REGISTER DESCRIPTIONS

Symbol Name	Command Code	Access	Bit Range	Default	Description
vbat_lo_alert_limit	0x01	R/W	[15:0]	0	Signed number that sets a lower limit that can be used to trigger an interrupt based on the per-cell battery voltage out of range. The value is based on the A/D value, vbat, which has a scaling factor of cell_count × 192.4µV/LSB. To compute the per-cell bit count, divide the desired trigger voltage by both cell_count and 192.4µV. The alert is enabled by setting en_vbat_lo_alert and can be read back and cleared at vbat_lo_alert.
vbat_hi_alert_limit	0x02	R/W	[15:0]	0	Signed number that sets an upper limit that can be used to trigger an interrupt based on the per-cell battery voltage out of range. The value is based on the A/D value, vbat, which has a scaling factor of cell_count × 192.4µV/LSB. To compute the per-cell bit count, divide the desired trigger voltage by both cell_count and 192.4µV. The alert is enabled by setting en_vbat_hi_alert and can be read back and cleared at vbat_hi_alert.
vin_lo_alert_limit	0x03	R/W	[15:0]	0	Signed number that sets a lower limit that can be used to trigger an interrupt based on input voltage out of range. The value is based on the A/D value, vin, which has a scaling factor of 1.649mV/LSB. The alert is enabled by setting en_vin_lo_alert and can be read back and cleared at vin_lo_alert.
vin_hi_alert_limit	0x04	R/W	[15:0]	0	Signed number that sets an upper limit that can be used to trigger an interrupt based on input voltage out of range. The value is based on the A/D value, vin, which has a scaling factor of 1.649mV/LSB. The alert is enabled by setting en_vin_hi_alert and can be read back and cleared at vin_hi_alert.
vout_lo_alert_limit	0x05	R/W	[15:0]	0	Signed number that sets a lower limit that can be used to trigger an interrupt based on vout voltage out of range. The value is based on the A/D value, vout, which has a scaling factor of 1.653mV/LSB. The alert is enabled by setting en_vout_lo_alert and can be read back and cleared at vout_lo_alert.
vout_hi_alert_limit	0x06	R/W	[15:0]	0	Signed number that sets an upper limit that can be used to trigger an interrupt based on vout voltage out of range. The value is based on the A/D value, vout, which has a scaling factor of 1.653mV/LSB. The alert is enabled by setting en_vout_hi_alert and can be read back and cleared at vout_hi_alert.
iin_hi_alert_limit	0x07	R/W	[15:0]	0	Signed number that sets an upper limit that can be used to trigger an interrupt based on input current out of range. The value is based on the A/D value, iin, which has a scaling factor of 1.466µV / RSNSI amperes/LSB. The alert is enabled by setting en_iin_hi_alert and can be read back and cleared at iin_hi_alert.
ibat_lo_alert_limit	0x08	R/W	[15:0]	0	Signed number that sets a lower limit that can be used to trigger an interrupt based on charge current dropping below a particular value, such as during the constant-voltage phase of charging, or, load current exceeding a particular limit when not charging. When the charger is not running, and telemetry is enabled with force_telemetry_on, this limit indicates that the battery draw has exceeded a particular value. Telemetry will be enabled automatically if the input voltage exceeds the battery voltage, in which case discharge current will be nearly zero. ibat values are positive for charging and negative for discharging so the polarity of this register should be set according to the mode in which the limit alert is of interest. The value is based on the A/D value, ibat, which has a scaling factor of 1.466µV / RSNSB amperes/LSB. The alert is enabled by setting en_ibat_lo_alert and can be read back and cleared at ibat_lo_alert.
die_temp_hi_alert_limit	0x09	R/W	[15:0]	0	Signed number that sets an upper limit that can be used to trigger an interrupt based on high die temperature. The value in °C can be calculated from the A/D reading, die_temp, as TDIE(°C) = die_temp × 0.0215°C/LSB - 264.4°C. The alert is enabled by setting en_die_temp_hi_alert and can be read back and cleared at die_temp_hi_alert.
bsr_hi_alert_limit	0x0A	R/W	[15:0]	0	Sets an upper limit that can be used to trigger an interrupt based on high battery resistance. The per-cell battery resistance is relative to the battery charge current setting resistor, RSNSB, and can be computed in Ω from: BSR = cell_count × bsr × RSNSB / 500. The alert is enabled by setting en_bsr_hi_alert and can be read back and cleared at bsr_hi_alert.

REGISTER DESCRIPTIONS

Symbol Name	Command Code	Access	Bit Range	Default	Description
thermistor_voltage_hi_alert_limit	0x0B	R/W	[15:0]	0	Signed number that sets an upper limit that can be used to trigger an interrupt based on thermistor value out of range. The value is based on the A/D value for thermistor_voltage. The thermistor value can be determined by the expression RNTC = RNTCBIAS × (21829 - thermistor_voltage) / thermistor_voltage. Recall that the thermistor has a negative temperature coefficient so higher temperatures correspond to lower thermistor_voltage readings and vice-versa. The alert is enabled by setting en_thermistor_voltage_hi_alert can be read back and cleared at thermistor_voltage_hi_alert.
thermistor_voltage_lo_alert_limit	0x0C	R/W	[15:0]	0	Signed number that sets a lower limit that can be used to trigger an interrupt based on thermistor value out of range. The value is based on the A/D value for thermistor_voltage. The thermistor value can be determined by the expression RNTC = RNTCBIAS × (21829 - thermistor_voltage) / thermistor_voltage. Recall that the thermistor has a negative temperature coefficient so higher temperatures correspond to lower thermistor_voltage readings and vice-versa. The alert is enabled by setting en_thermistor_voltage_lo_alert and can be read back and cleared at thermistor_voltage_lo_alert.
EN_LIMIT_ALERTS_REG	0x0D	R/W	[15:0]	0	Enable limit monitoring and alert notification via SMBALERT
en_telemetry_valid_alert			[15]	0	To ensure high measurement accuracy, the telemetry system in the LTC4162 has a nominal start-up time of approximately 12ms. Setting this interrupt request causes an SMBALERT telemetry_valid_alert when telemetry_valid indicates that the telemetry system's readings are valid. Note that the switching battery charger will not operate until this telemetry system warmup period has passed, regardless of the state of this setting.
en_bsr_done_alert			[14]	0	Interrupt request that causes an SMBALERT upon bsr_done_alert when the bsr (battery-series-resistance) measurement is finished.
en_vbat_lo_alert			[11]	0	Interrupt request that causes an SMBALERT upon vbat_lo_alert when vbat is below vbat_lo_alert_limit.
en_vbat_hi_alert			[10]	0	Interrupt request that causes an SMBALERT upon vbat_hi_alert when vbat is above vbat_hi_alert_limit.
en_vin_lo_alert			[9]	0	Interrupt request that causes an SMBALERT upon vin_lo_alert when vin is below vin_lo_alert_limit.
en_vin_hi_alert			[8]	0	Interrupt request that causes an SMBALERT upon vin_hi_alert when vin is above vin_hi_alert_limit.
en_vout_lo_alert			[7]	0	Interrupt request that causes an SMBALERT upon vout_lo_alert when vout is below vout_lo_alert_limit.
en_vout_hi_alert			[6]	0	Interrupt request that causes an SMBALERT upon vout_hi_alert when vout is above vout_hi_alert_limit.
en_iin_hi_alert			[5]	0	Interrupt request that causes an SMBALERT upon iin_hi_alert when iin is above iin_hi_alert_limit.
en_ibat_lo_alert			[4]	0	Interrupt request that causes an SMBALERT upon ibat_lo_alert when ibat is below ibat_lo_alert_limit.
en_die_temp_hi_alert			[3]	0	Interrupt request that causes an SMBALERT upon die_temp_hi_alert when die_temp is above die_temp_hi_alert_limit.
en_bsr_hi_alert			[2]	0	Interrupt request that causes an SMBALERT upon bsr_hi_alert when bsr is above bsr_hi_alert_limit.
en_thermistor_voltage_hi_alert			[1]	0	Interrupt request that causes an SMBALERT upon thermistor_voltage_hi_alert when thermistor_voltage is above thermistor_voltage_hi_alert_limit. Recall that the thermistor has a negative temperature coefficient so higher thermistor_voltage readings correspond to lower temperatures.
en_thermistor_voltage_lo_alert			[0]	0	Interrupt request that causes an SMBALERT upon thermistor_voltage_lo_alert when thermistor_voltage is below thermistor_voltage_lo_alert_limit. Recall that the thermistor has a negative temperature coefficient so lower thermistor_voltage readings correspond to higher temperatures.

REGISTER DESCRIPTIONS

Symbol Name	Command Code	Access	Bit Range	Default	Description
EN_CHARGER_STATE_ALERTS_REG	0x0E	R/W	[12:0]	0	Enable charger state notification via SMBALERT
en_bat_detect_failed_fault_alert			[12]	0	Interrupt request that causes an SMBALERT upon bat_detect_failed_fault_alert as indicated by bat_detect_failed_fault due to an inability to source power to the battery during battery detection testing (usually due to either iin_limit_active or vin_uvcl_active).
en_battery_detection_alert			[11]	0	Interrupt request that causes an SMBALERT upon battery_detection_alert as indicated by battery_detection due to the LTC4162 entering battery detection testing.
en_charger_suspended_alert			[8]	0	Interrupt request that causes an SMBALERT upon charger_suspended_alert as indicated by charger_suspended whereby battery charging is terminated due to suspend_charger or thermistor_voltage out of jeita_t1 - jeita_t6 range.
en_precharge_alert			[7]	0	Interrupt request that causes an SMBALERT upon precharge_alert as indicated by precharge denoting the onset of the precharge phase of a battery charging cycle.
en_cc_cv_charge_alert			[6]	0	Interrupt request that causes an SMBALERT upon cc_cv_charge_alert as indicated by cc_cv_charge denoting the onset of the constant current / constant voltage phase of a battery charging cycle.
en_ntc_pause_alert			[5]	0	Interrupt request that causes an SMBALERT upon ntc_pause_alert as indicated by ntc_pause whereby a battery charge cycle is interrupted due to thermistor_voltage out of range as set by the jeita_t1 through jeita_t6 values.
en_timer_term_alert			[4]	0	Interrupt request that causes an SMBALERT upon timer_term_alert as indicated by timer_term whereby a battery charge cycle terminates due to tcvtimer reaching max_cv_time, the maximum time allowed in constant_voltage mode.
en_c_over_x_term_alert			[3]	0	Interrupt request that causes an SMBALERT upon c_over_x_term_alert as indicated by c_over_x_term whereby a battery charge cycle terminates due to ibat dropping below the c_over_x_threshold.
en_max_charge_time_alert			[2]	0	Interrupt request that causes an SMBALERT upon max_charge_time_fault_alert as indicated by max_charge_time_fault whereby charging has terminated due to tchargetimer reaching max_charge_time.
en_bat_missing_fault_alert			[1]	0	Interrupt request that causes an SMBALERT upon bat_missing_fault_alert as indicated by bat_missing_fault whereby charging is prohibited if no battery is detected during the battery presence detection phase at the beginning of a charge cycle.
en_bat_short_fault_alert			[0]	0	Interrupt request that causes an SMBALERT upon bat_short_fault_alert as indicated by bat_short_fault whereby charging is prohibited if a shorted battery is detected during the battery presence detection phase at the beginning of a charge cycle.
EN_CHARGE_STATUS_ALERTS_REG	0x0F	R/W	[5:0]	0	Enable charge status notification via SMBALERT
en_ilim_reg_active_alert			[5]	0	Interrupt request that causes an ilim_reg_active_alert SMBALERT upon ilim_reg_active (VCSP-VCSN greater than 45mV). May indicates that the switching regulator is currently controlling power delivery based on a safety current limit. This should not occur under normal conditions and is likely the result of a circuit board fault. Alternately indicates that the switching regulator is in dropout (near 100% duty cycle) and is not regulating on any feedback control loop.
en_thermal_reg_active_alert			[4]	0	Interrupt request that causes a thermal_reg_active_alert SMBALERT upon thermal_reg_active indicating that the icharge_dac is being dialed back to reduce internal die heating.
en_vin_uvcl_active_alert			[3]	0	Interrupt request that causes a vin_uvcl_active_alert SMBALERT upon vin_uvcl_active indicating that the undervoltage regulation loop has taken control of the switching regulator.
en_iin_limit_active_alert			[2]	0	Interrupt request that causes a iin_limit_active_alert SMBALERT upon iin_limit_active indicating that the input current regulation loop has taken control of the switching regulator.

REGISTER DESCRIPTIONS

Symbol Name	Command Code	Access	Bit Range	Default	Description
en_constant_ current_alert			[1]	0	Interrupt request that causes a constant_current_alert SMBALERT upon constant_current indicating that the battery charger constant current regulation loop has taken control of the switching regulator.
en_constant_ voltage_alert			[0]	0	Interrupt request that causes a constant_voltage_alert SMBALERT upon constant_voltage indicating that the battery charger constant voltage regulation loop has taken control of the switching regulator.
thermal_reg_start_ temp	0x10	R/W	[15:0]	17897	Signed number that sets the start of the temperature region for thermal regulation. To prevent overheating, a thermal regulation feedback loop utilizing die_temp sets an upper limit on icharge_dac following a linear gradient from full scale (31) to minimum scale (0) between thermal_reg_start_temp and thermal_reg_end_temp. The default value of 17897 corresponds to 120°C.
thermal_reg_end_ temp	0x11	R/W	[15:0]	18130	Signed number that sets the end of the temperature region for thermal regulation. To prevent overheating, a thermal regulation feedback loop utilizing die_temp sets an upper limit on icharge_dac following a linear gradient from full scale (31) to minimum scale (0) between thermal_reg_start_temp and thermal_reg_end_temp. The default value of 18130 corresponds to 125°C.
CONFIG_BITS_REG	0x14	R/W	[5:1]	0	System configuration settings
suspend_charger			[5]	0	Causes battery charging to be suspended. This setting should be used cautiously. For embedded battery systems where two wire interface communication relies on a minimum battery voltage, setting this bit could result in a deadlock that may require factory service to correct.
run_bsr			[4]	0	Causes the battery equivalent-series-resistance (bsr) measurement to be made as soon as a charge cycle starts or immediately if a charge cycle is already running.
telemetry_speed			[3]	0	Forces the telemetry system to take measurements at the higher rate of approximately once every 11ms whenever the telemetry system is on. When this bit is disabled, the telemetry system will slow down to about once every 5s to reduce power when not charging. Setting telemetry_speed to tel_high_speed in conjunction with force_telemetry_on with no input power available will increase battery drain. Enums: tel_high_speed = 1, tel_low_speed = 0
force_telemetry_on			[2]	0	Causes the telemetry system to operate at all times, including times when only battery power is available.
mppt_en			[1]	0	Causes the Maximum Power-Point Tracking algorithm to run. The maximum power point algorithm takes control of the input undervoltage regulation control loop via the input_undervoltage_dac to seek the optimum power-point for resistive sources such as a long cable or solar panel.
iin_limit_target	0x15	R/W	[5:0]	63	Controls the target input current limit setting. The input current is limited by regulating charge current in response to the voltage across an external current sense resistor, RSNSI, between the CLP and CLN pins and is given by (iin_limit_target + 1) × 500µV / RSNSI. Note that the LTC4162 can only limit charge current based on this setting. It does not have the authority to block current from passing directly through to the system load. Connecting the system load to the battery, however, can allow total input current control.
input_undervoltage_ setting	0x16	R/W	[7:0]	31	Controls the input undervoltage regulation setting. The regulation voltage, given by (input_undervoltage_setting + 1) × 140.625mV, is the voltage at which the charge current will be reduced to prevent further droop in supply voltage due to a resistive source. If mppt_en is set, the MPPT algorithm will override this setting. The actual input undervoltage value can be read back from the input_undervoltage_dac.
arm_ship_mode	0x19	R/W	[15:0]	0	Setting this register to arm arms the ultra low-power ship and store mode. Ship mode does not take effect until the VIN pin drops below approximately 1V or immediately if VIN is already below 1V. Enum: arm = 21325

REGISTER DESCRIPTIONS

Symbol Name	Command Code	Access	Bit Range	Default	Description
charge_current_setting	0x1A	R/W	[4:0]	31	Controls the target charge current regulation servo level. The charge current is regulated by servoing the voltage across an external current sense resistor, RSNSB, between the CSP and CSN pins. The servo voltage is given by (charge_current_setting + 1) × 1mV. The effective charge current, determined by the external resistor, RSNSB, is given by (charge_current_setting + 1) × 1mV / RSNSB. icharge_dac will follow charge_current_setting unless thermal_reg_active is true or the JEITA algorithm, with en_jeita, has altered it.
vcharge_setting	0x1B	R/W	[4:0]	31	Controls the final charge voltage regulation servo level. To maintain inherent over-charge protection, only Lithium Ion appropriate charge voltage values can be selected. The charge voltage setting can be computed from cell_count × (vcharge_setting × 12.5mV + 3.8125V) where vcharge_setting ranges from 0 to 31 (4.2V max). vcharge_dac will follow vcharge_setting unless the advanced JEITA temperature control system (en_jeita) has altered it. Enum: vcharge_lion_default = 31
c_over_x_threshold	0x1C	R/W	[15:0]	2184	Signed number that sets the ibat A/D value used to qualify C/x detection and termination. The C/x level is based on the value for ibat which has a scaling factor of 1.466µV / RSNSB amperes/LSB. For example, to make the C/x level C/10 (a very common choice) then c_over_x_threshold should be set to c_over_10 which is 10% of the maximum possible ibat reading (32mV × 37.5 × 18,191 / 10). 32mV is the full scale charge current signal from CSP to CSN, 37.5 is the internal charge amplifier's gain and 18,191 is the A/D's span term in counts per Volt. Enum: c_over_10 = 2184
max_cv_time	0x1D	R/W	[15:0]	14400	Sets the constant-voltage termination setting against which the tcvtimer is compared. The timer begins at the onset of the constant_voltage phase of charging and increments at one count per second. The default setting is 14,400 (4 hours). Enums: 30mins = 1800, 1hour = 3600, 2hours = 7200, 4hours_default = 14400
max_charge_time	0x1E	R/W	[15:0]	0	Sets the total charge time termination setting against which the tchargetimer is compared. The default value of 0 disables the total charge time feature and prevents the tchargetimer from running. If enabled with a non zero value, the tchargetimer begins counting at the onset of a charge cycle and increments at one count per minute. Enum: maxchargetime_disable = 0
jeita_t1	0x1F	R/W	[15:0]	16117	Signed number that sets the JEITA temperature region transition temperature T1 between JEITA regions R1 and R2. The temperature is based on the thermistor reading from the telemetry system; RNTC = RNTCBIAS × (21829 - thermistor_voltage) / thermistor_voltage. Recall that the thermistor has a negative temperature coefficient so jeita_t1, representing colder temperatures, will have the highest value and jeita_t6, representing warmer temperatures, will have the lowest value. The default value of 16117 maps to about 0°C for the expected thermistor β value of 3490K.
jeita_t2	0x20	R/W	[15:0]	14113	Signed number that sets the JEITA temperature region transition temperature T2 between JEITA regions R2 and R3. The temperature is based on the thermistor reading from the telemetry system; RNTC = RNTCBIAS × (21829 - thermistor_voltage) / thermistor_voltage. Recall that the thermistor has a negative temperature coefficient so jeita_t1, representing colder temperatures, will have the highest value and jeita_t6, representing warmer temperatures, will have the lowest value. The default value of 14113 maps to about 10°C for the expected thermistor β value of 3490K.
jeita_t3	0x21	R/W	[15:0]	7970	Signed number that sets the JEITA temperature region transition temperature T3 between JEITA regions R3 and R4. The temperature is based on the thermistor reading from the telemetry system; RNTC = RNTCBIAS × (21829 - thermistor_voltage) / thermistor_voltage. Recall that the thermistor has a negative temperature coefficient so jeita_t1, representing colder temperatures, will have the highest value and jeita_t6, representing warmer temperatures, will have the lowest value. The default value of 7970 maps to about 40°C for the expected thermistor β value of 3490K.

REGISTER DESCRIPTIONS

Symbol Name	Command Code	Access	Bit Range	Default	Description
jeita_t4	0x22	R/W	[15:0]	7112	Signed number that sets the JEITA temperature region transition temperature T4 between JEITA regions R3 and R4. The temperature is based on the thermistor reading from the telemetry system; RNTC = RNTCBIAS × (21829 - thermistor_voltage) / thermistor_voltage. Recall that the thermistor has a negative temperature coefficient so jeita_t1, representing colder temperatures, will have the highest value and jeita_t6, representing warmer temperatures, will have the lowest value. The default value of 7112 maps to about 45°C for the expected thermistor β value of 3490K.
jeita_t5	0x23	R/W	[15:0]	6325	Signed number that sets the JEITA temperature region transition temperature T5 between JEITA regions R5 and R6. The temperature is based on the thermistor reading from the telemetry system; RNTC = RNTCBIAS × (21829 - thermistor_voltage) / thermistor_voltage. Recall that the thermistor has a negative temperature coefficient so jeita_t1, representing colder temperatures, will have the highest value and jeita_t6, representing warmer temperatures, will have the lowest value. The default value of 6325 maps to about 50°C for the expected thermistor β value of 3490K.
jeita_t6	0x24	R/W	[15:0]	4970	Signed number that sets the JEITA temperature region transition temperature T6 between JEITA regions R6 and R7. The temperature is based on the thermistor reading from the telemetry system; RNTC = RNTCBIAS × (21829 - thermistor_voltage) / thermistor_voltage. Recall that the thermistor has a negative temperature coefficient so jeita_t1, representing colder temperatures, will have the highest value and jeita_t6, representing warmer temperatures, will have the lowest value. The default value of 4970 maps to about 60°C for the expected thermistor β value of 3490K.
VCHARGE_ JEITA_6_5_REG	0x25	R/W	[9:0]	631	vcharge_setting values for JEITA temperature regions jeita_t6 and jeita_t5
vcharge_jeita_6			[9:5]	19	Sets the charge voltage to be used in JEITA region 6 as illustrated in the JEITA Temperature Qualified Charging section. The value corresponds to vcharge_setting and can be calculated using vcharge_jeita_6 × 12.5mV + 3.8125V. The default value of 19 corresponds to 4.05V.
vcharge_jeita_5			[4:0]	23	Sets the charge voltage to be used in JEITA region 5 as illustrated in the JEITA Temperature Qualified Charging section. The value corresponds to vcharge_setting and can be calculated using vcharge_jeita_5 × 12.5mV + 3.8125V. The default value of 23 corresponds to 4.1V.
VCHARGE_ JEITA_4_3_2_REG	0x26	R/W	[14:0]	24575	vcharge_setting values for JEITA temperature regions jeita_t4, jeita_t3, and jeita_t2
vcharge_jeita_4			[14:10]	23	Sets the charge voltage to be used in JEITA region 4 as illustrated in the JEITA Temperature Qualified Charging section. The value corresponds to vcharge_setting and can be calculated using vcharge_jeita_4 × 12.5mV + 3.8125V. The default value of 23 corresponds to 4.1V
vcharge_jeita_3			[9:5]	31	Sets the charge voltage to be used in JEITA region 3 as illustrated in the JEITA Temperature Qualified Charging section. The value corresponds to vcharge_setting and can be calculated using vcharge_jeita_3 × 12.5mV + 3.8125V. The default value of 31 corresponds to 4.2V.
vcharge_jeita_2			[4:0]	31	Sets the charge voltage to be used in JEITA region 2 as illustrated in the JEITA Temperature Qualified Charging section. The value corresponds to vcharge_setting and can be calculated using vcharge_jeita_2 × 12.5mV + 3.8125V. The default value of 31 corresponds to 4.2V.
ICHARGE_ JEITA_6_5_REG	0x27	R/W	[9:0]	495	charge_current_setting values for JEITA temperature regions jeita_t6 and jeita_t5
icharge_jeita_6			[9:5]	15	Sets the charge current to be used in JEITA region 6 as illustrated in the JEITA Temperature Qualified Charging section. The value corresponds to charge_current_setting where the charge current can be calculated using (icharge_jeita_6 + 1) × 1mV / RSNSB. The default value of 15 corresponds to a VCSP-VCSN servo voltage of 16mV which is half scale or C/2.
icharge_jeita_5			[4:0]	15	Sets the charge current to be used in JEITA region 5 as illustrated in the JEITA Temperature Qualified Charging section. The value corresponds to charge_current_setting where the charge current can be calculated using (icharge_jeita_5 + 1) × 1mV / RSNSB. The default value of 15 corresponds to a VCSP-VCSN servo voltage of 16mV which is half scale or C/2.
ICHARGE_ JEITA_4_3_2_REG	0x28	R/W	[14:0]	32751	charge_current_setting value for JEITA temperature regions jeita_t4, jeita_t3, and jeita_t2

REGISTER DESCRIPTIONS

Symbol Name	Command Code	Access	Bit Range	Default	Description
icharge_jeita_4			[14:10]	31	Sets the charge current to be used in JEITA region 4 as illustrated in the JEITA Temperature Qualified Charging section. The value corresponds to charge_current_setting where the charge current can be calculated using (icharge_jeita_4 + 1) × 1mV / RSNSB. The default value of 31 corresponds to a VCSP-VCSN servo voltage of 32mV which is full scale.
icharge_jeita_3			[9:5]	31	Sets the charge current to be used in JEITA region 3 as illustrated in the JEITA Temperature Qualified Charging section. The value corresponds to charge_current_setting where the charge current can be calculated using (icharge_jeita_3 + 1) × 1mV / RSNSB. The default value of 31 corresponds to a VCSP-VCSN servo voltage of 32mV which is full scale.
icharge_jeita_2			[4:0]	15	Sets the charge current to be used in JEITA region 2 as illustrated in the JEITA Temperature Qualified Charging section. The value corresponds to charge_current_setting where the charge current can be calculated using (icharge_jeita_2 + 1) × 1mV / RSNSB. The default value of 15 corresponds to a VCSP-VCSN servo voltage of 16mV which is half scale or C/2.
CHARGER_CONFIG_BITS_REG	0x29	R/W	[2:0]	1	Battery charger configuration settings
en_c_over_x_term			[2]	0	Enables charge current based (C/x) battery charger termination as set by ibat dropping to the c_over_x_threshold in constant_voltage.
en_jeita			[0]	1	Enables the JEITA temperature qualified charging system.
tchargetimer	0x30	R	[15:0]	0	If max_charge_time is written to a non zero value tchargetimer is the elapsed time in minutes since the beginning of a charge cycle. The LTC4162 will terminate charging when tchargetimer reaches the value in max_charge_time.
tcvtimer	0x31	R	[15:0]	0	This is the elapsed time in seconds since the battery charger has been in the constant_voltage phase of charging. If this value exceeds max_cv_time then charging is considered complete and will terminate.
charger_state	0x34	R	[12:0]	256	Real time battery charger state indicator. Individual bits are mutually exclusive. Enums: bat_detect_failed_fault = 4096, battery_detection = 2048, charger_suspended = 256, precharge = 128, cc_cv_charge = 64, ntc_pause = 32, timer_term = 16, c_over_x_term = 8, max_charge_time_fault = 4, bat_missing_fault = 2, bat_short_fault = 1
charge_status	0x35	R	[5:0]	0	Charge status indicator. Individual bits are mutually exclusive and are only active in charging states. Enums: ilim_reg_active = 32, thermal_reg_active = 16, vin_uvcl_active = 8, iin_limit_active = 4, constant_current = 2, constant_voltage = 1, charger_off = 0
LIMIT_ALERTS_REG	0x36	R	[15:0]	0	Limit alert register. This input/output register indicates that an enabled alert has occurred. Individual alerts are enabled in EN_LIMIT_ALERTS_REG. Writing 0 to any bit clears that alert. Once set, alert bits remain high until cleared or disabled.
telemetry_valid_alert			[15]	0	Alert that indicates that the telemetry system warm-up time has expired and valid telemetry data is available from the serial port. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_telemetry_valid_alert.

REGISTER DESCRIPTIONS

Symbol Name	Command Code	Access	Bit Range	Default	Description
bsr_done_alert			[14]	0	Alert that indicates that the battery equivalent-series-resistance measurement is finished and a result is available in bsr. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_bsr_done_alert.
vbat_lo_alert			[11]	0	Alert that indicates that vbat is below the value set by vbat_lo_alert_limit. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_vbat_lo_alert.
vbat_hi_alert			[10]	0	Alert that indicates that vbat is above the value set by vbat_hi_alert_limit. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_vbat_hi_alert.
vin_lo_alert			[9]	0	Alert that indicates that vin is below the value set by vin_lo_alert_limit. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_vin_lo_alert.
vin_hi_alert			[8]	0	Alert that indicates that vin is above the value set by vin_hi_alert_limit. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_vin_hi_alert.
vout_lo_alert			[7]	0	Alert that indicates that vout is below the value set by vout_lo_alert_limit. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_vout_lo_alert.
vout_hi_alert			[6]	0	Alert that indicates that vout is above the value set by vout_hi_alert_limit. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_vout_hi_alert.
iin_hi_alert			[5]	0	Alert that indicates that iin is above the value set by iin_hi_alert_limit. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_iin_hi_alert.
ibat_lo_alert			[4]	0	Alert that indicates that ibat is below the value set by ibat_lo_alert_limit. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_ibat_lo_alert.
die_temp_hi_alert			[3]	0	Alert that indicates that die_temp is above the value set by die_temp_hi_alert_limit. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_die_temp_hi_alert.
bsr_hi_alert			[2]	0	Alert that indicates that bsr is above the value set by bsr_hi_alert_limit. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_bsr_hi_alert.
thermistor_voltage_hi_alert			[1]	0	Alert that indicates that thermistor_voltage is above the value set by thermistor_voltage_hi_alert_limit. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_thermistor_voltage_hi_alert.
thermistor_voltage_lo_alert			[0]	0	Alert that indicates that thermistor_voltage is below the value set by thermistor_voltage_lo_alert_limit. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_thermistor_voltage_lo_alert.
CHARGER_STATE_ALERTS_REG	0x37	R	[12:0]	0	Alert that indicates that charger states have occurred. Individual bits are enabled by EN_CHARGER_STATE_ALERTS_REG. Writing 0 to any bit while writing 1s to the remaining bits clears that alert. Once set, alert bits remain high until cleared or disabled.
bat_detect_failed_fault_alert			[12]	0	Alert that indicates a bat_detect_failed_fault. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_bat_detect_failed_fault_alert.
battery_detection_alert			[11]	0	Alert that indicates the battery charger is performing battery_detection. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_battery_detecttion_alert.
charger_suspended_alert			[8]	0	Alert that indicates the battery charger is in the charger_suspended state. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_charger_suspended_alert.

REGISTER DESCRIPTIONS

Symbol Name	Command Code	Access	Bit Range	Default	Description
precharge_alert			[7]	0	Alert that indicates that the battery charger is in the precharge phase. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_precharge_alert.
cc_cv_charge_alert			[6]	0	Alert that indicates that the battery charge is in the cc_cv_charge phase. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_cc_cv_charge_alert.
ntc_pause_alert			[5]	0	Alert that indicates that the battery charger is in the ntc_pause state. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_ntc_pause_alert.
timer_term_alert			[4]	0	Alert that indicates that the battery charge is in the timer_term state. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_timer_term_alert.
c_over_x_term_alert			[3]	0	Alert that indicates that the battery charge is in the c_over_x_term state. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_c_over_x_term_alert.
max_charge_time_fault_alert			[2]	0	Alert that indicates that the battery charge is in the max_charge_time_fault state. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_max_charge_time_alert.
bat_missing_fault_alert			[1]	0	Alert that indicates that a bat_missing_fault has been detected. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_bat_missing_fault_alert.
bat_short_fault_alert			[0]	0	Alert that indicates that a bat_short_fault has been detected. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_bat_short_fault_alert.
CHARGE_STATUS_ALERTS_REG	0x38	R	[5:0]	0	Alerts that charge_status indicators have occurred. Individual bits are enabled by EN_CHARGE_STATUS_ALERTS_REG. Writing 0 to any bit clears that alert. Once set, alert bits remain high until cleared or disabled.
ilim_reg_active_alert			[5]	0	Alert that indicates that charge_status is ilim_reg_active. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_ilim_reg_active_alert.
thermal_reg_active_alert			[4]	0	Alert that indicates that charge_status is thermal_reg_active. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_thermal_reg_active_alert.
vin_uvcl_active_alert			[3]	0	Alert that indicates that charge_status is vin_uvcl_active. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_vin_uvcl_active_alert.
iin_limit_active_alert			[2]	0	Alert that indicates that charge_status is iin_limit_active. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_iin_limit_active_alert.
constant_current_alert			[1]	0	Alert that indicates that charge_status is constant_current. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_constant_current_alert.
constant_voltage_alert			[0]	0	Alert that indicates that charge_status is constant_voltage. This alert bit is cleared by writing it back to 0 with the remaining bits in this register set to 1s. It can also be cleared by clearing en_constant_voltage_alert.
SYSTEM_STATUS_REG	0x39	R	[8:0]	N/A	Real time system status indicator bits
en_chg			[8]	N/A	Indicates that the battery charger is active.
cell_count_err			[7]	N/A	A cell count error will occur and charging will be inhibited if the CELLS0 and CELLS1 pins are programmed for more than 8 cells. cell_count_err always indicates true when telemetry is not enabled such as when the charger is not enabled.

REGISTER DESCRIPTIONS

Symbol Name	Command Code	Access	Bit Range	Default	Description
no_rt			[5]	N/A	Indicates that no frequency setting resistor is detected on the RT pin. The RT pin impedance detection circuit will typically indicate a missing RT resistor for values above 1.4MΩ. no_rt always indicates true when the battery charger is not enabled such as when there is no input power available.
thermal_shutdown			[4]	N/A	Indicates that the LTC4162 is in thermal shutdown protection due to an excessively high die temperature (typically 150°C).
vin_ovlo			[3]	N/A	Indicates that input voltage shutdown protection is active due to an input voltage above its protection shut-down threshold of approximately 38.6V.
vin_gt_vbat			[2]	N/A	Indicates that the VIN pin voltage is sufficiently above the battery voltage to begin a charge cycle (typically +150mV).
vin_gt_4p2v			[1]	N/A	Indicates that the VIN pin voltage is at least greater than the switching regulator under-voltage lockout level (4.2V typical).
intvcc_gt_2p8v			[0]	N/A	Indicates that the INTVCC pin voltage is greater than the telemetry system lockout level (2.8V typical).
vbat	0x3A	R	[15:0]	0	Signed number that indicates the A/D measurement for the per-cell battery voltage. The value is based on the A/D scaling factor for the battery voltage measurement which is cell_count × 192.4µV/LSB at the BATSENS+ pin.
vin	0x3B	R	[15:0]	0	Signed number that indicates the A/D measurement for the input voltage. The value is based on the A/D scaling factor for the input voltage measurement which is 1.649mV/LSB.
vout	0x3C	R	[15:0]	0	Signed number that indicates the A/D measurement for the vout voltage. The value is based on the A/D scaling factor for the output voltage measurement which is 1.653mV/LSB.
ibat	0x3D	R	[15:0]	0	Signed number that indicates the A/D measurement for the battery current. The value is based on the A/D scaling factor for the charge current measurement (VCSP - VCSN) which is 1.466µV / RSNSB amperes/LSB. If the charger is not enabled the value represents drain on the battery and will be negative.
iin	0x3E	R	[15:0]	0	Signed number that indicates the A/D measurement for the input current (VCLP - VCLN). The value is based on the A/D scaling factor for the input current measurement which is 1.466µV / RSNSI amperes/LSB.
die_temp	0x3F	R	[15:0]	0	Signed number that indicates the A/D measurement for the die temperature. The value can be calculated from the A/D reading in °C as TDIE(°C) = die_temp × 0.0215°C/LSB - 264.4°C.
thermistor_voltage	0x40	R	[15:0]	0	Signed number that indicates the A/D measurement for the NTC pin voltage. The thermistor value can be determined by the expression RNTC = RNTCBIAS × thermistor_voltage / (21829 - thermistor_voltage). Recall that the thermistor has a negative temperature coefficient so higher temperatures make lower thermistor_voltage readings and vice-versa. Enum: open_thermistor = 21684
bsr	0x41	R	[15:0]	0	Indicates the A/D measurement for the per-cell battery resistance. The battery resistance is relative to the battery charge current setting resistor, RSNSB, and can be computed in Ω from cell_count × bsr × RSNSB / 500. If the charge current, ibat, is below icharge_over_10, bsr_questionable will be set.

REGISTER DESCRIPTIONS

Symbol Name	Command Code	Access	Bit Range	Default	Description
jeita_region	0x42	R	[2:0]	0	Indicates the LTC4162 JEITA battery temperature region containing the thermistor_voltage. The temperature region consists of the values bounded by the transition temperatures jeita_t(R-1) and jeita_t(R). Recall that the thermistor has a negative temperature coefficient so higher temperatures make lower thermistor_voltage readings and vice-versa. JEITA temperature-controlled charging is active only when en_jeita is at its default value of 1. JEITA regions R7 (jeita_region = 7) and R1 (jeita_region = 1) indicate that the thermistor_voltage (battery temperature) is out of range for charging and therefore charging is paused (ntc_pause). The transition temperatures are set by jeita_t1 through jeita_t6. Enums: R7 = 7, R6 = 6, R5 = 5, R4 = 4, R3 = 3, R2 = 2, R1 = 1
CHEM_CELLS_REG	0x43	R	[11:0]	0	Programmed battery chemistry
chem			[11:8]	0	Indicates the chemistry of the battery being charged. For additional safety, application software can test this value to ensure that the correct version of the LTC4162 (LTC4162-L, LTC4162-F or LTC4162-S) is populated on the circuit board. Enums: LTC4162_LAD = 0, LTC4162_L42 = 1, LTC4162_L41 = 2, LTC4162_L40 = 3, LTC4162_FAD = 4, LTC4162_FFS = 5, LTC4162_FST = 6, LTC4162_SST = 8, LTC4162_SAD = 9
cell_count			[3:0]	0	Indicates the cell count value detected by the CELLS0 and CELLS1 pin strapping. cell_count always indicates 0 when the battery charger is not enabled such as when there is no input power available. Enum: Unknown = 0
icharge_dac	0x44	R	[4:0]	0	Indicates the actual charge current setting applied to the charge current digital to analog converter. icharge_dac is ramped up/down to implement digital soft-start/stop. The LTC4162 sets the value of icharge_dac based on charger_state, thermistor_voltage, and charger settings including charge_current_setting, icharge_jeita_2 through icharge_jeita_6, jeita_t1 through jeita_t6 and en_jeita. Recall that the charge current is regulated by controlling the voltage across an external current sense resistor RSNSB. The servo voltage is given by (icharge_dac + 1) × 1mV. The charge current servo level is thus given by (icharge_dac + 1) × 1mV/RSNSB.
vcharge_dac	0x45	R	[4:0]	0	This is the actual battery voltage setting applied to the charge voltage digital to analog converter. The LTC4162 sets the value of vcharge_dac based on charger_state, thermistor_voltage, and charger settings including vcharge_setting, vcharge_jeita_2 through vcharge_jeita_6, jeita_t1 through jeita_t6, thermistor_voltage and en_jeita. The charge voltage setting can be computed from cell_count × (vcharge_setting × 12.5mV + 3.8125V) where vcharge_setting ranges from 0 to 31 (4.2V max).
iin_limit_dac	0x46	R	[5:0]	0	Indicates the actual input current limit. The iin_limit_dac will follow the value programmed in iin_limit_target. The input current will be regulated to a maximum value given by (iin_limit_dac + 1) × 500µV / RSNSI.
vbat_filt	0x47	R	[15:0]	0	Signed number that is a digitally filtered version of the A/D measurement of vbat. The value is based on the A/D scaling factor for the battery voltage measurement which is cell_count × 192.4µV/LSB at the BATSENS+ pin.

REGISTER DESCRIPTIONS

Symbol Name	Command Code	Access	Bit Range	Default	Description
bsr_charge_current	0x48	R	[15:0]	0	Signed number that is the battery charge current that existed during the battery series resistance measurement. The value is based on the A/D value, ibat, which has a scaling factor of 1.466µV / RSNSB amperes/LSB. If the battery series resistance (bsr) test runs with ibat values less than icharge_over_10, the accuracy of the test is questionable due to low signal level and bsr_questionable will set. Rerunning the battery series resistance test earlier in the charge cycle with higher ibat, and therefore higher bsr_charge_current, will give the most accurate result. Enum: icharge_over_10 = 2184
TELEMETRY_ STATUS_REG	0x4A	R	[1:0]	0	Telemetry system status register
bsr_questionable			[1]	0	Indicates that the battery series resistance measurement is questionable due to low signal, specifically that ibat was less than icharge_over_10, when the last battery series resistance (bsr) measurement was taken. bsr_charge_current contains the ibat A/D value present when the battery series resistance measurement was made.
telemetry_valid			[0]	0	Indicates that the telemetry system autozero amplifiers have had sufficient time, approximately 12ms, to null their offsets. Battery charging is disabled until the telemetry system warm up time has passed.
input_undervoltage_ dac	0x4B	R	[7:0]	0	Input undervoltage regulation digital to analog converter value. The regulation voltage is given by (input_undervoltage_dac + 1) × 140.625mV. If enabled, the MPPT algorithm will directly manipulate this value. Otherwise it will follow input_undervoltage_setting.

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