



- Designed for 12/24V systems
- Compact housing
- Customised features and applications
- Universal calibration and monitoring

Introduction

SIGRA electric vehicle power control unit manages the complete powertrain. The control unit features a powerful microcontroller designed for automotive safety applications to provide high performance. This control unit utilizes MATLAB/Simulink based software development process to speed up the algorithm development by using automatic code and document generation. The flexible hardware design allows for easy customisation of functionalities as per customer specifications.

SIGRA provides the option to include new functionalities and applications as per our customers need. We provide TAPAS universal measurement and calibration protocol for calibrating the powertrain control unit.

We provide the option to run software code on the powertrain control unit that has been developed by our customers. This feature can run in parallel to all the powertrain control unit functionalities.

We deliver libraries and a package of MATLAB/ Simulink toolboxes to interface with all I/Os and calibration tool with access to all signals.

Application

This platform can be used for development of all the applications as required by a modern electric/hybrid vehicles. Some of these applications are

Drive management

Communication with the BMS

AC charging communication and monitoring

DC charging monitoring

Communication with the on-board charger

Communication with the power steering control unit

Communication with instrument cluster unit and infotainment system

Cabin climate control management

Control of the Auxiliary MCU

Communication with DC-DC charger

Universal calibration and monitoring

System diagnostics

Drive Management	<p>Driving models and torque profiles</p> <ul style="list-style-type: none"> - Standard single pedal driving - ECO mode (With configurable speed and torque profile) <p>Gas pedal readings</p> <ul style="list-style-type: none"> - Hall sensor position inputs <p>Analog / Digital / CAN gear input</p>
Charging Management	<p>AC charging</p> <ul style="list-style-type: none"> - IEC 61851 (EU) - SAE J1772 (US) - GB/T 27930 (China) <p>DC charging</p> <ul style="list-style-type: none"> - GB/T 20234 (China) - Communication with BMS to enable DC Charging
Body control and infotainment	<p>Communication with dashboard and instrument cluster</p> <p>Climate control (Air-conditioned and heating)</p>
Auxiliary Motor Drive Management	<p>Control Auxiliary motor MCU for Power Steering and Air-conditioner control</p>
Diagnostics	<p>CAN bootloader for remote software updates</p> <p>End of line testing</p> <p>CAN bootloader for remote software updates</p> <p>Calibration and parameterization</p>
Safety	<p>AEC-Q100 qualified components</p> <p>Safety microcontroller</p> <p>Watchdog functionality</p> <p>Fault management system</p>

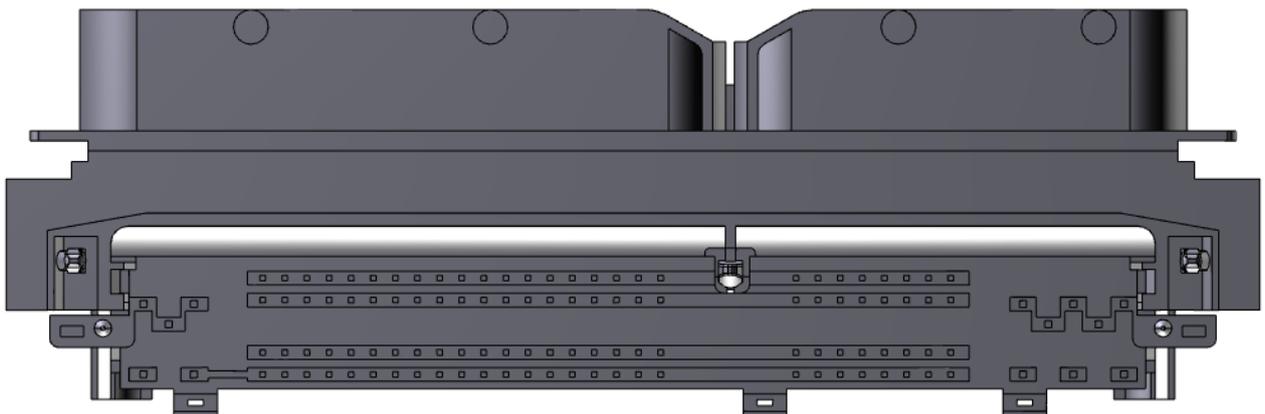
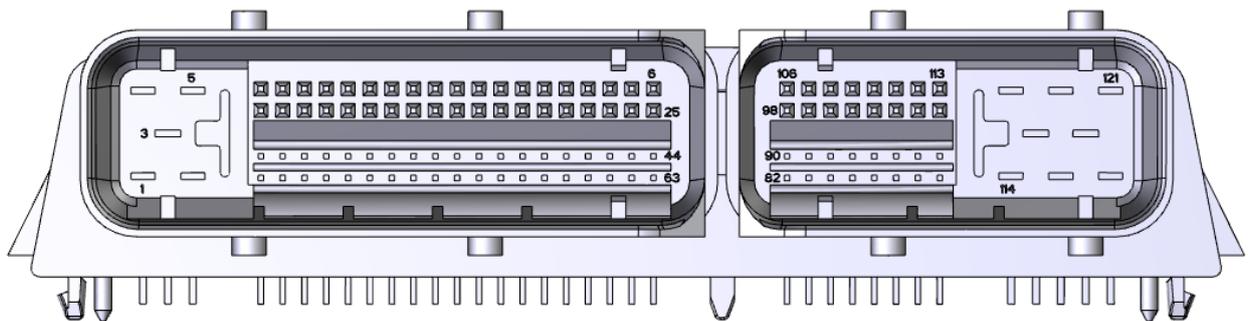
Physical Dimensions

Dimensions: 183mm x 150.5mm x 35mm



Connector

TE connectivity / AMP connector – 81 pin connector



High Level Specifications

81 PIN platform

Microcontroller: Texas Instruments Safety Microcontroller TMS570LS family, 160 MHz

Memory: 3MB program Flash, 256KB RAM, 64KB of Flash for Emulated EEPROM

Operating Voltage: 7V – 32V

Inputs:

5V ADC inputs (3 Nos.)

Dedicated AC charging control pilot detection ADC input

12V ADC input (1 No.)

24V ADC input (2 Nos.)

Dedicated 12V or 24V power supply ADC input

Dedicated AC charging control pilot PWM input

2 multipurpose PWM inputs (upto 12V peak-peak, frequency 1kHz)

10 multipurpose active-high digital inputs (upto 28V)

Dedicated active-high digital inputs for ACC and IGN key positions

7 multipurpose active-low digital inputs (upto 28V)

Outputs:

14 multipurpose low-side outputs (Max. 1A load)

2 dedicated low-side outputs controlled with PWM inputs

2 multipurpose high-side outputs (Max. 1A load)

3 sensor supply (5V)

Communication:

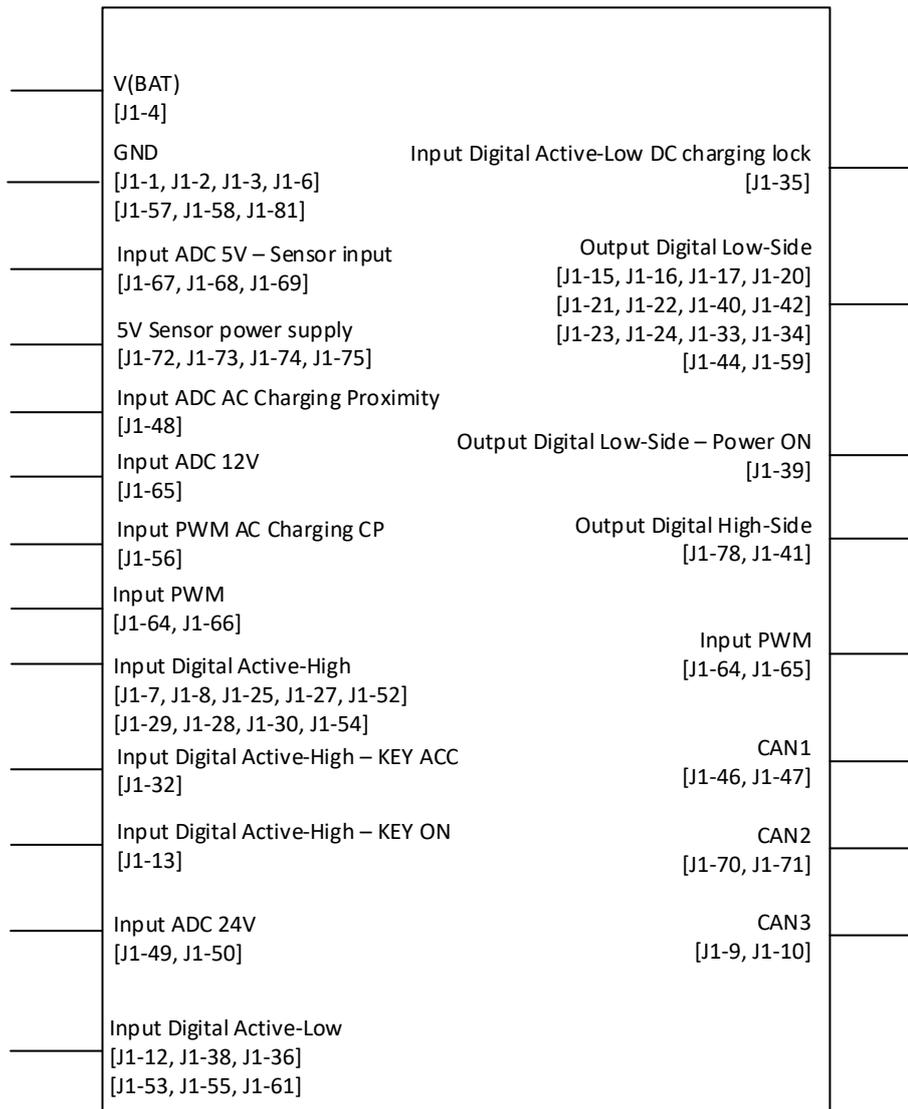
3 CAN channels (1 channel dedicated for SW flashing and diagnostics; 2 channels can be used for vehicle CAN communication)

Safety:

AEC-Q100 qualified components

External watchdog

Pinout



Signal Conditioning

V(BAT) [J1-4]	Nominal: 7V-32V Reverse voltage protection – 1s 42V load dump protection Overvoltage shutdown
GND [J1-1, J1-2, J1-3, J1-6] SGND – Sensor GND [J1-57, J1-58, J1-81]	All grounds are internally connected
Input ADC 5V – Sensor input [J1-67, J1-68, J1-69]	Reverse voltage protection Vin: 0-5V Time constant: 1.6ms A/D Resolution: 10 bits

5V Sensor power supply [J1-72, J1-73, J1-74, J1-75]	Nominal:5V Load: 150mA (per pin)
Input ADC AC Charging Proximity [J1-48]	AC charging plug lock Reverse voltage protection Vin: 0-5V Time constant: 1.6ms A/D Resolution: 10 bits 330Ohm pull-up to 5V As per J1772 signalling circuit
Input ADC 12V – Sensor input [J1-65]	Reverse voltage protection Vin: 0-15V Time constant: 12ms A/D Resolution: 10 bits
Input ADC 24V – Sensor input [J1-49, J1-50]	Reverse voltage protection Vin: 0-26V Time constant: 24ms A/D Resolution: 10 bits
Input PWM AC Charging CP [J1-56]	Voltage: -12V to 12V Frequency: 1KHz Duty Cycle: 0% to 100%
Input PWM [J1-64, J1-66]	Voltage: 0 to 12V Frequency: 1KHz – 2 KHz Duty Cycle: 0% to 100%
Input Digital Active-High [J1-7, J1-8, J1-11, J1-25, J1-27, J1-52] [J1-29, J1-28, J1-30, J1-54]	Automotive contact monitoring solution Input withstand 42V and Reverse battery ESD protection Typical wetting current: 10mA
Input Digital Active-High – KEY ACC [J1-32]	Dedicated pin to detect key in ACC position Turn ON the VCU when key in ACC position is detected 8.9kOhm pull-down to ground
Input Digital Active-High – KEY ON [J1-13]	Dedicated pin to detect key in ACC position Can be used to turn ON the VCU (optional) 8.9kOhm pull-down to ground
Input Digital Active-Low [J1-12, J1-38, J1-36] [J1-53, J1-55, J1-61]	Automotive contact monitoring solution Input withstand 42V and Reverse battery ESD protection Typical wetting current: 10mA Drop-out voltage : 2V (typ)
Input Digital Active-Low DC charging lock [J1-35]	Turn ON the VCU when DC charging lock detected Automotive contact monitoring solution Input withstand 42V and Reverse battery ESD protection Typical wetting current: 10mA Drop-out voltage : 2V (typ)
Output Digital Low-Side [J1-15, J1-16, J1-17, J1-20] [J1-21, J1-22, J1-40, J1-42] [J1-23, J1-24, J1-33, J1-34] [J1-44, J1-59]	Short-circuit protection Over temperature and overvoltage protection ESD protection Maximum current: 1A Voltage clamp: 45V to 60V Turn-on /turn-off delay = 6uS

	Solenoid, Relay and Resistive loads
Output Digital Low-Side – Power ON [J1-39]	Automatically goes high when VCU is powered ON. Can be used to enable or power any other ECU (via a relay when the VCU is powered ON) Short-circuit protection Over temperature and overvoltage protection ESD protection Maximum current: 1A Voltage clamp: 45V to 60V Turn-on /turn-off delay = 6uS Solenoid, Relay and Resistive loads
Output PWM [J1-23, J1-59] - optional	Short-circuit protection Over temperature and overvoltage protection ESD protection 0-5V peak (Complementary output) Frequency: 1kHz – 2kHz
Output Digital High-Side [J1-78, J1-41]	Short-circuit protection Over temperature and overvoltage protection ESD protection Maximum current: 3A Voltage: 7V to 34V
Input PWM [J1-64, J1-65]	Vin: 0-5V Frequency: 1kHz – 2KHz Duty Cycle: 0% to 100%
CAN1 [J1-46, J1-47] CAN2 [J1-70, J1-71]	SAE J2284, SAE J1939, ISO 11783, NMEA 2000 qualified Bus fault protection High frequency noise filtered ESD Protection 120Ohm termination Baud rate: upto 1Mbit/s
CAN3 [J1-9, J1-10]	SW Flashing and Diagnostics CAN SAE J2284, SAE J1939, ISO 11783, NMEA 2000 qualified Bus fault protection High frequency noise filtered ESD Protection 120Ohm termination Baud rate: upto 1Mbit/s

Special Function PINs

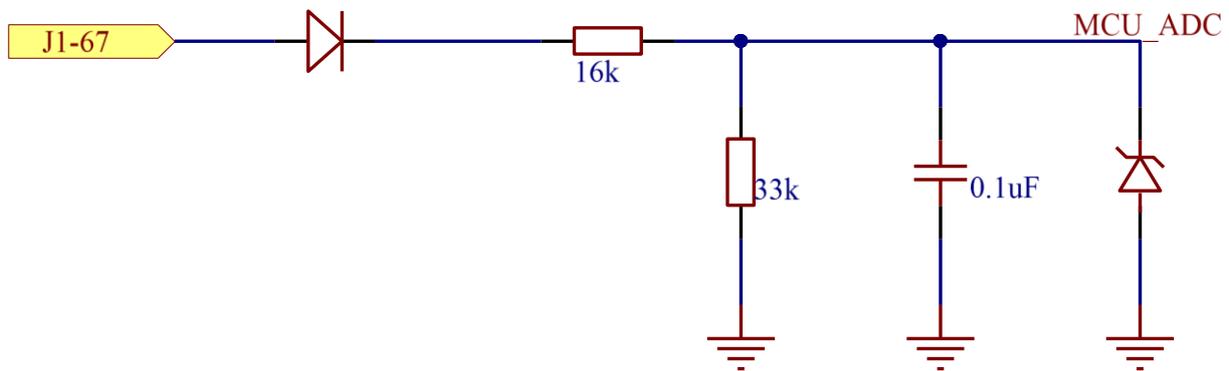
Following PINs have dedicated or special functions

Input Digital Active High – KEY ACC [J1-32]	KEY Position ACC – Active High input signal is used to power on the VCU when the key is in ACC position
Input Digital – KEY ON [J1-13]	KEY Position ON – Active High input signal is used to power on the VCU (optional – can be used by connecting a jumper)

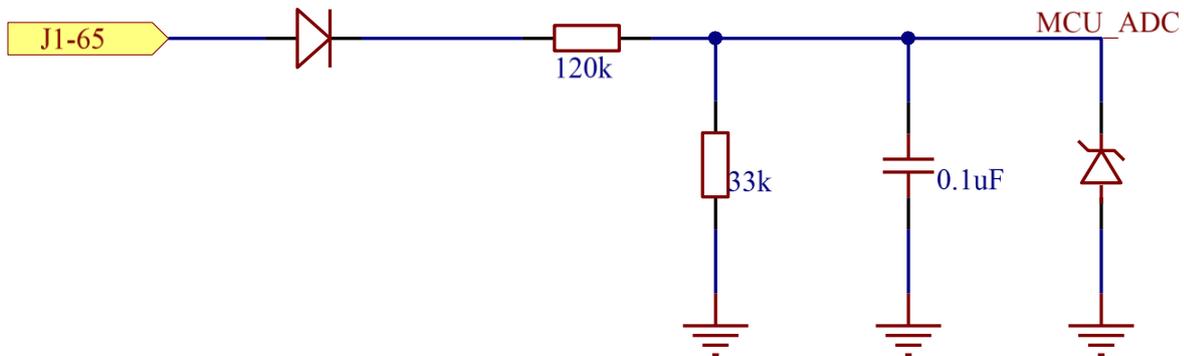
Input Digital – DC Charging lock [J1-35]	DC charging lock – Active Low digital input is also a signal used to power on the VCU for DC charging purpose
Input ADC – AC charging lock – Proximity [J1-48]	AC charging lock – Proximity ADC input is also a signal used to power on the VCU and begin AC charging
Input PWM – AC charging CP [J1-56]	AC charging CP – dedicated PWM input
V(BAT) – [J1-4]	BAT voltage is monitored and is used to power ON the VCU to recharge the low voltage battery

Input ADC sensor input

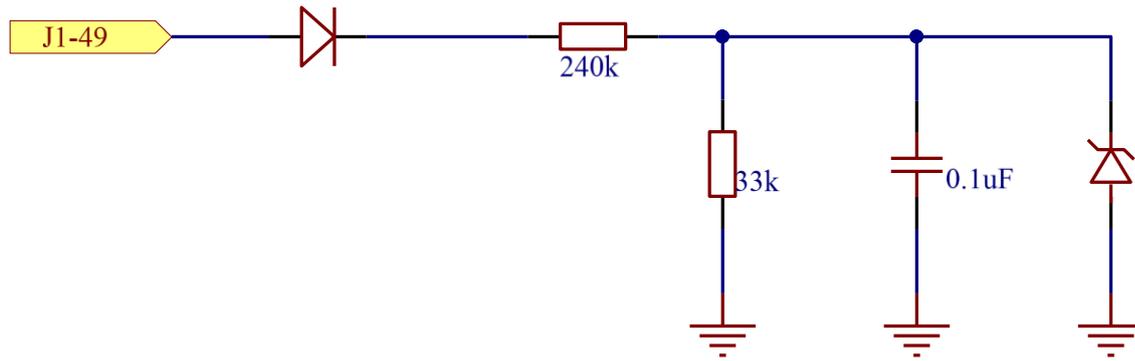
ADC 5V Sensor input



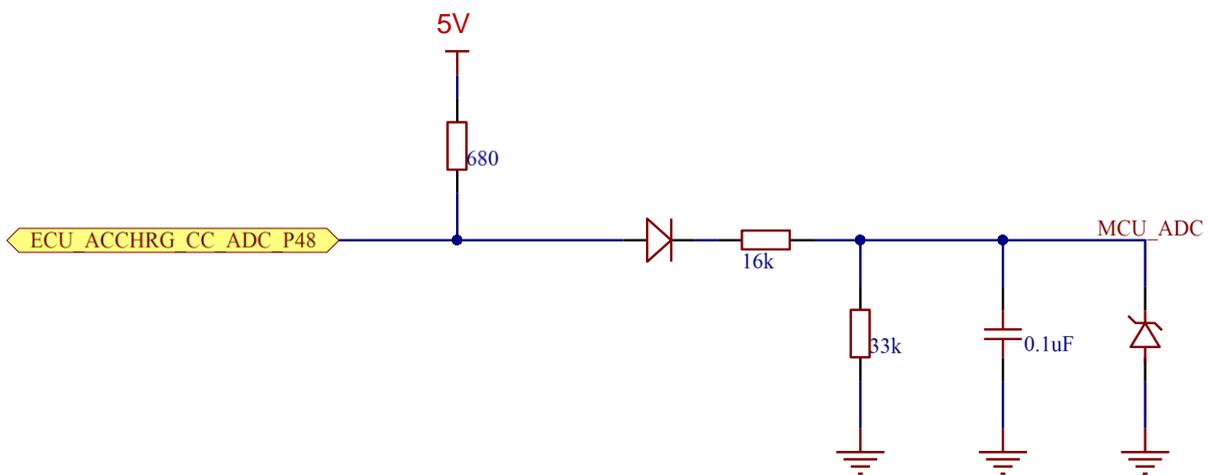
ADC 12V Sensor input



ADC 24V Sensor Input



Input ADC AC Charging Proximity



5V sensor power supply

