LDS6107

PureTouch™* Capacitive Touch Sensor IC Configuration Registers
Detailed Register Information and Default Values

Purpose:
The purpose of this document is to provide detail on the registers available for configuration and performance optimization of the LDS6107 device.

Scope:
This register document covers the LDS6107 (13-channel touch controller). ***The other members of the LDS61xx family have their own Detailed Register documents as the relevant bit locations vary by device.***

Initialization:
Not all registers need to be initialized under normal usage conditions, as the default conditions may be appropriate and certain functions and features may not be used in the application.

However, the following registers should be initialized in all cases, as their proper configuration is necessary for fundamental operation:

- **0x00A: DCM configuration**
  - Pin C4/DCM11 is set as a DCM pin by default. It must be reset during initialization if not used as a DCM pin.
- **0x041 and 0x042: Touch Sensor Enable**
  - Only those channels to be used as sensor input should be set to the "1" state. All other bits in these registers (including reserved/unused bits) should be set to "0"
- **0x043 and 0x044: Touch Interrupt Enable**
  - To enable proper interrupt operation, these registers should be configured identically to the Touch Sensor Enable registers 0x041 and 0x042
- **0x061-0x073 (non-contiguous, memory page 1): Touch Threshold Levels**
  - Sets the touch threshold levels which affect the sensitivity of each sensor.
  - ***Register 0x05F should be set to Memory Page 1 prior to writing to these registers***

If using Low Power/Sleep mode, the following registers should be initialized:

- **0x055: Idle Configuration Register**
  - Set value to 24 (dec) to enable sleep period configuration (0x056) in 1ms increments
- **0x056: Sleep Period Configuration**
  - Sets the sleep period between scan cycles. See the LDS61xx AN1 application note for more information.
- **0x003: Sleep Wait**
  - Sets the time the device will wait after the last touch before reverting back to Low Power mode

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Recommended Initialization:

The following registers are recommended to be initialized for optimized operation.

- **0x04E: SELC_Unit Configuration**
  - Determines SELC unit steps utilized during calibration process. Use of adaptive SELC algorithm will accelerate calibration process. Recommended register setting: 5000h.
- **0x051: Ambient Calibration**
  - Determines how quickly ambient calibration occurs when no-touch value drifts above/below the plus/minus noise region. Recommended register setting: 0A1Fh.
- **0x052: Recalibration Configuration**
  - Sets the delay before a recalibration is initiated when capacitive signal is above the ambient threshold and below the touch threshold. The default IC value (99 decimal) results in a delay of "0.8s x # of active sensor channels". When few sensor channels are utilized, this may result in too short a delay. This delay should be at least 4-5s to avoid calibrating out an approaching finger.
- **0x053: Stuck Touch**
  - Determines how quickly forced recalibration occurs when touch persists for abnormally long length of time. Optimal setting depends upon usage model.
- **0x061-0x073 (non-contiguous, memory page 0): Initial SELC**
  - Sets the starting value for SELC for each sensor. Loading initial SELC values for each sensor will result in faster recalibration times. Recommended setting determined during prototype stage.
- **0x075: Touch Hysteresis**
  - Sets the amount of capacitance value units below Touch Threshold to still be considered a continuation of current/active touch. Recommended register setting: 0005h to 000Ah.

By default, the INTB (Interrupt) pin is configured as an active-low CMOS output, with a fixed duration of 2us when a touch or untouch event occurs. INTB may also be configured as active high (0x008 bit 15 = 1) and as an open drain output requiring a pull-up or pull-down resistor (0x008 bit 3 = 1), depending upon system requirements.

Finally, INTB may also be configured in "Read Reset" mode (0x008 bit 1 = 1), in which case Touch Status Register 0x045 must be read in order to release/reset the INTB pin. Read Reset mode corresponds to the default INTB mode of operation of IDT's LDS60xx family of products.

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Functional Groupings

Function	Register	Description
RESET	0x000 0x001	Cold Reset Software Reset
POWER	0x002 0x055 0x056 0x003	Normal Operation, Low Power Mode, Shutdown Idle Time - For Low Power Mode Sleep Configuration Sleep Wait
INTERRUPT	0x008 0x043-0x044	INTERRUPT Configuration Touch Interupt Enable
GPIO	0x009	GPIO Config
DCM	0x00A	DCM Mode
MANUFACTURER ID	0x01F	Manufacturer/Product Family ID
TOUCH CONFIGURATION	0x040 0x041 - 0x042 0x05F	Touch mode - All touches reported, Strongest Touch, Dual Strongest Touches Touch Sensor Enable Touch Parameter Memory Page Selection
TOUCH STATUS	0x045 - 0x046 0x084 - 0x0CD (non-contiguous)	Touch Status Cap Value (Read Only)
THRESHOLD SETTING (SENSITIVITY)	0x05F 0x061 - 0x073	Touch Parameter Memory Page Selection - Touch threshold conditions Touch Threshold Value (Memory Page 1)
BUILT-IN SLIDER/SCROLL	0x04B 0x074	Slider/Scroll Position and Direction Reading Slider/Scroll Enable
CALIBRATION & SELC	0x04E 0x050 0x051 0x052 0x053 0x05F 0x061 - 0x073 (non-contiguous) 0x084 - 0x0CD (non-contiguous)	SELC Step Size, Ambient Calibration Enable, Calibration Status Calibration Timeout Ambient Calibration Recalibration Configuration Stuck Touch (Forced Recalibration) Touch Paramater Page Selection Calibration Parameters (Memory Pages 0, 2, 3, and 4) SELC Value (Read Only)
STRONGEST TOUCH CONFIGURATION	0x040 0x057 0x075	Strongest Touch Enable Strongest Touch Replacement Time Strongest Touch Hysteresis
RELATIVE STRONGEST\ TOUCH	0x076	Relative Strongest Touch Mode Enable
UNDEBOUNCE	0x076	# of consecutive scan cycles required before untouch is recognized
DEBOUNCE	0x057	Debounce time criteria
HYSERESIS	0x075	Touch Hysteresis Value + Strongest Touch Hysteresis
GUARD/SUPPRESS CHANNEL	0x07C-0x07D 0x07E-0x07F	Guard Channel Enable Guard Channel Mask
NOISE IMMUNITY	0x077	Set to 8001 (hex) for optimal noise filtering.

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	Reset															
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x000	W	Cold Reset															
0x001	W	Software Reset															

Register Name	Position	Description	Function	Remark
COLD RESET		Hardware reset	Any value invokes HW reset (all configuration registers revert to default)	
SOFT RESET		Software reset	Any value invokes SW reset (keeps user settings, but recalibrates)	

	POWER															
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x002	R/W							Internal	Internal							LP	SHUTDOWN
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
LP	[1]	power saving mode	0 : Normal mode, 1 : Low Power Mode	
SHUTDOWN	[0]	shutdown mode	0 : Normal mode, 1 : Shutdown mode (only Serial I/F bus active)	

	SLEEP WAIT															
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x003	R/W	SLEEP WAIT															
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
SLEEP WAIT	[15:0]	Full Power to Low Power wait time	Wait time = SLEEP WAIT x Scan Cycle Time (Scan Cycle Time = ~2ms x # of active sensors)	

	INTB Config															
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x008	R/W	INT_POL	Internal										INTB DRIVE			INTB MODE	
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
INT_POL	[15]	interrupt polarity	0 : active Low, 1: active High	
INTB DRIVE	[4:3]	interupt drive	0x0 : CMOS output 0x1 : OPEN-DRAIN output (pull up resistor required)	
INTB MODE	[1:0]	interupt signaling type	00: Fixed Duration Mode (INTB pin drives for 2us Fixed Duration) 01: Internal mode 1x: Read Reset Mode (INTB pin drives until Register 0x045 is read)	

	GPIO Config															
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x009	R/W												GPIO Input Config			GPI/O	
Default Values	0002h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

Register Name	Position	Description	Function	Remark
GPIO Input Config	[4:2]	GPIO input configuration	0x0 : not used 0x1 : negative level-sensitive 0x2 : positive level-sensitive 0x3 : not used 0x4 : not used 0x5 : negative edge-triggered 0x6 : positive edge-triggered 0x7 : both edge-triggered	
GPI/O	[1:0]	GPIO state	0x0 : not used 0x1 : input 0x2 : active low output 0x3 : active high output	

Detailed Register Information and Default Values

	DCM Config																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x00A	R/W							Internal	DCM11	Internal				DCM9-DCM6			Internal
Default Values	0100h	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
DCM Enable	[8], [4:1]	DCM Function Enable	0 : disable, 1: enable	

	MID																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x01F	R	Internal								Manufacturer ID				Device ID			
Default Values	00F2h	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	0

Register Name	Position	Description	Function	Remark
Manufacturer ID	[7:4]	IDT PureTouch	IDT PureTouch = 1111	
Device Family ID	[3:0]	LDS61xx Family	LDS61xx Family = 0010	

	TOUCH CONFIG																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x040	R/W	TCH_ENABLE	Internal					BUTTON_MODE				Internal		READY	Decimation		
Default Values	8030h	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0

Register Name	Position	Description	Function	Remark
TCH_ENABLE	[15]	Touch Function Enable	0 : Touch function in idle state, 1: Touch function in active state	
BUTTON_MODE	[9:8]	Touch Preference Mode (Strongest Touch Modes)	0x0 : Unrestricted mode, All touches reported 0x1 : Strongest Touch Mode 0x2 : Two Strongest Touches Mode 0x3 : reserved	
DEVICE_READY	[3]	Device Ready	0 : Self initialization state, 1: OK for host communication If DEVICE_READY=0, all bits except DEVICE_READY should be ignored.	Read Only Bit
Decimation	[2:0]	CDC decimation	**0x0 : 1024 (default)** 0x1 : 512 0x2 : 256 0x3 : 128 0x4 : 2048	Consult IDT representative if decimation is changed from 1024 default

	Touch Sensor Enable (Channels 0-4)																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x041	R/W							Internal	C4	Internal				C3-C0			Internal
Default Values	001Eh	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0

	Touch Sensor Enable (Channels 5-12)																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x042	R/W							C12-C11		Internal		C10-C5					
Default Values	0100h	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
TOUCH_ENBL	[8], [4:1] [9:8], [5:0]	Touch enable for each channel	0 : Channel disabled as touch sensor 1 : Channel enabled as touch sensor (may be overridden by LED Enable) DCM register 0x00A has priority over 0x041 in case of dual assignment	

	INTERRUPT ENABLE (Channels 0-4)																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x043	R/W							Internal	C4	Internal				INT_ENABLE (C3-C0)			Internal
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	INTERRUPT ENABLE (Channels 5-12)																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x044	R/W							C12-C11		Internal		INT_ENABLE (C10-C5)					
Default Values	0300h	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
TOUCH_INT_EN	[8], [4:1] [9:8], [5:0]	Touch interrupt enable for each channel	0 : disable 1 : enable	

Detailed Register Information and Default Values

	TOUCH STATUS (Channels 0-4)																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x045	R							Internal	C4	Internal			Touch Status (C3-C0)				Internal
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	TOUCH STATUS (Channels 5-12)																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x046	R	GPI_INT						C12-C11		Internal		Touch Status (C10-C5)					
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	**Position**	**Description**	**Function**	**Remark**
GPI_INT	[15]	GPI interrupt status	0 : no GPI interrupt, 1 : GPI interrupt (Used if GPIO is configured as input via Register 0x009)	
TOUCH_INT_STS	[8], [4:1] [9:8], [5:0]	Touch interrupt status for each channel	Indicates which touch sensor channel was activated by a touch when INTB signal is triggered	

	SCROLL STATUS																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x04B	R/W	Internal	Internal							SCROLL_INT	DIR_ENBL	SCROLL_DIR	POSITION_ID				
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	**Position**	**Description**	**Function**	**Remark**
SCROLL_INT	[7]	Scroll/Slider Touch Interrupt	0 : Not Touched 1 : Position Interrupt Status	Read Only Bit
DIR_ENBL	[6]	Scroll/Slider Touch Direction Enable(Active) Status	0 : Not movement 1 : Direction Enable(Active)	
SCROLL_DIR	[5]	Scroll/Slider Touch Direction Status	0 : Low/Left/CCW Direction 1 : High/Right/CW Direction	Read Only
POSITION_ID	[4:0]	Scroll/Slider Touch Position ID	- Value : 0 (Not Used for Scroll/Slider Input Type) - Value : 1~10 (Scroll/Slider Touch Position ID)	Read Only

	SELC CONFIG and CALIBRATION STATUS																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x04E	R/W	Internal	ACTIVE	AMB_DIS	Internal									SELC_UNIT			
Default Values	0002h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

Register Name	**Position**	**Description**	**Function**	**Remark**
ACTIVE	[14]	touch calibration status	0 : in calibration state 1 : calibration finished	Read Only Bit
AMB_DIS	[13]	ambient calibration disable	0 : ambient calibration active 1 : disable ambient calibration	Optional disabling of ambient cal
SELC_UNIT	[3:0]	SELC change amount during calibration	0 : adaptive SELC tracking algorithm used others : During tracking, SELC changes its value by the amount of SELC_UNIT	Refer to 6100 AN2 App Note

	CALIBRATION TIMEOUT																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x050	R/W	Internal	Internal							CALIB_TIMEOUT							
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	**Position**	**Description**	**Function**	**Remark**
CALIB_TIMEOUT	[7:0]	calibration timeout limit	0x0 : infinite 0x1 : when calibration iteration reaches CALIB_TIMEOUT, tracking is done.	

	AMBIENT CALIBRATION																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x051	R/W	CNT_DEC_LIMIT								CNT_INC_LIMIT							
Default Values	1F1Fh	0	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1

Register Name	**Position**	**Description**	**Function**	**Remark**
CNT_DEC_LIMIT	[15:8]	Value determines how quickly ambient calibration is triggered (negative side)	0x0 : INVALID others : count limit	
CNT_INC_LIMIT	[7:0]	Value determines how quickly ambient calibration is triggered (posative side)	0x0 : INVALID others : count limit	

Detailed Register Information and Default Values

	RECALIBRATION CONFIGURATION																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x052	R/W						RECAL_DELAY										
Default Values	0063h	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1

Register Name	Position	Description	Function	Remark
RECAL_DELAY	[10:0]	Wait time prior to forced recalibration when cap value above ambient threshold but below touch threshold (i.e. not an actual touch)	wait time = (RECAL_DELAY+1) * single round time * 4 Max time = 16.4s (1 ch) to 213s (13ch)	Default is 0.8s x # of active ch with 1024 decimation

	STUCK TOUCH																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x053	R/W						CNT_TOUCH_LIMIT										
Default Values	0063h	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1

Register Name	Position	Description	Function	Remark
CNT_TOUCH_LIMIT	[10:0]	Wait time prior to forced recalibration when cap value is above threshold level (stuck touch scenario)	wait time = (CNT_TOUCH_LIMIT+1) * single round period * 4 Max time = 16.4s (1 ch) to 213s (13ch)	Default is 0.8s x # of active ch with 1024 decimation

	IDLE CONFIG																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x055	R/W	MAX_DEACT_IDLE															
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
MAX_DEACT_IDLE	[15:0]	staying IDLE time during inactive touch channel selected	Idle time = (MAX_DEACT_IDLE+1) * OSC period (2us) All channels treated as inactive during Sleep Period	Init file must set this to 24(dec) to enable 1ms increments of SLEEP_TIME with 1024 decimation

	SLEEP CONFIG																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x056	R/W	SLEEP TIME															
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
SLEEP_TIME	[15:0]	# of ms of desired sleep time	Determines duty cycle between active (full power) and sleep (reduced power) that determines average current consumption in low power mode	Init file must set 0x055 to 24(dec) to enable 1ms increments of SLEEP_TIME with 1024 decimation

	DEBOUNCE AND STRONGEST TOUCH CONFIGURATION																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x057	R/W	DEBOUNCE				REPLACEMENT_TIME											
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
DEBOUNCE	[15:12]	# of consecutive scan cycles required before first touch is recognized	Debounce time criteria required to register first touch Time = DEBOUNCE x scan cycle time, where scan cycle time is equal to 2ms x # of active sensors	
REPLACEMENT_TIME	[11:0]	# of consecutive scan cycles required for new touch with strongest signal to replace current strongest touch	Strongest Touch Mode (Absolute or Relative) option to minimize frequent toggling between two touches of comparable strength Time = REPLACEMENT_TIME x scan cycle time, where scan cycle time is equal to 2ms x # of active sensors	Set to "0" for Two Strongest Touch

Detailed Register Information and Default Values

	TOUCH PARAMETER PAGE SELECTION																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x05F	W	0:initial SELC, 1: touch threshold, 2:ambient threshold, 3:minus noise level, 4:plus noise level														PAGE	
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
PAGE	[2:0]	indirect memory access address	0 : Initial SELC (May be used to accelerate calibration times) Please refer to 6100 AN2 app note for detaills 1 : Touch Threshold (# capacitive units above baseline to activate touch) 2 : Ambient Threshold (Defines region, along with touch threshold, within which recalibration is delayed by RECAL_DELAY 0x052) 3 : Minus Noise Level (Defines - region within which baseline may vary without triggering an ambient recalibration) 4 : Plus Noise Level (Defines + region within which baseline may vary without triggering an ambient recalibration)	Refer to 6100 AN2 App Note

	TOUCH PARAMETERS																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x061	W						Touch0 PARAM[10:0]										
0x062	W						Touch1 PARAM[10:0]										
0x063	W						Touch2 PARAM[10:0]										
0x064	W						Touch3 PARAM[10:0]										
0x068	W						Touch4 PARAM[10:0]										
0x06A	W						Touch5 PARAM[10:0]										
0x06B	W						Touch6 PARAM[10:0]										
0x06C	W						Touch7 PARAM[10:0]										
0x06D	W						Touch8 PARAM[10:0]										
0x06E	W						Touch9 PARAM[10:0]										
0x06F	W						Touch10 PARAM[10:0]										
0x072	W						Touch11 PARAM[10:0]										
0x073	W						Touch12 PARAM[10:0]										
Default Values (PAGE=0)	00B8h	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0
Default Values (PAGE=1)	0028h	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
Default Values (PAGE=2)	000Ah	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
Default Values (PAGE=3)	0003h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Default Values (PAGE=4)	0003h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1

Register Name	Position	Description	Function	Remark
Touch PARAM	[10:0]	multiplexed touch parameter	0 : Initial SELC (May be used to accelerate calibration times) Please refer to 6100 AN2 app note for detaills 1 : Touch Threshold (# capacitive units above baseline to activate touch) 2 : Ambient Threshold (Defines region, along with touch threshold, within which recalibration is delayed by RECAL_DELAY 0x052) 3 : Minus Noise Level (Defines - region within which baseline may vary without triggering an ambient recalibration) 4 : Plus Noise Level (Defines + region within which baseline may vary without triggering an ambient recalibration)	Refer to 6100 AN2 App Note

	SCROLL/SLIDER CHANNEL ENABLE																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x074	R/W	INT_SEL	Internal						SCE C4	Internal			Scroll Channel Enable (C3-C0)				Internal
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
INT_SEL	[15]	SCROLL/SLIDER Touch channel Interrupt Enable	0 : disable, 1: enable	
SCROLL_CH[4]	[8]	channel 4 Scroll/Slider Touch Enable	0 : disable, 1: enable	
SCROLL_CH[3]	[4]	channel 3 Scroll/Slider Touch Enable	0 : disable, 1: enable	
SCROLL_CH[2]	[3]	channel 2 Scroll/Slider Touch Enable	0 : disable, 1: enable	
SCROLL_CH[1]	[2]	channel 1 Scroll/Slider Touch Enable	0 : disable, 1: enable	
SCROLL_CH[0]	[1]	channel 0 Scroll/Slider Touch Enable	0 : disable, 1: enable	

Detailed Register Information and Default Values

	TOUCH HYSTERESIS																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x075	R/W	STR_HYSTERESIS[15:8]								HYSTERESIS[7:0]							
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
STR_HYSTERESIS	[15:8]	Strongest Touch Hysteresis value	Extra/additional capacitance value required for new strongest touch to replace current strongest touch. For example, if STR_HYSTERESIS is set to a value of 15 (decimal), the capacitance value required to displace the current strongest touch must be at least 15 capacitance units higher than the current value of the current strongest touch.	
HYSTERESIS	[7:0]	Touch Hysteresis Value (# of cap value units permitted to decrease below Touch Threshold while still maintaining touch status)	Value range : 0~255 Example: Assuming baseline value of 510 and Touch Threshold setting of 40, capacitive value above 550 triggers an initial touch event. If HYSTERESIS value is set to "15", then the sensor capacitive value may go as low as 535 (550-35) and still be considered as original touch.	

	RELATIVE STRONGEST AND UNDEBOUNCE																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x076	R/W	RELATIVE_EN	INTERNAL											UN_DEBOUNCE [3:0]			
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
RELATIVE_EN	[15]	Relative Strongest Touch Mode	0 : disable, 1: enable	
UN_DEBOUNCE	[3:0]	# of consecutive scan cycles required before UNtouch is recognized	Debounce time required for UNtouch event to be recognized Time = DEBOUNCE x scan cycle time, where scan cycle time is equal to 2ms x # of active sensors	

	NOISE IMMUNITY ENABLE																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x077	R/W	NI_ENBL	INTERNAL			NI_OPTION											
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
Noise Immunity EN	[15]	Enable Noise Immunity	0 : disable, 1: enable. ***Recommended Value = 1***	Set to "1"
Noise Immunity Option	[11:0]	Noise Immunity Option	Setting Options. ***Recommended Value = 1***	Set to "1"

	Guard Channel Enable Register [C0~C10]																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x07C	R/W	GUARD_CH[10:5]						INTERNAL	GC4	Internal				GUARD_CH[3:0]			INTERNAL
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
GUARD_CH[10]	[15]	channel 10 guard channel enable	0 : disable, 1: enable	
GUARD_CH[9]	[14]	channel 9 guard channel enable	0 : disable, 1: enable	
GUARD_CH[8]	[13]	channel 8 guard channel enable	0 : disable, 1: enable	
GUARD_CH[7]	[12]	channel 7 guard channel enable	0 : disable, 1: enable	
GUARD_CH[6]	[11]	channel 6 guard channel enable	0 : disable, 1: enable	
GUARD_CH[5]	[10]	channel 5 guard channel enable	0 : disable, 1: enable	
GUARD_CH[4]	[8]	channel 4 guard channel enable	0 : disable, 1: enable	
GUARD_CH[3]	[4]	channel 3 guard channel enable	0 : disable, 1: enable	
GUARD_CH[2]	[3]	channel 2 guard channel enable	0 : disable, 1: enable	
GUARD_CH[1]	[2]	channel 1 guard channel enable	0 : disable, 1: enable	
GUARD_CH[0]	[1]	channel 0 guard channel enable	0 : disable, 1: enable	

	Guard Channel Enable Register [C11-C12]																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x07D	R/W													GUARD_CH[12:11]		Internal	
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
GUARD_CH[12]	[3]	channel 12 guard channel enable	0 : disable, 1: enable	
GUARD_CH[11]	[2]	channel 11 guard channel enable	0 : disable, 1: enable	

Detailed Register Information and Default Values

	Guard Channel Mask Register [C0-C10]																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x07E	R/W	GUARD_MASK[10:5]						INTERNAL	GM4	Internal				GUARD_MASK[3:0]			INTERNAL
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
GUARD_MSK[10]	[15]	channel 10 guard mask enable	0 : disable, 1: enable	
GUARD_MSK[9]	[14]	channel 9 guard mask enable	0 : disable, 1: enable	
GUARD_MSK[8]	[13]	channel 8 guard mask enable	0 : disable, 1: enable	
GUARD_MSK[7]	[12]	channel 7 guard mask enable	0 : disable, 1: enable	
GUARD_MSK[6]	[11]	channel 6 guard mask enable	0 : disable, 1: enable	
GUARD_MSK[5]	[10]	channel 5 guard mask enable	0 : disable, 1: enable	
GUARD_MSK[4]	[8]	channel 4 guard mask enable	0 : disable, 1: enable	
GUARD_MSK[3]	[4]	channel 3 guard mask enable	0 : disable, 1: enable	
GUARD_MSK[2]	[3]	channel 2 guard mask enable	0 : disable, 1: enable	
GUARD_MSK[1]	[2]	channel 1 guard mask enable	0 : disable, 1: enable	
GUARD_MSK[0]	[1]	channel 0 guard mask enable	0 : disable, 1: enable	

	Guard Channel Mask Register [C11-C12]																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x07F	R/W													GUARD_MSK[12:11]		Internal	
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Register Name	Position	Description	Function	Remark
GUARD_MSK[12]	[3]	channel 12 guard mask enable	0 : disable, 1: enable	
GUARD_MSK[11]	[2]	channel 11 guard mask enable	0 : disable, 1: enable	

	Cap Value and SELC Value																
Register Address	**Direction**	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0x084	R						Touch0 Cap										
0x085	R	Touch0 SELP					Touch0 SELC										
0x088	R						Touch1 Cap										
0x089	R	Touch1 SELP					Touch1 SELC										
0x08C	R						Touch2 Cap										
0x08D	R	Touch2 SELP					Touch2 SELC										
0x090	R						Touch3 Cap										
0x091	R	Touch3 SELP					Touch3 SELC										
0x0A0	R						Touch4 Cap										
0x0A1	R	Touch4 SELP					Touch4 SELC										
0x0A8	R						Touch5 Cap										
0x0A9	R	Touch5 SELP					Touch5 SELC										
0x0AC	R						Touch6 Cap										
0x0AD	R	Touch6 SELP					Touch6 SELC										
0x0B0	R						Touch7 Cap										
0x0B1	R	Touch7 SELP					Touch7 SELC										
0x0B4	R						Touch8 Cap										
0x0B5	R	Touch8 SELP					Touch8 SELC										
0x0B8	R						Touch9 Cap										
0x0B9	R	Touch9 SELP					Touch9 SELC										
0x0BC	R						Touch10 Cap										
0x0BD	R	Touch10 SELP					Touch10 SELC										
0x0C8	R						Touch11 Cap										
0x0C9	R	Touch11 SELP					Touch11 SELC										
0x0CC	R						Touch12 Cap										
0x0CD	R	Touch12 SELP					Touch12 SELC										
Default Values	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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