features

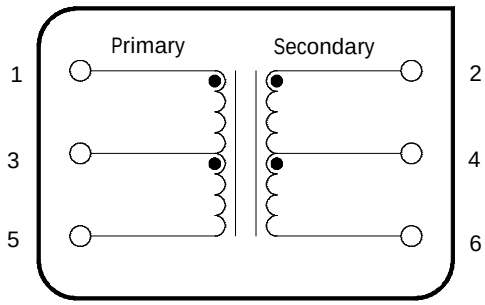
- Maxim Compatible
- 3.3V and 5V Versions
- Isolation to 6kVDC
- Under Approval to BS EN 60950
- Frequency Range to 500kHz
- Toroidal Construction
- Industry Standard Pinout
- UL 94V-0 Package Material
- Fully Encapsulated
- Low Profile

description

The 76253 series of converter transformers are specifically designed for use with the MAX253 chip set to provide isolated power supplies. The 5V version can supply 1W and the 3.3V version can supply 500mW. A centre tapped secondary winding allows for full bridge, half bridge or voltage doubling.

pin connections

6 Pin DIP (top view)



PRELIMINARY

Notice : This is not a final specification.
Some parametric limits may be subject to change.

absolute maximum ratings over operating free air temperature range

Operating free air temperature range	–40°C to 85°C
Storage temperature range	–50°C to 125°C
Lead Temperature 1.5mm from case for 10 seconds	300°C
Peak current I_{PK}	400mA
Isolation voltage 76253/XX (flash tested for 1 second)	1500VDC
Isolation voltage 76253/XX KV4 (flash tested for 1 second)	4000VDC
Isolation voltage 76253/XX EN (flash tested for 1 second)	6000VDC

electrical specifications over operating free air temperature range

76253/35

Parameter	Test Conditions	Value			Package Style	Unit
		Min.	Typ.	Max.		
Turns Ratio	$N_P : N_S$		1:√5		1	
Primary Inductance, L_P	100kHz, 250mV	0.30	0.38	0.46		mH
Secondary Inductance, L_S	100kHz, 250mV	1.60	2.00	2.40		mH
Leakage Inductance, L_L	100kHz, 250mV		0.30	1.00		μH
Interwinding Capacitance, Cww	100kHz, 250mV		30	50		pF
Primary DC Resistance, R_{DC}	>0.1VDC		0.40	1.00		Ω
Volt-time Product, E_T	5kHz, 5V	50	80			Vμs

76253/55

Parameter	Test Conditions	Value			Package Style	Unit
		Min.	Typ.	Max.		
Turns Ratio	$N_P : N_S$		1:1.31		1	
Primary Inductance, L_P	100kHz, 250mV	0.60	0.83	1.10		mH
Secondary Inductance, L_S	100kHz, 250mV	1.10	1.40	1.70		mH
Leakage Inductance, L_L	100kHz, 250mV		0.35	1.00		μH
Interwinding Capacitance, Cww	100kHz, 250mV		30	50		pF
Primary DC Resistance, R_{DC}	>0.1VDC		0.70	1.50		Ω
Volt-time Product, E_T	5kHz, 5V	50	65			Vμs

Note : All data taken at T_A = 25°C.

electrical specifications over operating free air temperature range

76253/35KV4

Parameter	Test Conditions	Value			Package Style	Unit
		Min.	Typ.	Max.		
Turns Ratio	$N_P : N_S$		1:√5		1	
Primary Inductance, L_P	100kHz, 20mV	110	142	185		μH
Secondary Inductance, L_S	100kHz, 20mV	550	710	850		μH
Leakage Inductance, L_L	100kHz, 250mV		3.00	5.00		μH
Interwinding Capacitance, Cww	100kHz, 250mV		4.20	8.00		pF
Primary DC Resistance, R_{DC}	>0.1VDC		0.30	0.50		Ω
Volt-time Product, E_T	5kHz, 5V	30	42			Vμs

76253/55KV4

Parameter	Test Conditions	Value			Package Style	Unit
		Min.	Typ.	Max.		
Turns Ratio	$N_P : N_S$		1:1.36		1	
Primary Inductance, L_P	100kHz, 20mV	190	240	310		μH
Secondary Inductance, L_S	100kHz, 20mV	350	444	540		μH
Leakage Inductance, L_L	100kHz, 250mV		5.20	8.00		μH
Interwinding Capacitance, Cww	100kHz, 250mV		4.20	8.00		pF
Primary DC Resistance, R_{DC}	>0.1VDC		0.40	0.60		Ω
Volt-time Product, E_T	5kHz, 5V	25	32			Vμs

Note : All data taken at T_A = 25°C.

electrical specifications over operating free air temperature range

76253/35EN

Parameter	Test Conditions	Value			Package Style	Unit
		Min.	Typ.	Max.		
Turns Ratio	$N_P : N_S$		1:√5		2	
Primary Inductance, L_P	100kHz, 250mV	53	92	120		μH
Secondary Inductance, L_S	100kHz, 250mV	350	460	600		μH
Leakage Inductance, L_L	100kHz, 250mV		0.80	5.00		μH
Interwinding Capacitance, Cww	100kHz, 250mV		1.80	3.00		pF
Primary DC Resistance, R_{DC}	>0.1VDC		0.60	1.00		Ω
Volt-time Product, E_T	5kHz, 5V	20	35			Vμs

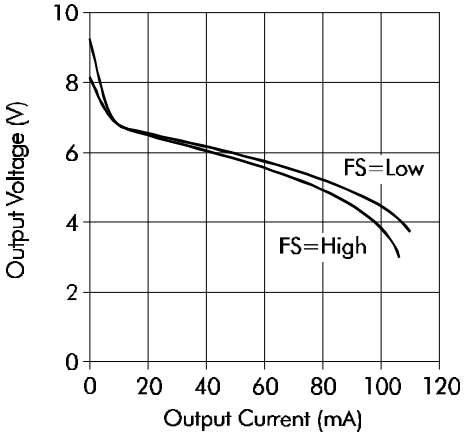
76253/55EN

Parameter	Test Conditions	Value			Package Style	Unit
		Min.	Typ.	Max.		
Turns Ratio	$N_P : N_S$		1:1.33		2	
Primary Inductance, L_P	100kHz, 250mV	120	205	250		μH
Secondary Inductance, L_S	100kHz, 250mV	280	362	445		μH
Leakage Inductance, L_L	100kHz, 250mV		3.90	5.00		μH
Interwinding Capacitance, Cww	100kHz, 250mV		1.20	3.00		pF
Primary DC Resistance, R_{DC}	>0.1VDC		0.90	1.50		Ω
Volt-time Product, E_T	5kHz, 5V	20	23			Vμs

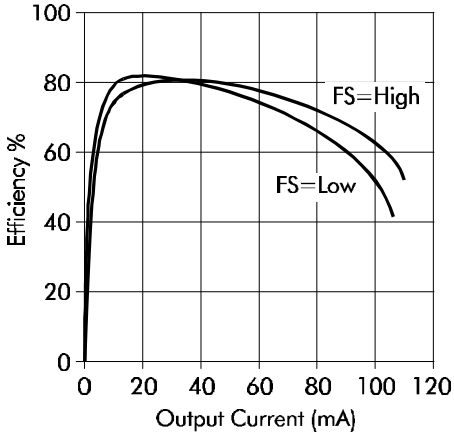
Note : All data taken at T_A = 25°C.

typical test circuit characteristics - 76253/35

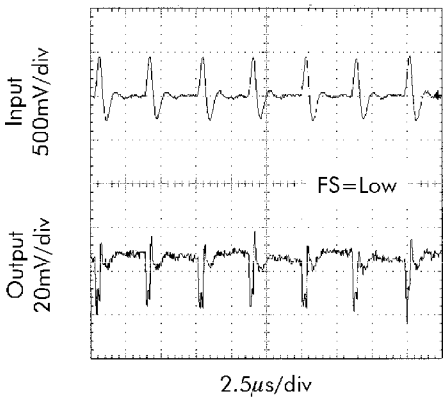
voltage curves

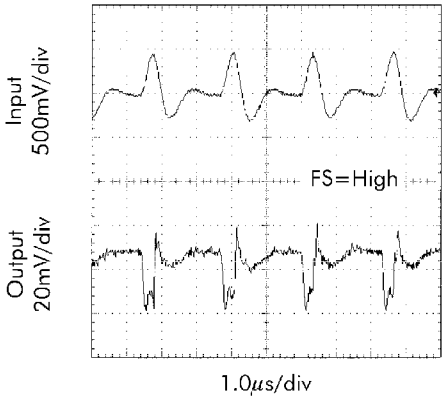


efficiency curves

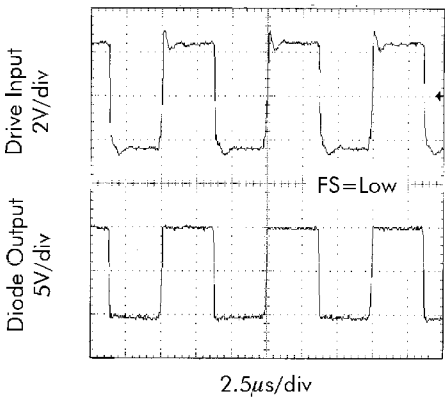


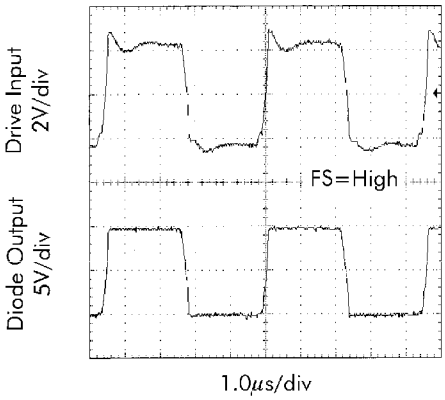
input/output voltage ripple





transformer voltage waveforms

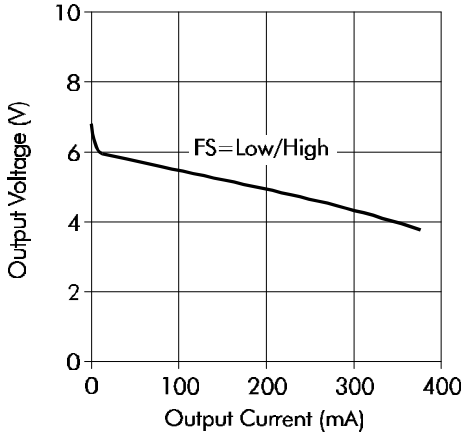




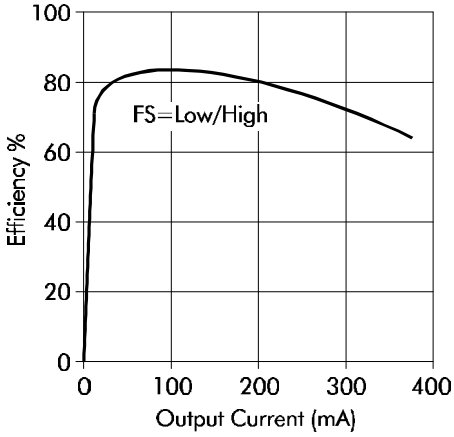
Note : All data taken at $T_A = 25°C$.

typical test circuit characteristics - 76253/55

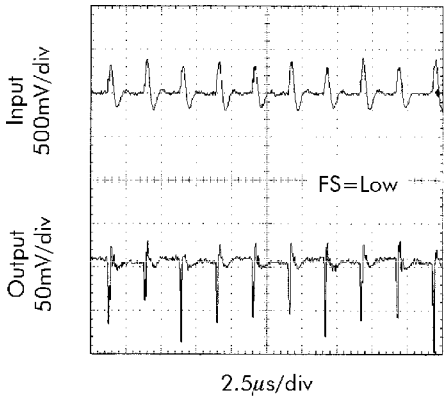
voltage curves

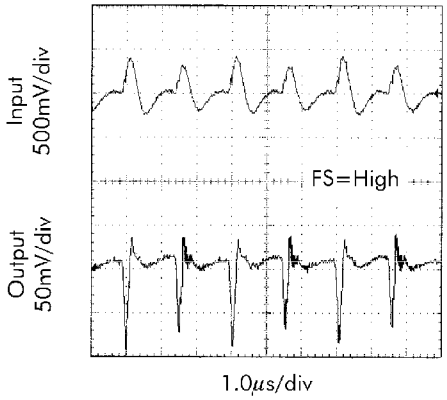


efficiency curves

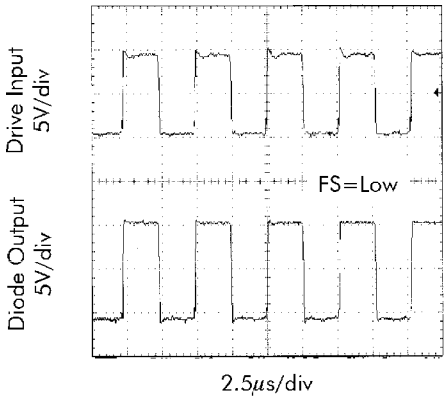


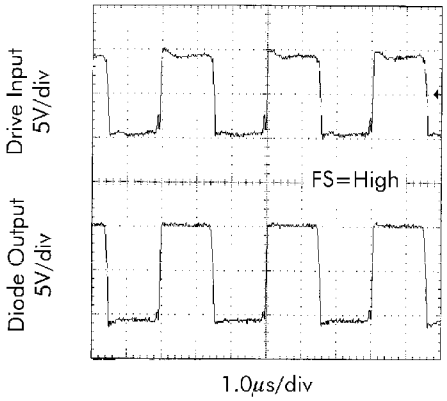
input/output voltage ripple





transformer voltage waveforms

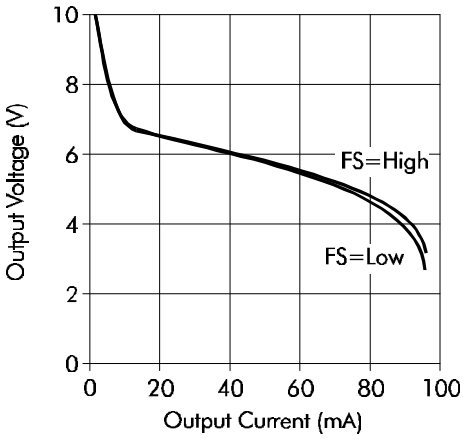




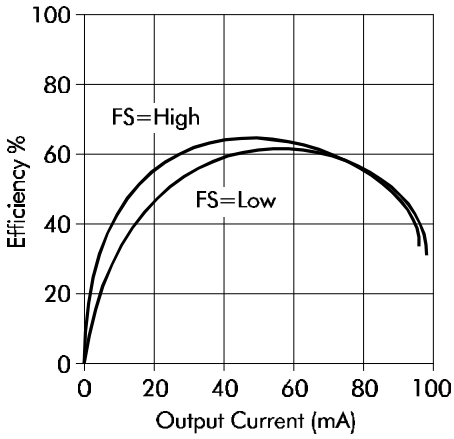
Note : All data taken at $T_A = 25°C$.

typical test circuit characteristics - 76253/35KV4

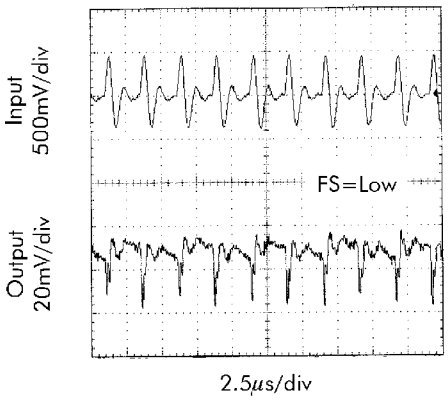
voltage curves

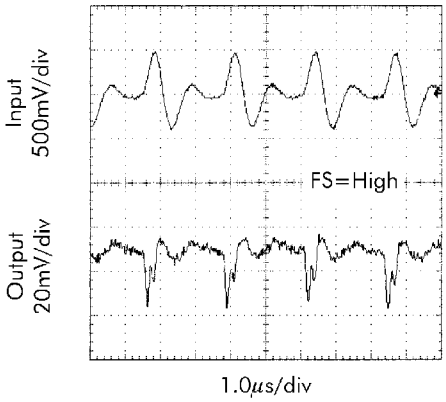


efficiency curves

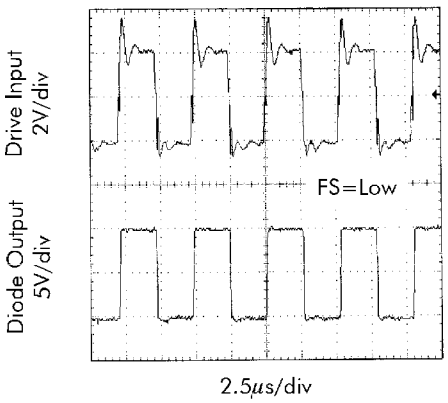


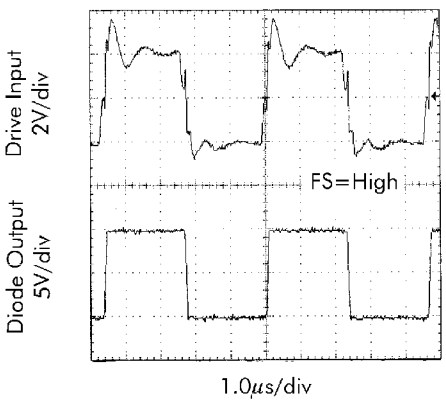
input/output voltage ripple





transformer voltage waveforms

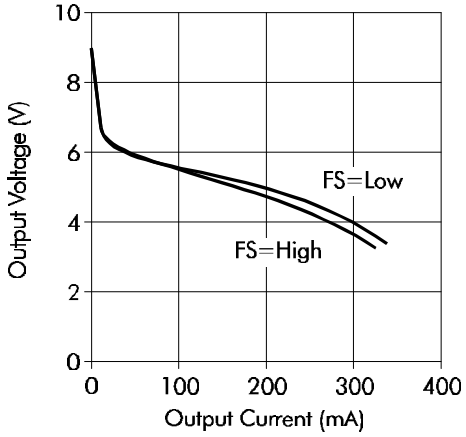




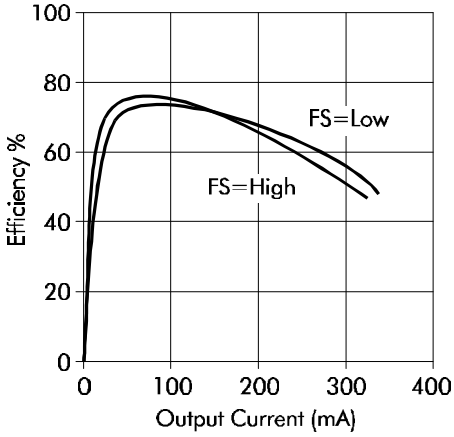
Note : All data taken at $T_A = 25°C$.

typical test circuit characteristics - 76253/55KV4

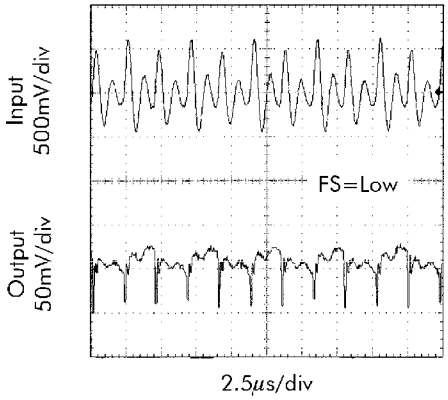
voltage curves

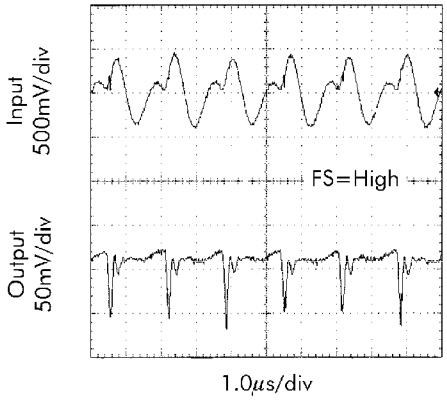


efficiency curves

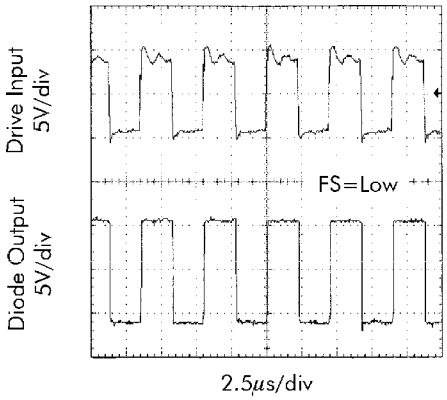


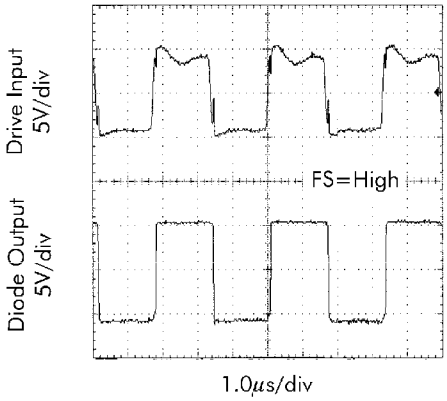
input/output voltage ripple





transformer voltage waveforms

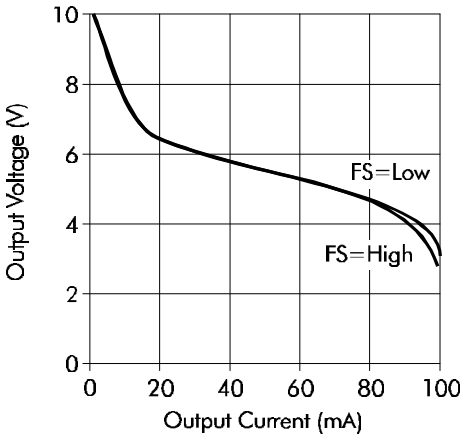




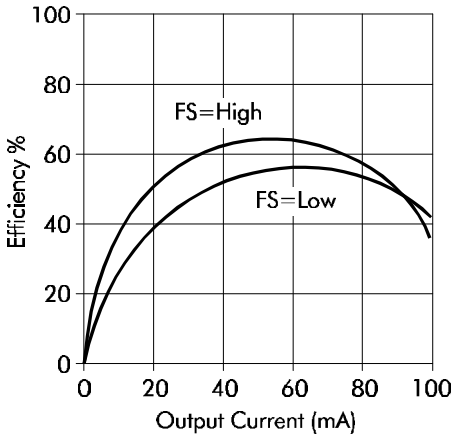
Note : All data taken at $T_A = 25°C$.

typical test circuit characteristics - 76253/35EN

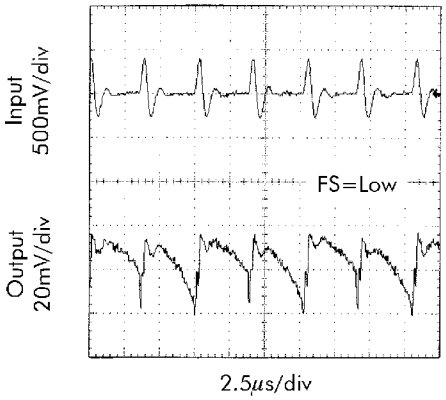
voltage curves

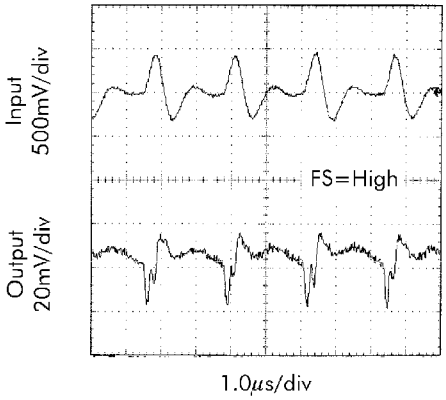


efficiency curves

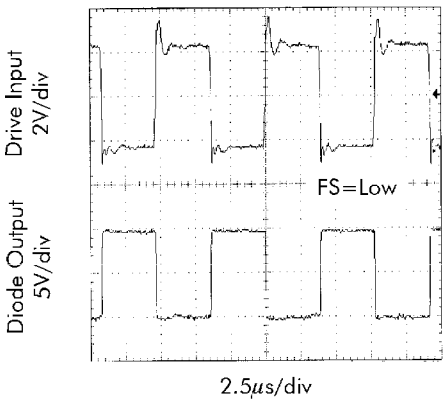


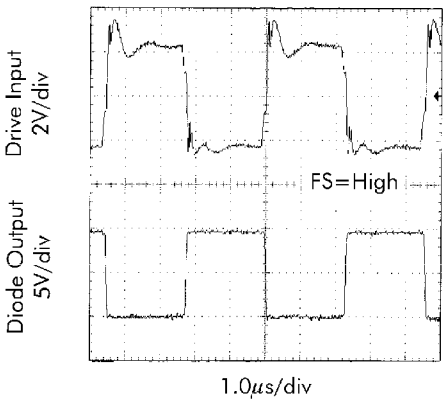
input/output voltage ripple





transformer voltage waveforms

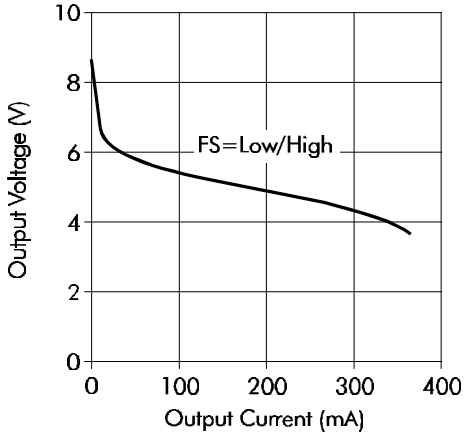




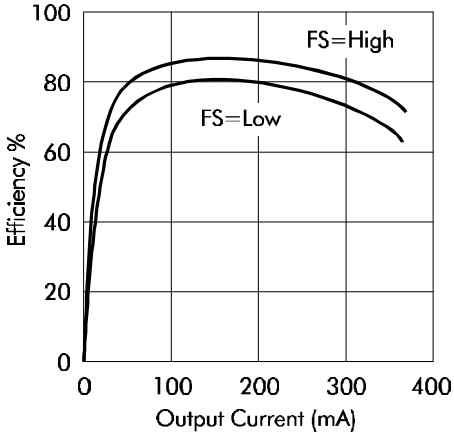
Note : All data taken at $T_A = 25°C$.

typical test circuit characteristics - 76253/55EN

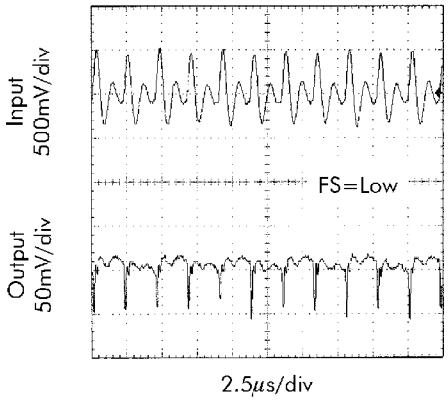
voltage curves

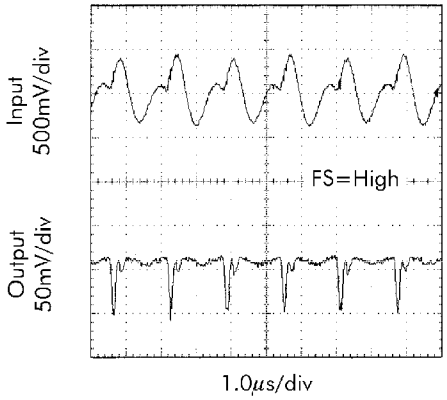


efficiency curves

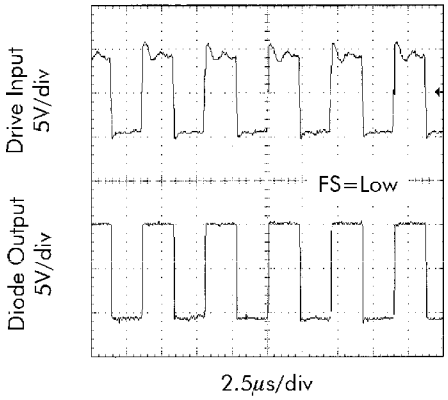


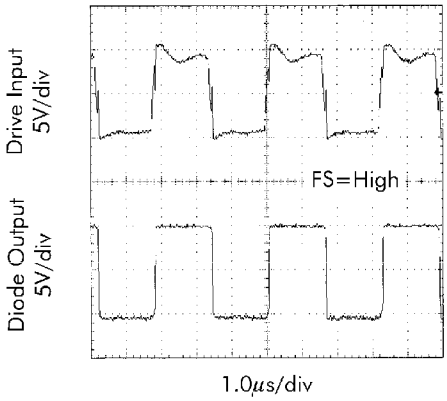
input/output voltage ripple





transformer voltage waveforms

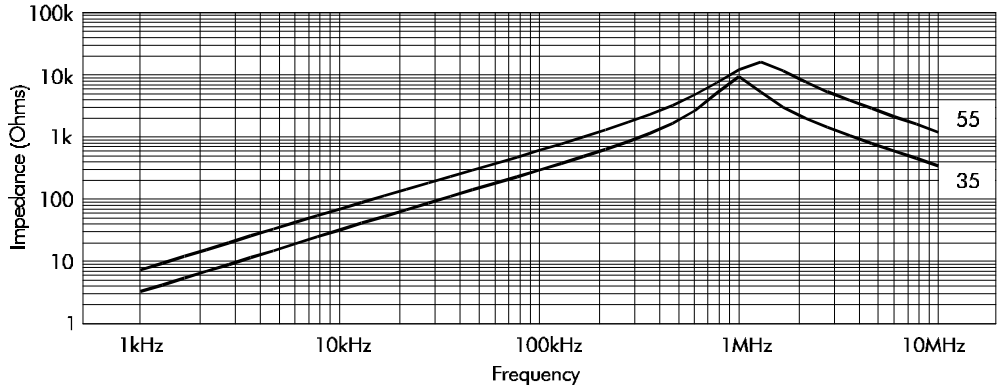




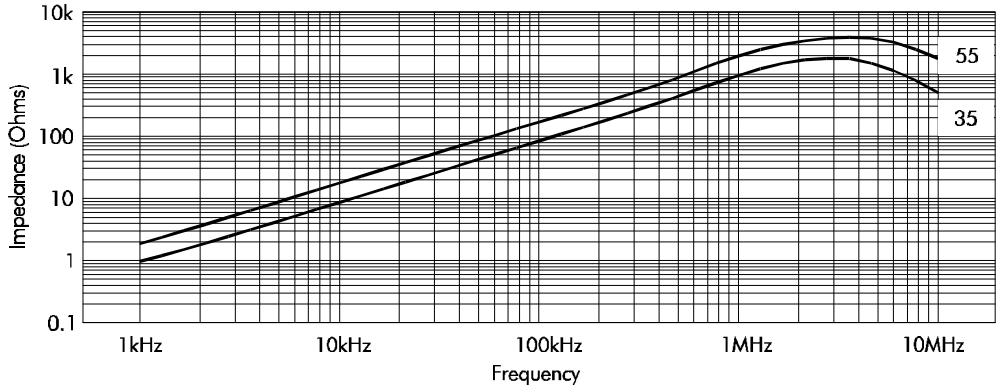
Note : All data taken at $T_A = 25°C$.

typical test circuit characteristics

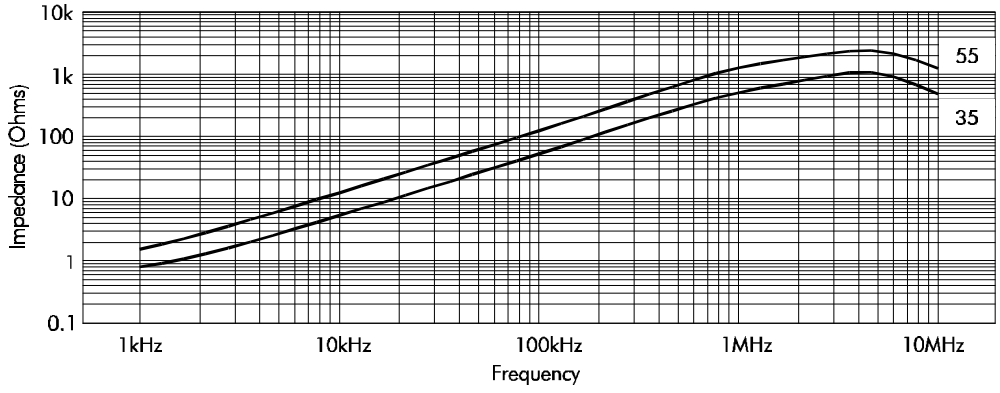
76253/XX impedance analysis



76253/XXKV4 impedance analysis



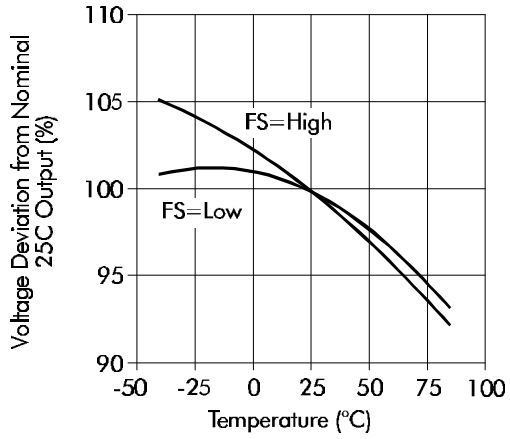
76253/XXEN impedance analysis



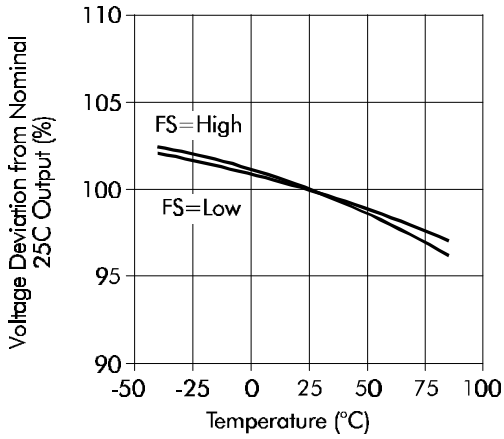
Note : All data taken at $T_A = 25°C$.

application circuit - high temperature performance characteristics

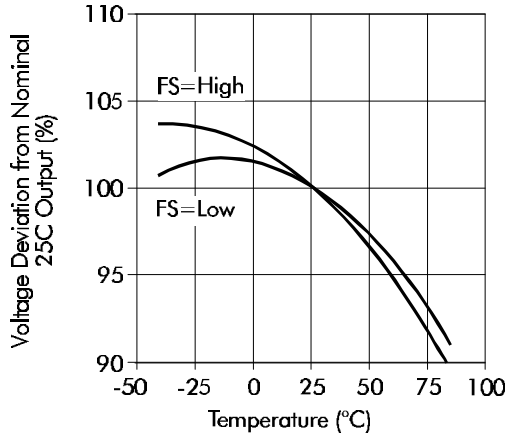
76253/35



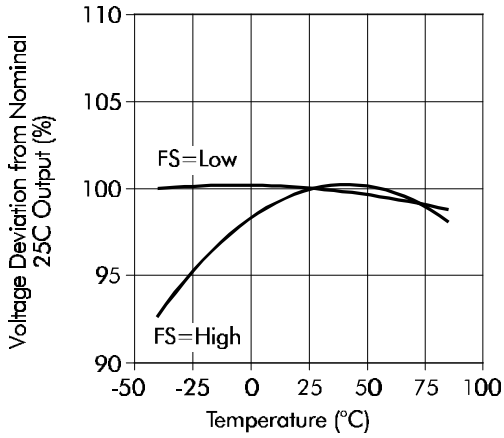
76253/55



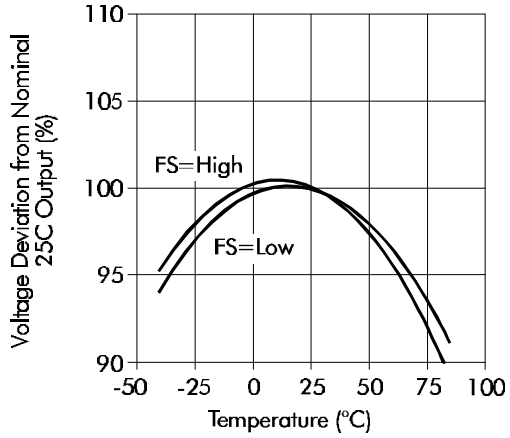
76253/35KV4



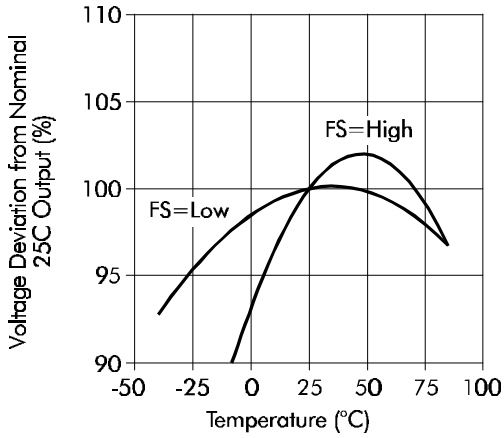
76253/55KV4



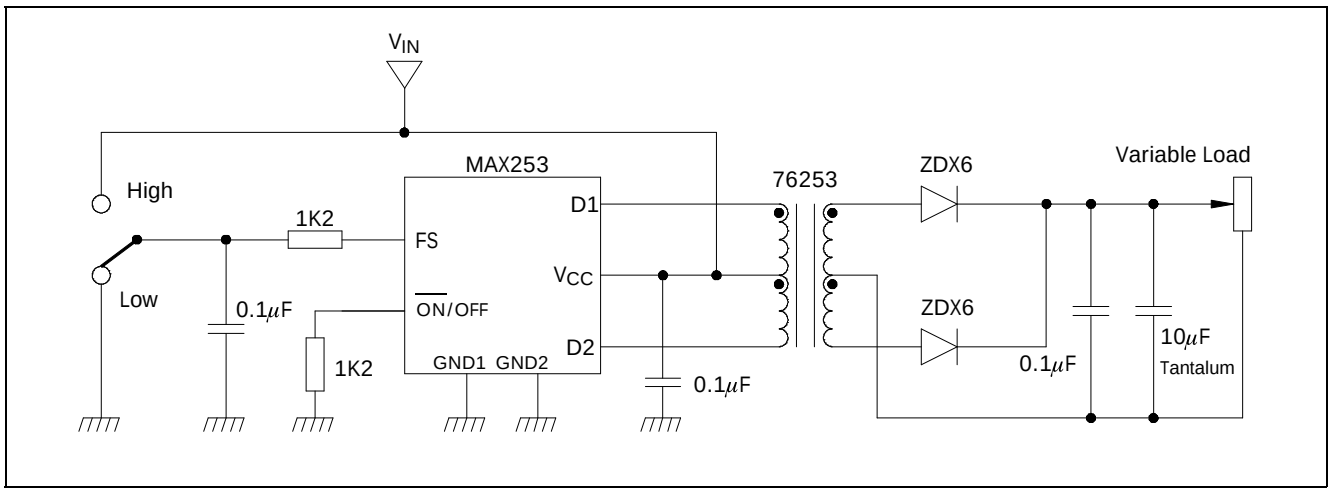
76253/35EN



76253/55EN



Note : All data taken at $T_A = 25°C$.



test circuit

All characterisation curves are derived from tests using the test circuit shown above featuring a MAX253 driver IC, a pair of ZDX6 fast rectifier diodes and a 10μF tantalum output capacitor.

applications

rectification circuits

The 76253 series are designed to provide a 5V output from either 3.3V or 5V supply to the MAX253 IC (see figure 1). Other output configurations can be derived to produce positive and negative 5V outputs (see figure 2) or voltage doubled output (see figures 3 & 4). Under rectification schemes other than the standard single rail 5V output, the total power drawn from the circuit must not exceed 1W for a 5V input supply and 500mW for a 3.3V input supply.

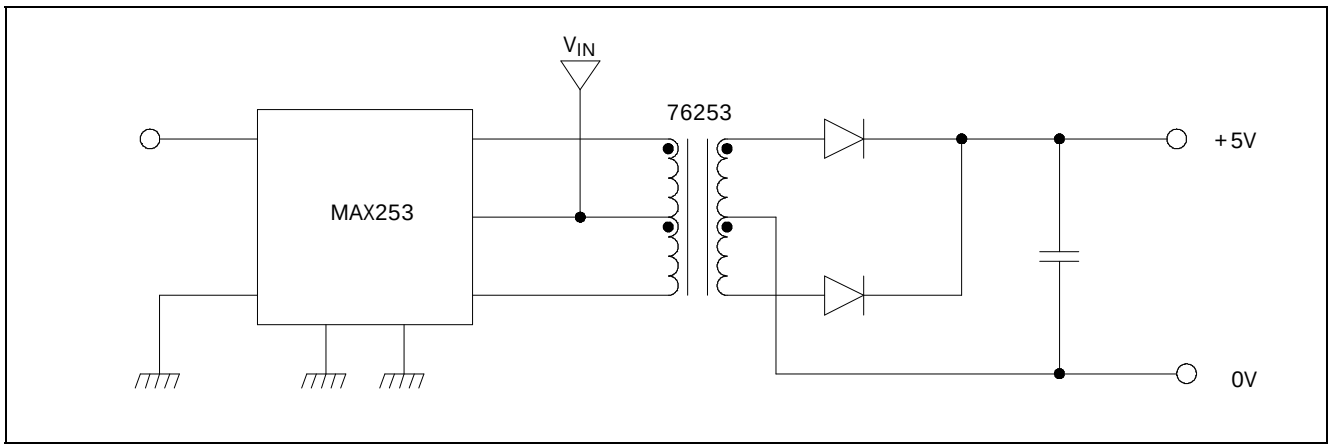


Figure 1 : *Full Wave Unipolar*

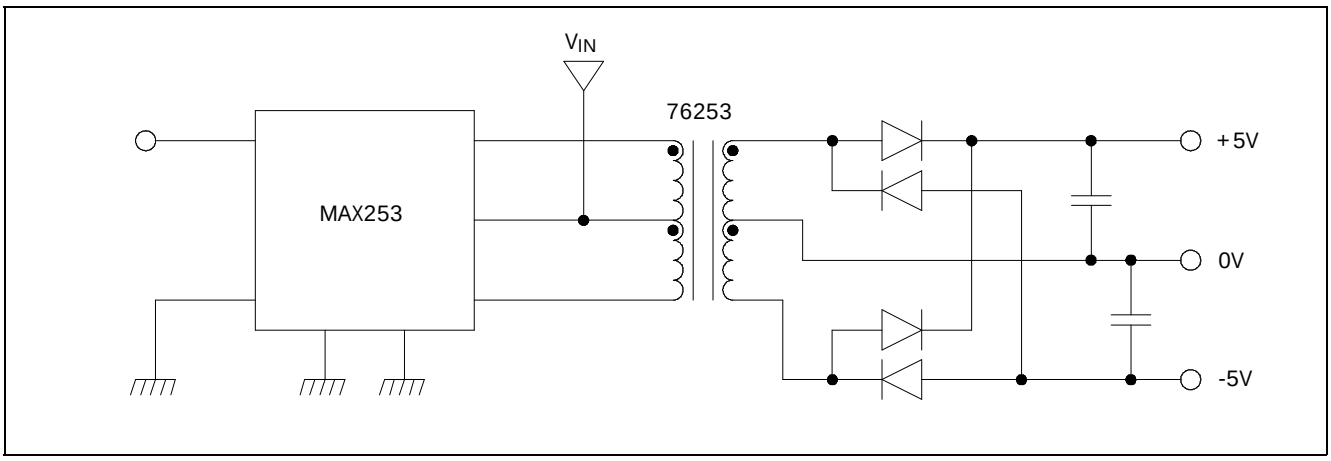


Figure 2 : *Full Wave Bipolar*

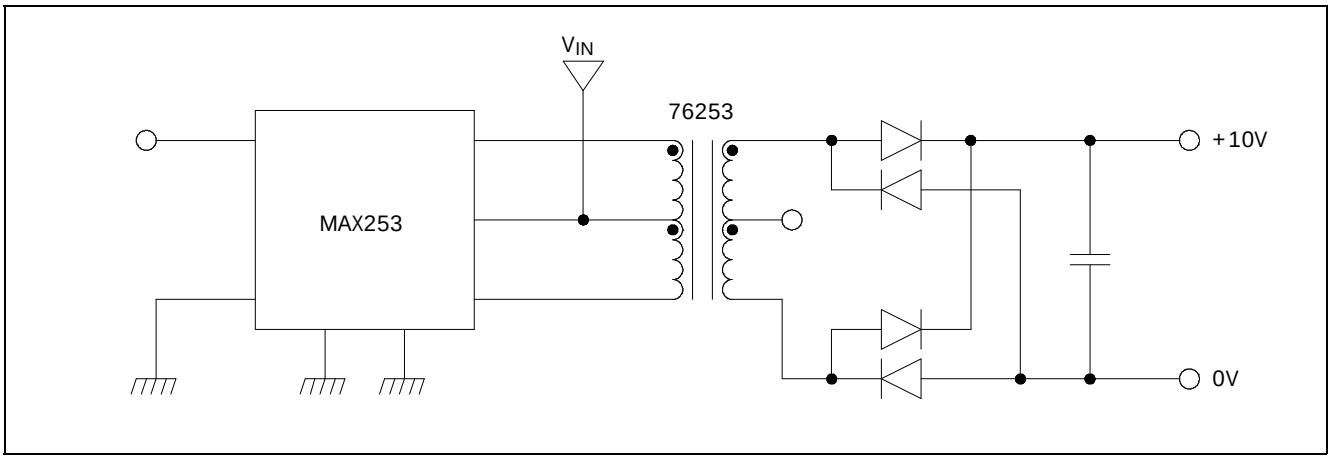


Figure 3 : *Full Wave Voltage Doubled Unipolar*

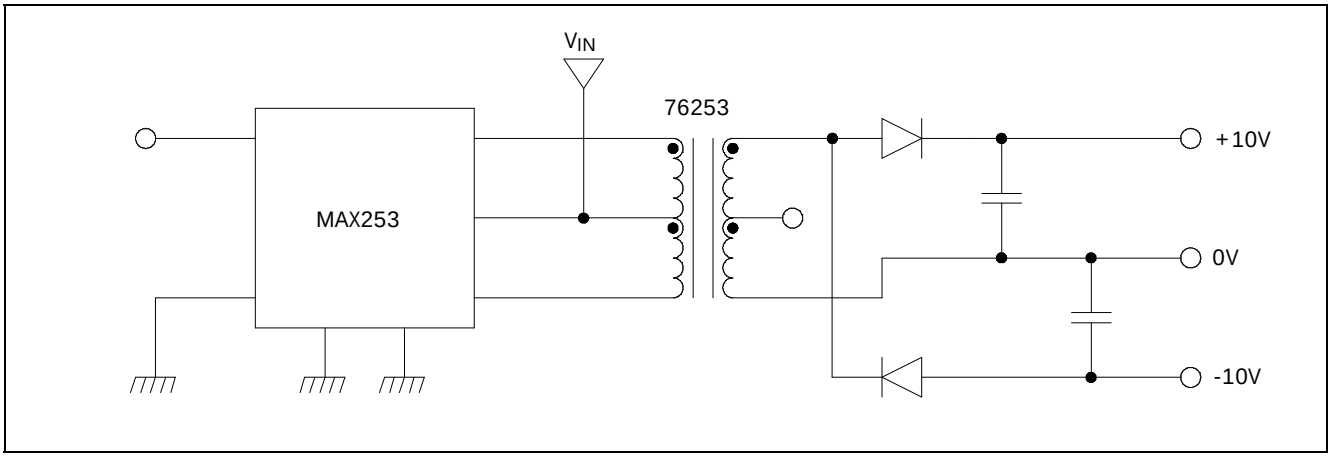


Figure 4 : *Half Wave Voltage Doubled Bipolar*

diode selection

The switching circuit can operate at a relatively high frequency (maximum 500kHz), hence, high speed rectifiers are recommended. If operating at low load levels (less than 50% maximum output current) low cost parts can be used even though they exhibit a high voltage drop. This is because at low output load the transformer output voltage is quite high and these lower cost parts will bring the voltage into regulation.

When operating at high load demands, high efficiency, low drop Schottky diodes are recommended, the final choice is left to the designer. It must be noted that different component combinations will produce different characteristic curves to those shown in this data sheet.

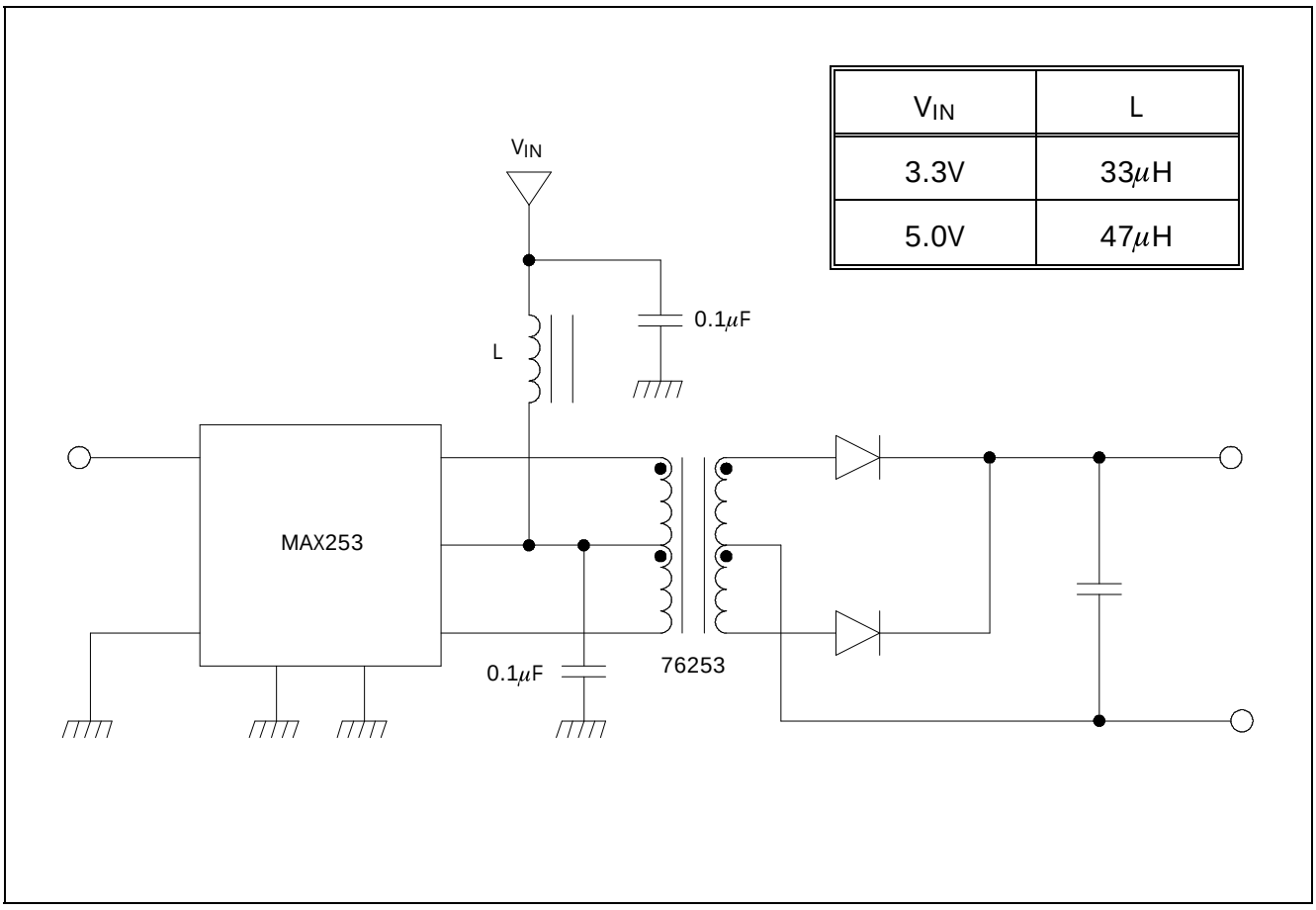
input filtering

The MAX253 IC driver and 76253 series transformer form a switching converter typically operating at either 200kHz (FS=LOW) or 350kHz (FS=HIGH). The circuit can therefore introduce some switching noise into the supply line feeding the MAX253. At Newport Components we recommend filtering this supply locally via a capacitor and inductor filter at the MAX253 to reduce the noise introduced to other circuits operating from the same supply rail (see figure 5).

output filtering

The output ripple from the rectifier circuit can be reduced further by a series inductor and second filter capacitor forming a pi-filter with the original smoothing capacitor (see figure 6). The values shown reduce ripple to less than 10mV at full load, further reductions can be achieved by using larger capacitor values. The largest recommended capacitor for the first stage smoothing is 22uF, up to 47uF can be used if required after the series inductor.

The output filter capacitors should exhibit low effective equivalent series resistance (ESR) at the switching frequency. Tantalum or ceramic capacitors are the recommended choice of dielectric.



V_{IN}	L
3.3V	33μH
5.0V	47μH

Figure 5 : *Input Filtering*

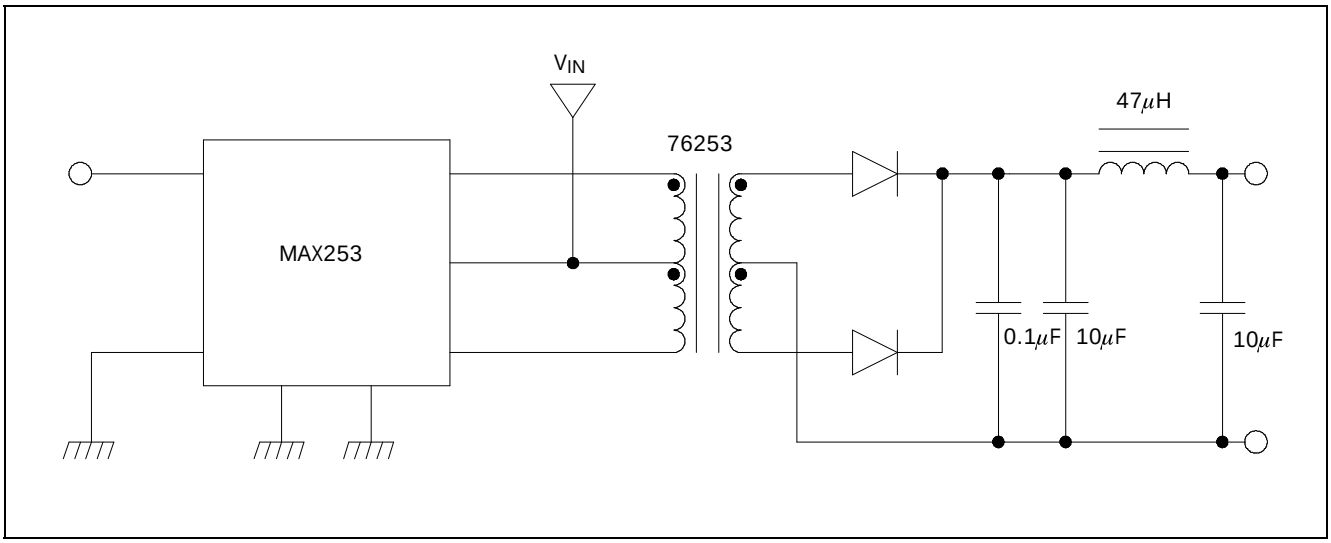


Figure 6 : *Output Filtering*

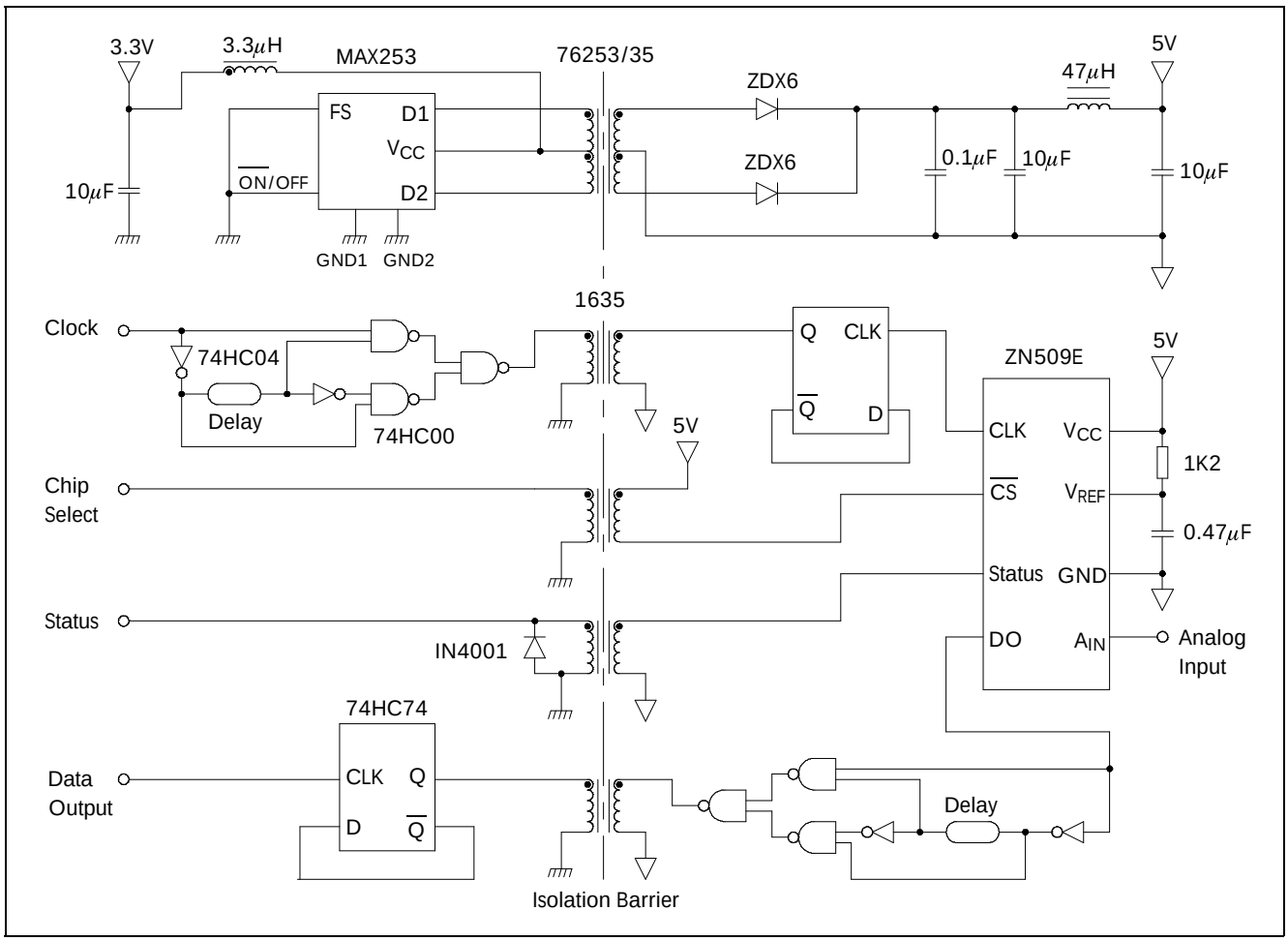


Figure 7 : *Transformer Isolated ADC*

transformer isolated ADC

The circuit in figure 7 offers a very low quiescent current for an isolated interface by using logic compatible tranfomer isolator/translator devices (1635). The isolators require some additional logic to interface with the ADC and a 3.3V logic controller, a few 74HC IC's and two delay lines are all that is required to implement full control over the ADC and its output.

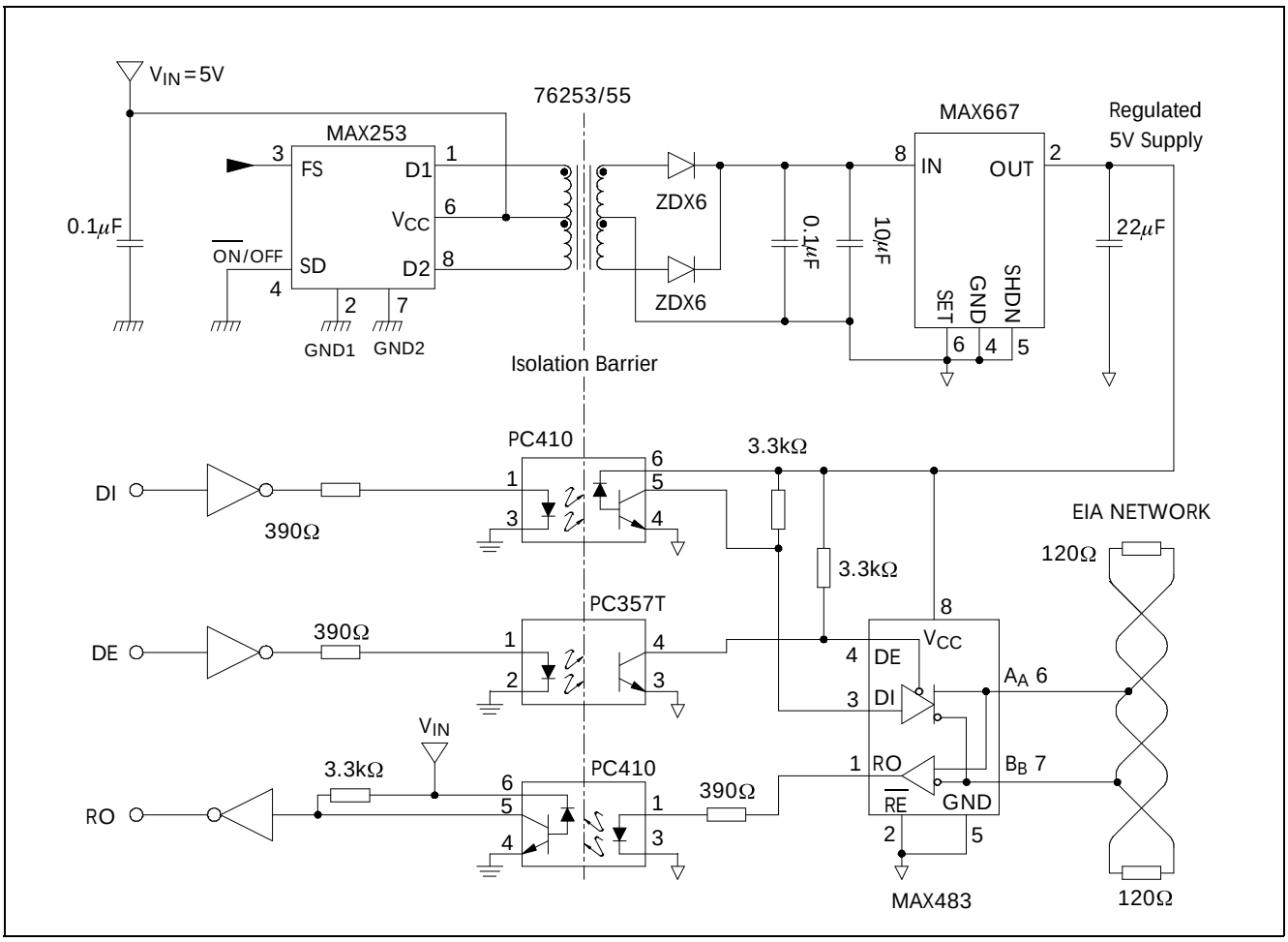


Figure 8 : *Isolated EIA485 Interface*

isolated EIA485 interface

In circuits which have a low output current demand, such as the above isolated EIA485 interface (see figure 8), a low drop-out linear regulator can be used on the output of the rectifier circuit to further reduce output ripple and noise.

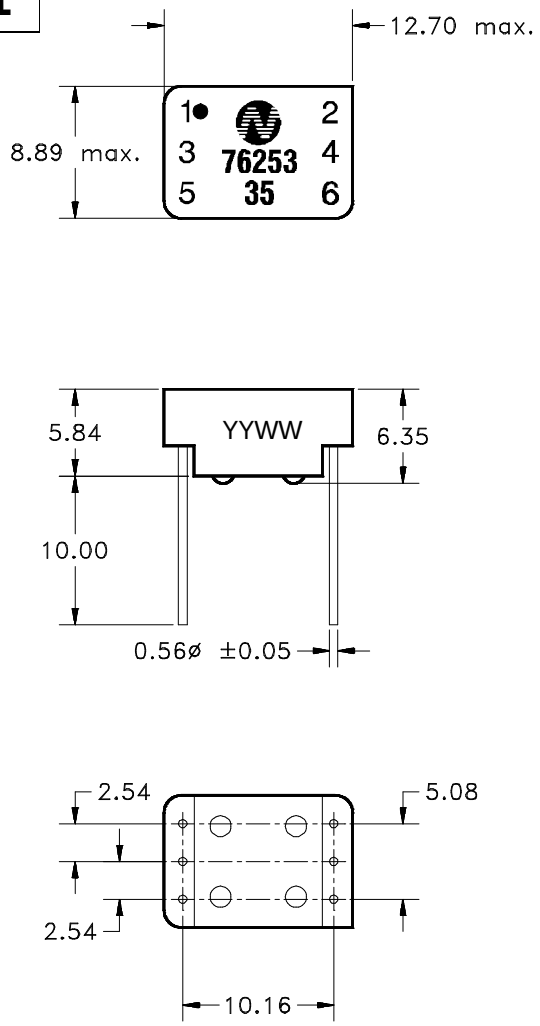
ordering information

Part Number	Input Voltage (V)	Output Voltage (V)	Output Current max. (mA)	Isolation Voltage (VDC)	Turns Ratio	Package Style
76253/35	3.3	5.0	100	1500	1:√5	1
76253/35KV4	3.3	5.0	100	4000	1:√5	1
76253/35EN	3.3	5.0	100	6000	1:√5	2
76253/55	5.0	5.0	200	1500	1:1.31	1
76253/55KV4	5.0	5.0	200	4000	1:1.36	1
76253/55EN	5.0	5.0	200	6000	1:1.33	2

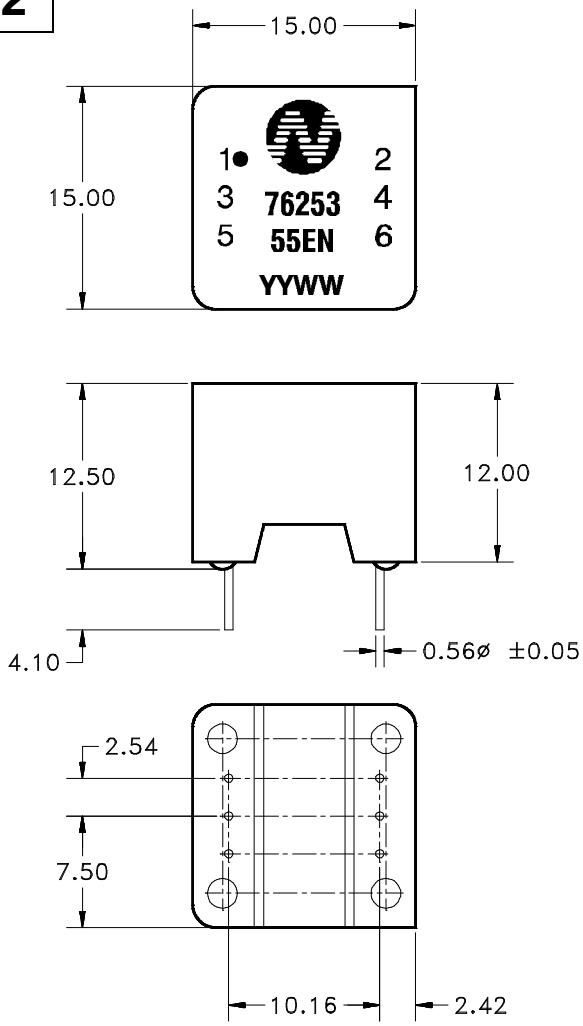
outline dimensions

6 Pin DIP package styles

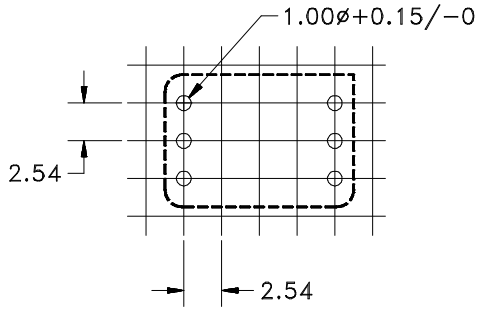
1

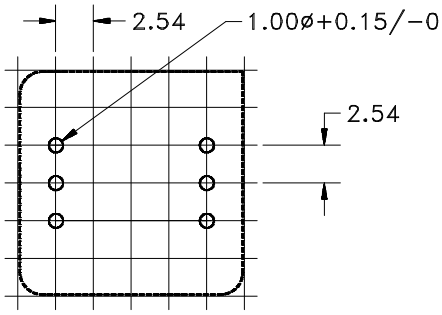


2



recommended footprint details





All pins on a 2.54mm pitch

All dimensions in mm XX.XX ±0.25

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