IP Data Sheet

Cascaded 3.3V boost-buck converter running either on a 10V up to 30V supply or on a backup battery supply

The TS_SPLITPI_3V3_X8 is a variable-frequency switching-mode power converter that regulates voltage on terminals V3V3 and VCC2 to typically 3.3V, either from 10V or more on sense-input V24V and power-input PV24V in buck-mode or from battery voltage as low as 1.9V in boost-buck mode, with the addition of discrete inductors, capacitors and diodes.

Mode switchover is controlled by voltage detection on V24V. For a voltage greater than 10V, buck-only mode operation is signalized by ON24V assertion. The minimum bill of material requires the buck inductor, the smoothing capacitor and optionally a polarity-reversal protecting diode between terminals V24V (anode) and PV24V (cathode). V24V is internally protected against voltage polarity reversal before detection.

For circuit applications running on a battery, the bill of material additionally requires the boost inductor, the flyback diode and a smoothing capacitor to terminal PV24V, to achieve a split-pi topology. Boost-buck mode regulation starts for battery voltage on terminal PVBATS greater than 1.9V.

Voltage regulation precision within ±0.1V is achievable for load current intensities up to 200mA in buck-only-mode and up to 133mA in battery-supplied boost-buck-mode.

Power cycling of V3V3 and VCC2 is possible by asserting input BUCKHALT.

Input RUNONVBAT set low turns off the converter, which then draws from a 2.2V battery less than 2.2nA max on PVBATS and 6nA max on PV24V.

The high-side switch between terminals PV24V and SPCOCOM_BUCK is protected against current intensity rising beyond typically 800mA.

Typical power buck conversion efficiency in case of 10V on V24V amounts to 89% at 200mA load, 82% at 25mA and 64% at 12.1mA.

The TS_SPLITPI_3V3_X8 provides its low-pass filtered bandgap reference voltage on pin VBG<2>, typically 1.247V at 27°C junction temperature with a variation of -1.2mV to 150°C.

The TS_SPLITPI_3V3_X8 contains TES junction over-temperature detector IP, TS_TEMP_DET_X8, providing outputs OVERTJ and CENTIGRADE.

The minimum continuous operation lifetime spans 100000 hours.

Technology: X-FAB XT018-0.18µm BCD-on-SOI CMOS

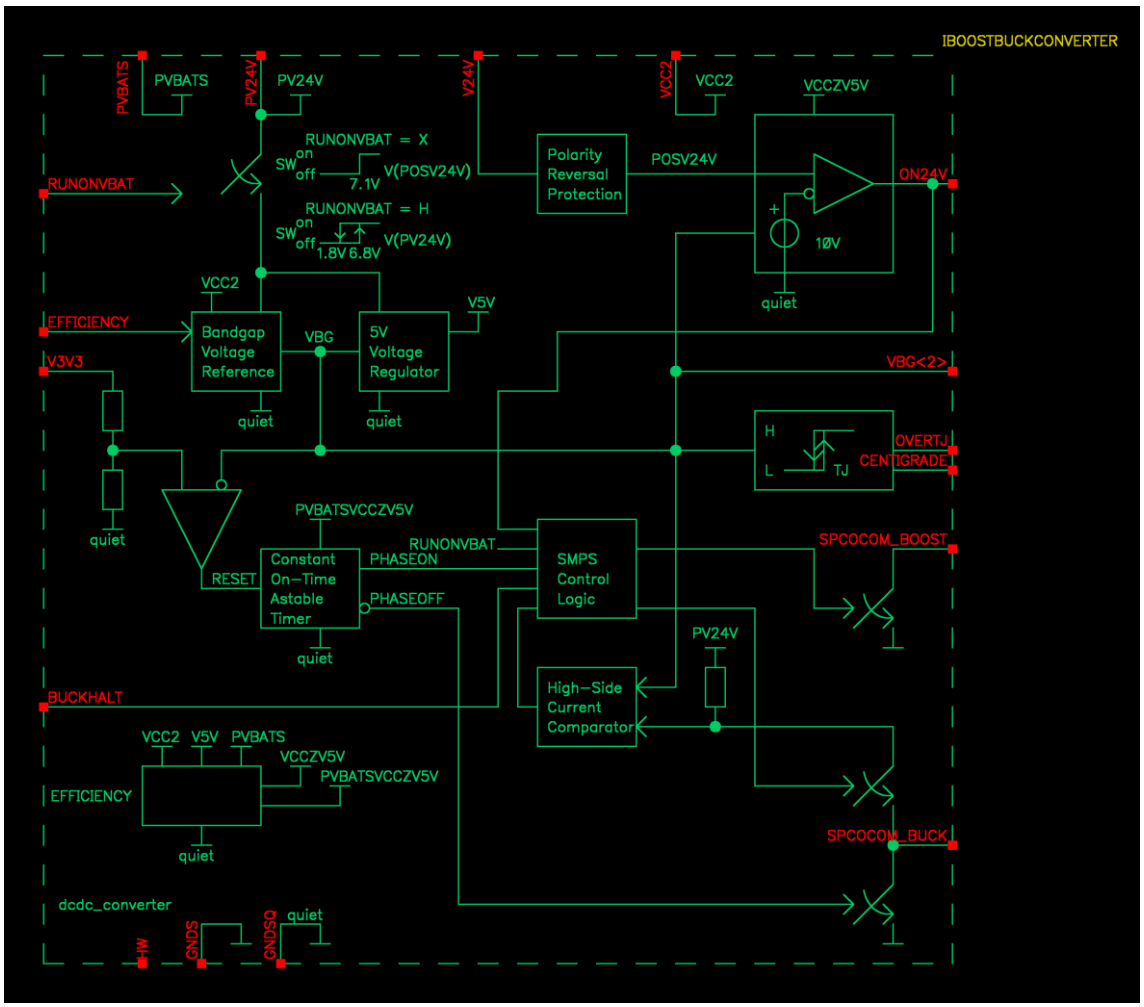

Fig. 1: Boost-Buck Converter Symbol

OPERATING CONDITIONS

Parameters	Values / Type
Junction temperature range	-40°C up to +150°C
Supply voltages with respect to ground GNDS and GNDSQ	PVBATS: 1.9V up to 3.6V V24V, PV24V: 10V up to 30V
Maximum DC load current intensity	Buck-only mode: 200mA Boost-buck mode: 133mA
ON24V, VBG<2>, OVERTJ and CENTIGRADE output loads	CMOS respectively PMOS gate

Table 1: Boost-Buck Converter Operating Conditions

SPECIFICATION

Parameters	Values / Type
Reference voltage at 27°C junction temperature	VBG: 1.247V (±8.5mV)
Reference voltage maximum deviation up to 150°C	ΔVBG: -1.2mV (±3.5mV)
V3V3, VCC2 regulated voltage	3.3V (±0.1V)
Switching frequency upon V3V3, VCC2 voltage rising	2MHz (±0.5MHz)
High-side switch on-time without overcurrent-triggered interrupt	420ns (±100ns)
High-side switch current limiter threshold	800mA (±300mA)
2.2V-battery-supplied shutdown current consumption (RUNONVBAT = L, V24V terminal unconnected or grounded)	PVBATS: 0.46nA (max 2.2nA, min 0.42nA) PV24V: 0.1nA (max 6nA, min 0.06nA) SPCOCOM_BOOST: 28pA (4.1nA, min 7pA)
OVERTJ logic-H voltage	VCC2 voltage
Detector low-going temperature threshold (OVERTJ toggles to logic-L as junction temperature falls)	138.2°C ± 5.3°C (± 3 sigma)
Detector hysteresis (high-going low-going temperature threshold difference)	9°C ± 1.5°C (± 3 sigma)
CENTIGRADE output voltage at 10°C junction temperature	99.5mV typical
CENTIGRADE output voltage slope up to 150°C	+8.99mV/°C typical
Operating power consumption	252mW max at V(V24V) = 30V, ILOAD = 200mA
Area	1.04mm²

Table 2: Boost-Buck Converter Specifications

Sales & Marketing Contact

TES Electronic Solutions

sales_dst@tes-dst.com

LAYOUT VIEW