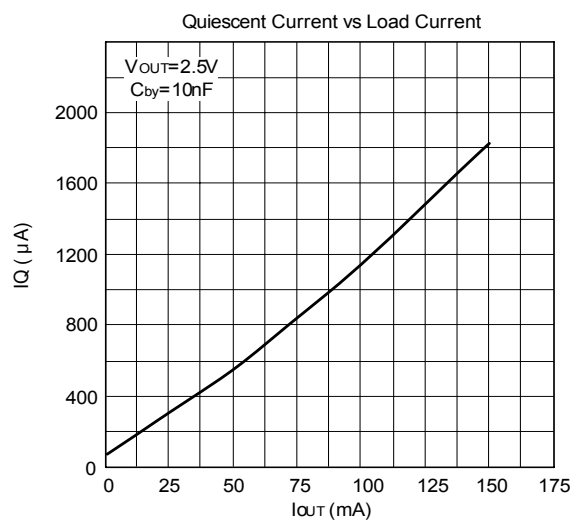
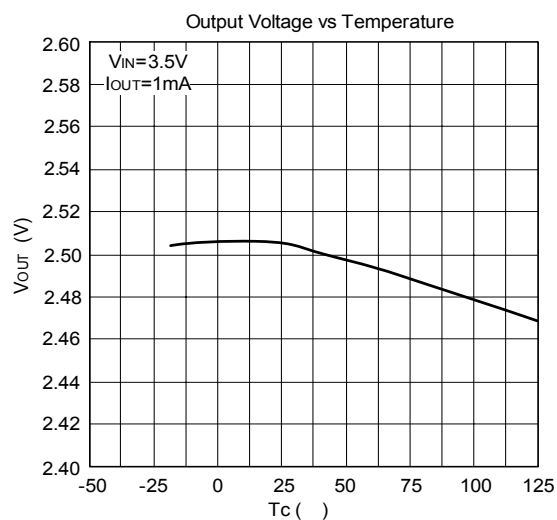
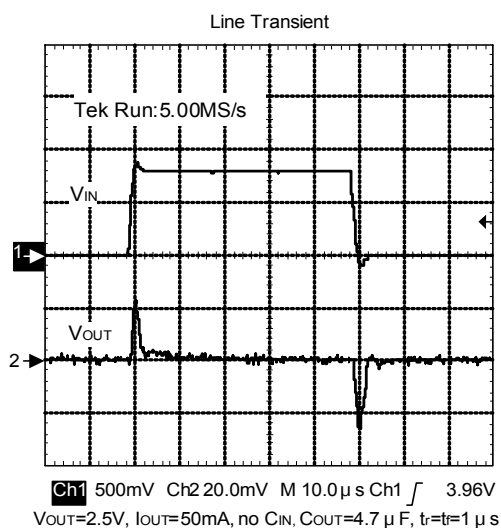
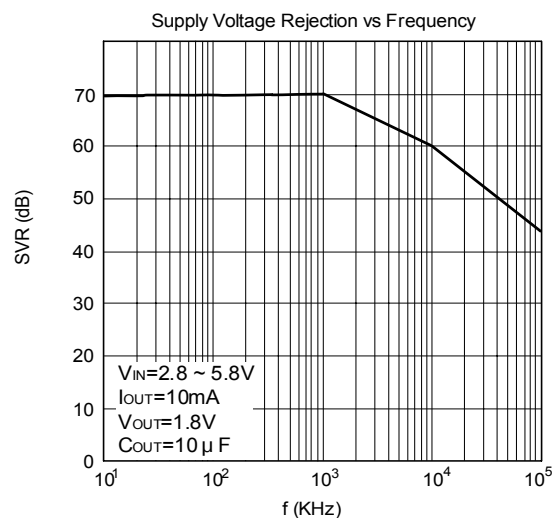
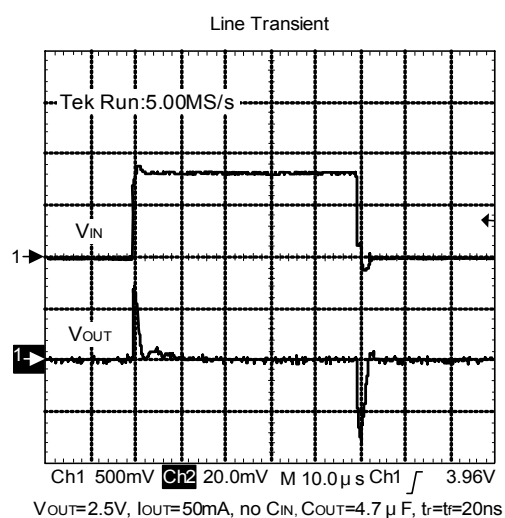
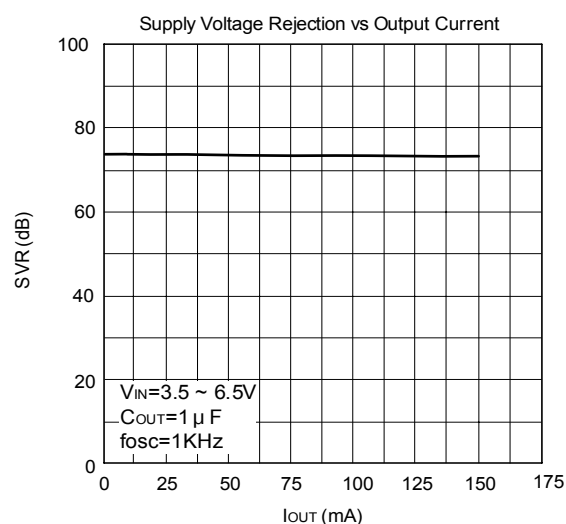
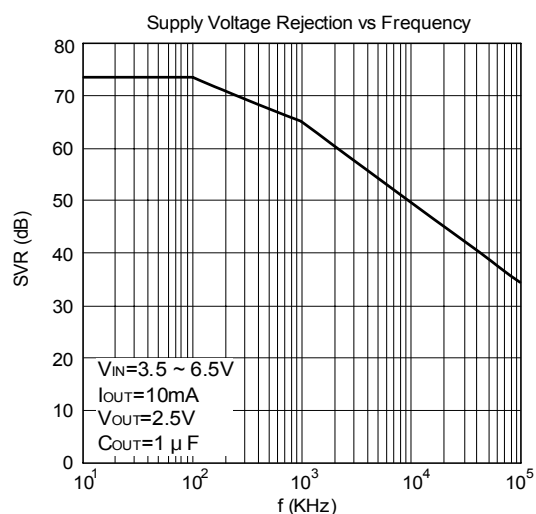
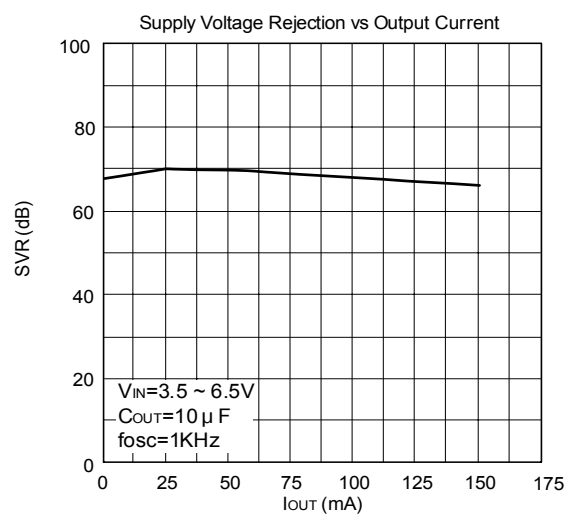


Fig 1. REVERSE CURRENT TEST CIRCUIT

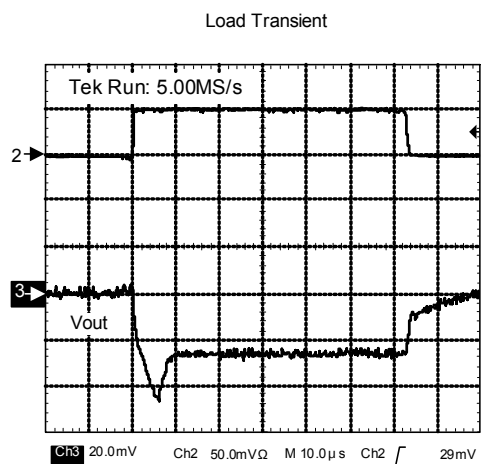
- TYPICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$, $C_{IN}=1\mu\text{F}$, $C_{OUT}=2.2\mu\text{F}$, $C_{BYP}=100\text{nF}$, unless otherwise specified)



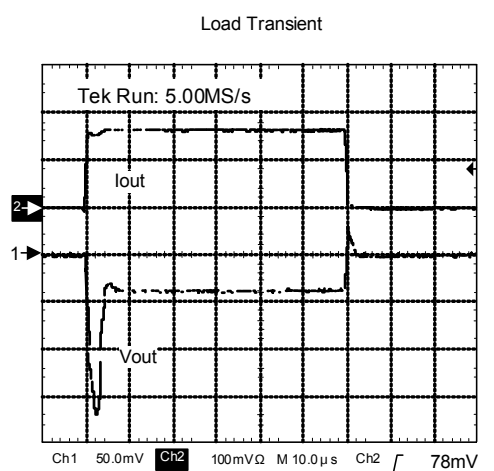
TYPICAL CHARACTERISTICS(Cont.)



TYPICAL CHARACTERISTICS(Cont.)



$V_{OUT}=2.5V$, $I_{OUT}=0\sim 50mA$, no C_{IN} , $C_{OUT}=10\mu F$, $t_s=t_r=2ns$



$V_{OUT}=2.5V$, $I_{OUT}=50mA$, no C_{IN} , $C_{OUT}=4.7\mu F$, $t_s=t_r=20ns$

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