

SN6501 Multi-Transformer EVM User's Guide

This user's guide explains how to quickly obtain the push-pull converter performance results with the SN6501 evaluation module (EVM). This EVM provides five push-pull converters for various input-to-output voltage conversions utilizing regulated and non-regulated outputs. All push-pull converters use low-power, center-tapped transformers from Wurth-Electronics/Midcom whose designs have been optimized in form-factor, turns ratio, and saturation product to operate in combination with the SN6501 transformer driver. [Table 1](#) lists the push-pull converter configurations with their associated transformers and [Figure 3](#) shows the EVM schematic.

Table 1. Push-pull Converters Provided on the SN6501 EVM

Converter Configuration	Application VIN : VOUT	LDO	Xfmr No.	Turns Ratio	V-T (Vμs)	Performance Characteristics
1	3.3 V : 3.3 V	No	T1	1.0:1.1	7	Figure 6 and Figure 7
2	5 V : 5 V		T2	1.0:1.1	11	Figure 8 and Figure 9
3	3.3 V : 5 V		T3	1.0:1.7		Figure 10 and Figure 11
4	3.3 V : 5 V	Yes	T4	1.0:2.0		Figure 12 and Figure 13
5a	3.3 V : 3.3 V		T5	1.0:1.3		Figure 14 and Figure 15
5b	5 V : 5 V					Figure 16 andFigure 17

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1 Performance Measurements

Figure 1 shows the principle measurement set-up when using discrete volt and amp meters. Note: Sense lines have been used to prevent efficiency losses due to I^2R heating.

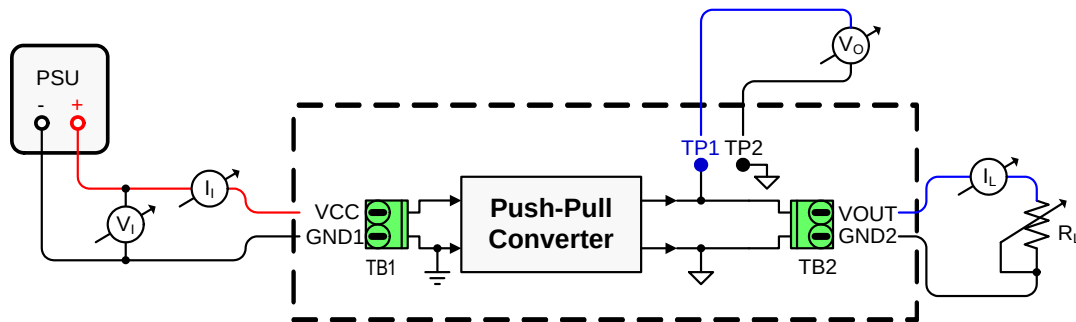


Figure 1. Measurement Set-Up for Measuring Output Voltage and Efficiency as a Function of Load Current

The nominal input voltage V_I of 3.3 V or 5 V, depending on the push-pull converter configuration, is applied to the input terminal block, while measuring the input current I_I . The output voltage V_O , taken from the output and ground test pins TPx, is recorded as a function of the load current I_L , which is adjusted with the load resistor R_L , that connects to the output terminal block. While the above measurement principle applies to all push-pull converters, the 5th converter providing two regulated outputs allows for only one linear regulator (LDO) to be active while the other one must be disabled. Thus, for a 3.3 Vin-to-3.3 Vout or a 5 Vin-to-5 Vout configuration, apply the jumper settings as shown in Figure 2.

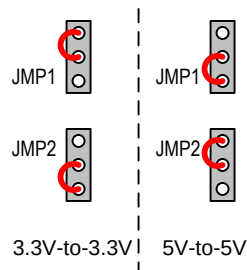


Figure 2. Jumper Settings

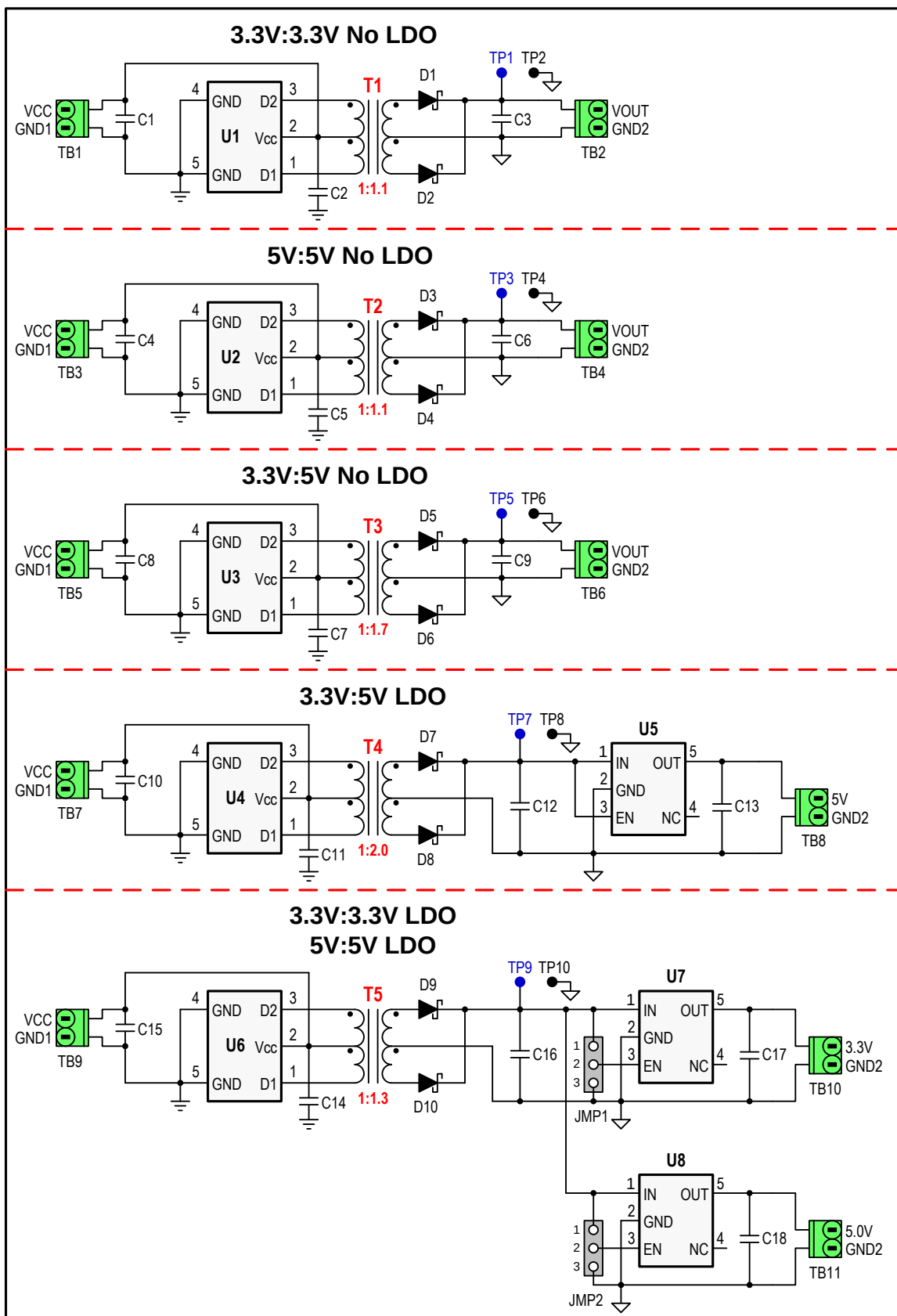


Figure 3. SN6501 EVM Schematic

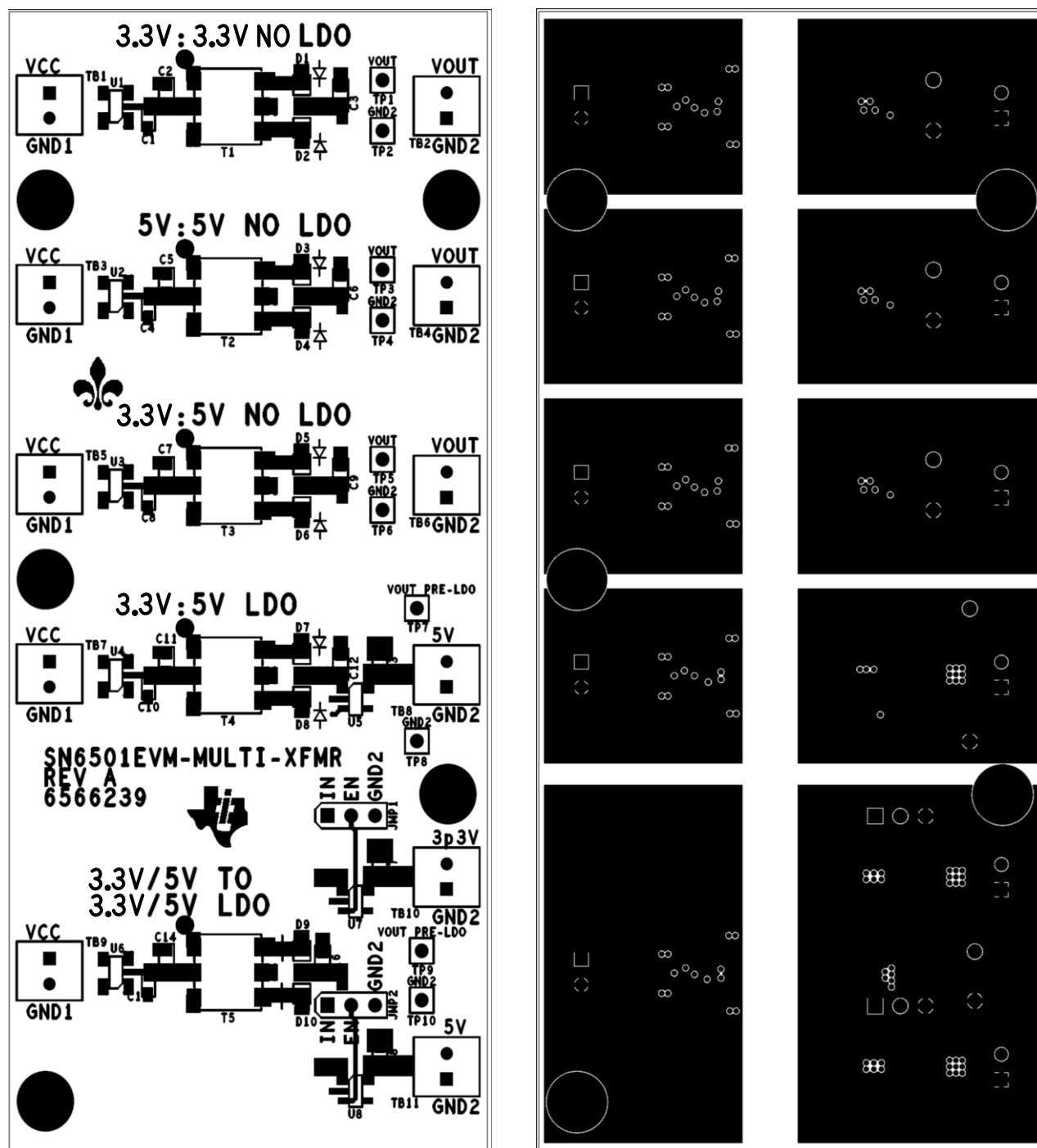


Figure 4. Top Layer (Left) and Layer 2 (Right)

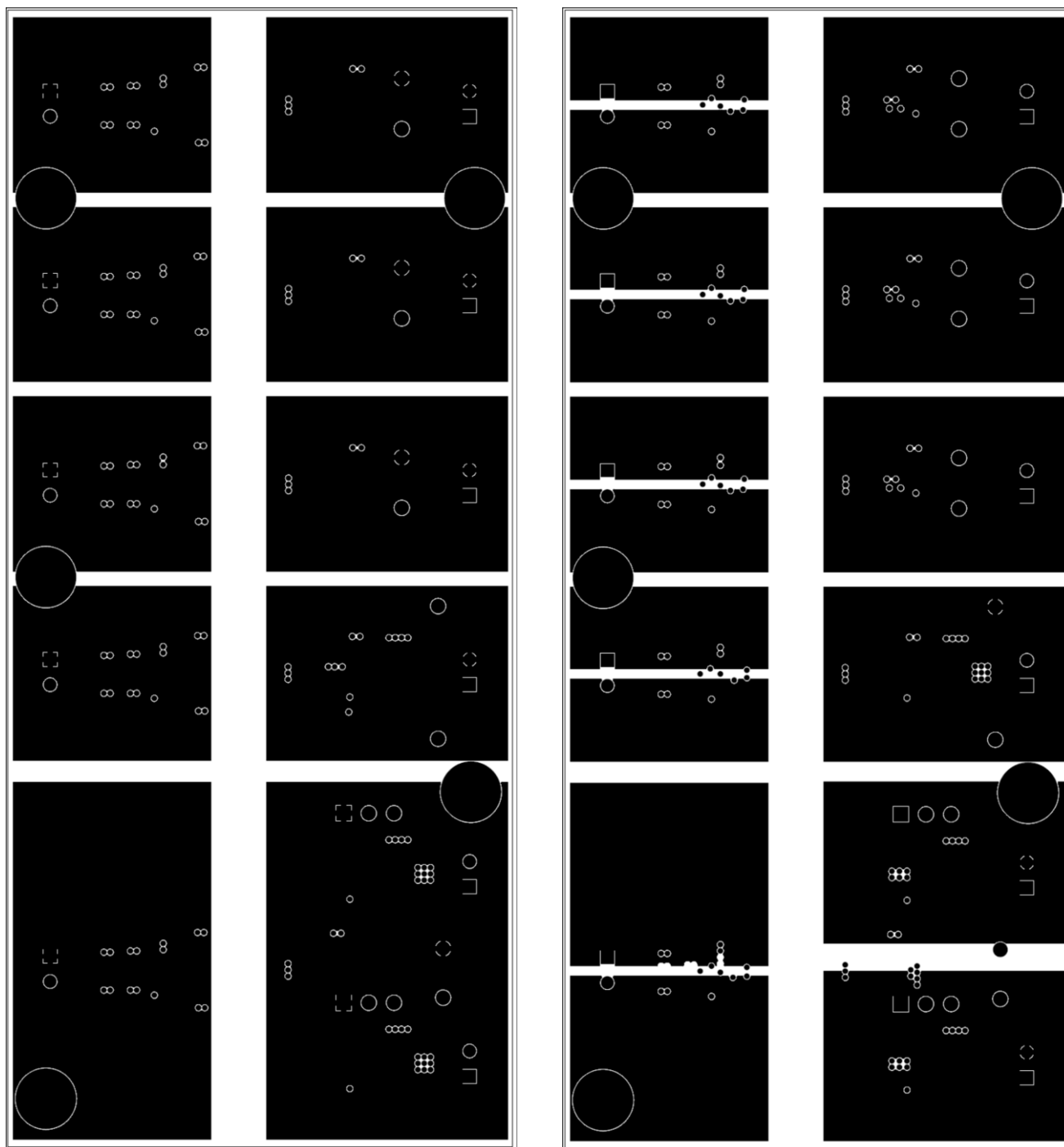


Figure 5. Layer 3 (Left) and Bottom Layer (Right)

1.1 Bill Of Materials

DESIGNATOR	VALUE	DESCRIPTION	PACKAGE	MFR	PART NUMBER
C1, C4, C8, C10, C15	1μF, 10%, 10V, X5R	Capacitor	0402	Taiyo Yuden	LMK105BJ105KV-F
C2, C3, C5, C6, C7, C9, C11, C12, C14, C16	1μF, 10%, 16V, X7R	Capacitor	0603	TDK	C1608X7R1C105K
C13, C17, C18	4.7μF, 10%, 6.3V, X5R	Capacitor	0603	TDK	C1608X5R0J475K/0.80
D1, D2, D3, D4, D5, D6, D7, D8, D9, D10	MBR0520L	Rectifier Diode	SOD-123	ON-Semi	MBR0520LT1G
U1, U2, U3, U4, U6	SN6501	Transformer Driver	DBV	TI	SN6501DBV
U7	TPS76333	3.3 V, 3% LDO	DBV	TI	TPS76333DBVR
U5, U8	TPS76350	5 V, 3% LDO	DBV	TI	TPS76350DBVR
T1	1:1.1, 7Vμs	Transformer	6.73 x 7.14 x 4.06 mm	Wurth Electronics/Midcom	760390011
T2	1:1.1, 11Vμs				760390012
T3	1:1.7, 11Vμs				760390013
T4	1:2.0, 11Vμs				760390015
T5	1:1.3, 11Vμs				760390014
TP1, TP3, TP5, TP7, TP9	Test Loop - Black	Test Point	0.04	Keystone Electronics	5001
TP2, TP4, TP6, TP8, TP10	Test Loop - Blue	Test Point	0.04	Components Corporation	TP-105-40-06
JMP1, JMP2	1 x 3 Jumper	Jumper	0.1"	Samtec	HTSW-150-07-G-S
TB1 to TB11	2-pin female	Terminal Block	2.54 cm	Phoenix Contact	1725656

1.2 Performance Characteristics (Push-Pull Converters with Non-Regulated Outputs)

Figure 6 through Figure 11 show performance characteristics for push-pull converters with non-regulated outputs.

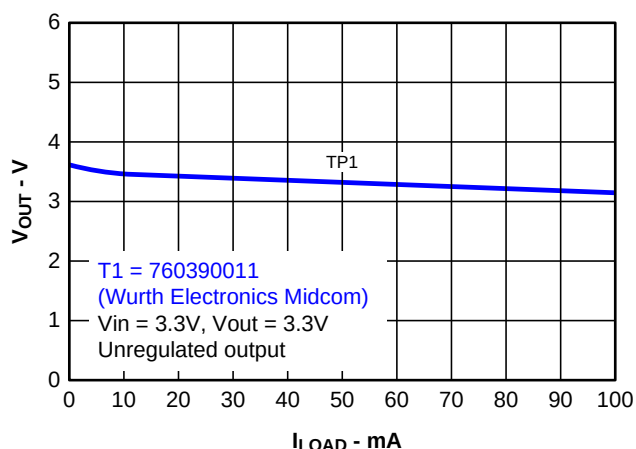


Figure 6. Output Voltage Versus Load Current
Vin = 3.3 V, Vout = 3.3 V

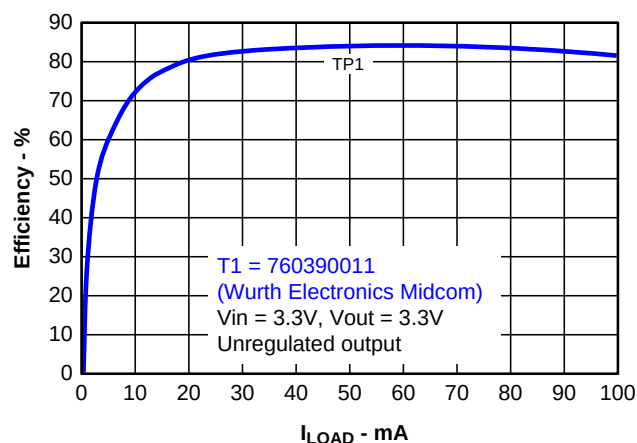


Figure 7. Efficiency Versus Load Current
Vin = 3.3 V, Vout = 3.3 V

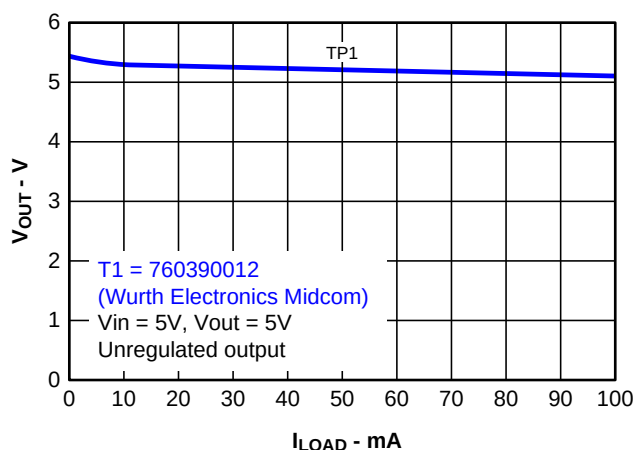


Figure 8. Output Voltage Versus Load Current
Vin = 5 V, Vout = 5 V

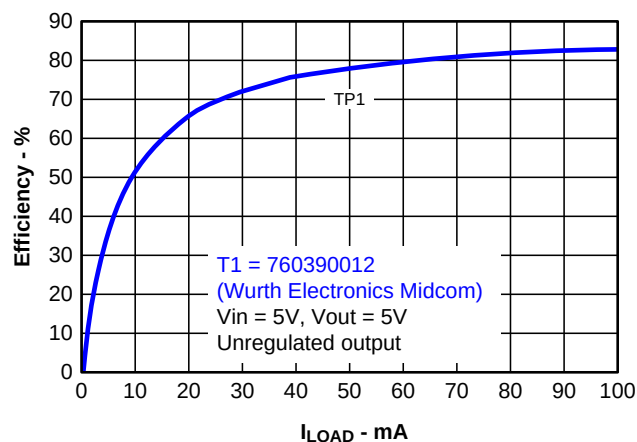


Figure 9. Efficiency Versus Load Current
Vin = 5 V, Vout = 5 V

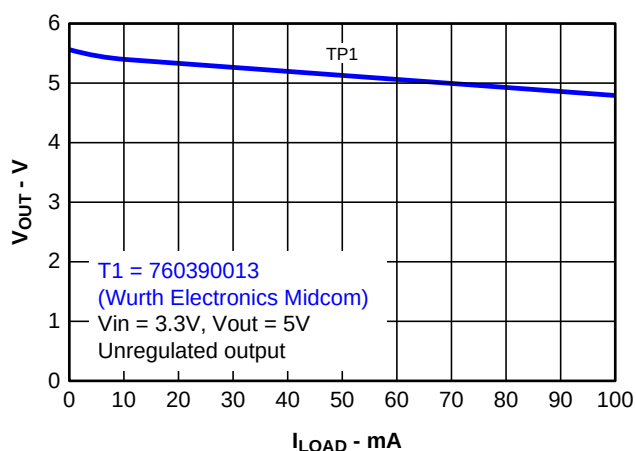


Figure 10. Output Voltage Versus Load Current
Vin = 3.3 V, Vout = 5 V

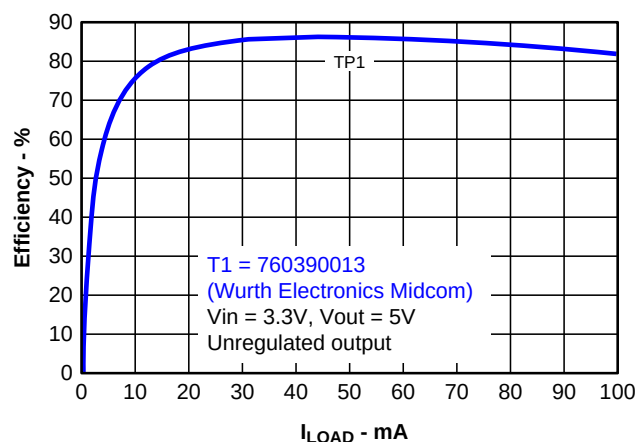


Figure 11. Efficiency Versus Load Current
Vin = 3.3 V, Vout = 5 V

1.2.1 Performance Characteristics (Push-Pull Converters with Regulated Outputs)

Figure 12 through Figure 17 show performance characteristics for push-pull converters with regulated outputs.

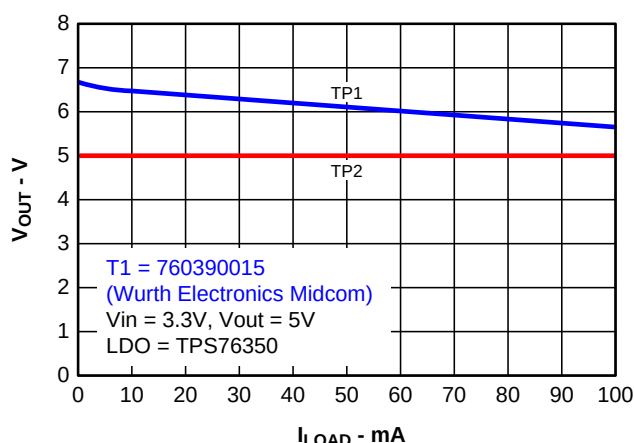


Figure 12. Output Voltage Versus Load Current
Vin = 3.3 V, Vout = 5 V

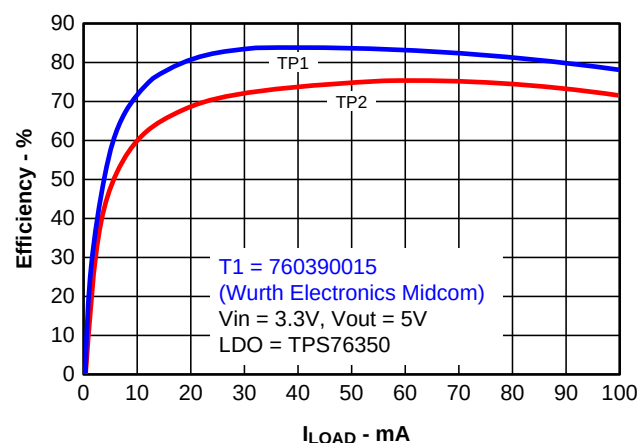


Figure 13. Efficiency Versus Load Current
Vin = 3.3 V, Vout = 5 V

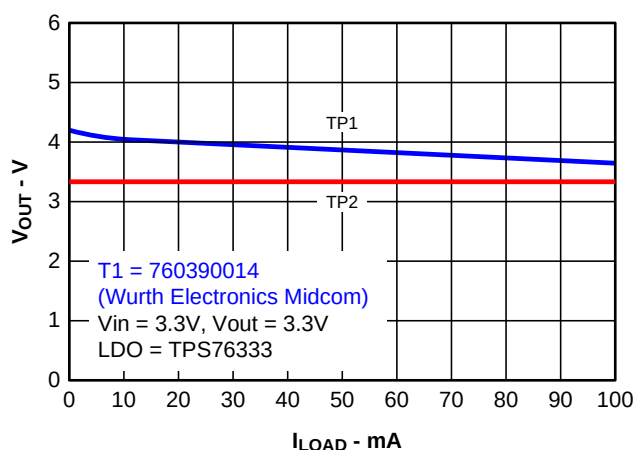


Figure 14. Output Voltage Versus Load Current
Vin = 3.3 V, Vout = 3.3 V

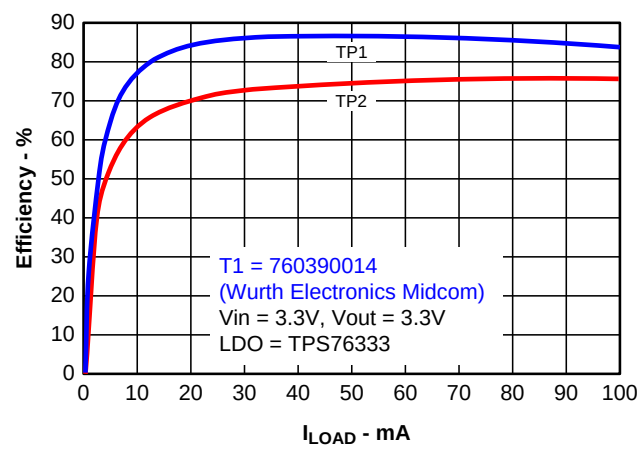


Figure 15. Efficiency Versus Load Current
Vin = 3.3 V, Vout = 3.3 V

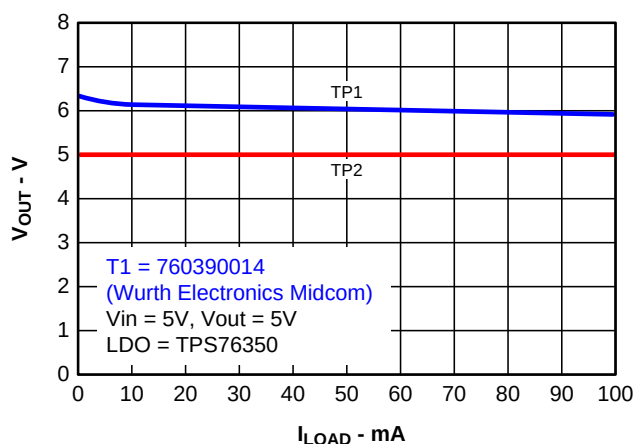


Figure 16. Output Voltage Versus Load Current
Vin = 5 V, Vout = 5 V

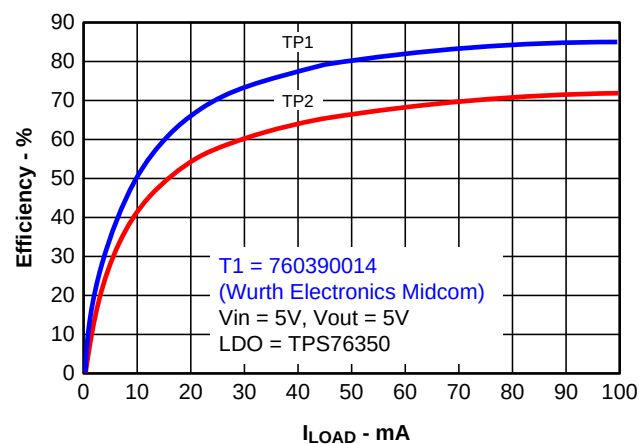


Figure 17. Efficiency Versus Load Current
Vin = 5 V, Vout = 5 V

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Caution

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Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs including detachable antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

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