Application Brief

Optimizing Digital Cockpit Processing Units (DCPUs) Using Logic and Translation

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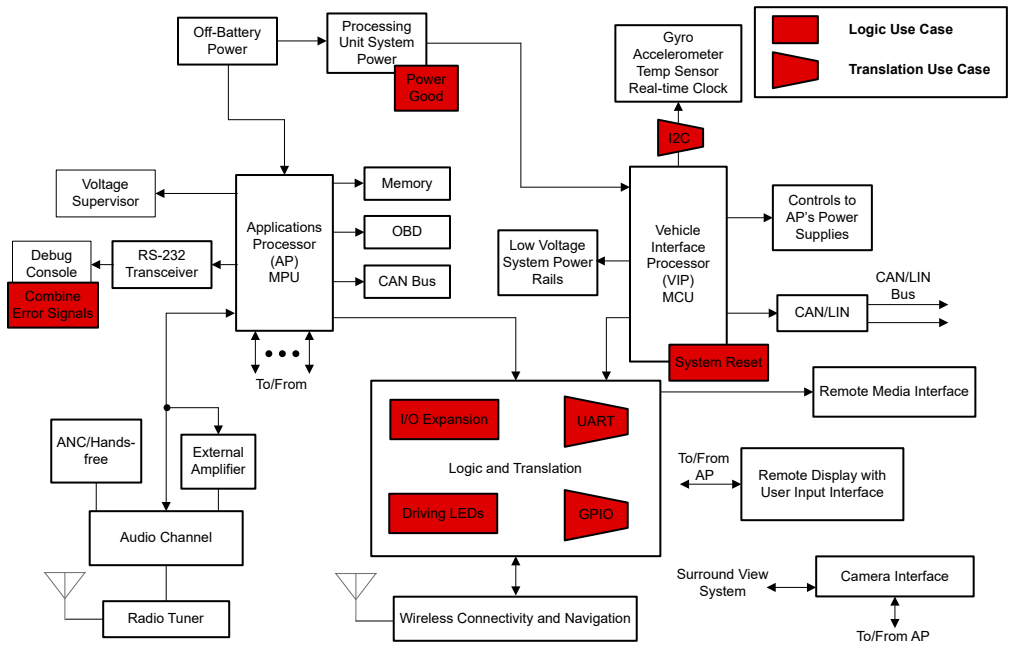
Functional Block Diagram

Simplified Block Diagram for Digital Cockpit Processing Unit (DCPU) shows a simplified DCPU to illustrate the logic and translation use cases. Each red block has an associated use-case document; links are provided in Table 1 and Table 2. For a more complete block diagram, see the interactive online end equipment reference diagram for DCPUs.



Simplified Block Diagram for Digital Cockpit Processing Unit

Logic and Translation Use Cases

Each use case links to a separate document that provides additional details including a block diagram, design tips, and part recommendations. The nearest block and use-case identifiers are listed to match to the use cases shown in the provided *simplified block diagram*.

Table 1. Logic Use Cases

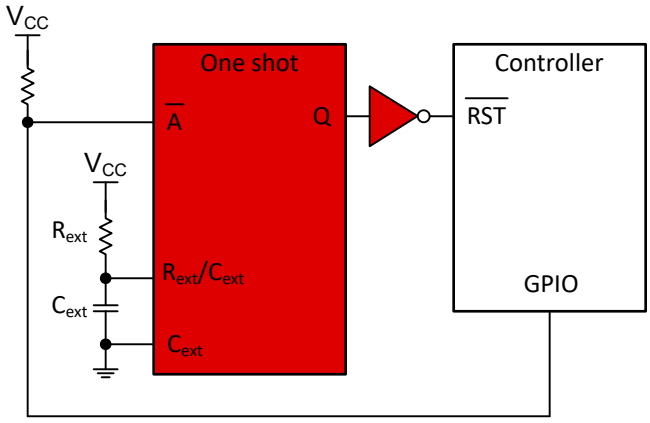
Nearest Block	Use-Case Identifier	Use Case
Processing Unit System Power	Power Good Combination	*Combine Power Good Signals*
Debug Console	Fault Combination	*Use Fewer Inputs to Monitor Error Signals*
Logic and Translation	Driving LEDs	*Drive Indicator LEDs*
	I/O Expansion	*Increase the Number of Outputs on a Microcontroller*

Table 2. Translation Use Cases

Nearest Block	Use-Case Identifier	Use Case
VIP MCU	I2C	*Translate Voltages for I2C*
Logic and Translation	UART	*Translate Voltages for UART*
	GPIO	*Translate Voltages for GPIO*

Reset a System for Short Time

System controllers can use GPIO pins to reset other components if a fault is detected; however, system controllers generally cannot reset themselves or their entire system. By using a monostable multivibrator, the system controller can reset the entire system.



Design Considerations

- Either falling-edge or rising-edge trigger configurations can be used for this application. See the data sheet of your selected multivibrator for details.
- A pullup or pulldown resistor is required to return the input signal to a valid state once the system controller turns off. The recommended value for this resistor is 10 kΩ.
- Retriggerable or non-retriggerable monostable multivibrators can be used for this operation
- *[FAQ] [H] Monostable Multivibrators - Top Questions Answered*
- *[FAQ] How does a slow or floating input affect a CMOS device?*
- *[FAQ] Where do I find maximum power dissipation for a device?*
- Ask a question on the *TI E2E™* forum

Table 3. Recommended Parts

Part Number	AEC-Q100	V_{CC} Range	Function	Features
SN74LVC1G123		1.65 V – 5.5 V	Single-channel multivibrator	Retriggerable, Schmitt-trigger inputs
SN74LV123A		2 V – 5.5 V	Dual-channel multivibrator	Retriggerable, Schmitt-trigger inputs, inverted output
SN74LV123A-Q1	✓			
SN74LV221A		2 V – 5.5 V	Dual-channel multivibrator	Schmitt-trigger inputs, inverted output
SN74LV221A-Q1	✓			
SN74AHC1G04		2 V – 5.5 V	Single-channel inverting buffer	
SN74AHC1G04-Q1	✓			

For more devices, browse through the *online parametric tool* which allows users to sort by desired voltage, channel numbers, and other features.

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