

ORDER INFORMATION <http://www.linear.com/product/LTC3897#orderinfo>

LEAD FREE FINISH	TAPE AND REEL	PART MARKING	PACKAGE DESCRIPTION	TEMPERATURE RANGE
LTC3897EUHF#PBF	LTC3897EUHF#TRPBF	3897	38-Lead (5mm x 7mm) Plastic QFN	–40°C to 125°C
LTC3897IUHF#PBF	LTC3897IUHF#TRPBF	3897	38-Lead (5mm x 7mm) Plastic QFN	–40°C to 125°C
LTC3897HUHF#PBF	LTC3897HUHF#TRPBF	3897	38-Lead (5mm x 7mm) Plastic QFN	–40°C to 150°C
LTC3897EFE#PBF	LTC3897EFE#TRPBF	LTC3897FE	38-Lead Plastic TSSOP	–40°C to 125°C
LTC3897IFE#PBF	LTC3897IFE#TRPBF	LTC3897FE	38-Lead Plastic TSSOP	–40°C to 125°C
LTC3897HFE#PBF	LTC3897HFE#TRPBF	LTC3897FE	38-Lead Plastic TSSOP	–40°C to 150°C

Consult LTC Marketing for parts specified with wider operating temperature ranges.

*The temperature grade is identified by a label on the shipping container.

For more information on lead free part marking, go to: <http://www.linear.com/leadfree/>

For more information on tape and reel specifications, go to: <http://www.linear.com/tapeandreel/>. Some packages are available in 500 unit reels through designated sales channels with #TRMPBF suffix.

ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the specified operating junction temperature range, otherwise specifications are at $T_A = 25^\circ\text{C}$ (Note 2). $V_{IN} = 12\text{V}$, $V_{BIAS} = 12\text{V}$, unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage and Operating Current						
V_{BIAS}	Bias Voltage Operating Range		4.5		75	V
	SENSE Pins Common Mode Range (BOOST Converter Input Supply Voltage)		2.3		65	V
V_{IN}	Input Supply Voltage Operating Range		4.2		75	V
	Reverse Input Current	$V_{IN} = -30\text{V}$		0	–10	μA
I_Q	Input DC Supply Current	(Note 5)				
	Pulse-Skipping or Forced Continuous Mode	RUN = 12V, $V_{FB} = 1.25\text{V}$ (No Load)		1.32		mA
	Burst Mode (Sleep)	RUN = 12V, DGEN = SGEN = 0V, $V_{FB} = 1.25\text{V}$ (No Load), CS = $IS^+ = IS^- = V_{SPFB} = 0\text{V}$		55	90	μA
		RUN = DGEN = 12V, SGEN = 0V, $V_{FB} = 1.25\text{V}$ (No Load), CS = 12V, $IS^+ = IS^- = CS - 0.1\text{V}$		125	175 190	μA
		RUN = 12V, DGEN = 0V, SGEN = 12V, $V_{FB} = 1.25\text{V}$ (No Load), CS = $IS^+ = IS^- = 12\text{V}$		260	350 380	μA
		RUN = DGEN = SGEN = 12V, $V_{FB} = 1.25\text{V}$ (No Load), CS = 12V, $IS^+ = IS^- = CS - 0.1\text{V}$		325	450	μA
	Shutdown	RUN = DGEN = SGEN = 0V		15	22	μA
BOOST Controller Main Control Loop						
V_{OUT}	Regulated Boost Output Voltage in Synchronous Configuration				60	V
V_{FB}	Regulated Feedback Voltage	$I_{TH} = 1.2\text{V}$ (Note 4)	● 1.188	1.200	1.212	V
I_{FB}	Feedback Current	(Note 4)		±10	±50	nA
	Reference Line Voltage Regulation	(Note 4) $V_{IN} = 6\text{V}$ to 75V		0.002	0.02	%/V
	Output Voltage Load Regulation	(Note 4)				
		(Note 4) Measured in Servo Loop, I_{TH} Voltage = 1V to 0.6V	●	0.01	0.1	%
		(Note 4) Measured in Servo Loop, I_{TH} Voltage = 1V to 1.4V	●	–0.01	–0.1	%

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SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
g_m	Error Amplifier Transconductance	$I_{TH} = 1.2\text{V}$		2		mmho
UVLO	Undervoltage Lockout	DRV _{CC} Ramping Up				
		DRVUV = 0V	●	4.0	4.2	V
		DRVUV = INTV _{CC}	●	7.5	7.8	V
		DRV _{CC} Ramping Down				
		DRVUV = 0V	●	3.6	3.8	V
		DRVUV = INTV _{CC}	●	6.4	6.7	V
V_{RUN}	RUN Pin ON Threshold	V_{RUN} Rising	●	1.18	1.28	V
	RUN Pin Hysteresis			100		mV
I_{SS}	Soft-Start Charge Current	$V_{SS} = \text{GND}$		7	10	μA
$V_{SENSE1,2(\text{MAX})}$	Maximum Current Sense Threshold	$V_{FB} = 1.15\text{V}$, $I_{LIM} = \text{INTV}_{CC}$, $V_{SENSE+} = 12\text{V}$	●	125	140	mV
		$V_{FB} = 1.15\text{V}$, $I_{LIM} = \text{Float}$, $V_{SENSE+} = 12\text{V}$	●	85	95	mV
		$V_{FB} = 1.15\text{V}$, $I_{LIM} = \text{GND}$, $V_{SENSE+} = 12\text{V}$	●	41	48	mV
	Matching Between $V_{SENSE1(\text{MAX})}$ and $V_{SENSE2(\text{MAX})}$	$V_{FB} = 1.15\text{V}$, $I_{LIM} = \text{INTV}_{CC}$, $V_{SENSE+} = 12\text{V}$	●	-12	0	mV
		$V_{FB} = 1.15\text{V}$, $I_{LIM} = \text{Float}$, $V_{SENSE+} = 12\text{V}$	●	-10	0	mV
		$V_{FB} = 1.15\text{V}$, $I_{LIM} = \text{GND}$, $V_{SENSE+} = 12\text{V}$	●	-9	0	mV
	SENSE+ Pin Current	$V_{FB} = 1.1\text{V}$, $I_{LIM} = \text{Float}$		250	350	μA
	SENSE- Pin Current	$V_{FB} = 1.1\text{V}$, $I_{LIM} = \text{Float}$			±2	μA
	Top Gate Pull-Up Resistance	DRV _{CC} = 10V		2.5		Ω
	Top Gate Pull-Down Resistance	DRV _{CC} = 10V		1.5		Ω
BDSW	BOOST to DRV _{CC} Switch On-Resistance	$V_{SW} = 0\text{V}$, $V_{DRVSET} = \text{INTV}_{CC}$		2.6	3.7	Ω
		DTC = 0V		55	70	ns
		DTC = Float		90	120	ns
		DTC = INTV _{CC}		170	235	ns
	Bottom Gate Off to Top Gate On Switch-On Delay Time	DTC = 0V		55	70	ns
		DTC = Float		90	120	ns
		DTC = INTV _{CC}		170	235	ns
	Maximum BG Duty Factor			96		%
$t_{ON(\text{MIN})}$	Minimum BG On-Time	(Note 7) $V_{DRVSET} = \text{INTV}_{CC}$		90		ns

DRV_{CC} LDO Regulator

	DRV _{CC} Voltage from Internal V_{BIAS} LDO	$V_{EXTVCC} = 0\text{V}$ $7\text{V} < V_{BIAS} < 75\text{V}$, $DRVSET = 0\text{V}$ $11\text{V} < V_{BIAS} < 75\text{V}$, $DRVSET = \text{INTV}_{CC}$	5.8	6.0	6.2	V
			9.6	10.0	10.4	V
	DRV _{CC} Load Regulation from V_{BIAS} LDO	$I_{CC} = 0\text{mA}$ to 50mA , $V_{EXTVCC} = 0\text{V}$, $V_{DRVSET} = \text{INTV}_{CC}$		0.7	2	%
	DRV _{CC} Voltage from Internal EXTV _{CC} LDO	$7\text{V} < V_{EXTVCC} < 13\text{V}$, $DRVSET = 0\text{V}$ $11\text{V} < V_{EXTVCC} < 13\text{V}$, $DRVSET = \text{INTV}_{CC}$	5.8	6.0	6.2	V
			9.6	10.0	10.4	V
	DRV _{CC} Load Regulation from Internal EXTV _{CC} LDO	$I_{CC} = 0\text{mA}$ to 50mA , $V_{EXTVCC} = 8.5\text{V}$, $V_{DRVSET} = 0\text{V}$		0.7	2	%

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SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
	EXTV _{CC} LDO Switchover Voltage	EXTV _{CC} Ramping Positive DRVUV = 0V DRVUV = INTV _{CC}	4.5 7.4	4.7 7.7	4.9 8.0	V V
	EXTV _{CC} Hysteresis			250		mV
	Programmable DRV _{CC}	R _{DRVSET} = 50k Ω , V _{EXTVCC} = 0V		5.0		V
	Programmable DRV _{CC}	R _{DRVSET} = 70k Ω , V _{EXTVCC} = 0V	6.4	7.0	7.6	V
	Programmable DRV _{CC}	R _{DRVSET} = 90k Ω , V _{EXTVCC} = 0V		9.0		V

Oscillator and Phase-Locked Loop

	Programmable Frequency	R _{FREQ} = 25k		105		kHz
		R _{FREQ} = 60k	335	400	465	kHz
		R _{FREQ} = 100k		760		kHz
	Lowest Fixed Frequency	V _{FREQ} = 0V	320	350	380	kHz
	Highest Fixed Frequency	V _{FREQ} = INTV _{CC}	488	535	585	kHz
f _{SYNC}	Synchronizable Frequency	PLLIN/MODE = External Clock	● 75		850	
	PLLIN/MODE Input High Level	PLLIN/MODE = External Clock	● 2.5			V
	PLLIN/MODE Input Low Level	PLLIN/MODE = External Clock	●		0.5	V

BOOST1 and BOOST2 Charge Pump

	BOOST Charge Pump Available Output Current	FREQ = 0V, Forced Continuous or Pulse-Skipping Mode V _{SW1,2} = 12V; V _{BOOST1,2} = 16.5V V _{SW1,2} = 12V; V _{BOOST1,2} = 19.5V		70 30		μA μA
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Surge Stopper

	SGEN Pin ON Threshold	V _{SGEN} Rising	● 1.16	1.26	1.36	V
	SGEN Pin Hysteresis			100		mV
	SG Pin Output High Voltage (V _{SG} – V _{CS})	V _{IN} = 4.2V, I _{SG} = 0, –1 μA , DG – CS = 1V	● 4.5		8	V
		V _{IN} = 8V to 7.5V, I _{SG} = 0, –1 μA	● 10	12	16	V
	SG Pin Pull-Up Current	V _{IN} = SG = DG = CS = 12V	● –5	–10	–15	μA
	SG Pin Pull-Down Current	Overvoltage: SPFB = 1.5V, SG – CS = 5V	● 50	130		mA
		Overcurrent: $\Delta V_{IS} = 100\text{mV}$, SG – CS = 5V	● 50	130		mA
		Shutdown: DGEN = SGEN = 0V, SG – CS = 5V	● 0.4	1		mA
	CS Pin Input Current	V _{IN} = CS = 12V, IS ⁺ = IS [–] = 11.9V, SGEN = Float	●	2	6	μA
		V _{IN} = CS = 12V, SGEN = 0V	●	25	100	μA
		V _{CS} = –30V	●	–2.5	–3.5	mA
V _{SPFB}	Regulated Surge Protection Feedback Voltage		● 1.205	1.235	1.265	V
ΔV_{IS}	Overcurrent Fault Threshold, (V _{IS⁺} – V _{IS[–]})	IS [–] > 2.5V	● 45	50	55	mV
		IS [–] < 1.5V = 1.5V	● 21	27	33	mV
	IS ⁺ Pin Input Current	IS ⁺ = IS [–] = V _{IN} = CS = 12V, SGEN = DGEN = Float	●	35	100	μA
		IS ⁺ = IS [–] = V _{IN} = CS = 12V, SGEN = DGEN = 0V	●	1	15	μA
	SPFB Pin Input Current	SPFB = 1.235V	●	±20	±500	nA
	IS [–] Pin Input Current	IS ⁺ = IS [–] = V _{IN} = CS = 12V, SGEN = DGEN = Float	●	20	100	μA
		IS ⁺ = IS [–] = V _{IN} = CS = 12V, SGEN = DGEN = 0V	●	5	15	μA

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SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
$I_{TMR,UP}$	TMR Pin Pull-Up Current, Overvoltage	TMR = 1V, SPFB = 1.5V, $V_{IN} - V_{IS^-} = 0.5\text{V}$ TMR = 1V, SPFB = 1.5V, $V_{IN} - V_{IS^-} = 70\text{V}$	● ●	-1.5 -43	-2.5 -53	-3.2 -63	-3.7 μA
	TMR Pin Pull-Up Current, Overcurrent	TMR = 1V, $\Delta V_{IS} = 60\text{mV}$, $V_{IN} - V_{IS^-} = 0.5\text{V}$ TMR = 1V, $\Delta V_{IS} = 60\text{mV}$, $V_{IN} - V_{IS^-} = 75\text{V}$ 70V	● ●	-6 -230	-10 -210	-15 -270	-16 -290 μA
	TMR Pin Pull-Up Current, Warning	TMR = 1.3V, SPFB = 1.5V, $V_{IN} - V_{IS^-} = 0.5\text{V}$	●	-3	-5	-8	μA
	TMR Pin Pull-Up Current, Retry	TMR = 1V, SPFB = 1.5V	●	-1.5	-2.5	-3.2	-3.7 μA
$I_{TMR,DN}$	TMR Pin Pull-Down Current	TMR = 1V, SPFB = 1.5V, Retry SGEN = 0V	● ●	1.2 0.4	2 0.75	2.8 1.5	μA mA
	Retry Duty Cycle, Overcurrent	$\Delta V_{IS} = 60\text{mV}$, $V_{IN} - V_{IS^-} = 12\text{V}$	●	0.06	0.08	0.11	0.12%
	TMR Pin Thresholds	SG Falling, $V_{IN} = 4.2\text{V}$ to 75V 70V SG Rising (after 32 cycles), $V_{IN} = 4.2\text{V}$ to 75V 70V	● ●	1.31 0.13	1.35 0.15	1.38 0.18	V V
Ideal Diode							
	DGEN Pin ON Threshold	V_{DGEN} Rising	●	1.16	1.26	1.36	V
	DGEN Pin Hysteresis				100		mV
	DG Pin Output High Voltage, ($V_{DG} - V_{CS}$)	$V_{IN} = 4.2\text{V}$, $I_{DG} = 0$, $-1\mu\text{A}$, No Fault, SG Open	●	4.5			V
		$8\text{V} < V_{IN} < 75\text{V}$ 70V, $I_{DG} = 0$, $-1\mu\text{A}$, No Fault, SG Open	●	10	12	16	V
	DG Pin Pull-Up Current	DG = CS = $V_{IN} = 12\text{V}$, CS – IS ⁺ = 0.1V	●	-5	-10	-15	μA
	DG Pin Pull-Down Current	DG = CS + 5V, CS – IS ⁺ = -0.2V	●	60	130		mA
		DG = CS + 5V, SGEN = DGEN = 0V	●	0.4	1		mA
ΔV_{SD}	Source-Drain Regulation Voltage, ($V_{CS} - V_{IS^+}$)	DG – CS = 2.5V, $V_{IN} = \text{CS} = 4.2\text{V}$ to 75V 70V	●	20	30	40	mV
	DG Turn Off Propagation Delay in Fault Condition	CS – IS ⁺ = -1V, DG High to Low	●		0.6	2	μS

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

Note 2: The LTC3897 is tested under pulsed load conditions such that $T_J \approx T_A$. The LTC3897E is guaranteed to meet specifications from 0°C to 85°C junction temperature. Specifications over the -40°C to 125°C operating junction temperature range are assured by design, characterization and correlation with statistical process controls. The LTC3897I is guaranteed over the -40°C to 125°C operating junction temperature range. The LTC3897H is guaranteed over the -40°C to 150°C operating temperature range. High junction temperatures degrade operation lifetime. Operation lifetime is derated for junction temperatures greater than 125°C . Note that the maximum ambient temperature consistent with these specifications is determined by specific operating conditions in conjunction with board layout, the rated package thermal impedance and other environmental factors. The junction temperature (T_J , in $^\circ\text{C}$) is calculated from the ambient temperature (T_A , in $^\circ\text{C}$) and power dissipation (P_D , in watts) according to the formula:

$$T_J = T_A + (P_D \cdot \theta_{JA}), \text{ where } \theta_{JA} = 34^\circ\text{C/W for the QFN package and where } \theta_{JA} = 28^\circ\text{C/W for the FE package.}$$

Note 3: This IC includes overtemperature protection that is intended to protect the device during momentary overload conditions. The maximum rated junction temperature will be exceeded when this protection is active. Continuous operation above the specified absolute maximum operating junction temperature may impair device reliability or permanently damage the device.

Note 4: The LTC3897 is tested in a feedback loop that serves V_{FB} to the output of the error amplifier while maintaining I_{TH} at the midpoint of the current limit range.

Note 5: Dynamic supply current is higher due to the gate charge being delivered at the switching frequency.

Note 6: Rise and fall times are measured using 10% and 90% levels. Delay times are measured using 50% levels.

Note 7: See Minimum On-Time Considerations in the Applications Information section.

Note 8: Internal clamps limit the SG and DG pins to minimum of 10V above the CS pin. Driving these pins to voltages beyond the clamp may damage the device.

Note 9: Do not apply a voltage or current source to these pins. They must be connected to capacitive loads only, otherwise permanent damage may occur.