PRELIMINARY

DATEL®
INNOVATION and EXCELLENCE

Dual Output
Mixed Voltage, DSM Models

Surface-Mount, 3.3V and 5V 15Watt, DC/DC Converters

Features

- **Regulated 5V and 3.3V outputs**
- **5V @ 2.65Amps/3.3V @ 3 Amps capability**
- **15 Watts total output power**
- **Small 1" x 2" x 0.52" SMT package**
- **Available input voltage ranges: 10-18V, 18-36V or 36-75V**
- **No-load stable operation**
- **UL1950 and EN60950 safety approvals**
- **CE mark available (75V-input models)**
- **Continuous short-circuit protection**
- **Fully isolated, 1500Vdc guaranteed**
- **–40 to +100°C operating temperature**
- **Input under and overvoltage shutdown**
- **Output OVP, thermal shutdown**

For surface-mount applications requiring 15 Watts of power from 5V and 3.3V, DATEL offers a new power sharing DC/DC converter capable of meeting your output current requirements. The DSM-5/2.65-3.3/3-D48 (36-75V input), DSM-5/2.65-3.3/3-D24 (18-36V input) and DSM-5/2.65-3.3/3-D12 (10-18V input) are fully isolated DC/DC converters capable of delivering any combination of 5V and 3.3V output current up to a combined total of 15 Watts of output power.

Housed in a 1" x 2" x 0.52" metal, surface-mount package coated with electrically non-conductive finish, these converters are regulated by a 3.3V control loop that provides load regulation of ±0.5% for 3.3V output and ±2% for 5V output. All models include input Pi filtering, input overvoltage and undervoltage shutdown circuitry, output overvoltage protection, output short-circuit and current-limiting protection, and thermal shutdown. All models provide trim capability and an on/off control function or sync control. Fully synchronous output rectification provides high efficiency (86%) and a stable output under no-load conditions.

DSM power sharing modules offer low output ripple and noise performance, 1500 Vdc isolation voltage, and are fully specified for –40 to +100°C operation. These devices meet IEC950, UL1950 and EN6950 safety standards; CB reports are available on request. "D48" models are CE marked (meets LVD requirements).

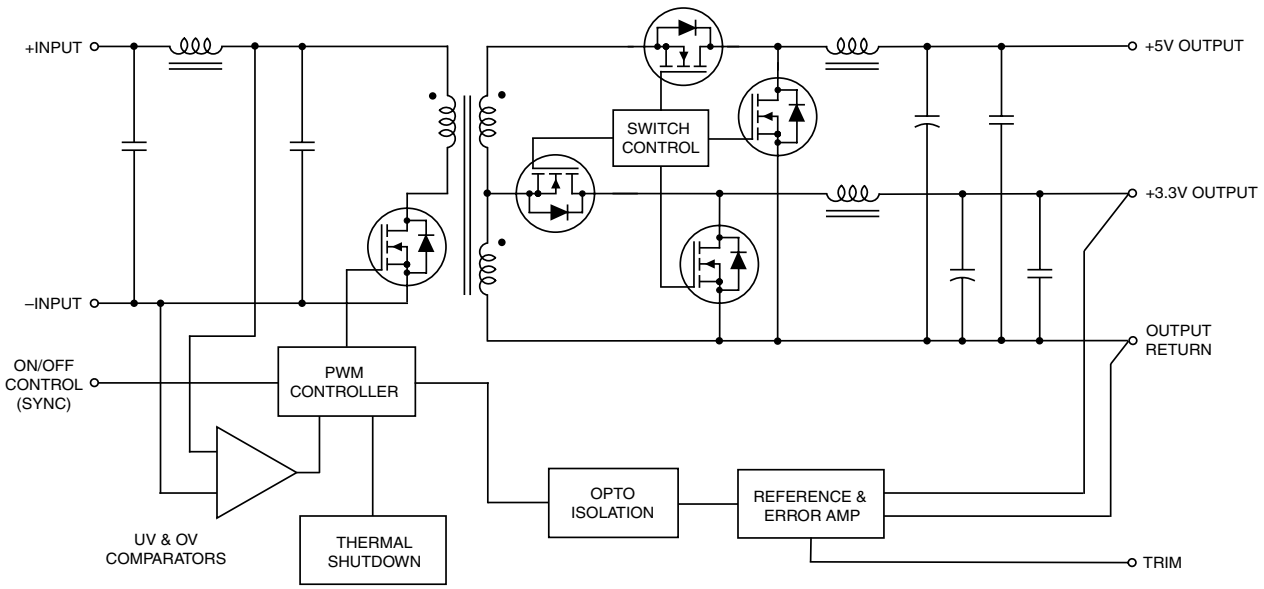

Figure 1. Simplified Schematic

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Performance Specifications and Ordering Guide ①

Model	Output						Input			Efficiency		Package (Case, Pinout)
	V_{OUT} (Volts)	I_{OUT} ② (Amps)	R/N (mVp-p) ③		Regulation (Max.)		V_{IN} Nom. (Volts)	Range (Volts)	I_{IN} ⑤ (mA)	Min.	Typ.	
			Typ.	Max.	Line	Load ④						
DSM-5/2.65-3.3/3-D12	5	2.65	40	75	±1%	±2%	12	10-18	70/1450	83%	86%	C18A, P36
	3.3	3	60	100	±0.5%	±0.5%						
DSM-5/2.65-3.3/3-D24	5	2.65	40	75	±1%	±2%	24	18-36	40/720	83%	86%	C18A, P36
	3.3	3	60	100	±0.5%	±0.5%						
DSM-5/2.65-3.3/3-D48	5	2.65	40	75	±1%	±2%	48	36-75	20/360	83%	86%	C18A, P36
	3.3	3	60	100	±0.5%	±0.5%						

① Typical at T_A = +25°C under nominal line voltage and balanced "full-load" conditions (5V @ 1.5A/3.3V @ 2.25A).
② Any combination of 5V/3.3V rated I_{OUT} current, not to exceed 15 Watts of output power. (See derating graphs.)
③ Ripple/Noise (R/N) measured over a 20MHz bandwidth. All models are specified with 0.47µF ceramic in parallel with 100µF tantalum output capacitors.
④ Tested from 10% to 100% full load (other output at 10% full load).
⑤ Nominal line voltage, no load/balanced full-power condition.

PART NUMBER STRUCTURE

DSM - 5 / 2.65 - 3.3 / 3 - D48 S

Dual Output/ Surface-Mount Series

V_1 Nominal Output Voltage: 5 Volts

I_1 Maximum Output Current: 2.65 Amps

V_2 Nominal Output Voltage: 3.3 Volts

I_2 Maximum Output Current: 3 Amps

Input Voltage Range:
D12 = 10-18 Volts (12V nominal)
D24 = 18-36 Volts (24V nominal)
D48 = 36-75 Volts (48V nominal)

Add "S" suffix as desired

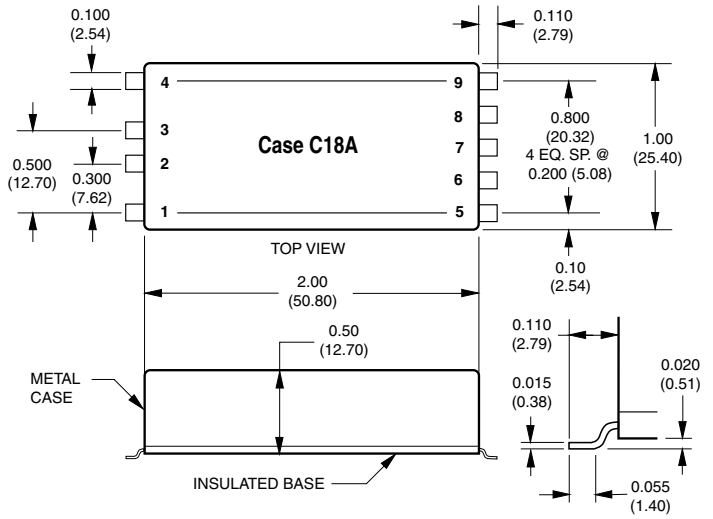
Part Number Suffixes

DSM 15 Watt DC/DC's are designed so an On/Off Control function with either positive polarity (no suffix), or a Sync function ("S" suffix) can be added in the pin 3 position.

No Suffix On/Off Control function (positive polarity) on pin 3

S Sync function on pin 3

MEC ANICAL SPECIFI CATIONS



I/O Connections	
Pin	Function P36
1	+Input
2	–Input
3	On/Off Control
4	Case
5	+5V Output
6	NC
7	Output Output
8	+3.3V Output
9	Trim

Performance/Functional Specifications

Typical @ T_A = +25°C under nominal line voltage, balanced "full-load" conditions, unless noted. ①

Input	
Input Voltage Range:	
D12 Models	10-18 Volts (12V nominal)
D24 Models	18-36 Volts (24V nominal)
D48 Models	36-75 Volts (48V nominal)
Overvoltage Shutdown:	
D12 Models	19-23 Volts (21V nominal)
D24 Models	37-42 Volts (40V typical)
D48 Models	77-81 Volts (78.5V typical)
Start-Up Threshold:	
D12 Models	9-10 Volts (9.3V typical)
D24 Models	16.5-18 Volts (17V typical)
D48 Models	34-36 Volts (35V typical)
Undervoltage Shutdown:	
D12 Models	7.0-8.5 Volts (8V typical)
D24 Models	16-17 Volts (16.5V typical)
D48 Models	32.5-35.5 Volts (34.5V typical)
Input Current:	
Normal Operating Conditions	See Ordering Guide
Standby Mode:	
Off, OV, UV, Thermal Shutdown	10mA
Input Reflected Ripple Current:	
Source Impedance	<0.1Ω, no external input filtering
D12 Models	TBD
D24/D48 Models	TBD
Internal Input Filter Type	Capacitive (1.5µF)
Reverse-Polarity Protection:	
D12 Models	1 minute duration, 4A maximum
D24 Models	1 minute duration, 2A maximum
D48 Models	1 minute duration, 1A maximum
On/Off Control: (Pin 3): ③ ④ ⑥	On = open or 13V - $+V_{IN}$, I_{IN} @ 13V = 800µA Off = 0-0.8V, I_{IN} @ 0V = 1mA
Sync: (Option, Pin 4): ③ ④	
Input Threshold (Rising Edge Active)	1-2.7 Volts
Input Voltage Low	0-0.9 Volts
Input Voltage High	2.8-5 Volts
Input Resistance	35kΩ minimum
Output High Voltage (100µA load)	3.5-4.8 Volts
Output Drive Current	35mA
Input/Output Pulse Width	160-360nsec

Output	
V_{OUT} Accuracy:	
5V Output	±2% maximum
3.3V Output	±1.5% maximum
Minimum Loading Per Specification	250mA
Minimum Load For Stability	No load
Ripple/Noise (20MHz BW) ⑤	See Ordering Guide
Line/Load Regulation	See Ordering Guide
Efficiency	See Ordering Guide / Efficiency Curves
Cross Regulation:	
5V Output	
(5V@0.25A, 3.3V@0.25-3A)	TBD
3.3V Output	
(3.3V@0.25A, 5V@0.25-2.65A)	TBD
Trim Range ②	±5%
Isolation Voltage:	
Input-to-Output	1500Vdc minimum
Input-to-Case	TBD Vdc minimum
Output-to-Case	TBD Vdc minimum

Output (continued)		
Isolation Capacitance	470pF	
Isolation Resistance	100MΩ	
Current Limit Inception:		
5V @ 95% V_{OUT} (3.3V @ 0.25A)	4-5.5 Amps	
3.3V @ 98.5% V_{OUT} (5V @ 0.25A)	3-4 Amps	
Short Circuit Current:		
5V Output	5.5 Amps average, continuous current	
3.3V Output	3 Amps average, continuous current	
Overvoltage Protection:	Magnetic feedback	
5V Output	TBD Volts	
3.3V Output	TBD Volts	
Maximum Capacitive Loading:		
D12 Models	TBD µF (5V)	TBD µF (3.3V)
D24 Models	TBD µF (5V)	TBD µF (3.3V)
D48 Models	TBD µF (5V)	TBD µF (3.3V)
Temperature Coefficient	±0.02% per °C	

Dynamic Characteristics	
Dynamic Load Response: ②	
5V (50-100% step to 97.5% V_{OUT})	300µsec maximum (3.3V @ 0.25A)
3.3V (50-100% step to 98.5% V_{OUT})	300µsec maximum (5V @ 0.25A)
Start-Up Time:	
V_{IN} to V_{OUT}	10msec maximum
On/Off to V_{OUT}	TBD msec maximum
Switching Frequency	250kHz (±25kHz)

Environmental	
MTBF: ⑦	
D12 Models	TBD hours
D24 Models	TBD hours
D48 Models	TBD hours
Operating Temperature: (Ambient): ②	
Without Derating:	+60°C
With Derating	To +100°C (See Derating Curves)
Case Temperature:	
Maximum Operational	+100°C
For Thermal Shutdown	TBD °C minimum, TBD°C maximum
Storage Temperature	–40 to +120°C

Physical	
Dimensions	2" x 1" x 0.52" (50.8 x 25.4 x 13.2mm)
Internal Case Connection	Case connection via pin 4
Case Material	Corrosion resistant steel with non-conductive, epoxy-based, black enamel finish and plastic baseplate
Pin Material	Brass, solder coated, surface-mount leads
Weight TBD ounces	1.4 ounces (39.7 grams)
Primary to Secondary Insulation Level	Operational

① Balanced "full-load" is 5V @ 1.5A/3.3V @ 2.25A. All models are specified with external 0.47µF ceramic and 100µF tantalum output capacitors.
② See Technical Notes/Graphs for details.
③ The On/Off Control function can be replaced with a Sync function. See Part Number Suffixes and Technical Notes for details.
④ Applying a voltage to On/Off Control (pin 3) when no input power is applied to the converter can cause permanent damage.
⑤ Output noise may be further reduced with the installation of additional external output capacitors. See Technical Notes.
⑥ On/Off control is designed to be driven with open collector or by appropriate voltage levels. Voltages must be referenced to the –Input (Pin 2).
⑦ Demonstrated MTBF available on request.
⑧ For conditions with less than minimum loading, outputs remain stable. However, regulation performance will degrade.

Absolute Maximum Ratings		
Input Voltage:		
Continuous:	D12 Models	23 Volts
	D24 Models	42 Volts
	D48 Models	81 Volts
Transient (100msec):	D12 Models	25 Volts
	D24 Models	50 Volts
	D48 Models	100 Volts
Input Reverse-Polarity Protection: ②		Input Current must be limited. 1 minute duration. Fusing recommended.
D12 Models		4 Amps
D24 Models		2 Amps
D48 Models		2 Amps
Output Current ②		Current limited. Devices can withstand an indefinite output short circuit.
On/Off Control (Pin 3) Max. Voltages:		
Referenced to –Input (pin 2)		
No Suffix		$+V_{IN}$
S Suffix		+5.7 Volts
Storage Temperature		–40 to +120°C
Lead Temperature (Soldering, 10 sec.)		+300°C

These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability. Proper operation under conditions other than those listed in the Performance/Functional Specifications Table is not implied, nor recommended.

TECHNICAL NOTES

Trimming Output Voltages

The DSM converters have a trim capability (Pin 9) that allow users to adjust the output voltages ±5%. A trim adjustment will cause an equal percentage of change in both outputs. Adjustments to the output voltages can be accomplished via a trim pot, Figure 2, or a single fixed resistor as shown in Figures 3 and 4. A single fixed resistor can increase or decrease the output voltage depending on its connection. Fixed resistors should have absolute TCR's less than 100ppm/°C to minimize sensitivity to changes in temperature.

A single resistor connected from the Trim pin (Pin 9) to the +3.3V Output (Pin 8), see Figure 3, will decrease the output voltages. A resistor connected from the Trim pin (Pin 9) to Output Return (Pin 7) will increase the output voltages.

Trim adjustments greater than 5% can have an adverse effect on the converter's performance and is not recommended.

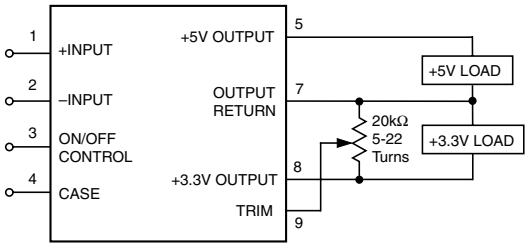
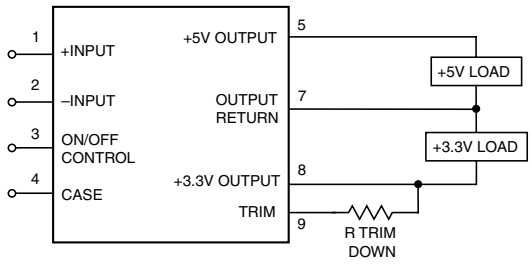


Figure 2. Trim Connections Using A Trimpot



$$R_{T_{DOWN}}(k\Omega) = \frac{2.49(V_O - 1.234)}{3.3 - V_O} - 16.9$$

Figure 3. Decrease Output Voltage Trim Connections Using A Fixed Resistor

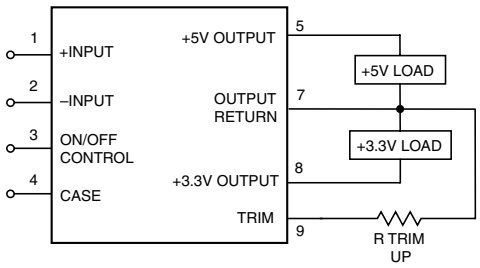
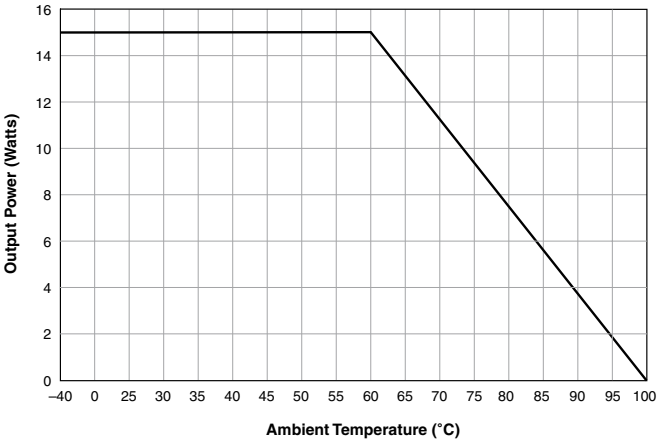


Figure 4. Increase Output Voltage Trim Connections Using A Fixed Resistor

$$R_{T_{UP}}(k\Omega) = \frac{3.073}{V_O - 3.3} - 16.9$$

Accuracy of adjustment is subject to tolerances or resistor values and factory-adjusted output accuracy.
V_O = desired output voltage.

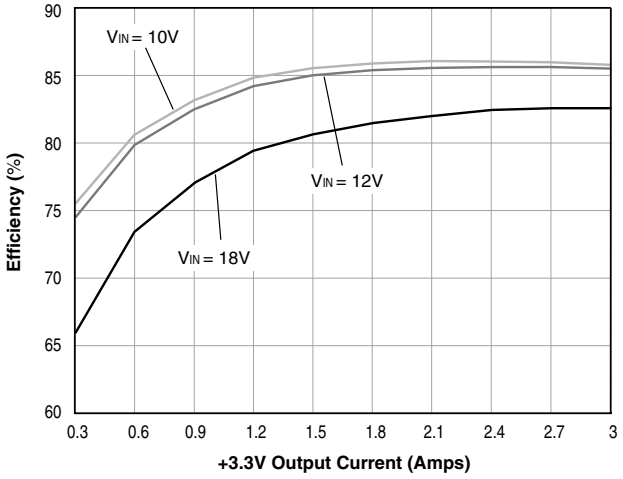
Output Power vs. Ambient Temperature
V_{IN} = Nominal, Natural Convection Air flow



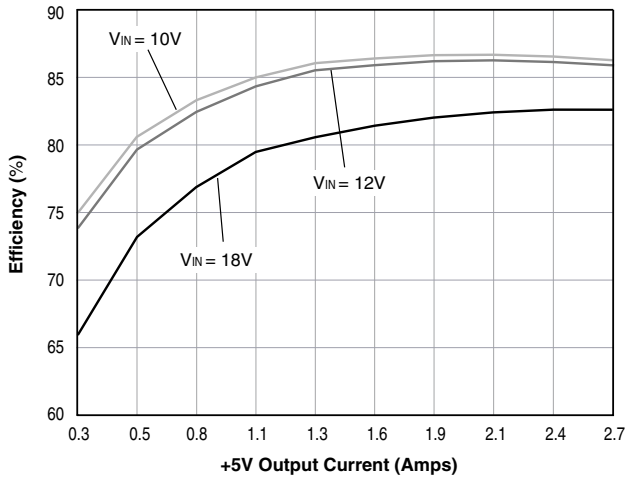
Typical Performance Curves

D12 Models

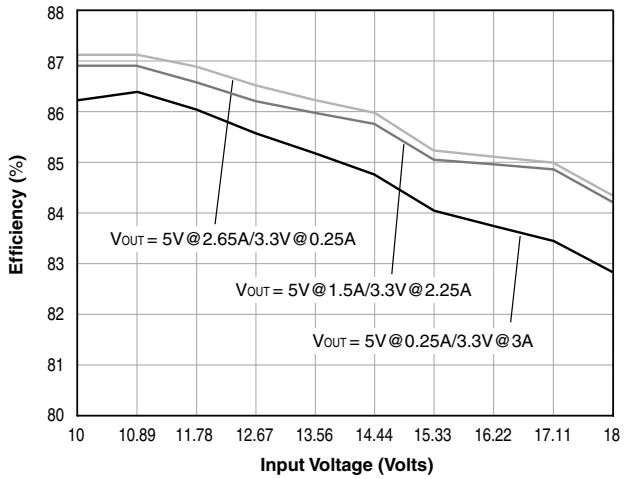
DSM-5/2.65-3.3/3-D12 - Typical 3.3 V_{OUT} Efficiency vs. Load
(+5V @ 250mA)



DSM-5/2.65-3.3/3-D12 - Typical 5 V_{OUT} Efficiency vs. Load
(+3.3V @ 250mA)

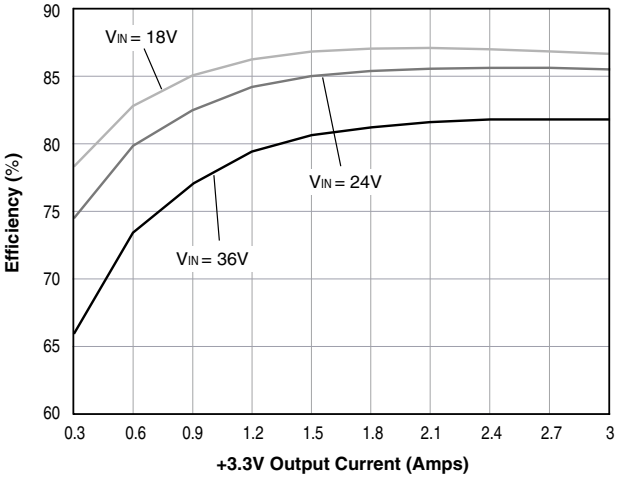


DSM-5/2.65-3.3/3-D12 - Efficiency vs. Line and Load

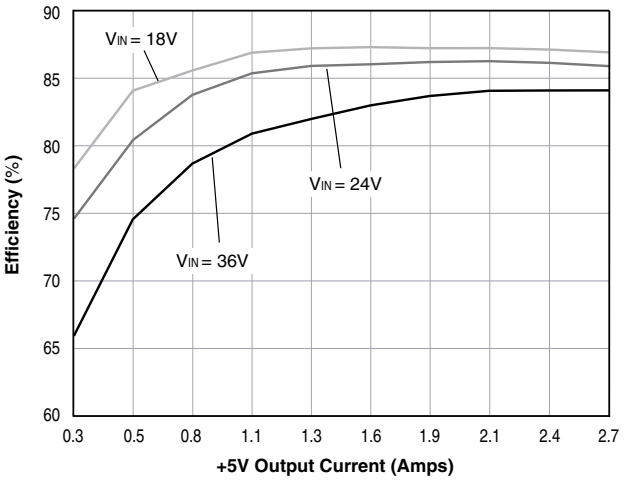


D24 Models

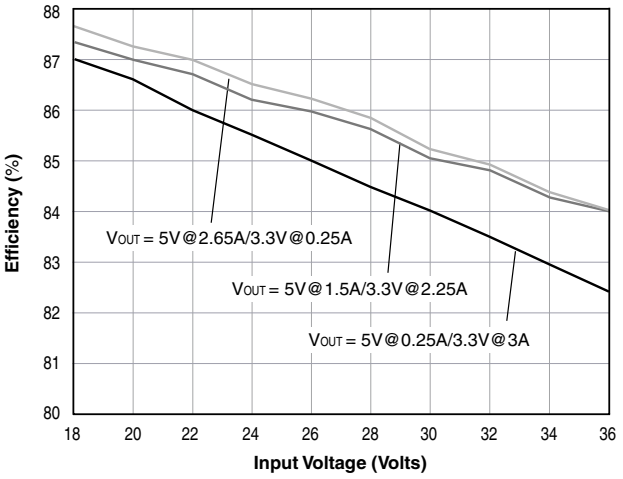
DSM-5/2.65-3.3/3-D24 - Typical 3.3 V_{OUT} Efficiency vs. Load
(+5V @ 250mA)



DSM-5/2.65-3.3/3-D24 - Typical 5 V_{OUT} Efficiency vs. Load
(+3.3V @ 250mA)



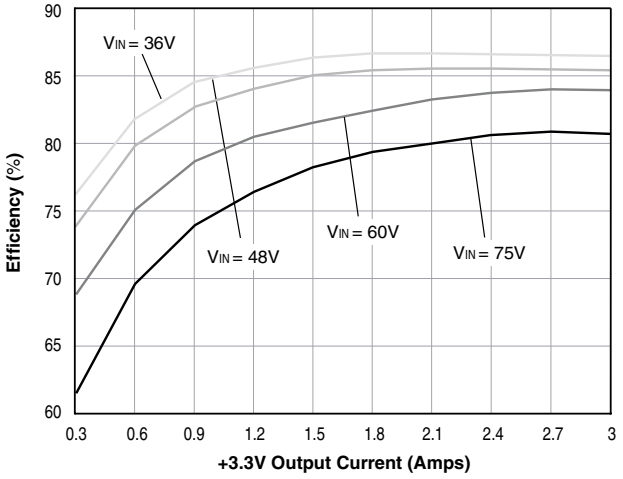
DSM-5/2.65-3.3/3-D24 - Efficiency vs. Line and Load



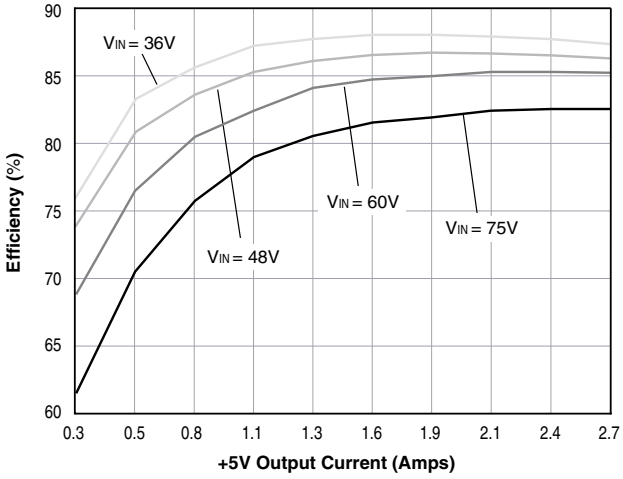
Typical Performance Curves

D48 Models

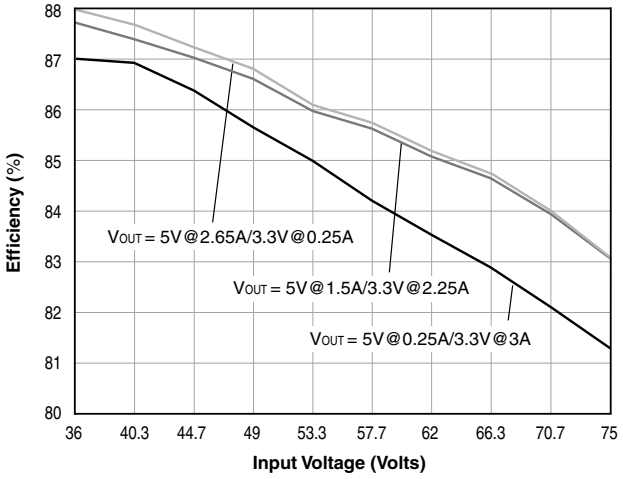
DSM-5/2.65-3.3/3-D48 - Typical 3.3 V_{OUT} Efficiency vs. Load
(+5V @ 250mA)



DSM-5/2.65-3.3/3-D48 - Typical 5 V_{OUT} Efficiency vs. Load
(+3.3V @ 250mA)

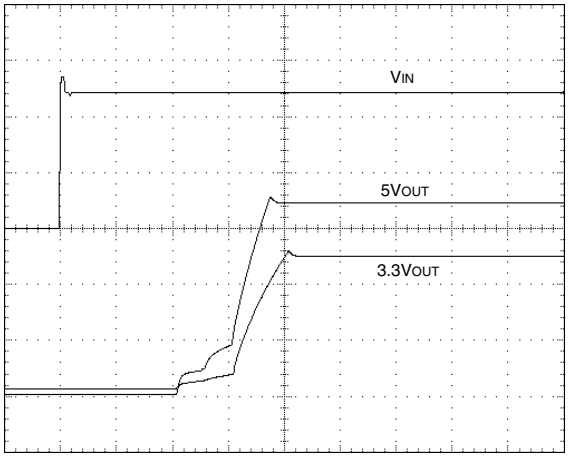


DSM-5/2.65-3.3/3-D48 - Efficiency vs. Line and Load



D12, 24, 48 Models

Start-Up from V_{IN}
(V_{IN} = nominal, 5V @ 1.5A/3.3V @ 2.25A,
0.47µF || 100µF tantalum output capacitors.)



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