

### General Description

The ILC514X is an innovative, multilevel voltage detector, designed to monitor the terminal voltage of a power source and provide up to four independent flags when the voltage levels drop below designated levels. The ILC514X is unique in its design because one device can now signal the user when a discharging battery goes below four (4) different threshold voltages and because it requires no external precision components to monitor these voltage levels. The open drain flags are asserted when the terminal voltage goes below their designated thresholds and are de-asserted 140ms after the thresholds are exceeded. Additionally, the ILC514X has a manual reset pin that allows the system to assert all flags for a minimum of 200ms.

Built using Impala's proprietary Analog CMOS process, the ILC514X is packaged in a spacesaving MSOP10 package. Quiescent current is below 10 $\mu$ A. The threshold values for the reset flags are factory set. Alternate values may be discussed with Impala Product Marketing. Threshold values are accurate to within  $\pm 1\%$ . The device is available in three output configurations: Open Drain  $\overline{\text{RESET}}$ , Push Pull  $\overline{\text{RESET}}$  and Push Pull RESET.

### Features

- Four levels of a single terminal voltage monitored
- No precision external components
- < 10 $\mu$ A Quiescent current
- Available in three output configurations  
ILC5140 Open Drain  $\overline{\text{RESET}}$   
ILC5141 Push Pull  $\overline{\text{RESET}}$   
ILC5142 Push Pull RESET
- Threshold accuracies within  $\pm 1\%$
- Small MSOP10 plastic package
- Factory preset threshold voltages
- Manual reset input pin
- Minimum 140ms delay on reset

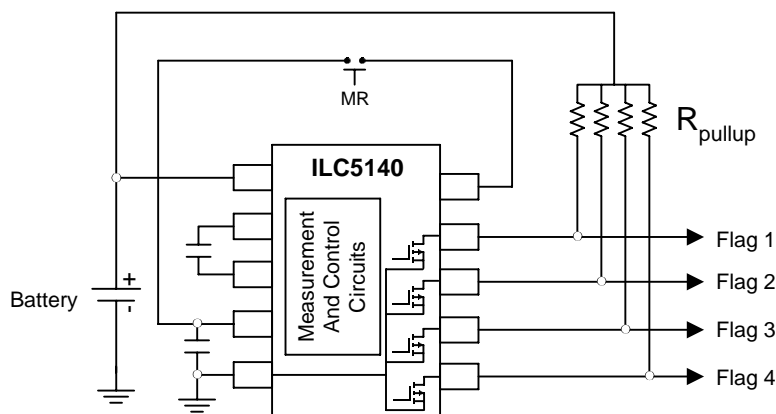
### Applications

- Handheld PC's
- PDA's
- Notebook PC's
- Battery electronics
- Medical Instrumentation
- Personal Electronics
- Personal Communicators

### Ordering Information\* $T_A = -40^\circ\text{C to } +85^\circ\text{C}$

ILC514XCS	10-Pin MSOP
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### Typical Circuit



## Pin-Package Configurations

## To Be Assigned

Pin Number	Name	Pin Description and Function
TBD	V <sub>IN</sub>	Voltage input from power source - battery or power supply
TBD	GND	IC Ground Pin
TBD	CP+	Charge Pump Capacitor +
TBD	CP-	Charge Pump Capacitor -
TBD	CPV <sub>SS</sub>	Charge Pump V <sub>SS</sub>
TBD	MR	Manual Reset Input (Connects to CPV <sub>SS</sub> pin)
TBD	F1	Connection for output flags. Flags are asserted in order of decreasing voltage thresholds. F1 is asserted at a higher voltage than F2, F2 is asserted at a higher voltage than F3 and F3 is asserted at a higher voltage than F4. Output flags are: ILC5140 - Open Drain $\overline{\text{RESET}}$ , ILC5141 - Push Pull $\overline{\text{RESET}}$ , ILC5142 - Push Pull $\overline{\text{RESET}}$
TBD	F2	
TBD	F3	
TBD	F4	

## Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Ratings	Units
Supply Voltage (V+ to GND, or GND to OUT)	$V_{CC}$	+6	V
All Other Inputs	$V_{IN}$	+6	V
Output Current Per Flag	$I_{OUT}$	20	mA
Voltage on FLAG pin relative to GND	$V_{Flg}$	$V_{IN} + 0.3V$	V
Rate or Rise, $V_{CC}$		100	V/ $\mu$ s
Continuous Power Dissipation (T= +85°C)	$P_D$	470	mW
Operating Temperature Ranges	$T_A$	-40 to +85	°C
Maximum Junction Temperature	$T_{J(MAX)}$	170	°C
Storage Temperature Range	$T_{stg}$	-40 to +125	°C
Lead Temperature (soldering, 10sec)		300	°C
Package Thermal Resistance	$\theta_{JA}$	TBD	°C/W

## DC Electrical Characteristics ILC514X

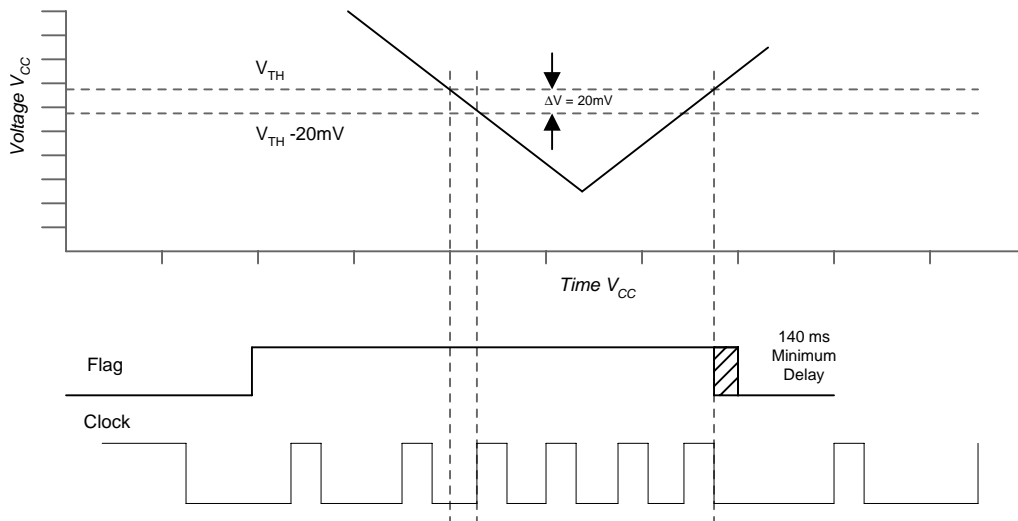
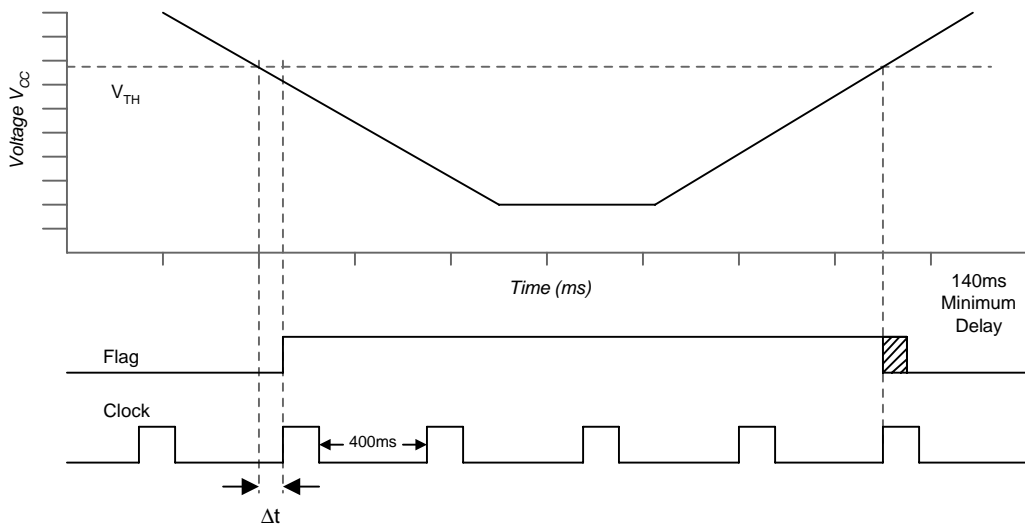
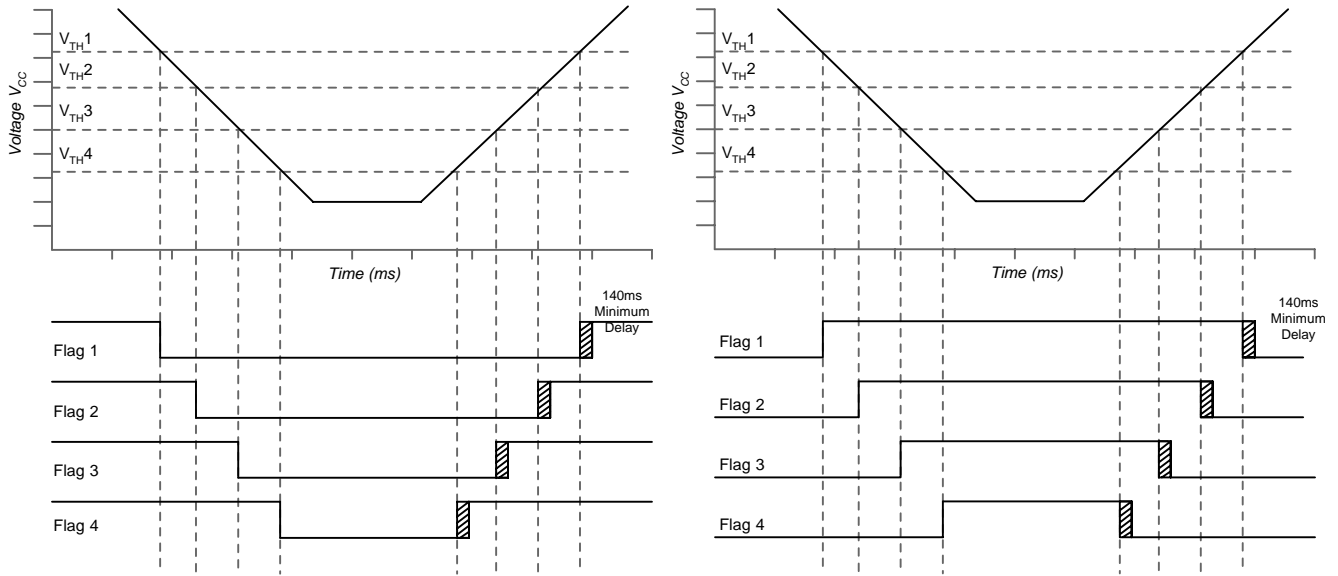
Unless otherwise specified, all limits are at  $T_A = 25^\circ\text{C}$

**Boldface** limits apply over the operating temperature range.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Operating Supply Voltage (RESET in correct state)	$V_{CC}$	$T_A = 0^\circ\text{C}$ to $+85^\circ\text{C}$	1.8		5.5	V
		$T_A = -40^\circ\text{C}$ to $+105^\circ\text{C}$	<b>2.0</b>		<b>5.5</b>	V
Reset Threshold Voltage			$V_{TH}-1\%$	$V_{TH}$	$V_{TH}-1\%$	V
Supply Current	$I_{CC}$	$V_{CC} < 3.6V$		10	30	$\mu$ A
MR Input Voltage		$V_{CC} < 3.6V$		$-V_{CC}$		V
Output Sink Current				3.2		mA
Output Voltage Low, RESET	$V_{OL}$					V
Output Voltage High, RESET	$V_{OH}$		$0.8V_{CC}$	30-50	0.4	V
Reset Threshold Tempco						ppm/°C

## AC Electrical Characteristics ILC514X

Parameter	Symbol	Conditions	Min	Typ	Max	Units
MR Minimum Pulse Width				20		$\mu$ s
$V_{CC}$ Detect to Flag Enable				20		$\mu$ s
$V_{CC}$ Detect to Flag Enable			120	240		ms



### Detailed Description

The ILC514X is designed to monitor the terminal voltage of a power source such as a battery and to assert a flag depending on the internally set threshold voltages. Up to four flags can be used to warn of declining stages of a battery's life. The flags are arranged in order of decreasing threshold values; therefore Flag 1 is asserted at  $V_{TH1}$ , Flag 2 is asserted at a voltage  $V_{TH2}$  which is lower than  $V_{TH1}$  and so on. The ILC514C is ideally suited for systems such as PDA's, notebooks and personal electronics where multiple warning and resets are desirable. An example of such a requirement is in a PDA, where Flag 1 is asserted at  $V_{TH1} = 2.9V$  "LOW BATTERY WARNING" flag; Flag 2 is asserted at  $V_{TH2} = 2.7V$  "DISABLE CMOS WRITE"; Flag 3 is asserted at  $V_{TH3} = 2.5V$  "DISABLE IrDA PORT" and Flag 4 is asserted at  $V_{TH4} = 2.3V$  "DISABLE SYSTEM EXCEPT CHARGING."

### RESET AND RESET

The ILC514X has three output configurations: Open Drain (ILC5140) RESET, Push Pull (ILC5141) RESET and Push Pull (ILC5142) RESET

### Voltage Thresholds

The ILC5140 series will be offered in a variety of voltage thresholds corresponding to industry standard requirements. In addition, customer defined voltage thresholds are available on a special ordering basis. Please consult Impala marketing for conditions surrounding custom thresholds.

### Threshold Detect to Flag Enable

The ILC5140 samples the input voltage once every 400 ms. This sampling rate was chosen to conserve battery life and at the same time keep a reasonable vigil on the terminal voltage level. Once the threshold has been passed, the flag enable function reacts within 30 $\mu$ s.

In addition to the 400ms sampling, a sample and hold circuit compares the input voltage to the most recent sample and if there is a DV greater than 20mV the input sampling is turned on continuously until either a flag is asserted or the threshold is regained. If, during the continuous sampling a threshold is crossed, the flag is enabled. This method inherently prevents accidental tripping of the flag during minor input voltage level glitches.

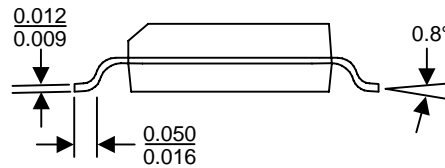
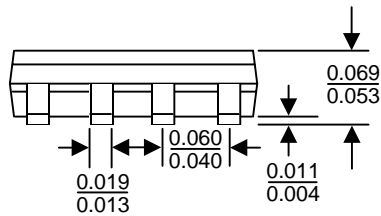
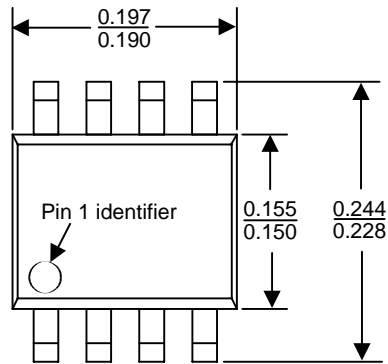
Once the threshold is crossed on an increasing voltage level, the flag is disabled 140ms after such a threshold is detected. This is a minimum time since an additional 400ms may be added if the threshold is not detected at the beginning of a regular sampling.

### Voltage Thresholds for the Flags

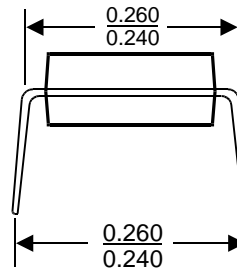
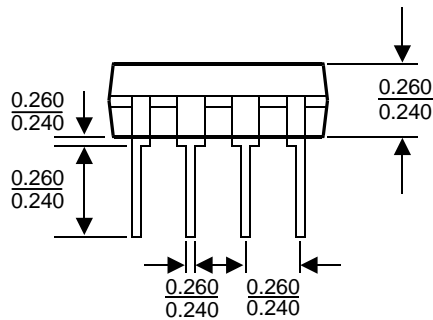
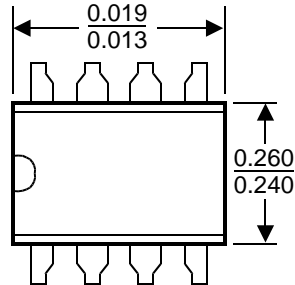
The flags are labelled Flag 1, Flag 2, Flag 3, Flag 4. Voltage thresholds are arranged in order of decreasing voltage levels, therefore Flag 1 will have a higher threshold than Flag 2 and so on.

Packaging Information

M Package, 8-Pin Small-Outline



N Package, 8-Pin Plastic Dual In-Line



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