



High-Efficiency, Quad-Output, Main Power-Supply Controllers for Notebook Computers

General Description

The MAX8732/MAX8733/MAX8734 dual step-down, switch-mode power-supply (SMPS) controllers generate logic-supply voltages in battery-powered systems. The MAX8732/MAX8733/MAX8734 include two pulse-width modulation (PWM) controllers, adjustable from 2V to 5.5V or fixed at 5V and 3.3V. These devices feature two linear regulators providing 5V and 3.3V always-on outputs. Each linear regulator provides up to 100mA output current with automatic linear-regulator bootstrapping to the main SMPS outputs. The MAX8732/MAX8733/MAX8734 include on-board power-up sequencing, a power-good (PGOOD) output, digital soft-start, and internal soft-stop output discharge that prevents negative voltages on shutdown.

Maxim's proprietary Quick-PWM™ quick-response, constant on-time PWM control scheme operates without sense resistors and provides 100ns response to load transients while maintaining a relatively constant switching frequency. The unique ultrasonic pulse-skipping mode maintains the switching frequency above 25kHz, which eliminates noise in audio applications. Other features include pulse skipping, which maximizes efficiency in light-load applications, and fixed-frequency PWM mode, which reduces RF interference in sensitive applications.

The MAX8732 features a 200kHz/5V and 300kHz/3.3V SMPS for highest efficiency, while the MAX8733 features a 400kHz/5V and 500kHz/3.3V SMPS for "thin and light" applications. The MAX8734 provides a pin-selectable switching frequency, allowing either 200kHz/300kHz or 400kHz/500kHz operation of the 5V/3.3V SMPSs, respectively. The MAX8732/MAX8733/MAX8734 are available in 28-pin QSOP packages and operate over the extended temperature range (-40°C to +85°C).

The MAX8732/MAX8733/MAX8734 are pin-for-pin upgrades to the MAX1777/MAX1977/MAX1999. The MAX1999 Evaluation Kit can be used to evaluate the MAX8732/MAX8733/MAX8734.

Applications

Notebook and Subnotebook Computers
PDAs and Mobile Communication Devices
3- and 4-Cell Li+ Battery-Powered Devices

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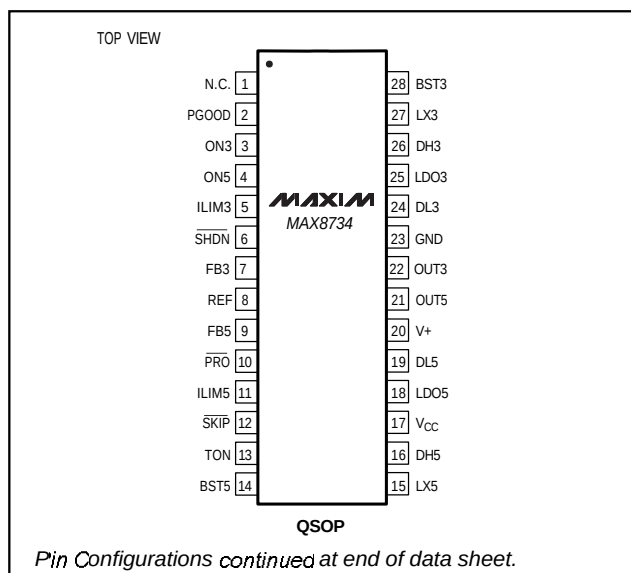
Features

- ◆ No Current-Sense Resistor Needed (MAX8734)
- ◆ Accurate Current Sense with Current-Sense Resistor (MAX8732/MAX8733)
- ◆ 1.5% Output Voltage Accuracy
- ◆ 3.3V and 5V 100mA Bootstrapped Linear Regulators
- ◆ Internal Soft-Start and Soft-Stop Output Discharge
- ◆ Quick-PWM with 100ns Load Step Response
- ◆ 3.3V and 5V Fixed or Adjustable Outputs (Dual Mode™)
- ◆ 4.5V to 24V Input Voltage Range
- ◆ Enhanced Ultrasonic Pulse-Skipping Mode (25kHz min)
- ◆ Power-Good (PGOOD) Signal
- ◆ Overvoltage Protection Enable/Disable

Ordering Information

PART	TEMP RANGE	PIN-PACKAGE	5V/3V SWITCHING FREQUENCY
MAX8732EEI	-40°C to +85°C	28 QSOP	200kHz/300kHz
MAX8733EEI	-40°C to +85°C	28 QSOP	400kHz/500kHz
MAX8734EEI	-40°C to +85°C	28 QSOP	200kHz/300kHz or 400kHz/500kHz

Pin Configurations



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ABSOLUTE MAXIMUM RATINGS

V+, SHDN to GND V to +25V
 BST_ to GND V to +30V
 LX_ to BST_ -6V to +0.3V
 CS_ to GND (MAX8732/MAX8733 only) -2V to +6V
 VCC, LDO5, LDO3, OUT3, OUT5, ON3, ON5, REF,
 FB3, FB5, SKIP, PRO, PGOOD to GND V to +6V
 DH3 to LX3 0.3V to (VBST3 + 0.3V)
 DH5 to LX5 0.3V to (VBST5 + 0.3V)
 ILIM3, ILIM5 to GND 0.3V to (VCC + 0.3V)
 DL3, DL5 to GND 0.3V to (VLDO5 + 0.3V)
 TON to GND (MAX8734 only) V to +6V

LDO3, LDO5, REF Short Circuit to GND Momentary
 LDO3 Current (Internal Regulator) Continuous +100mA
 LDO3 Current (Switched Over to OUT3) Continuous +200mA
 LDO5 Current (Internal Regulator) Continuous +100mA
 LDO5 Current (Switched Over to OUT5) Continuous +200mA
 Continuous Power Dissipation (T_A = +70°C)
 28-Pin QSOP (derate 10.8mW/°C above +70°C) 860mW
 Operating Temperature Range -40°C to +85°C
 Junction Temperature +150°C
 Storage Temperature Range -65°C to +150°C
 Lead Temperature (soldering, 10s) +300°C

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

(Circuit of Figure 1 and Figure 2, no load on LDO5, LDO3, OUT3, OUT5, and REF, V+ = 12V, ON3 = ON5 = VCC, VSHDN = 5V, T_A = 0°C to +85°C, unless otherwise noted. Typical values are at T_A = +25°C.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
MAIN SMPS CONTROLLERS					
V+ Input Voltage Range	LDO5 in regulation	6		24	V
	V+ = LDO5, V _{OUT5} < 4.43V	4.5		5.5	
3.3V Output Voltage in Fixed Mode	V+ = 6V to 24V, FB3 = GND, V _{SKIP} = 5V	3.285	3.330	3.375	V
5V Output Voltage in Fixed Mode	V+ = 6V to 24V, FB5 = GND, V _{SKIP} = 5V, MAX8732/MAX8734 (TON = VCC)	4.975	5.050	5.125	V
	V+ = 7V to 24V, FB5 = GND, V _{SKIP} = 5V, MAX8733/MAX8734 (TON = GND)				
Output Voltage in Adjustable Mode	V+ = 6V to 24V, either SMPS	1.975	2.00	2.025	V
Output Voltage Adjust Range	Either SMPS	2.0		5.5	V
FB3, FB5 Adjustable-Mode Threshold Voltage	Dual-Mode comparator	0.1		0.2	V
DC Load Regulation	Either SMPS, V _{SKIP} = 5V, 0 to 5A		-0.1		%
	Either SMPS, SKIP = GND, 0 to 5A		-1.5		
	Either SMPS, V _{SKIP} = 2V, 0 to 5A		-1.7		
Line Regulation	Either SMPS, 6V < V+ < 24V		0.005		%/V
Current-Limit Threshold (Positive, Default)	ILIM_ = VCC, GND - CS_ (MAX8732/MAX8733), GND - LX_ (MAX8734)	93	100	107	mV
Current-Limit Threshold (Positive, Adjustable)	GND - CS_ (MAX8732/MAX8733), GND - LX_ (MAX8734)	V _{ILIM} = 0.5V	40	50	mV
		V _{ILIM} = 1V	93	100	
		V _{ILIM} = 2V	185	200	
Zero-Current Threshold	SKIP = GND, ILIM_ = VCC, GND - CS_ (MAX8732/MAX8733), GND - LX_ (MAX8734)		3		mV
Current-Limit Threshold (Negative, Default)	SKIP = ILIM_ = VCC, GND - CS_ (MAX8732/MAX8733), GND - LX_ (MAX8734)		-120		mV
Soft-Start Ramp Time	Zero to full limit		1.7		ms

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MAX8732/MAX8733/MAX8734

ELECTRICAL CHARACTERISTICS (continued)

(Circuit of Figure 1 and Figure 2, no load on LDO5, LDO3, OUT3, OUT5, and REF, V+ = 12V, ON3 = ON5 = VCC, VSHDN = 5V, TA = 0°C to +85°C, unless otherwise noted. Typical values are at TA = +25°C.)

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS	
Operating Frequency	MAX8732 or MAX8734 (VTON = 5V), SKIP = VCC	5V SMPS	200			kHz	
		3.3V SMPS	300				
	MAX8733 or MAX8734 (VTON = 0), SKIP = VCC	5V SMPS	400				
		3.3V SMPS	500				
	SKIP = REF		25	36			
On-Time Pulse Width	MAX8732 or MAX8734 (VTON = 5V)	VOUT5 = 5.05V	1.895	2.105	2.315	μs	
		VOUT3 = 3.33V	0.833	0.925	1.017		
	MAX8733 or MAX8734 (VTON = 0)	VOUT5 = 5.05V	0.895	1.052	1.209		
		VOUT3 = 3.33V	0.475	0.555	0.635		
Minimum Off-Time			250	300	350	ns	
Maximum Duty Cycle	MAX8732 or MAX8734 (VTON = 5V)	VOUT5 = 5.05V	94			%	
		VOUT3 = 3.33V	91				
	MAX8733 or MAX8734 (VTON = 0)	VOUT5 = 5.05V	88				
		VOUT3 = 3.33V	85				
INTERNAL REGULATOR AND REFERENCE							
LDO5 Output Voltage	ON3 = ON5 = GND, 6V < V+ < 24V, 0 < ILDO5 < 100mA		4.90	5.00	5.10	V	
LDO5 Short-Circuit Current	LDO5 = GND		190			mA	
LDO5 Undervoltage-Lockout Fault Threshold	Falling edge of LDO5, hysteresis = 1%		3.7	4.0	4.3	V	
LDO5 Bootstrap Switch Threshold	Falling edge of OUT5, rising edge at OUT5 regulation point		4.43	4.56	4.69	V	
LDO5 Bootstrap Switch Resistance	LDO5 to OUT5, VOUT5 = 5V		1.4			3.2	Ω
LDO3 Output Voltage	ON3 = ON5 = GND, 6V < V+ < 24V, 0 < ILDO3 < 100mA		3.28	3.35	3.42	V	
LDO3 Short-Circuit Current	LDO3 = GND		180			mA	
LDO3 Bootstrap Switch Threshold	Falling edge of OUT3, rising edge at OUT3 regulation point		2.80	2.91	3.02	V	
LDO3 Bootstrap Switch Resistance	LDO3 to OUT3, VOUT3 = 3.2V		1.5			3.5	Ω
REF Output Voltage	No external load		1.980	2.000	2.020	V	
REF Load Regulation	0 < ILOAD < 50μA		10			mV	
REF Sink Current	REF in regulation		10	μA			
V+ Operating Supply Current	LDO5 switched over to OUT5, 5V SMPS		25			50	μA
V+ Standby Supply Current	V+ = 6V to 24V, both SMPSSs off, includes ISHDN		150			250	μA
V+ Shutdown Supply Current	V+ = 4.5V to 24V		6			15	μA
Quiescent Power Consumption	Both SMPSSs on, FB3 = FB5 = SKIP = GND, VOUT3 = 3.5V, VOUT5 = 5.3V		3			4.5	mW
FAULT DETECTION							
Overvoltage Trip Threshold	FB3 or FB5 with respect to nominal regulation point		+8	+11	+14	%	

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ELECTRICAL CHARACTERISTICS (continued)

(Circuit of Figure 1 and Figure 2, no load on LDO5, LDO3, OUT3, OUT5, and REF, V+ = 12V, ON3 = ON5 = VCC, VSHDN = 5V, TA = 0°C to +85°C, unless otherwise noted. Typical values are at TA = +25°C.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Overvoltage Fault Propagation Delay	FB3 or FB5 delay with 50mV overdrive		10		μs
PGOOD Threshold	FB3 or FB5 with respect to nominal output, falling edge, typical hysteresis = 1%	-12	-9.5	-7	%
PGOOD Propagation Delay	Falling edge, 50mV overdrive		10		μs
PGOOD Output Low Voltage	ISINK = 4mA			0.3	V
PGOOD Leakage Current	High state, forced to 5.5V			1	μA
Thermal-Shutdown Threshold			+160		°C
Output Undervoltage Shutdown Threshold	FB3 or FB5 with respect to nominal output voltage	65	70	75	%
Output Undervoltage Shutdown Blanking Time	From ON_ signal	10	22	35	ms
INPUTS AND OUTPUTS					
Feedback Input Leakage Current	VFB3 = VFB5 = 2.2V	-200	+40	+200	nA
PRO Input Voltage	Low level			0.6	V
	High level	1.5			
SKIP Input Voltage	Low level			0.8	V
	Float level	1.7		2.3	
	High level	2.4			
TON Input Voltage	Low level			0.8	V
	High level	2.4			
ON3, ON5 Input Voltage	Clear fault level/SMPS off level			0.8	V
	Delay start level	1.7		2.3	
	SMPS on level	2.4			
Input Leakage Current	VPRO or VTON = 0 or 5V	-1		+1	μA
	VON_ = 0 or 5V	-2		+2	
	VSKIP = 0 or 5V	-1		+1	
	VSHDN = 0 or 24V	-1		+1	
	VCS_ = 0 or 5V	-2		+2	
	VILIM3, VILIM5 = 0 or 2V	-0.2		+0.2	
SHDN Input Trip Level	Rising edge	1.2	1.6	2.0	V
	Falling edge	0.96	1.00	1.04	
DH_ Gate-Driver Sink/Source Current	DH3, DH5 forced to 2V		2		A
DL_ Gate-Driver Source Current	DL3 (source), DL5 (source), forced to 2V		1.7		A
DL_ Gate-Driver Sink Current	DL3 (sink), DL5 (sink), forced to 2V		3.3		A
DH_ Gate-Driver On-Resistance	BST - LX_ forced to 5V		1.5	4.0	Ω
DL_ Gate-Driver On-Resistance	DL_, high state (pullup)		2.2	5.0	Ω
	DL_, low state (pulldown)		0.6	1.5	

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MAX8732/MAX8733/MAX8734

ELECTRICAL CHARACTERISTICS (continued)

(Circuit of Figure 1 and Figure 2, no load on LDO5, LDO3, OUT3, OUT5, and REF, V+ = 12V, ON3 = ON5 = VCC, VSHDN = 5V, TA = 0°C to +85°C, unless otherwise noted. Typical values are at TA = +25°C.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
OUT3, OUT5 Discharge-Mode On-Resistance			12	40	Ω
OUT3, OUT5 Discharge-Mode Synchronous Rectifier Turn-On Level		0.2	0.3	0.4	V

ELECTRICAL CHARACTERISTICS

(Circuit of Figure 1 and Figure 2, no load on LDO5, LDO3, OUT3, OUT5, and REF, V+ = 12V, ON3 = ON5 = VCC, VSHDN = 5V, TA = -40°C to +85°C, unless otherwise noted.) (Note 1)

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
MAIN SMPS CONTROLLERS						
V+ Input Voltage Range	LDO5 in regulation		6		24	V
	V+ = LDO5, VOUT5 < 4.41V		4.5		5.5	
3.3V Output Voltage in Fixed Mode	V+ = 6V to 24V, FB3 = GND, VSKIP = 5V		3.27		3.39	V
5V Output Voltage in Fixed Mode	V+ = 6V to 24V, FB5 = GND, VSKIP = 5V, MAX8732/MAX8734 (TON = VCC)		4.95		5.15	V
	V+ = 7V to 24V, FB5 = GND, VSKIP = 5V, MAX8733/MAX8734 (TON = GND)					
Output Voltage in Adjustable Mode	V+ = 6V to 24V, either SMPS		1.97		2.03	V
Output Voltage Adjust Range	Either SMPS		2.0		5.5	V
FB3, FB5 Adjustable-Mode Threshold Voltage	Dual-Mode comparator		0.1		0.2	V
Current-Limit Threshold (Positive, Default)	ILIM_ = VCC, GND - CS_ (MAX8732/MAX8733), GND - LX_ (MAX8734)		90		110	mV
Current-Limit Threshold (Positive, Adjustable)	GND - CS_ (MAX8732/MAX8733), GND - LX_ (MAX8734)	VILIM_ = 0.5V	40		60	mV
		VILIM_ = 1V	90		110	
		VILIM_ = 2V	180		220	
On-Time Pulse Width	MAX8732 or MAX8734 (VTON = 5V)	VOUT5 = 5.05V	1.895		2.315	μs
		VOUT3 = 3.33V	0.833		1.017	
	MAX8733 or MAX8734 (VTON = 0)	VOUT5 = 5.05V	0.895		1.209	
		VOUT3 = 3.33V	0.475		0.635	
Minimum Off-Time			200		400	ns
INTERNAL REGULATOR AND REFERENCE						
LDO5 Output Voltage	ON3 = ON5 = GND, 6V < V+ < 24V, 0 < ILDO5 < 100mA		4.90		5.10	V
LDO5 Undervoltage-Lockout Fault Threshold	Falling edge of LDO5, hysteresis = 1%		3.7		4.3	V

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ELECTRICAL CHARACTERISTICS (continued)

(Circuit of Figure 1 and Figure 2, no load on LDO5, LDO3, OUT3, OUT5, and REF, $V^+ = 12.0\text{V}$, $ON3 = ON5 = V_{CC}$, $V_{SHDN} = 5\text{V}$, $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, unless otherwise noted.) (Note 1)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
LDO5 Bootstrap Switch Threshold	Falling edge of OUT5, rising edge at OUT5 regulation point	4.43		4.69	V
LDO5 Bootstrap Switch Resistance	LDO5 to OUT5, $V_{OUT5} = 5\text{V}$			3.2	Ω
LDO3 Output Voltage	$ON3 = ON5 = \text{GND}$, $6\text{V} < V^+ < 24\text{V}$, $0 < I_{LDO3} < 100\text{mA}$	3.27		3.43	V
LDO3 Bootstrap Switch Threshold	Falling edge of OUT3, rising edge at OUT3 regulation point	2.80		3.02	V
LDO3 Bootstrap Switch Resistance	LDO3 to OUT3, $V_{OUT3} = 3.2\text{V}$			3.5	Ω
REF Output Voltage	No external load	1.975		2.025	V
REF Load Regulation	$0 < I_{LOAD} < 50\mu\text{A}$			10	mV
REF Sink Current	REF in regulation	10			μA
V^+ Operating Supply Current	LDO5 switched over to OUT5, 5V SMPS			50	μA
V^+ Standby Supply Current	$V^+ = 6\text{V}$ to 24V , both SMPSS off, includes I_{SHDN}			300	μA
V^+ Shutdown Supply Current	$V^+ = 4.5\text{V}$ to 24V			15	μA
Quiescent Power Consumption	Both SMPSS on, $FB3 = FB5 = \text{SKIP} = \text{GND}$, $V_{OUT3} = 3.5\text{V}$, $V_{OUT5} = 5.3\text{V}$			4.5	mW
FAULT DETECTION					
Overvoltage Trip Threshold	$FB3$ or $FB5$ with respect to nominal regulation point	+8		+14	%
PGOOD Threshold	$FB3$ or $FB5$ with respect to nominal output, falling edge, typical hysteresis = 1%	-12		-7	%
PGOOD Output Low Voltage	$I_{SINK} = 4\text{mA}$			0.3	V
PGOOD Leakage Current	High state, forced to 5.5V			1	μA
Output Undervoltage Shutdown Threshold	$FB3$ or $FB5$ with respect to nominal output voltage	65		75	%
Output Undervoltage Shutdown Blanking Time	From $ON_$ signal	10		40	ms
INPUTS AND OUTPUTS					
Feedback Input Leakage Current	$V_{FB3} = V_{FB5} = 2.2\text{V}$	-200		+200	nA
PRO Input Voltage	Low level			0.6	V
	High level	1.5			
SKIP Input Voltage	Low level			0.8	V
	Float level	1.7		2.3	
	High level	2.4			
TON Input Voltage	Low level			0.8	V
	High level	2.4			

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ELECTRICAL CHARACTERISTICS (continued)

(Circuit of Figure 1 and Figure 2, no load on LDO5, LDO3, OUT3, OUT5, and REF, $V^+ = 12.0\text{V}$, $ON3 = ON5 = V_{CC}$, $V_{SHDN} = 5\text{V}$, $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, unless otherwise noted.) (Note 1)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
ON3, ON5 Input Voltage	Clear fault level/SMPS off level			0.8	V
	Delay start level	1.7		2.3	
	SMPS on level	2.4			
Input Leakage Current	V_{PRO} or $V_{TON} = 0$ or 5V	-1		+1	μA
	$V_{ON_} = 0$ or 5V	-1		+1	
	$V_{SKIP} = 0$ or 5V	-2		+2	
	$V_{SHDN} = 0$ or 24V	-1		+1	
	$V_{CS_} = 0$ or 5V	-2		+2	
	V_{ILIM3} , $V_{ILIM5} = 0$ or 2V	-0.2		+0.2	
SHDN Input Trip Level	Rising edge	1.2		2.0	V
	Falling edge	0.96		1.04	
DH_ Gate-Driver On-Resistance	BST - LX_ forced to 5V			4.0	Ω
DL_ Gate-Driver On-Resistance	DL_, high state (pullup)			5.0	Ω
	DL_, low state (pulldown)			1.5	
OUT3, OUT5 Discharge-Mode On-Resistance				40	Ω
OUT3, OUT5 Discharge-Mode Synchronous Rectifier Turn-On Level		0.2		0.4	V

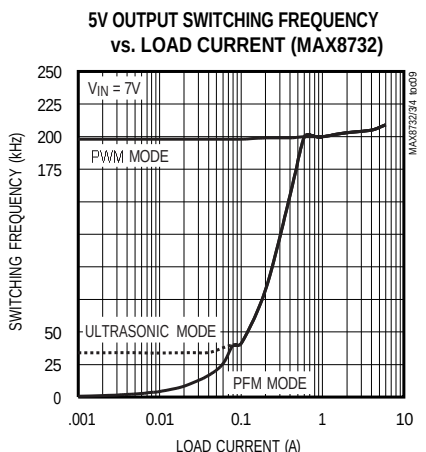
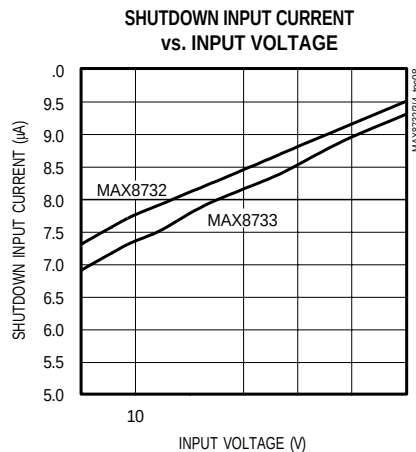
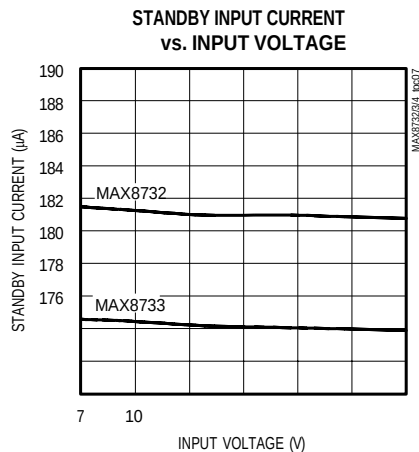
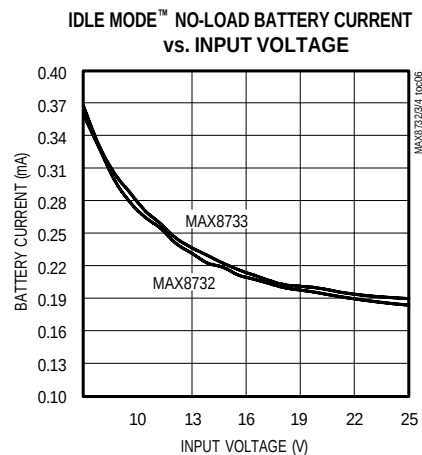
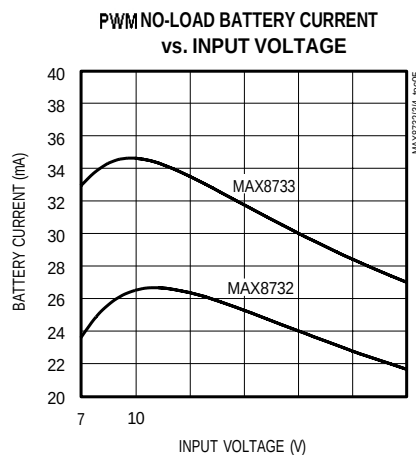
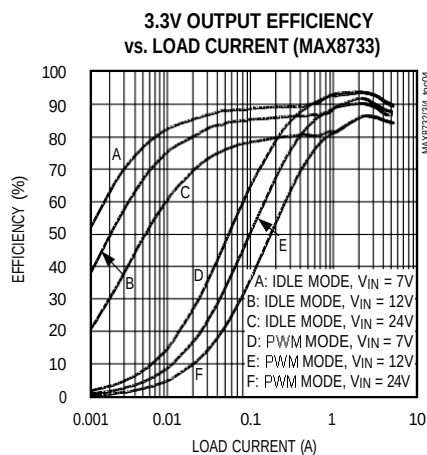
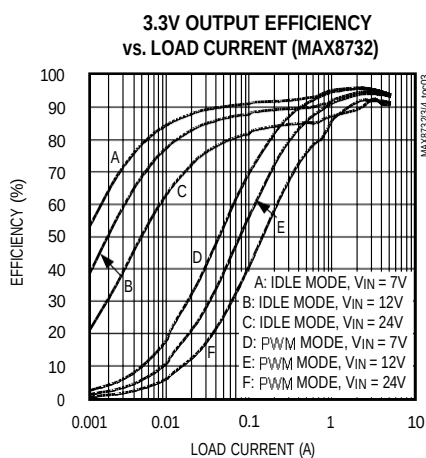
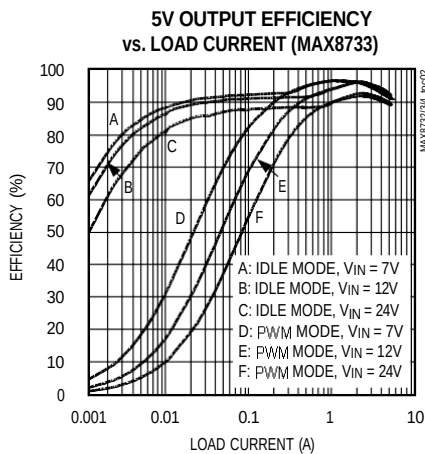
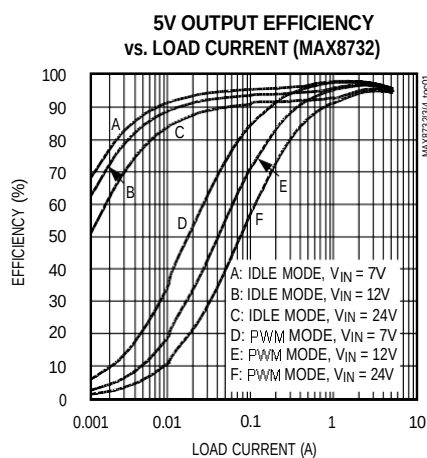
Note 1: Specifications to -40°C are guaranteed by design, not production tested.

MAX8732/MAX8733/MAX8734

High-Efficiency, Quad-Output, Main Power-Supply Controllers for Notebook Computers

Typical Operating Characteristics

(Circuit of Figure 1 and Figure 2, no load on LDO5, LDO3, OUT3, OUT5, and REF, $V_+ = 12V$, $ON3 = ON5 = V_{CC}$, $SHDN = V_+$, $R_{CS} = 7m\Omega$, $V_{ILIM_} = 0.5V$, $T_A = +25^\circ C$, unless otherwise noted.)

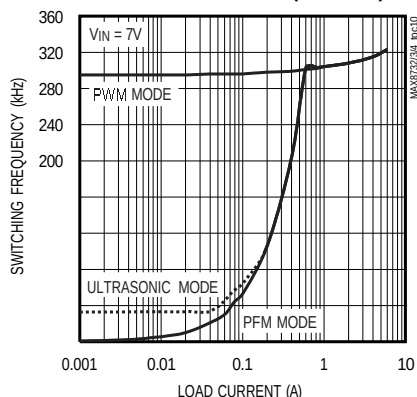


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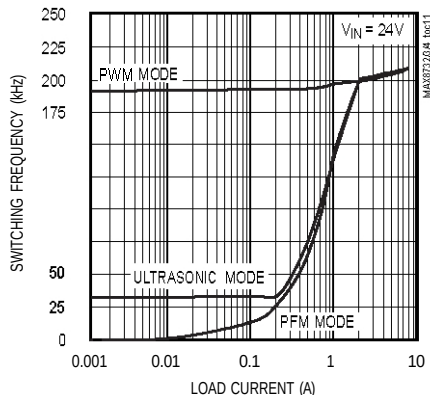
Typical Operating Characteristics (continued)

(Circuit of Figure 1 and Figure 2, no load on LDO5, LDO3, OUT3, OUT5, and REF, $V_+ = 12V$, $ON3 = ON5 = V_{CC}$, $SHDN = V_+$, $R_{CS} = 7m\Omega$, $V_{ILIM_} = 0.5V$, $T_A = +25^\circ C$, unless otherwise noted.)

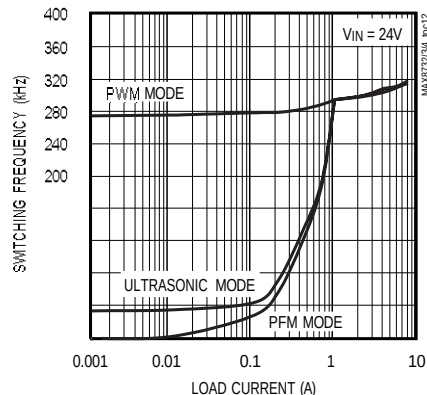
3.3V OUTPUT SWITCHING FREQUENCY vs. LOAD CURRENT (MAX8732)



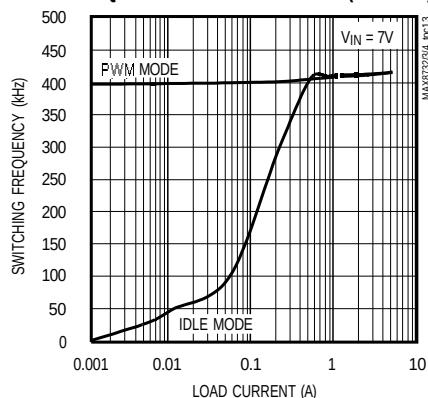
5V OUTPUT SWITCHING FREQUENCY vs. LOAD CURRENT (MAX8732)



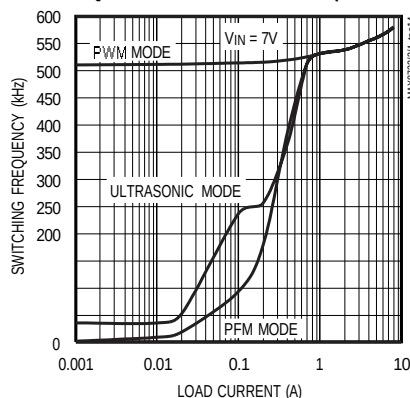
3.3V OUTPUT SWITCHING FREQUENCY vs. LOAD CURRENT (MAX8732)



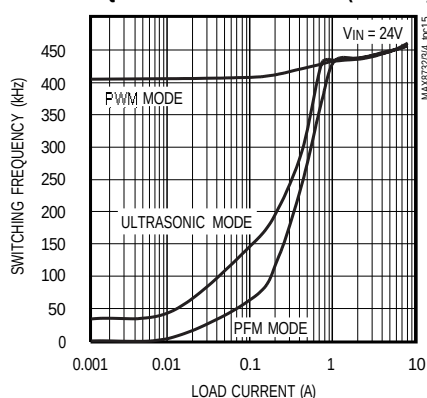
5V OUTPUT SWITCHING FREQUENCY vs. LOAD CURRENT (MAX8733)



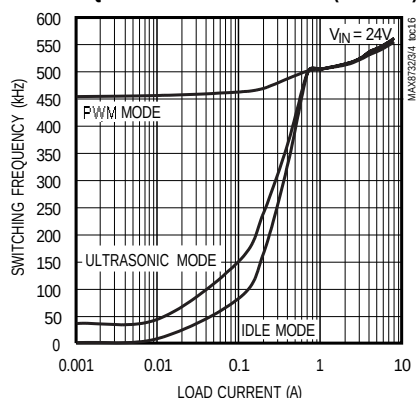
3.3V OUTPUT SWITCHING FREQUENCY vs. LOAD CURRENT (MAX8733)



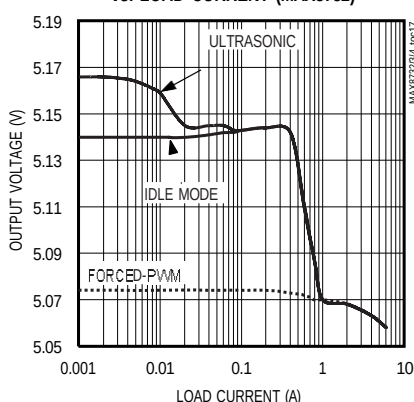
5V OUTPUT SWITCHING FREQUENCY vs. LOAD CURRENT (MAX8733)



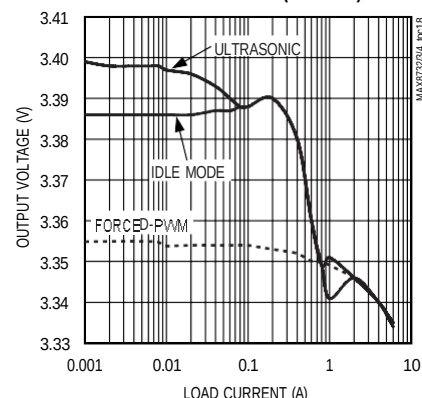
3.3V OUTPUT SWITCHING FREQUENCY vs. LOAD CURRENT (MAX8733)



OUT5 VOLTAGE REGULATION vs. LOAD CURRENT (MAX8732)



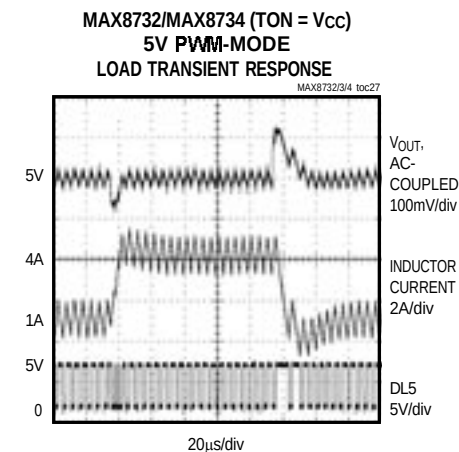
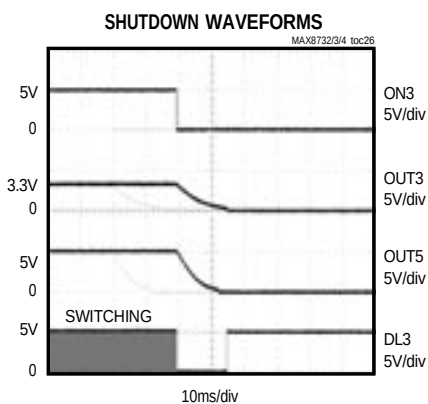
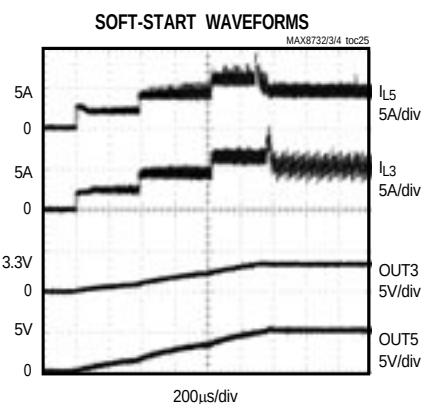
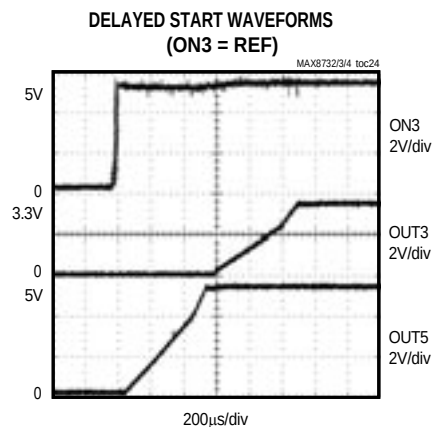
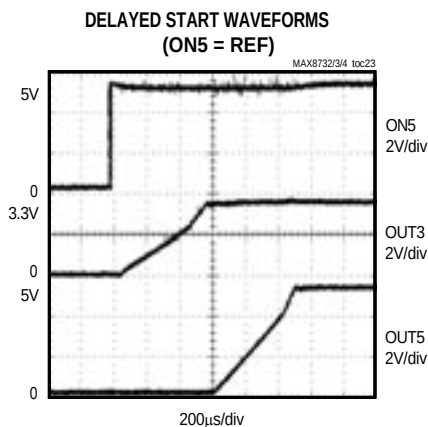
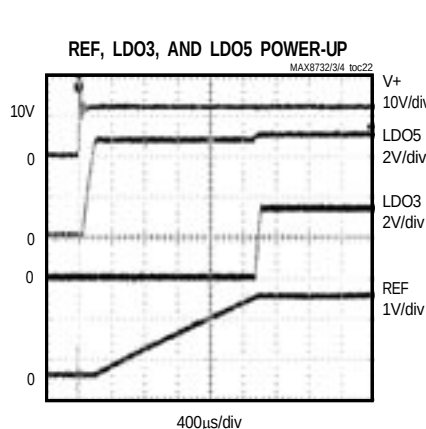
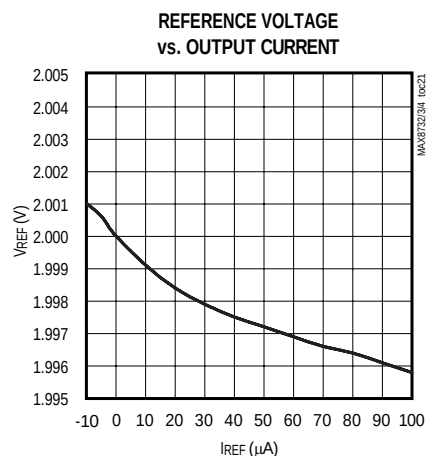
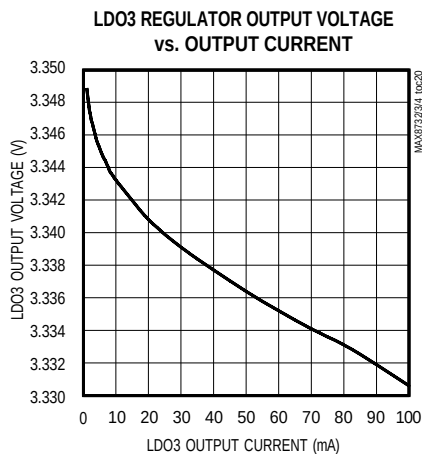
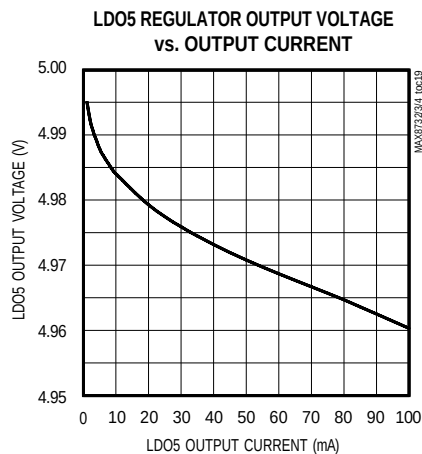
OUT3 VOLTAGE REGULATION vs. LOAD CURRENT (MAX8732)



High-Efficiency, Quad-Output, Main Power-Supply Controllers for Notebook Computers

Typical Operating Characteristics (continued)

(Circuit of Figure 1 and Figure 2, no load on LDO5, LDO3, OUT3, OUT5, and REF, $V_+ = 12V$, $ON3 = ON5 = V_{CC}$, $SHDN = V_+$, $R_{CS} = 7m\Omega$, $V_{ILIM_} = 0.5V$, $T_A = +25^\circ C$, unless otherwise noted.)

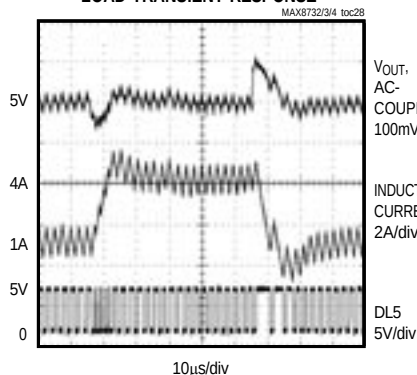


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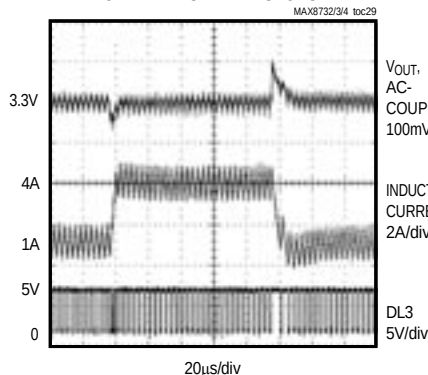
Typical Operating Characteristics (continued)

(Circuit of Figure 1 and Figure 2, no load on LDO5, LDO3, OUT3, OUT5, and REF, $V_+ = 12V$, $ON3 = ON5 = V_{CC}$, $SHDN = V_+$, $R_{CS} = 7m\Omega$, $V_{ILIM_} = 0.5V$, $T_A = +25^\circ C$, unless otherwise noted.)

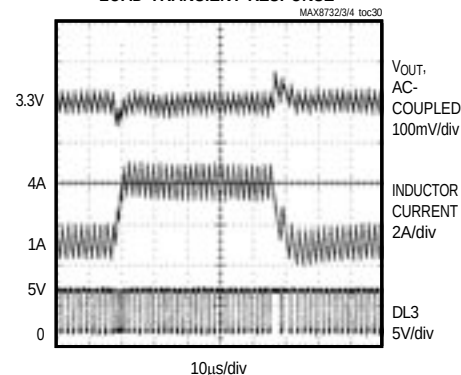
MAX8733/MAX8734 (TON = GND)
5V PFM-MODE
LOAD TRANSIENT RESPONSE



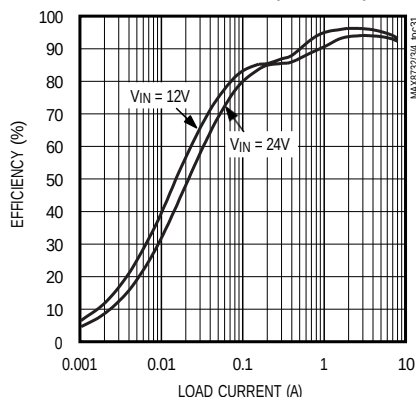
MAX8732/MAX8734 (TON = VCC)
3.3V PFM-MODE
LOAD TRANSIENT RESPONSE



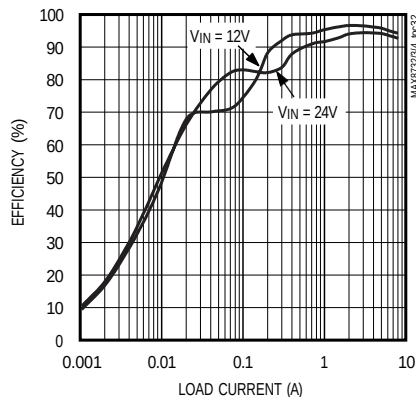
MAX8733/MAX8734 (TON = GND)
3.3V PFM-MODE
LOAD TRANSIENT RESPONSE



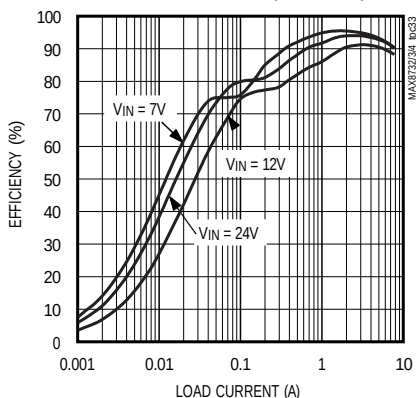
5V ULTRASONIC EFFICIENCY
vs. LOAD CURRENT (TON = VCC)



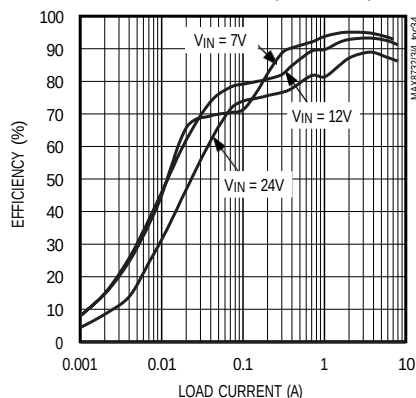
5V ULTRASONIC EFFICIENCY
vs. LOAD CURRENT (TON = GND)



3.3V ULTRASONIC EFFICIENCY
vs. LOAD CURRENT (TON = VCC)



3.3V ULTRASONIC EFFICIENCY
vs. LOAD CURRENT (TON = GND)



MAX8732/MAX8733/MAX8734

High-Efficiency, Quad-Output, Main Power-Supply Controllers for Notebook Computers

Pin Description

PIN		NAME	FUNCTION
MAX8732 MAX8733	MAX8734		
1	—	CS3	3.3V SMPS Current-Sense Input. Connect CS3 to a current-sensing resistor from the source of the synchronous rectifier to GND. The voltage at ILIM3 determines the current-limit threshold (see the <i>Current-Limit (ILIM) Circuit</i> section).
—	1	N.C.	No Connection. Not internally connected.
2	2	PGOOD	Power-Good Output. PGOOD is an open-drain output that is pulled low if either output is disabled or is more than 10% below its nominal value.
3	3	ON3	3.3V SMPS Enable Input. The 3.3V SMPS is enabled if ON3 is greater than the SMPS on level and disabled if ON3 is less than the SMPS off level. If ON3 is connected to REF, the 3.3V SMPS starts after the 5V SMPS reaches regulation (delay start). Drive ON3 below the clear fault level to reset the fault latches.
4	4	ON5	5V SMPS Enable Input. The 5V SMPS is enabled if ON5 is greater than the SMPS on level and disabled if ON5 is less than the SMPS off level. If ON5 is connected to REF, the 5V SMPS starts after the 3.3V SMPS reaches regulation (delay start). Drive ON5 below the clear fault level to reset the fault latches.
5	5	ILIM3	3.3V SMPS Current-Limit Adjustment. The GND-LX current-limit threshold defaults to 100mV if ILIM3 is connected to VCC. In adjustable mode, the current-limit threshold is 1/10th the voltage seen at ILIM3 over a 0.5V to 3V range. The logic threshold for switchover to the 100mV default value is approximately $V_{CC} - 1V$. Connect ILIM3 to REF for a fixed 200mV threshold.
6	6	SHDN	Shutdown Control Input. The device enters its 6 μ A supply current shutdown mode if VSHDN is less than the SHDN input falling-edge trip level and does not restart until VSHDN is greater than the SHDN input rising-edge trip level. Connect SHDN to V+ for automatic startup. SHDN can be connected to V+ through a resistive voltage-divider to implement a programmable undervoltage lockout.
7	7	FB3	3.3V SMPS Feedback Input. Connect FB3 to GND for fixed 3.3V operation. Connect FB3 to a resistive voltage-divider from OUT3 to GND to adjust the output from 2V to 5.5V.
8	8	REF	2V Reference Output. Bypass to GND with a 0.22 μ F (min) capacitor. REF can source up to 100 μ A for external loads. Loading REF degrades FB_ and output accuracy according to the REF load-regulation error.
9	9	FB5	5V SMPS Feedback Input. Connect FB5 to GND for fixed 5V operation. Connect FB5 to a resistive voltage-divider from OUT5 to GND to adjust the output from 2V to 5.5V.
10	10	PRO	Overvoltage and Undervoltage Fault Protection Enable/Disable. Connect PRO to VCC to disable undervoltage, overvoltage protection, and discharge mode (DL = low in shutdown). Connect PRO to GND to enable undervoltage and overvoltage protection (see the <i>Fault Protection</i> section), and output discharge mode.
11	11	ILIM5	5V SMPS Current-Limit Adjustment. The GND-LX current-limit threshold defaults to 100mV if ILIM5 is connected to VCC. In adjustable mode, the current-limit threshold is 1/10th the voltage seen at ILIM5 over a 0.5V to 3V range. The logic threshold for switchover to the 100mV default value is approximately $V_{CC} - 1V$. Connect ILIM5 to REF for a fixed 200mV threshold.
12	12	SKIP	Low-Noise Mode Control. Connect SKIP to GND for normal Idle-Mode (pulse-skipping) operation or to VCC for PWM mode (fixed frequency). Connect to REF or leave floating for

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