

Features

- Current-controlled Output Current Source with 4 Input Channels
- Low-power Consumption
- Output Current up to 150 mA, Read Channel and Channel 2
- Output Current up to 200 mA, Channel 3 and Channel 4
- Total Output Current to 300 mA
- Rise Time 1.0 ns, Fall Time 1.1 ns
- On-chip RF Oscillator
- Control Frequency and Swings by Use of 2 External Resistors
- Oscillator Frequency Range from 200 MHz to 600 MHz
- Oscillator Swing to 100 mA
- Single 5V Power Supply
- Common Enable/Disable Input
- TTL/CMOS Control Signals
- Small SSO16 Package

Application

- DVD-RAM
- DVD-RW
- DVD+RW
- CD-RW
- Writable Optical Drives

1. Description

The T0820 is a laser diode driver for the operation of a grounded laser diode for writable optical drives. It includes four channels for four different optical power levels which are controlled by a separate IC. The read channel generates a continuous output level whereas channels 2 to 4 are provided as write channels with very fast switching speeds. Write current pulses are enabled when a "low" signal is applied to the NE pins. All channels are summed together at the IOOUT pin. Read channel and channel 2 can contribute up to 150 mA and channels 3 and 4 up to 200 mA to the total output current of up to 300 mA. A total gain of 100 is provided between each reference current input and the selected output. Although the reference inputs are current inputs voltage control is possible by using external resistors. Frequency and swing can be set by two external resistors. Oscillation is enabled by a "high" at the ENOSC pin. Complete output current and oscillator switch-off is achieved by a 'low' at the ENABLE input.

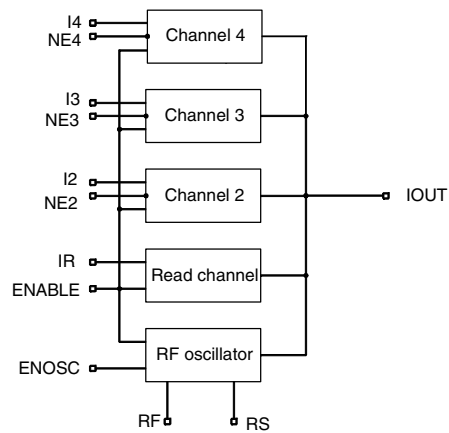


4-channel Laser Driver with RF Oscillator

T0820



Figure 1-1. Block Diagram



2. Pin Configuration

Figure 2-1. Pinning SSO16

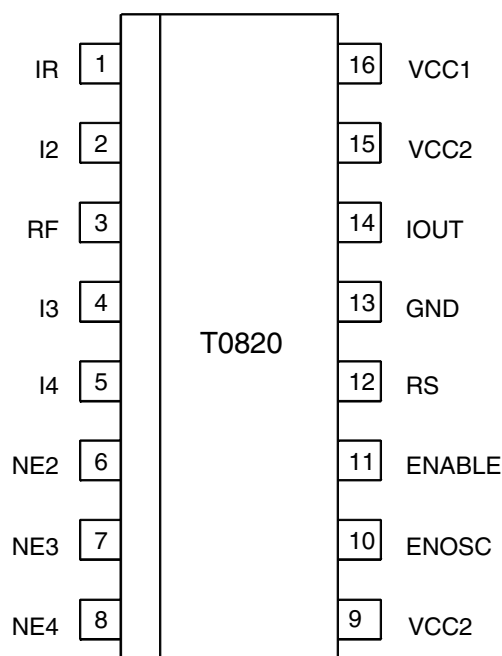


Table 2-1. Pin Description

Pin	Symbol	Type	Function
1	IR	Analog	Input current, bias voltage approximately GND
2	I2	Analog	Input current, bias voltage approximately GND
3	RF	Analog	External resistor to GND sets oscillator frequency
4	I3	Analog	Input current, bias voltage approximately GND
5	I4	Analog	Input current, bias voltage approximately GND
6	NE2	Digital	Digital control of channel 2 (low active)
7	NE3	Digital	Digital control of channel 3 (low active)
8	NE4	Digital	Digital control of channel 4 (low active)
9	VCC2	Supply	+5V power supply for IOUT
10	ENOSC	Digital	Enables RF oscillator (high active)
11	ENABLE	Digital	Enables output current (high active)
12	RS	Analog	External resistor to GND sets oscillator swing
13	GND	Supply	Ground
14	IOUT	Analog	Output current source for laser diode
15	VCC2	Supply	+5V power supply for IOUT
16	VCC1	Supply	+5V power supply for circuit

3. Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Parameters	Symbol	Value	Unit
Supply voltage	V_{CC}	-0.5 to +6.0	V
Input voltage at I _R , I ₂ , I ₃ , I ₄	V_{IN1}	-0.5 to +0.8	V
Input voltage at NE2, NE3, NE4, ENOSC	V_{IN2}	-0.5 to $V_{CC} + 0.5$	V
Output voltage	V_{OUT}	-0.5 to $V_{CC} - 1$	V
Power dissipation	P_{MAX}	0.7 ⁽¹⁾ to 1 ⁽²⁾	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	-65 to +125	°C

Notes: 1. $R_{thJA} \leq 115 \text{ k/W}$, $T_{amb} = 70^\circ\text{C}$
2. $R_{thJA} \leq 115 \text{ k/W}$, $T_{amb} = 25^\circ\text{C}$

4. Thermal Resistance

Parameters	Symbol	Value	Unit
Junction ambient	R_{thJA}	115 ⁽¹⁾	K/W

Note: 1. Measured with multi-layer test board (JEDEC standard)

5. Operating Range

Parameters	Symbol	Value	Unit
Supply voltage range	V_{CC}	4.5 to 5.5	V
Input current	$I_{IR}, I_{I2}, I_{I3}, I_{I4}$	< 2	mA
External resistor to GND to set oscillator frequency	R_F	> 3	k Ω
External resistor to GND to set oscillator swing	R_S	> 100	Ω
Operating temperature range	T_{amb}	0 to +70	°C

6. Electrical Characteristics: General

$V_{CC} = 5V$, $T_{amb} = 25^{\circ}C$, ENABLE = High, NE2 = NE3 = NE4 = High, ENOSC = Low, unless otherwise specified

No.	Parameters	Test Condition	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
1	Power supply								
1.1	Supply current, power down	ENABLE = Low, NE2 = NE3 = NE4 = Low	9, 15, 16	ICC_{PD2}		0.3		mA	A
1.2	Supply current, read mode, oscillator disabled	$I_{IR} = I_{I2} = I_{I3} = I_{I4} = 500 \mu A$	9, 15, 16	ICC_{R1}		95		mA	A
1.3	Supply current, read mode, oscillator enabled	$I_{IR} = I_{I2} = I_{I3} = I_{I4} = 500 \mu A$, ENOSC = High, RS = 560 Ω , RF = 7.5 k Ω	9, 15, 16	ICC_{R2}		100		mA	A
1.4	Supply current, write mode	$I_{IR} = I_{I2} = I_{I3} = I_{I4} = 500 \mu A$, NE2 = NE3 = NE4 = Low	9, 15, 16	ICC_W		230		mA	A
1.5	Supply current, input off	$I_{IR} = I_{I2} = I_{I3} = I_{I4} = 0 \mu A$	9, 15, 16	ICC_{off}		16		mA	A
2	Digital inputs								
2.1	NE2/NE3/NE4 low voltage		6, 7, 8	VNE_{LO}			1.3	V	A
2.2	NE2/NE3/NE4 high voltage		6, 7, 8	VNE_{HI}	2.0			V	A
2.3	ENABLE low voltage		11	VEN_{LO}			0.5	V	A
2.4	ENABLE high voltage		11	VEN_{HI}	3.0			V	A
2.5	ENOSC low voltage		10	VEO_{LO}			0.5	V	A
2.6	ENOSC high voltage		10	VEO_{HI}	3.0			V	A
3	Current at digital inputs								
3.1	NE2/NE3/NE4 low current	NE = 0V	6, 7, 8	INE_{LO}	-300			μA	A
3.2	NE2/NE3/NE4 high current	NE = 5V	6, 7, 8	INE_{HI}			800	μA	A
3.3	ENABLE low current	ENABLE = 0V	11	IEN_{LO}	-150			μA	A
3.4	ENABLE high current	ENABLE = 5V	11	IEN_{HI}			100	μA	A
3.5	ENOSC low current	ENOSC = 0V	10	IEO_{LO}	-100			μA	A
3.6	ENOSC high current	ENOSC = 5V	10	IEO_{HI}			800	μA	A

* Type means: A: 100% tested B: 100% correlation tested C: Characterized on samples D: Design parameter

7. Electrical Characteristics: Laser Amplifier

$V_{CC} = 5V$, $T_{amb} = 25^{\circ}C$, ENABLE = High, unless otherwise specified

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
4	Laser Amplifier								
4.1	Best fit current gain	Any channel ⁽¹⁾	14	GAIN	90	105	130	mA/mA	A
4.2	Best fit current offset	Any channel ⁽¹⁾	14	IOS	-8		+4	mA	A
4.3	Output current linearity	Any channel ⁽¹⁾	14	ILIN	-3		+3	%	A
4.4	Input current range	Input is sinking	1, 2, 4, 5	IDAC	0		3	mA	C
4.5	Output current read channel	Output is sourcing	14	I_{OUTR}	150			mA	A
4.6	Output current channel 2	Output is sourcing	14	I_{OUT2}	150			mA	A
4.7	Output current channel 3	Output is sourcing	14	I_{OUT3}	200			mA	A
4.8	Output current channel 4	Output is sourcing	14	I_{OUT4}	200			mA	A
4.9	Output current read channel + channel 2	Output is sourcing	14	$I_{OUTR,2}$	150			mA	A
4.10	Output current channel 3 + channel 4	Output is sourcing	14	$I_{OUT3,4}$	200			mA	A
4.11	Total output current	Output is sourcing	14	I_{OUT}	300			mA	A
4.12	IOOUT series resistor	$I_{OUT} = 250$ mA total R_{OUT} to V_{CC} -Rail	14	R_{OUT}		8		Ω	C
4.13	I_{IN} input impedance	R_{IN} is to GND	1, 2, 4, 5	R_{IN}	150	200	250	Ω	A
4.14	NE threshold	Temperature stabilized	6, 7, 8	V_{TH}		1.68		V	B
4.15	Output off current 1	ENABLE = Low		$IOFF_1$			1	mA	A
4.16	Output off current 2	NE2 = NE3 = NE4 = High, $I_{IR} = 0$ μA , $I_{I2} = I_{I3} = I_{I4} = 500$ μA	14	$IOFF_2$			1	mA	A
4.17	Output off current 3	NE2 = NE3 = NE4 = Low, $I_{IR} = I_{I2} = I_{I3} = I_{I4} = 0$ μA	14	$IOFF_3$			5	mA	A
4.18	I_{OUT} supply sensitivity, read mode	$I_{OUT} = 40$ mA, $V_{CC} = 5V \pm 10\%$, read only	14	VSE_R	-4		-1	%/V	A
4.19	I_{OUT} supply sensitivity, write mode	$I_{OUT} = 80$ mA, 40 mA read + 40 mA write, $V_{CC} = 5V \pm 10\%$	14	VSE_W	-4		0.2	%/V	A
4.20	I_{OUT} current output noise	$I_{OUT} = 40$ mA, ENOSC = Low	14	INO_O		3		nA/ rt-Hz	C
4.21	I_{OUT} temperature sensitivity, read mode	$I_{OUT} = 40$ mA, read only	14	TSE_R		-500		ppm/ $^{\circ}C$	C
4.22	I_{OUT} temperature sensitivity, write mode	$I_{OUT} = 80$ mA, 40 mA read + 40 mA Write	14	TSE_W		-600		ppm/ $^{\circ}C$	C

*) Type means: A =100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

Note: 1. Linearity of the amplifier is calculated using a best fit method at three operating points of

$$I_{OUT} \text{ at } 20 \text{ mA, } 40 \text{ mA, and } 60 \text{ mA. } I_{OUT} = (I_{IN} \times GAIN) + I_{OS}$$

8. Electrical Characteristics: Laser Current Amplifier Output AC Performance

$V_{CC} = +5V$, $I_{OUT} = 40\text{ mA}$ DC with 40 mA pulse, $T_{amb} = 25^{\circ}C$, unless otherwise specified

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
5	Laser Current Amplifier Output AC Performance								
5.1	Write rise time	$I_{OUT} = 40\text{ mA (read)} + 40\text{ mA (10\% - 90\%)}^{(1)}$	14	t_{RISE}		1.0	3.0	ns	C
5.2	Write fall time	$I_{OUT} = 40\text{ mA (read)} + 40\text{ mA (10\% - 90\%)}^{(1)}$	14	t_{FALL}		1.1	3.0	ns	C
5.3	Output current overshoot	$I_{OUT} = 40\text{ mA (read)} + 40\text{ mA}^{(1)}$	14	OS		5		%	C
5.4	I_{OUT} ON prop delay	NE 50% High-Low to I_{OUT} at 50% of final value	14	t_{ON}		2.0		ns	C
5.5	I_{OUT} OFF prop delay	NE 50% Low-High to I_{OUT} at 50% of final value	14	t_{OFF}		2.0		ns	C
5.6	Disable time	ENABLE 50% High-Low to I_{OUT} at 50% of final value	14	t_{DIS}		10		ns	C
5.7	Enable time	ENABLE 50% Low-High to I_{OUT} at 50% of final value	14	t_{EN}		50		ns	C
5.10	Amplifier bandwidth	$I_{OUT} = 50\text{ mA}$, all channels, -3 dB value	14	BW_{LCA}		20		MHz	C
6	Oscillator								
6.1	Oscillator frequency	RF = 7.5 k Ω RS = 560 Ω	14	F_{OSC}	255	300	350	MHz	A
6.2	Oscillator temperature coefficient	RF = 7.5 k Ω RS = 560 Ω	14	TC_{OSC}		-150		ppm/ $^{\circ}C$	C
6.3	Disable time oscillator	ENOSC 50% Low-High to I_{OUT} at 50% of final value	14	T_{DISO}		4		ns	C
6.4	Enable time oscillator	ENOSC 50% High-Low to I_{OUT} at 50% of final value	14	T_{ENO}		2		ns	C
6.5	Oscillator swing	RF = 7.5 k Ω RS = 560 Ω	14	S_{OSC}	35		55	mApp	A

*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

Note: 1. Load resistor at I_{OUT} 10 Ω , measurement with a 50- Ω oscilloscope and a 39- Ω series resistor

9. Application Information

Figure 9-1. Oscillator Frequency vs. Resistor R_F ($R_S = 560\Omega$)

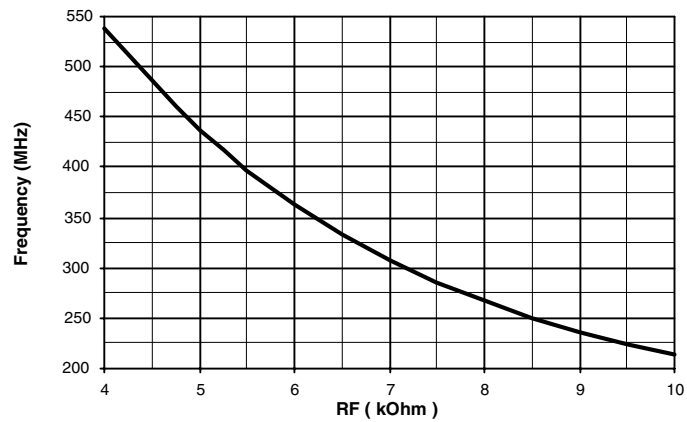


Figure 9-2. Oscillator Swing vs. Resistor R_S ($R_F = 7.5\text{ k}\Omega$)

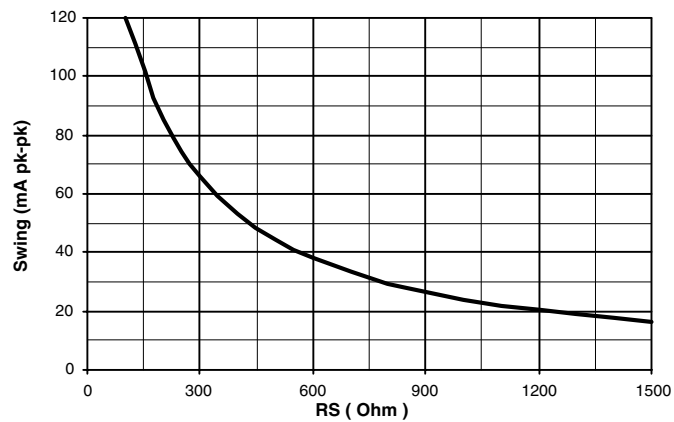


Figure 9-3. Oscillator Frequency Depending of Swing ($R_S = 560\Omega$)

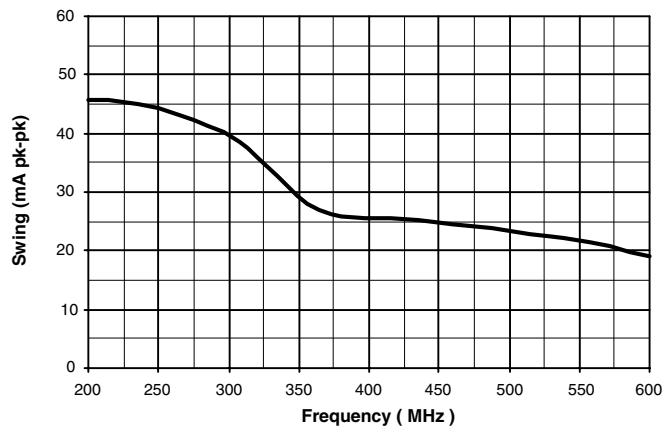


Figure 9-4. Transfer Characteristic of Channel 2 (gain = 112)

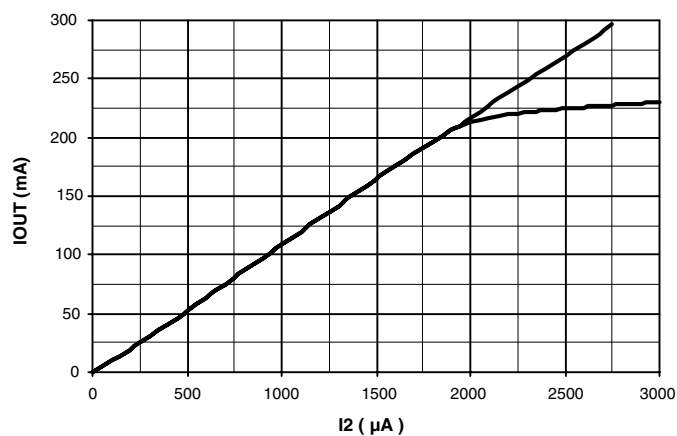


Figure 9-5. Transfer Characteristic of Channel 3 and 4 (gain = 112)

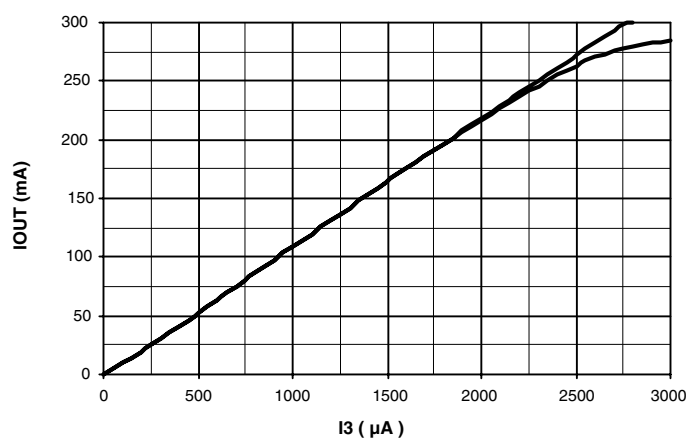


Figure 9-6. Step Response, Read Channel: 50 mA, Channel 3 = 200 mApp

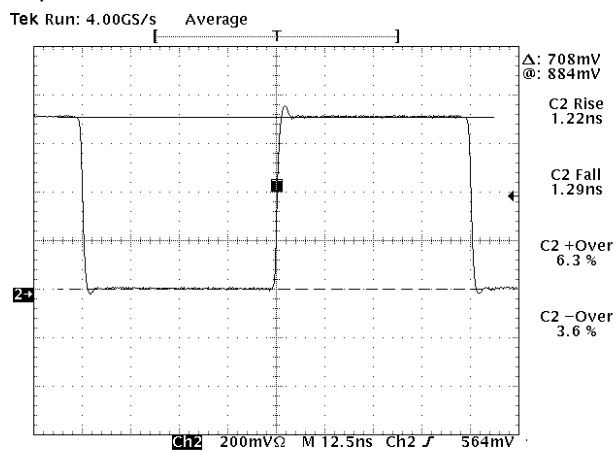


Figure 9-7. Timing Diagram

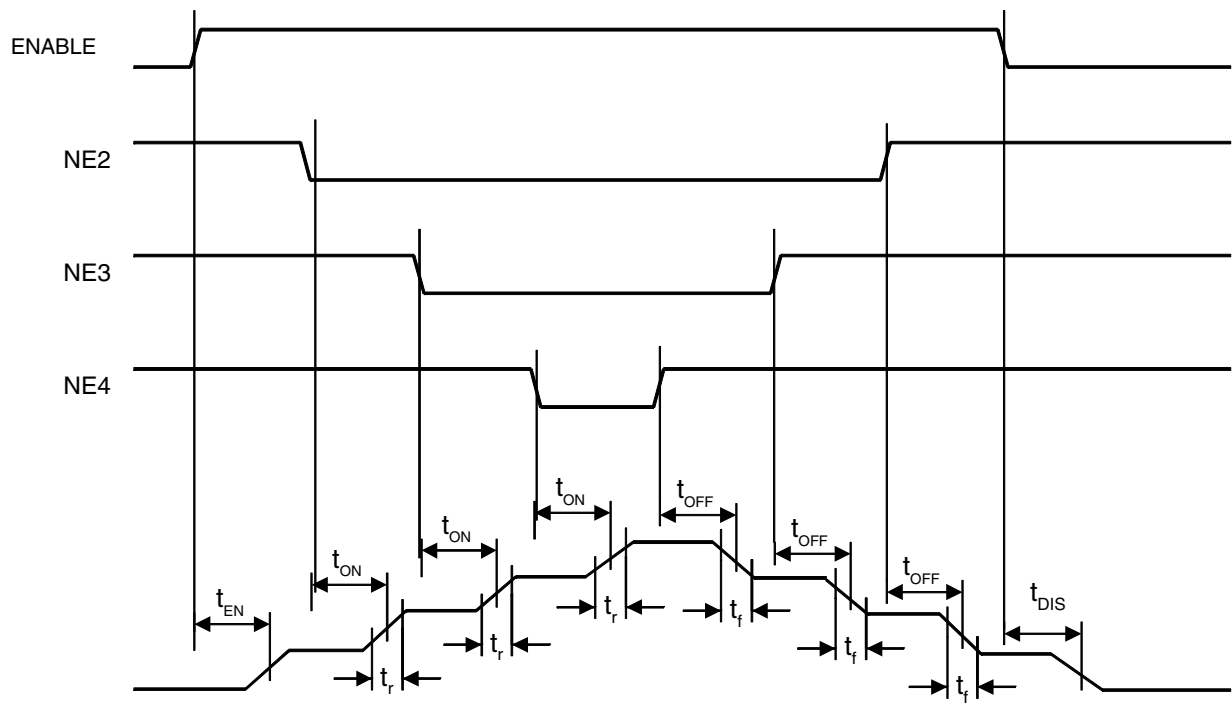
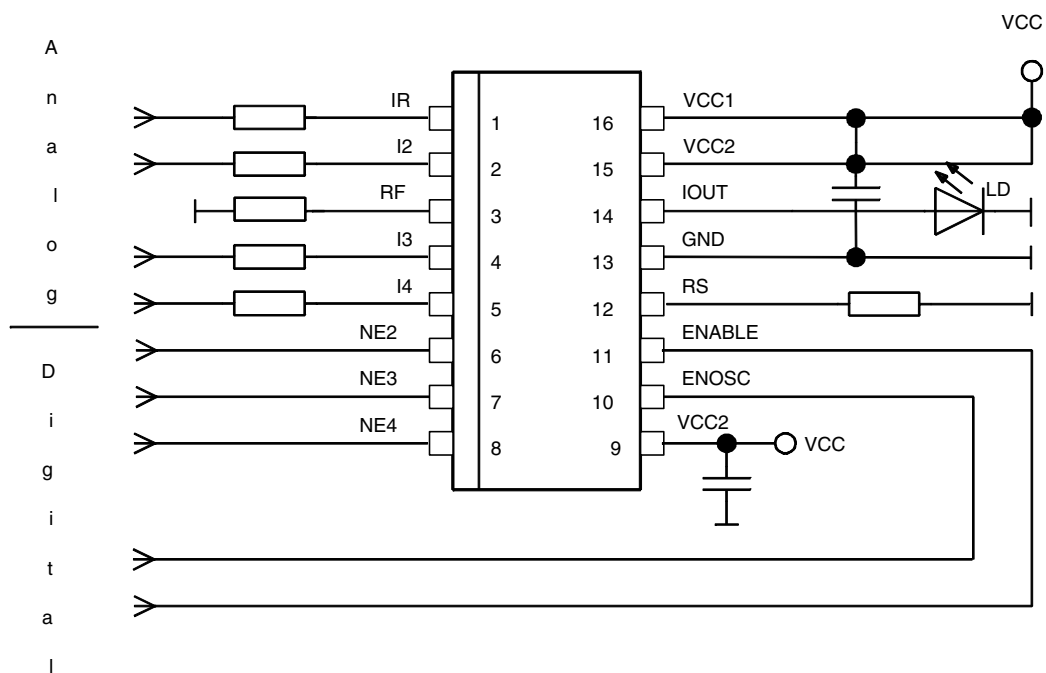


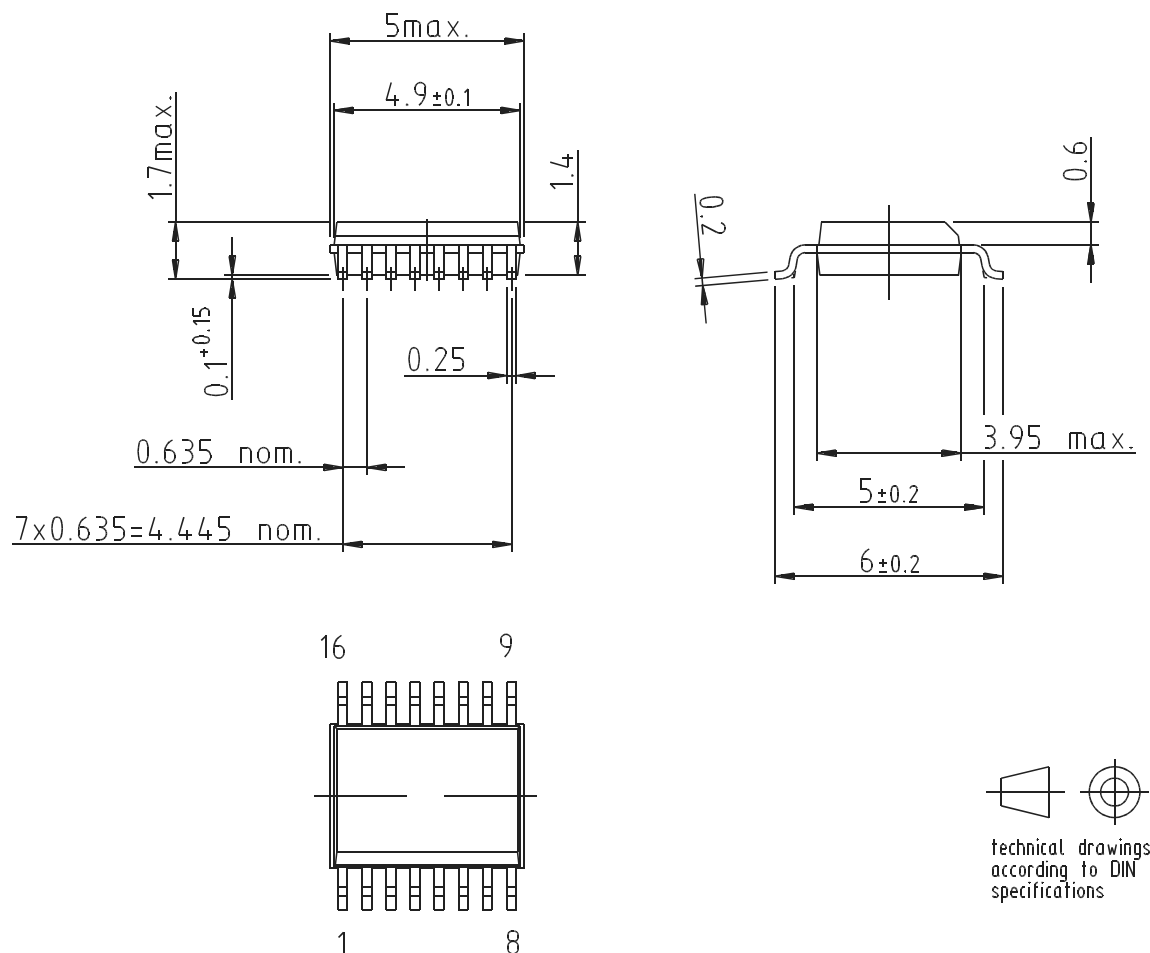
Figure 9-8. Typical Application Circuit



10. Ordering Information

Extended Type Number	Package	Remarks
T0820-TCQG	SS016	Taped and reeled, Pb-free

11. Package Information



Drawing refers to following types: SS016
 Package acc. JEDEC MO 137 AB

Drawing-No.: 6.543-5060.01-4
 Issue: 2; 05.02.99



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