

Product Change Notice (PCN)

Subject: Design and Mold Compound Change for the Intersil ISL78600ANZ* Products

Publication Date: 4/20/2016

Effective Date: 7/20/2016

Revision Description:

Initial Release

Description of Change:

All level and mold compound change to the ISL78600ANZ* to improve overall product performance.

Part numbers affected – ISL78600ANZ; ISL78600ANZ-T

Reason for Change:

The changes include several product performance improvements as listed below:

1. BGREF – implemented an amended secondary reference to improve performance post assembly of device onto printed circuit board.
2. Improved Latch-up performance

The mold compound change improves thermal stability of device post solder, for better precision performance.

The changes align the datasheet with the product characteristics and is necessary to maintain product manufacturability in support of customer delivery requirements. Details regarding the changes are contained in Appendix B. the updated data sheet is available on the Intersil web site at:

<http://www.intersil.com/content/dam/Intersil/documents/isl7/isl78600.pdf>

Impact on fit, form, function, quality & reliability:

The change will have no other impact on the form, fit, function, quality, reliability and environmental compliance of the devices.

Product Identification:

Product affected by this change is identifiable via Intersil's internal traceability system.

Qualification status: Complete, see Appendix A

Sample availability: 4/20/2016

Device material declaration: Available upon request

Questions or requests pertaining to this change notice, including additional data or samples, must be sent to Intersil within 30 days of the publication date.

For additional information regarding this notice, please contact your regional change coordinator (below)			
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Appendix A: Qualification Results

Qualification Results				
Stress	Test Method	Sample Size (total)	# of Lots	Result
High Temperature Operating Life (HTOL)	JESD22-A108	231	3	Pass
Early Life Failure Rate (ELFR)	AEC Q100-008	2400	3	Pass
Biased Hast (BHAST)	JESD22-A110	231	3	Pass
High Temperature Storage (HTS)	JESD22-A103	45	1	Pass
Unbiased HAST (UHAST)	JESD22-A118	231	3	Pass
Temperature Cycle (TC)	JESD22-A104	231	3	Pass

Appendix B: Datasheet Electrical Table Changes

From:

Absolute Maximum Ratings

Unless otherwise specified. With respect to VSS.

DIN, SCLK, CS, DOUT, DATA READY, COMMS SELECT n, ExTn, TEMPREG, REF, V3P3, VCC, FAULT, COMMS RATE n, BASE, EN, VDDEXT	-0.2V to 4.1V
V2P5	-0.2V to 2.9V
VBAT	-0.5V to 6.3V
DhI1, DLo1, DHi2, DLo2	-0.5V to (VBAT + 0.5V)
VCO	-0.5V to +9.0V
VC1	-0.5V to +18V
VC2	-0.5V to +18V
VC3	-0.5V to +27V
VC4	-0.5V to +27V
VC5	-0.5V to +36V
VC6	-0.5V to +36V
VC7	-0.5V to +49V
VC8	-0.5V to +49V
VC9	-0.5V to +54V
VC10	-0.5V to +63V
VC11	-0.5V to +63V
VC12	-0.5V to +63V
Vcn (for n = 0 to 12)	-0.5 to VBAT +0.5V
CBn (for n = 1 to 12)	-0.5 to VBAT +0.5V
CBn (for n = 1 to 9)	V(VCn-1) -0.5V to V(VCn-1) +9V
CBn (for n = 10 to 12)	V(VCn) -9V to V(VCn) +0.5V
Current into Vcn, VBAT, VSS (Latch-up Test)	±100mA
ESD Rating	
Human Body Model (Tested per JESD22-A114F)	2kV
Capacitive Discharge Model (Tested per JESD22-C101D)	500V
Latch-up (Tested per JESD-78B; Class 2, Level A)	100mA

NOTE: DOUT, DATA READY, and FAULT are digital outputs and should not be driven from external sources. V2P5, REF, TEMPREG and BASE are analog outputs and should not be driven from external sources.

Thermal Information

Thermal Resistance (Typical)	$\theta_{JA}(C/W)$	$\theta_{JC}(C/W)$
64 Ld TQFP Package (Notes 5, 6)	49	9
Max Continuous Package Power Dissipation		400mW
Storage Temperature		-55°C to +125°C
Max Operating Junction Temperature		+125°C
Pb-Free Reflow Profile		Refer to JEDEC J STD 020D

Recommended Operating Conditions

TA, Ambient Temperature Range	-40°C to +105°C
VBAT	6V to 60V
VBAT (Daisy Chain Operation)	10V to 60V
Vcn (for n = 1 to 12)	V(VCn-1) to V(VCn-1) + 5V
VCO	-0.1V to 0.1V
CBn (for n = 1 to 9)	V(VCn-1) to V(VCn-1) + 9V
CBn (for n = 10 to 12)	V(VCn) -9V to V(VCn)
DIN, SCLK, CS, COMMS SELECT 1, COMMS SELECT 2, V3P3, VCC, COMMS RATE 0, COMMS RATE 1, EN	0V to 3.6V
Ext1, Ext2, Ext3, Ext4	0V to 2.5V

To:

Absolute Maximum Ratings

Unless otherwise specified. With respect to VSS.

BASE	-0.2V to 5.5V
DIN, SCLK, CS, DOUT, DATA READY, COMMS SELECT n, ExTn, TEMPREG, REF, V3P3, VCC, FAULT, COMMS RATE n, EN, VDDEXT	-0.2V to 4.1V
V2P5	-0.2V to 2.9V
VBAT	-0.5V to 6.3V
DhI1, DLo1, DHi2, DLo2	-0.5V to (VBAT + 0.5V)
VCO	-0.5V to +9.0V
VC1	-0.5V to +18V
VC2	-0.5V to +18V
VC3	-0.5V to +27V
VC4	-0.5V to +27V
VC5	-0.5V to +36V
VC6	-0.5V to +36V
VC7	-0.5V to +49V
VC8	-0.5V to +49V
VC9	-0.5V to +54V
VC10	-0.5V to +63V
VC11	-0.5V to +63V
VC12	-0.5V to +63V
Vcn (for n = 0 to 12)	-0.5 to VBAT +0.5V
CBn (for n = 1 to 12)	-0.5 to VBAT +0.5V
CBn (for n = 1 to 9)	V(VCn-1) -0.5V to V(VCn-1) +9V
CBn (for n = 10 to 12)	V(VCn) -9V to V(VCn) +0.5V
Current into Vcn, VBAT, VSS (Latch-Up Test)	±100mA
ESD Rating	
Human Body Model (Tested per AECQ100-002)	2kV
Capacitive Discharge Model (Tested per AECQ100-011)	2kV
Latch-Up (Tested per AEC-Q100-004; Class 2, Level A)	100mA

NOTE: DOUT, DATA READY, and FAULT are digital outputs and should not be driven from external sources. V2P5, REF, TEMPREG and BASE are analog outputs and should not be driven from external sources.

Thermal Information

Thermal Resistance (Typical)	$\theta_{JA}(C/W)$	$\theta_{JC}(C/W)$
64 Ld TQFP Package (Notes 6, 7)	42	9
Maximum Continuous Package Power Dissipation		400mW
Storage Temperature		-55°C to +125°C
Maximum Operating Junction Temperature		+125°C
Pb-Free Reflow Profile		see TR493

Recommended Operating Conditions

TA, Ambient Temperature Range	-40°C to +105°C
VBAT	6V to 60V
VBAT (Daisy Chain Operation)	10V to 60V
Vcn (for n = 1 to 12)	V(VCn-1) to V(VCn-1) + 5V
VCO	-0.1V to 0.1V
CBn (for n = 1 to 9)	V(VCn-1) to V(VCn-1) + 9V
CBn (for n = 10 to 12)	V(VCn) -9V to V(VCn)
DIN, SCLK, CS, COMMS SELECT 1, COMMS SELECT 2, V3P3, VCC, COMMS RATE 0, COMMS RATE 1, EN	0V to 3.6V
Ext1, Ext2, Ext3, Ext4	0V to 2.5V

From:

Electrical Specifications VBAT = 6 to 60V, TA = -20°C to +60°C, unless otherwise specified. Biasing setup as in Figure 56 on page 84 or equivalent.

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 7)	TYP	MAX (Note 7)	UNITS
Power-Up Condition Threshold	V _{POR}	V _{BAT} voltage (rising)	4.8	5.1	5.6	V
Power-Up Condition Hysteresis	V _{PORhys}			400		mV

To:

Power-Up Condition Threshold	V _{POR}	V _{BAT} voltage (rising)	4.8	5.1	5.6	V
Power-Up Condition Hysteresis	V _{PORhys}			460		mV

From:

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 1)	TYP	MAX (Note 2)	UNITS
VBAT Supply Current	VBAT	Non-Daisy Chain configuration. Device enabled. No communications, ADC, measurement, balancing or open wire detection activity.				
		6V	7	35	80	μA
		39.6V	0	64	243	μA
		60V	0	90	250	μA
		-40°C to +105°C (Note 3)	0		280	μA
	VBATMASTER	Daisy Chain configuration – master device. Enabled. No communications, ADC, measurement, balancing or open wire detection activity.				
		6V	400	530	660	μA
		39.6V	500	680	900	μA
		60V	550	750	1000	μA
		-40°C to +105°C (Note 3)			1150	μA
	VBATMID	Daisy Chain configuration – MIDDLE stack device. Enabled. No communications, ADC, measurement, balancing or open wire detection activity.				
		6V	700	1020	1210	μA
		39.6V	900	1250	1560	μA
		60V	1000	1400	1700	μA
		-40°C to +105°C (Note 3)			1850	μA
	VBATTOP	Daisy Chain configuration – top device. Enabled. No communications, ADC, measurement, balancing or open wire detection activity.				
		6V	400	530	660	μA
		39.6V	500	680	900	μA
		60V	550	750	1000	μA
		-40°C to +105°C (Note 3)			1150	μA
	VBATSLEEP1 (Note 3)	Sleep mode (EN = 1, Daisy Chain configuration)				
		6V	14	18	23	μA
		39.6V	18	23	29	μA
		60V	20	25	30	μA
		-40°C to +105°C			44	μA
	VBATSLEEP2 (Note 3)	Sleep mode (EN = 1, Stand-alone, non-Daisy Chain)	3.2	5	16	μA
		-40°C to +105°C	3		70	μA
	VBATSHDN (Note 3)	Shutdown, device "off" (EN = 0) (Daisy Chain and Non-Daisy Chain configurations)				
		6V	1.3	7	15.5	μA
		39.6V	3	7	18	μA
		60V	5	7	23	μA
		-40°C to +105°C	1		77	μA

To:

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 4)	TYP	MAX (Note 5)	UNIT
Supply Current Specifications						
VBAT Supply Current	VBAT	Non-daisy chain configuration. Device enabled. No communications, ADC, measurement, balancing or open-wire detection activity.				
		6V		70	90	μA
		39.6V		73	95	μA
		60V		73	96	μA
		-40°C to +105°C (Note 3)			105	μA
	VBATMASTER	Daisy chain configuration – master device. Enabled. No communications, ADC, measurement, balancing or open-wire detection activity.				
		6V	400	550	660	μA
		39.6V	500	650	900	μA
		60V	550	710	1000	μA
		-40°C to +105°C (Note 3)			1150	μA
	VBATMID	Daisy chain configuration – Middle stack device. Enabled. No communications, ADC, measurement, balancing or open-wire detection activity.				
		6V	700	1020	1210	μA
		39.6V	900	1210	1560	μA
		60V	1000	1340	1700	μA
		-40°C to +105°C (Note 3)			1850	μA
	VBATTOP	Daisy chain configuration – top device. Enabled. No communications, ADC, measurement, balancing or open-wire detection activity.				
		6V	400	550	660	μA
		39.6V	500	650	900	μA
		60V	550	710	1000	μA
		-40°C to +105°C (Note 3)			1150	μA
	VBATSLEEP1 (Note 3)	Sleep mode (EN = 1, daisy chain configuration)				
		6V	13	28	44	μA
		39.6V	18	33	46	μA
		60V	20	35	50	μA
		-40°C to +105°C			120	μA
	VBATSLEEP2 (Note 3)	Sleep mode (EN = 1, stand-alone, non-daisy chain)	13.2	19	34.3	μA
		-40°C to +105°C	13.5		109	μA
	VBATSHDN (Note 3)	Shutdown, device "off" (EN = 0) (Daisy chain and non-daisy chain configurations)				
		6V	0	13	28	μA
		39.6V	7	15	26	μA
		60V	7	16	30	μA
		-40°C to +105°C			101	μA

From:

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 2)	TYP	MAX (Note 2)	UNITS
V _{BAT} Supply Current Tracking, Sleep Mode	I _{BATASLEEP} (Note 9)	EN = 1, Delay Chain Sleep Mode configuration. V _{BAT} current difference between any two devices operating at the same temperature and supply voltage. -40°C to +105°C	0	4	8	μA
			0		17	μA

To:

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 8)	TYP	MAX (Note 8)	UNIT
V _{BAT} Supply Current Tracking, Sleep Mode	I _{BATASLEEP} (Note 9)	EN = 1, delay chain sleep mode configuration. V _{BAT} current difference between any two devices operating at the same temperature and supply voltage. -40°C to +105°C	0		18	μA
			0		50	μA

From:

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 2)	TYP	MAX (Note 2)	UNITS
V _{BAT} Incremental Supply Current, Balancing	I _{BATBAL}	All balancing circuits on. Incremental current. Add to non-balancing V _{BAT} current. V _{BAT} = 39.6V -40°C to +105°C (Note 9)	250	300	350	μA
V3P3 Regulator Voltage (Normal)	V3P3N	EN = 1, Load current range 0 to 5mA. V _{BAT} = 39.6V -40°C to +105°C (Note 9)	3.25	3.35	3.45	V
V3P3 Regulator Voltage (Sleep)	V3P3S	EN = 1, Load current range. No load. (SLEEP). V _{BAT} = 39.6V -40°C to +105°C (Note 9)	2.45	2.7	2.95	V
V3P3 Regulator Control Current	I _{BASE}	Current sourced from BASE output. V _{BAT} = 6V -40°C to +105°C (Note 9)	1	1.5		mA
V3P3 Supply Current	I _{V3P3}	Device Enabled No measurement activity, Normal Mode -40°C to +105°C (Note 9)	0.8	1	1.2	mA
V _{REF} Reference Voltage	V _{REF}	EN = 1, No Load, Normal Mode		2.5		V
V _{DDEXT} Switch Resistance	R _{VDDEXT}	Switch "On" resistance. V _{BAT} = 39.6V -40°C to +105°C (Note 9)	8	12	17	Ω
VCC Supply Current	I _{VCC}	Device enabled (EN = 1), Stand-Alone or Datsy Configuration. No ADC or Datsy Chain communications active. -40°C to +105°C (Note 9)	2.0	3.25	4.5	mA
	I _{VCCACTIVE1}	Device enabled (EN = 1), Stand-Alone or Datsy Configuration. Average current during 10ms Scan Continuous operation. V _{BAT} = 39.6V		6.0		mA
	I _{VCCSLEEP}	Device enabled (EN = 1), Sleep mode. V _{BAT} = 39.6V		2.4		μA
	I _{VCCSHDN}	Device disabled (EN = 0), Shutdown mode. -40°C to +105°C (Note 9)	0	1.3	4.1	μA
					9.0	μA

To:

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 8)	TYP	MAX (Note 8)	UNIT
V _{BAT} Incremental Supply Current, Balancing	I _{BATBAL}	All balancing circuits on. Incremental current. Add to non-balancing V _{BAT} current. V _{BAT} = 39.6V -40°C to +105°C (Note 9)	250	300	350	μA
V3P3 Regulator Voltage (Normal)	V3P3N	EN = 1, Load current range 0 to 5mA. V _{BAT} = 39.6V -40°C to +105°C (Note 9)	3.25	3.35	3.45	V
V3P3 Regulator Voltage (Sleep)	V3P3S	EN = 1, Load current range. No load. (SLEEP). V _{BAT} = 39.6V		2.8		V
V3P3 Regulator Control Current	I _{BASE}	Current sourced from BASE output. V _{BAT} = 6V -40°C to +105°C (Note 9)	1			mA
V3P3 Supply Current	I _{V3P3}	Device enabled No measurement activity, Normal mode -40°C to +105°C (Note 9)	0.8	1	1.2	mA
V _{REF} Reference Voltage	V _{REF}	EN = 1, no load, normal mode		2.5		V
V _{DDEXT} Switch Resistance	R _{VDDEXT}	Switch "ON" resistance. V _{BAT} = 39.6V -40°C to +105°C (Note 9)	5		22	Ω
VCC Supply Current	I _{VCC}	Device enabled (EN = 1), Stand-alone or datsy configuration. No ADC or datsy chain communications active. -40°C to +105°C (Note 9)	2.00	3.25	4.50	mA
	I _{VCCACTIVE1}	Device enabled (EN = 1), Stand-alone or datsy configuration, average current during 10ms scan continuous operation. V _{BAT} = 39.6V		6.0		mA
	I _{VCCSLEEP}	Device enabled (EN = 1), Sleep mode. V _{BAT} = 39.6V		0.5		μA
	I _{VCCSHDN}	Device disabled (EN = 0), Shutdown mode. -40°C to +105°C (Note 9)	0	0.5	3.5	μA
					9.0	μA

From:

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 7)	TYP	MAX (Note 7)	UNITS
Cell Input Current. Note: Cell accuracy figures assume a fixed 1kΩ resistor is placed in series with each VCn pin (n = 0 to 12)	I _{CELL}	VC0 Input				
		VC0 ≥ 0.5 and VC0 ≤ 4.0V	-1.5	-1	-0.5	μA
		VC0 > 4.0V	-1.75		-0.5	μA
		-40°C to +105°C (Note 9)	-2.0	-1	-0.5	μA
		VC1, VC2, VC3 Inputs				
		VCn - VC(n-1) ≥ 0.5 and VCn-VC(n-1) ≤ 4.0V	-2.7	-2	-1.3	μA
		VCn - VC(n-1) > 4.0V	-2.85		-1.0	μA
		-40°C to +105°C (Note 9)	-3.0	-2	-0.84	μA
		VC4 Input				
		VCn - VC(n-1) ≥ 0.5 and VCn-VC(n-1) ≤ 4.0V	-0.6	0	0.71	μA
		VCn - VC(n-1) > 4.0V	-0.8		1.15	μA
		-40°C to +105°C (Note 9)	-0.84	0	1.31	μA
		VC5, VC6, VC7, VC8, VC9, VC10, VC11 Inputs				
		VCn - VC(n-1) < 2.6V	0.5	2	2.7	μA
		VCn - VC(n-1) ≥ 2.6V and VCn-VC(n-1) ≤ 4.0V	1.32	2	2.89	μA
		VCn - VC(n-1) > 4.0V	1.16	2	3.33	μA
		-40°C to +105°C (Note 9)	0.5	2	3.43	μA
		VC12 Input				
		VC12 - VC11 ≥ 0.5 and VC12-VC11 ≤ 4.0V	0.37	1	1.85	μA
		VC12 - VC11 > 4.0V	0.19		2.3	μA
		-40°C to +105°C (Note 9)	0.15	1	2.47	μA

To:

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 8)	TYP	MAX (Note 8)	UNIT
Cell Input Current. Note: Cell accuracy figures assume a fixed 1kΩ resistor is placed in series with each VCn pin (n = 0 to 12)	I _{CELL}	VC0 Input				
		VC0 ≥ 0.5 and VC0 ≤ 4.0V	-1.5	-1	-0.5	μA
		VC0 > 4.0V	-1.75		-0.50	μA
		-40°C to +105°C (Note 9)	-2.0	-1	-0.5	μA
		VC1, VC2, VC3 Inputs				
		VCn - VC(n-1) ≥ 0.5 and VCn-VC(n-1) ≤ 4.0V	-2.7	-2	-1.3	μA
		VCn - VC(n-1) > 4.0V	-2.85		-1.00	μA
		-40°C to +105°C (Note 9)	-3.0	-2	-1.0	μA
		VC4 Input				
		VCn - VC(n-1) ≥ 0.5 and VCn-VC(n-1) ≤ 4.0V	-0.6	0	0.6	μA
		VCn - VC(n-1) > 4.0V	-0.7		0.7	μA
		-40°C to +105°C (Note 9)	-0.8	0	0.8	μA
		VC5, VC6, VC7, VC8, VC9, VC10, VC11 Inputs				
		VCn - VC(n-1) < 2.6V	0.5	2	2.7	μA
		VCn - VC(n-1) ≥ 2.6V and VCn-VC(n-1) ≤ 4.0V	1.5	2	2.7	μA
		VCn - VC(n-1) > 4.0V	1.50	2	2.85	μA
		-40°C to +105°C (Note 9)	0.5	2	3.0	μA
		VC12 Input				
		VC12 - VC11 ≥ 0.5 and VC12 - C11 ≤ 4.0V	0.6	1	1.7	μA
		VC12 - VC11 > 4.0V	0.60		1.75	μA
		-40°C to +105°C (Note 9)	0.6	1	2.0	μA

From:

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 7)	TYP	MAX (Note 7)	UNITS
Initial V_{BAT} monitor Voltage Error (Note 10)	ΔV_{BAT}	Measured at $V_{BAT} = 36V$ to $43.2V$	-100		100	mV
		Measured at $V_{BAT} = 31.2V$ to $48V$	-125		125	mV
		Measured at $V_{BAT} = 31.2V$ to $59.4V$	-250		250	mV
		Measured at $V_{BAT} = 6V$ to $59.4V$	-320		332	mV
		Measured at $V_{BAT} = 6V$ to $59.4V$ $-40^{\circ}C$ to $+105^{\circ}C$ (Note 9)	-490		490	mV
External Temperature Monitoring Regulator	V_{TEMP}	Voltage on TEMPREG output. (0 to 2mA load)	2.475	2.5	2.525	V
External Temperature Output Impedance	R_{TEMP}	Output Impedance at TEMPREG pin. (Note 9)	0	0.1	0.2	Ω
External Temperature Input Range	V_{EXT}	Effective $EXTn$ input voltage range. For design reference. This is the input voltage range that does not trigger an open input condition.	0		2344	mV
External Temperature Input Pull-up	R_{EXTMP}	Pull-up resistor to $V_{TEMPREG}$ applied to each input during measurement		10		M Ω
External Temperature Input Offset	V_{EXTOFF}	$V_{BAT} = 39.6V$	-7.0		7.0	mV
		$V_{BAT} = 39.6V$, $-40^{\circ}C$ to $+105^{\circ}C$ (Note 9)	-10		10	mV
External Temperature Input INL	V_{EXTINL}	(Note 9)	-0.65		0.65	mV
External Temperature Input Gain Error	V_{EXTG}	Error at 2.5V input	-7.5		11	mV
		$-40^{\circ}C$ to $+105^{\circ}C$ (Note 9)	-13.4		19.3	mV

To:

Measured @ $V_{BAT} = 31.2V$ to $59.4V$ removed from datasheet

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 8)	TYP	MAX (Note 8)	UNIT
Initial V_{BAT} monitor Voltage Error (Note 10)	ΔV_{BAT}	Measured at $V_{BAT} = 36V$ to $43.2V$	-100		100	mV
		Measured at $V_{BAT} = 31.2V$ to $48V$	-125		125	mV
		Measured at $V_{BAT} = 6V$ to $59.4V$	-320		322	mV
		Measured at $V_{BAT} = 6V$ to $59.4V$ $-40^{\circ}C$ to $+105^{\circ}C$ (Note 9)	-490		490	mV
External Temperature Monitoring Regulator	V_{TEMP}	Voltage on TEMPREG output. (0 to 2mA load)	2.475	2.500	2.525	V
External Temperature Output Impedance	R_{TEMP}	Output Impedance at TEMPREG pin. (Note 9)	0	0.1	0.2	Ω
External Temperature Input Range	V_{EXT}	Effective $EXTn$ input voltage range. For design reference. This is the input voltage range that does not trigger an open input condition.	0		2344	mV
External Temperature Input Pull-Up	R_{EXTMP}	Pull-up resistor to $V_{TEMPREG}$ applied to each input during measurement		10		M Ω
External Temperature Input Offset	V_{EXTOFF}	$V_{BAT} = 39.6V$	-7.0		7.0	mV
		$V_{BAT} = 39.6V$, $-40^{\circ}C$ to $+105^{\circ}C$ (Note 9)	-10		10	mV
External Temperature Input INL	V_{EXTINL}	(Note 9)			± 0.61	mV
External Temperature Input Gain Error	V_{EXTG}	Error at 2.5V input	-7.5		11	mV
		$-40^{\circ}C$ to $+105^{\circ}C$ (Note 9)	-8		18.5	mV

From:

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 7)	TYP	MAX (Note 7)	UNITS
V2P5 Power-good Window	V _{2PH}	2.5V power-good window high threshold. V _{BAT} = 39.6V	2.62	2.7	2.766	V
		-40°C to +105°C (Note 9)	2.616		2.77	V
	V _{2PL} (Note 9)	2.5V power-good window low threshold. V _{BAT} = 39.6V	1.96	2.02	2.08	V
		-40°C to +105°C	1.90		2.14	V

To:

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 8)	TYP	MAX (Note 8)	UNIT
V2P5 Power-Good Window	V _{2PH}	2.5V power-good window high threshold. V _{BAT} = 39.6V	2.65	2.70	2.90	V
		-40°C to +105°C (Note 9)	2.53		2.90	V
	V _{2PL} (Note 9)	2.5V power-good window low threshold. V _{BAT} = 39.6V	1.85	2.03	2.24	V
		-40°C to +105°C	1.76		2.28	V

From:

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 7)	TYP	MAX (Note 7)	UNITS
Open VC1 Detection Threshold	V _{VC1}	CELL1 positive terminal (with respect to VSS) V _{BAT} = 39.6V (Note 9)	0.6	0.7	0.8	V
Primary Detection Threshold, VC2 to VC12	V _{VC2_12P}	V(VC(n - 1)) - V(VCn), n = 2 to 12 V _{BAT} = 39.6V (Note 9)	-2	-1.5	0	V
Secondary Detection Threshold, VC2 to VC12	V _{VC2_12S}	Via ADC. VC2 to VC12 only V _{BAT} = 39.6V (Note 9)	-100	-30	50	mV

To:

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 8)	TYP	MAX (Note 8)	UNIT
Open VC1 Detection Threshold	V _{VC1}	CELL1 positive terminal (with respect to VSS) V _{BAT} = 39.6V (Note 9)	0.6	0.7	0.8	V
Primary Detection Threshold, VC2 to VC12	V _{VC2_12P}	V(VC(n - 1)) - V(VCn), n = 2 to 12 V _{BAT} = 39.6V (Note 9)	-1.5	-1.2	-0.9	V
Secondary Detection Threshold, VC2 to VC12	V _{VC2_12S}	Via ADC. VC2 to VC12 only V _{BAT} = 39.6V (Note 9)	-100	-39	10	mV

From:

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 7)	TYP	MAX (Note 7)	UNITS
MEASUREMENT FUNCTION TIMING (Note 8)						
Cell Sample Time Start		Time to sample the first cell (CELL12) following CS going High. Scan voltages command		65	71.5	µs
Cell Sample Time Duration		Time to scan all 12 cells (sample of CELL12 to sample of CELL1) scan voltages command.		233	257	µs
Scan Voltages Processing Time		Time from start of scan to registers loaded to DATA READY going low		770	847	µs
Scan Temperatures Processing Time		Time from start of scan to registers loaded to DATA READY going low		2690	2959	µs
Scan Mixed Processing Time		Time from start of scan to registers loaded to DATA READY going low		830	913	µs
Scan Wires Processing Time		Time from start of scan to registers loaded to DATA READY going low		59.4	65.3	ms
Scan All Processing Time		Time from start of scan to registers loaded to DATA READY going low		63.2	69.5	ms
Measure Cell Voltage Processing Time		Time from start of measurement to register(s) loaded to DATA READY going low		180	198	µs
Measure V _{BAT} Voltage Processing Time		Time from start of measurement to register(s) loaded to DATA READY going low		130	143	µs
Measure Internal Temperature Processing Time		Time from start of measurement to register(s) loaded to DATA READY going low		110	121	µs
Measure External Temperature Input Processing Time		Time from start of measurement to register(s) loaded to DATA READY going low		2520	2772	µs
Measure Secondary Voltage Reference Time		Time from start of measurement to register(s) loaded to DATA READY going low		2520	2772	µs

8. Scan and Measurement start times are synchronised by the receiver to the falling edge of the 24th clock pulse (Daisy Chain systems) or to the falling edge of the 16th clock pulse (non-Daisy Chain, single device systems) of the Scan or Measure command. Clock pulses are at the SCLK pin for Master and Stand-alone devices, and at the DH/ DL0 pins for middle and top Daisy Chain devices. Maximum values are based on characterization of the internal clock and are not 100% tested.

To: Removed from new datasheet

From:

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 7)	TYP	MAX (Note 7)	UNITS
DATA READY Start Delay Time	$t_{DR:ST}$	Chip select high to DATA READY low. (Note 9)	100			ns
DATA READY Stop Delay Time	$t_{DR:SP}$	Chip select high to DATA READY high. (Note 9)			750	ns
DATA READY High Time	$t_{DR:WAIT}$	Time between bytes. (Note 9)	0.6			μs

To:

$t_{DR:ST}$ – removed from datasheet

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 8)	TYP	MAX (Note 8)	UNIT
DATA READY Stop Delay Time	$t_{DR:SP}$	Chip select high to DATA READY high		750		ns
DATA READY High Time	$t_{DR:WAIT}$	Time between bytes		1.0		μs