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## Features

- Current-controlled Output Current Source with 5 Input Channels
- 2 Selectable Outputs for Grounded Laser Diodes
- Output Current per Channel up to 200 mA
- Total Output Current up to 250 mA
- Rise Time 1.0 ns/Fall Time 1.1 ns
- On-chip RF Oscillator
- Control of 2 Different Frequencies and Swings by Use of 4 External Resistors
- Oscillator Frequency Range from 200 MHz to 600 MHz
- Oscillator Swing to 100 mA
- Single 5-V Power Supply
- Common Enable/Disable Input
- TTL/CMOS Control Signals
- Small SSO24 Package and QFN28 Package

## Applications

- Combo Drives (DVD + CD-RW)
- DVD-RAM with CD-RW Capability
- DVD-RW with CD-RW Capability

## 1. Description

The T0800 is a laser diode driver for the operation of two different, grounded laser diodes for DVD-RAM (650 nm) and CD-RW (780 nm). It includes five channels for five different optical power levels which are controlled by a separate IC. The read channel generates a continuous output level. The channels 2 to 5 are provided as write channels with very fast switching speeds. When a *low* signal is applied to the NE pins, write current pulses are enabled. All channels are summed together and switched to one of the two outputs IOUTA or IOUTB by the select input SELA. Each channel can contribute up to 200 mA to the total output current of up to 250 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. An on-chip RF oscillator reduces laser mode hopping noise during read mode. Frequency and swing can be set independently for the two selectable outputs with two pairs of resistors. Oscillation is enabled by a *high* signal at the ENOSC pin. Complete output current and oscillator switch-off is achieved by a *low* signal at the ENABLE input.



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## 5-Channel Laser Driver with RF Oscillator and 2 Outputs

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### T0800



## 2. Pin Configuration

Figure 2-1. Pinning SSO24

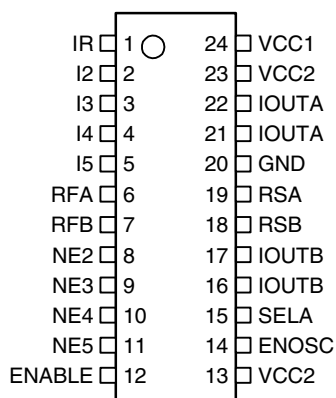


Table 2-1. Pin Description: SSO24

Pin	Symbol	Type	Function
1	IR	Analog	Input current, bias voltage approximately GND
2	I2	Analog	Input current, bias voltage approximately GND
3	I3	Analog	Input current, bias voltage approximately GND
4	I4	Analog	Input current, bias voltage approximately GND
5	I5	Analog	Input current, bias voltage approximately GND
6	RFA	Analog	External resistor to GND sets frequency of oscillator A
7	RFB	Analog	External resistor to GND sets frequency of oscillator B
8	NE2	Digital	Digital control of channel 2 (low active)
9	NE3	Digital	Digital control of channel 3 (low active)
10	NE4	Digital	Digital control of channel 4 (low active)
11	NE5	Digital	Digital control of channel 5 (low active)
12	ENABLE	Digital	Enables output current (high active)
13	VCC2	Supply	+5 V power supply for IOUT
14	ENOSC	Digital	Enables RF oscillator (high active)
15	SELA	Digital	High: selects IOUTA, RFA, RSA Low: selects IOUTB, RFB, RSB
16/17	IOUTB	Analog	Output current source B for laser diode
18	RSB	Analog	External resistor to GND sets swing of oscillator B
19	RSA	Analog	External resistor to GND sets swing of oscillator A
20	GND	Supply	Ground
21/22	IOUTA	Analog	Output current source A for laser diode
23	VCC2	Supply	+5 V power supply for IOUT
24	VCC1	Supply	+5 V power supply for circuit

Figure 2-2. Pinning QFN28

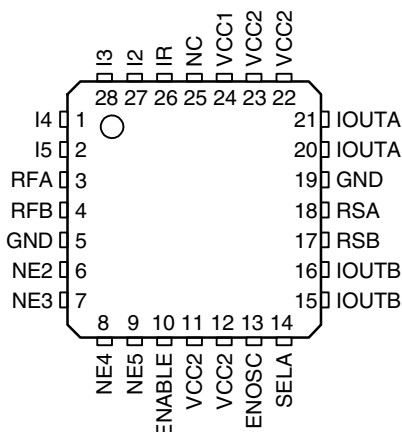
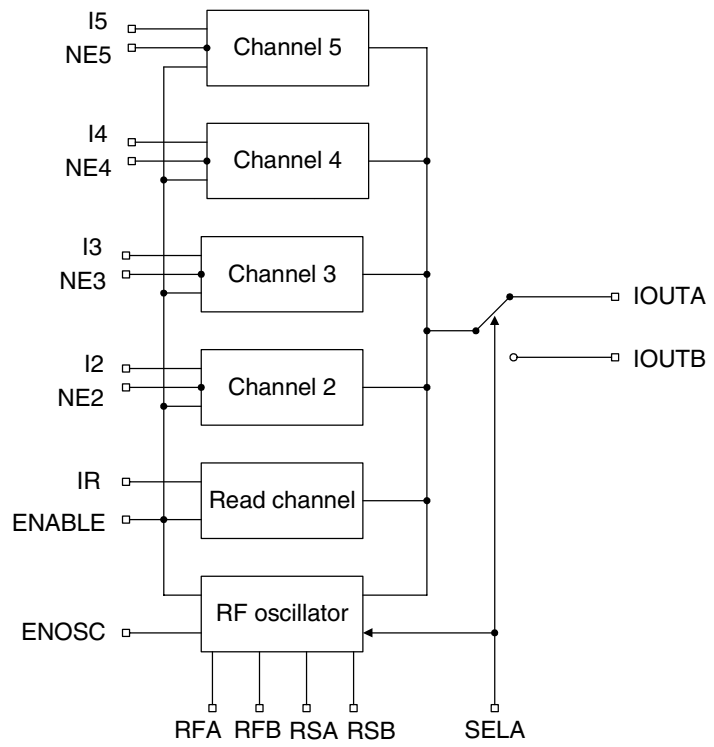


Table 2-2. Pin Description: QFN28

Pin	Symbol	Type	Function
1	I4	Analog	Input current, bias voltage approximately GND
2	I5	Analog	Input current, bias voltage approximately GND
3	RFA	Analog	External resistor to GND sets frequency of oscillator A
4	RFB	Analog	External resistor to GND sets frequency of oscillator B
5	GND	Supply	Ground
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	NE5	Digital	Digital control of channel 5 (low active)
10	ENABLE	Digital	Enables output current (high active)
11, 12	VCC2	Supply	+5 V power supply IOUT
13	ENOSC	Digital	Enables RF oscillator (high active)
14	SELA	Digital	High: selects IOUTA, RFA, RSA Low: selects IOUTB, RFB, RSB
15	IOUTB	Analog	Output current source B for laser diode
16	IOUTB	Analog	Output current source B for laser diode
17	RSB	Analog	External resistor to GND sets swing of oscillator B
18	RSA	Analog	External resistor to GND sets swing of oscillator A
19	GND	Supply	Ground
20	IOUTA	Analog	Output current source A for laser diode
21	IOUTA	Analog	Output current source A for laser diode
22, 23	VCC2	Supply	+5 V power supply IOUT
24	VCC1	Supply	+5 V power supply circuit
25	NC	-	Not connected
26	IR	Analog	Input current, bias voltage approximately GND
27	I2	Analog	Input current, bias voltage approximately GND
28	I3	Analog	Input current, bias voltage approximately GND
Paddle	-	-	Should be connected with ground

**Figure 2-3.** Block Diagram



### 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.

Parameter	Symbol	Value	Unit
Supply voltage	$V_{CC}$	-0.5 to +6.0	V
Input voltage at IR, I2, I3, I4, I5	$V_{IN1}$	-0.5 to +0.5	V
Input voltage at NE2, NE3, NE4, NE5, ENOSC	$V_{IN2}$	-0.5 to $V_{CC} + 0.5$	V
Output voltage	$V_{OUT}$	-0.5 to $V_{CC} - 1$	V
Power dissipation	$P_{tot}$	0.7 <sup>(1)</sup> to 1 <sup>(2)</sup>	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

Parameter	Symbol	Value <sup>(1)</sup>	Unit
Junction ambient	$R_{thJA}$	115 (SSO24) 35 (QFN28)	K/W K/W

Note: 1. Measured with multi-layer test board (JEDEC standard JESD51-7)

### 5. Recommended Operating Conditions

Parameter	Symbol	Value	Unit
Supply voltage range	$V_{CC}$	4.5 to 5.5	V
Input current	$I_{IR}, I_{I2}, I_{I3}, I_{I4}, I_{I5}$	< 2.5	mA
External resistor to GND to set oscillator frequency	RFA, RFB	> 3	k $\Omega$
External resistor to GND to set oscillator swing	RSA, RSB	> 100	$\Omega$
Operating temperature range	$T_{amb}$	0 to +70	°C

## 6. Electrical Characteristics

$V_{CC} = 5\text{ V}$ ,  $T_{amb} = 25^{\circ}\text{C}$ , ENABLE = High, NE2 = NE3 = NE4 = NE5 = High, ENOSC = Low, unless otherwise specified

No.	Parameters	Test Conditions	Pin <sup>(1)</sup>	Symbol	Min.	Typ.	Max.	Unit	Type*
<b>1</b>	<b>Power Supply</b>								
1.1	Supply current, power down	ENABLE = Low, NE2 = NE3 = NE4 = NE5 = Low	11, 12, 22, 23, 24	ICC <sub>PD2</sub>		0.5		mA	A
1.2	Supply current, read mode, oscillator disabled	$I_{IR} = I_{I2} = I_{I3} = I_{I4} = I_{I5} = 500\ \mu\text{A}$	11, 12, 22, 23, 24	ICC <sub>R1</sub>		115		mA	A
1.3	Supply current, read mode, oscillator enabled, output A selected	$I_{IR} = I_{I2} = I_{I3} = I_{I4} = I_{I5} = 500\ \mu\text{A}$ , ENOSC = High, RS = 560 $\Omega$ , RF = 7.5 k $\Omega$ , SELA = High	11, 12, 22, 23, 24	ICC <sub>R2</sub>		120		mA	A
1.4	Supply current, write mode	$I_{IR} = I_{I2} = I_{I3} = I_{I4} = I_{I5} = 500\ \mu\text{A}$ , NE2 = NE3 = NE4 = NE5 = Low	11, 12, 22, 23, 24	ICC <sub>W</sub>		320		mA	A
1.5	Supply current, input off	$I_{IR} = I_{I2} = I_{I3} = I_{I4} = I_{I5} = 0\ \mu\text{A}$	11, 12, 22, 23, 24	ICC <sub>off</sub>		18		mA	A
<b>2</b>	<b>Digital Inputs</b>								
2.1	NE2/NE3/NE4/NE5 low voltage		6, 7, 8, 9	VNE <sub>LO</sub>			1.1	V	A
2.2	NE2/NE3/NE4/NE5 high voltage		6, 7, 8, 9	VNE <sub>HI</sub>	2.0			V	A
2.3	SELA low voltage		14	VSELA <sub>LO</sub>			0.5	V	A
2.4	SELA high voltage		14	VSELA <sub>HI</sub>	2.0			V	A
2.5	ENABLE low voltage		10	VEN <sub>LO</sub>			0.5	V	A
2.6	ENABLE high voltage		10	VEN <sub>HI</sub>	2.0			V	A
2.7	ENOSC low voltage		13	VEO <sub>LO</sub>			0.5	V	A
2.8	ENOSC high voltage		13	VEO <sub>HI</sub>	2.0			V	A
<b>3</b>	<b>Currents at Digital Inputs</b>								
3.1	NE2/NE3/NE4/NE5 low current	NE = 0 V	6, 7, 8, 9	INE <sub>LO</sub>	-300			$\mu\text{A}$	A
3.2	NE2/NE3/NE4/NE5 high current	NE = 5 V	6, 7, 8, 9	INE <sub>HI</sub>			800	$\mu\text{A}$	A
3.3	SELA low current	SELA = 0 V	14	ISELA <sub>LO</sub>	-45			$\mu\text{A}$	A
3.4	SELA high current	SELA = 5 V	14	ISELA <sub>HI</sub>			150	$\mu\text{A}$	A
3.5	ENABLE low current	ENABLE = 0 V	10	IEN <sub>LO</sub>	-150			$\mu\text{A}$	A
3.6	ENABLE high current	ENABLE = 5 V	10	IEN <sub>HI</sub>			100	$\mu\text{A}$	A
3.7	ENOSC low current	ENOSC = 0 V	13	IEO <sub>LO</sub>	-100			$\mu\text{A}$	A
3.8	ENOSC high current	ENOSC = 5 V	13	IEO <sub>HI</sub>			800	$\mu\text{A}$	A

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

Note: 1. Related to QFN28 Package

## 7. Electrical Characteristics: Laser Amplifier

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

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
<b>4</b>	<b>Outputs IOUTA and IOUTB</b>								
4.1	Best fit current gain	Any channel <sup>(1)</sup>	15, 16, 20, 21	GAIN	90	100	130	mA/mA	A
4.2	Best fit current offset	Any channel <sup>(1)</sup>	15, 16, 20, 21	IOS	-8		+4	mA	A
4.3	Output current linearity	Any channel <sup>(1)</sup>	15, 16, 20, 21	ILIN	-3		+3	%	A
4.5	Output current per channel	Output is sourcing	15, 16, 20, 21	$I_{OUTR}$	200			mA	A
4.6	Total output current		15, 16, 20, 21	$I_{OUT}$	250			mA	A
4.7	$I_{IN}$ input impedance	$R_{IN}$ is to GND	1, 2, 26, 27, 28	$R_{IN}$	170	220	270	$\Omega$	A
4.8	NE threshold	Temperature stabilized	6, 7, 8, 9	VTH		1.68		V	C
4.9	Output off current 1	ENABLE = Low	15, 16, 20, 21	$I_{OFF1}$			1	mA	A
4.10	Output off current 2	NE2 = NE3 = NE4 = NE5 = High	15, 16, 20, 21	$I_{OFF2}$			1	mA	A
4.11	Output off current 3	NE2 = NE3 = NE4 = NE5 = Low, $I_{IR} = I_{I2} = I_{I3} = I_{I4} = I_{I5} =$ 0 $\mu\text{A}$	15, 16, 20, 21	$I_{OFF3}$			5	mA	A
4.12	$I_{OUT}$ supply sensitivity, read mode	$I_{OUT} = 40\text{ mA}$ , $V_{CC} = 5\text{ V} \pm 10\%$ , read-only	15, 16, 20, 21	$VSE_R$	-5		1	%V	A
4.13	$I_{OUT}$ supply sensitivity, write mode	$I_{OUT} = 80\text{ mA}$ , 40 mA read + 40 mA write, $V_{CC} = 5\text{ V} \pm 10\%$	15, 16, 20, 21	$VSE_W$	-6		0	%V	A
4.14	$I_{OUT}$ current output noise	$I_{OUT} = 40\text{ mA}$ , ENOSC = Low	15, 16, 20, 21	$INO_O$		3		nA/ rt-Hz	C
4.15	$I_{OUT}$ temperature sensitivity, read mode	$I_{OUT} = 40\text{ mA}$ , read only	15, 16, 20, 21	$TSE_R$		-100		ppm/ $^\circ\text{C}$	C
4.16	$I_{OUT}$ temperature sensitivity, write mode	$I_{OUT} = 80\text{ mA}$ , 40 mA read + 40 mA write	15, 16, 20, 21	$TSE_W$		-300		ppm/ $^\circ\text{C}$	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  $I_{OUT}$  at 20 mA, 40 mA, and 60 mA,  $I_{OUT} = (I_{IN} \times \text{GAIN}) + I_{OS}$

## 8. Electrical Characteristics

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

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
<b>5</b>	<b>Outputs IOUTA and IOUTB, AC Performance</b>								
5.1	Write rise time	$I_{OUT} = 40\text{ mA}$ (read) +40 mA (10%-90%) <sup>(1)</sup>	15, 16, 20, 21	$t_{RISE}$		1.0	3.0	ns	C
5.2	Write fall time	$I_{OUT} = 40\text{ mA}$ (read) +40 mA (10%-90%) <sup>(1)</sup>	15, 16, 20, 21	$t_{FALL}$		1.1	3.0	ns	C
5.3	Output current overshoot	$I_{OUT} = 40\text{ mA}$ (read) + 40 mA <sup>(1)</sup>	15, 16, 20, 21	OS		5		%	C
5.4	$I_{OUT}$ ON prop delay	NE 50% High-Low to $I_{OUT}$ at 50% of final value	15, 16, 20, 21	$t_{ON}$		2.0		ns	C
5.5	$I_{OFF}$ OFF prop delay	NE 50% Low-High to $I_{OUT}$ at 50% of final value	15, 16, 20, 21	$t_{OFF}$		2.0		ns	C
5.6	Disable time	ENABLE 50% High-Low to $I_{OUT}$ at 50% of final value	15, 16, 20, 21	$t_{DIS}$		20		ns	C
5.7	Enable time	ENABLE 50% Low-High to $I_{OUT}$ at 50% of final value	15, 16, 20, 21	$t_{EN}$		20		ns	C
5.8	Disable time oscillator	ENOSC 50% Low-High to $I_{OUT}$ at 50% of final value	15, 16, 20, 21	$T_{DISO}$		4		ns	C
5.9	Enable time oscillator	ENOSC 50% High-Low to $I_{OUT}$ at 50% of final value	15, 16, 20, 21	$T_{ENO}$		2		ns	C
5.10	SELA delay	SELA Low-High 50% to $I_{OUT}$ at 50% of final value	15, 16, 20, 21	$T_{SAH}$		TBD		ns	C
5.11	SELA delay	SELA High-Low 50% to $I_{OUT}$ at 50% of final value	15, 16, 20, 21	$T_{SAL}$		TBD		ns	C
5.12	Amplifier bandwidth	$I_{OUT} = 50\text{ mA}$ , all channels, -3 dB value	15, 16, 20, 21	$BW_{LCA}$		20		MHz	C
<b>6</b>	<b>Oscillator</b>								
6.1	Oscillator frequency	$R_F = 4.7\text{ k}\Omega$	15, 16, 20, 21	$F_{OSC}$	380	470	560	MHz	A
6.2	Oscillator temperature coefficient	$R_F = 4.7\text{ k}\Omega$	15, 16, 20, 21	$TC_{OSC}$		-150		ppm/ $^{\circ}\text{C}$	C
6.3	Disable time oscillator	ENOSC 50% High-Low to $I_{OUT}$ , at 10%/90% of final value	15, 16, 20, 21	$T_{DISO}$		4		ns	C
6.4	Enable time oscillator	ENOSC 50% Low-High to $I_{OUT}$ , at 10%/90% of final value	15, 16, 20, 21	$T_{ENO}$		2		ns	C

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



## 9. Application Information Oscillator

Figure 9-1. Frequency versus Resistor RFA and RFB (RS = 525 Ω)

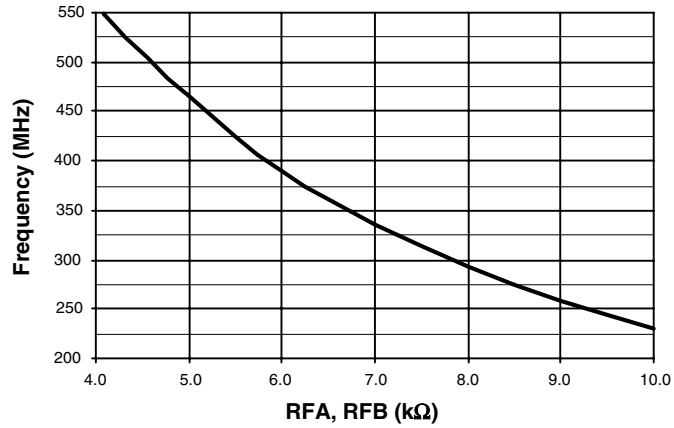


Figure 9-2. Swing versus Resistor RSA and RSB (RF = 7.82 kΩ)

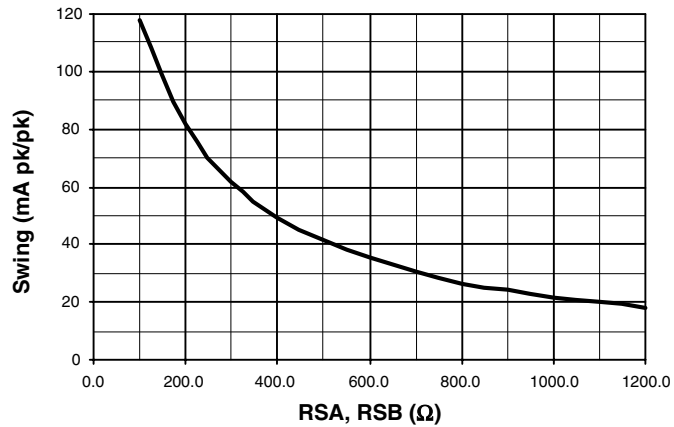
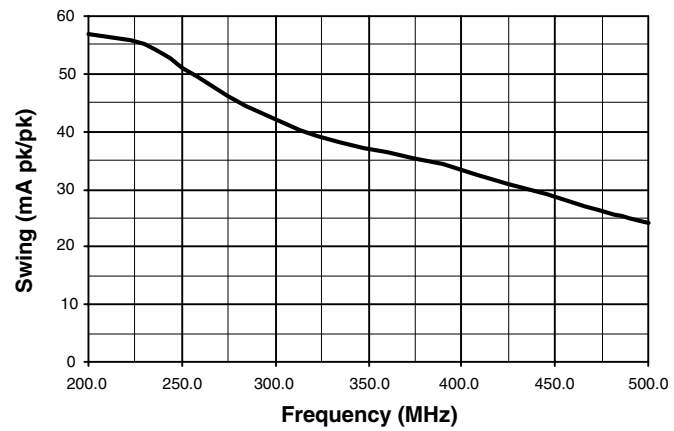
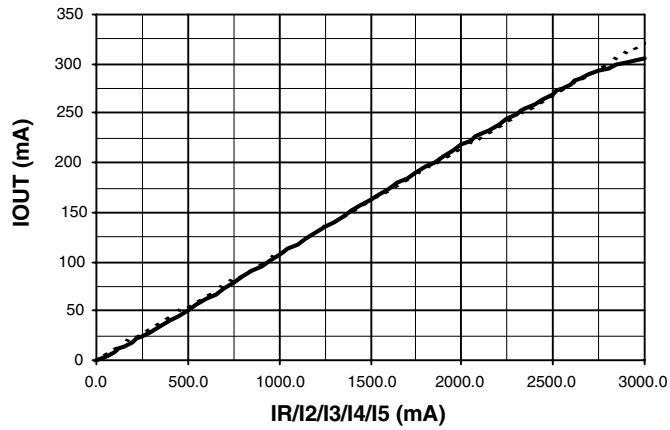


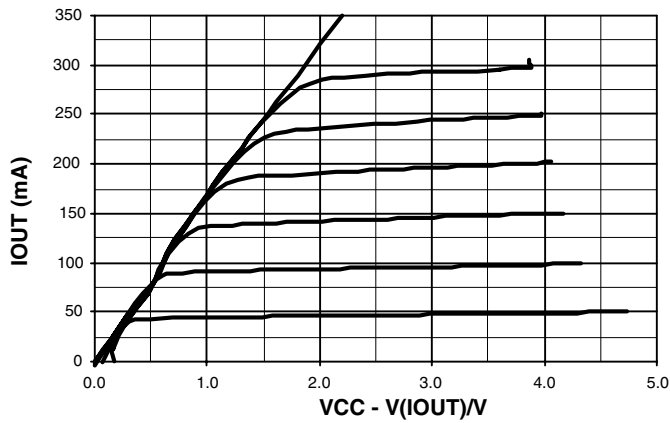
Figure 9-3. Frequency Dependency of Swing



**Figure 9-4.** Transfer Characteristic of all Channels (Gain = 111)



**Figure 9-5.** Output Characteristic (Voltage Compliance)  $R(IOUT) = 5.8 \Omega$



**Figure 9-6.** Output Pulse, Read: 50 mA, Write: 250 mA pk-pk

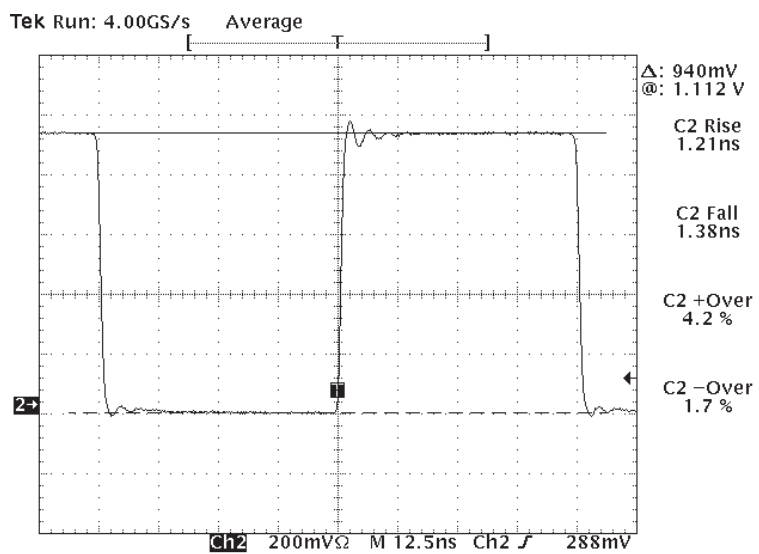


Figure 9-7. Timing Diagram of IOUT

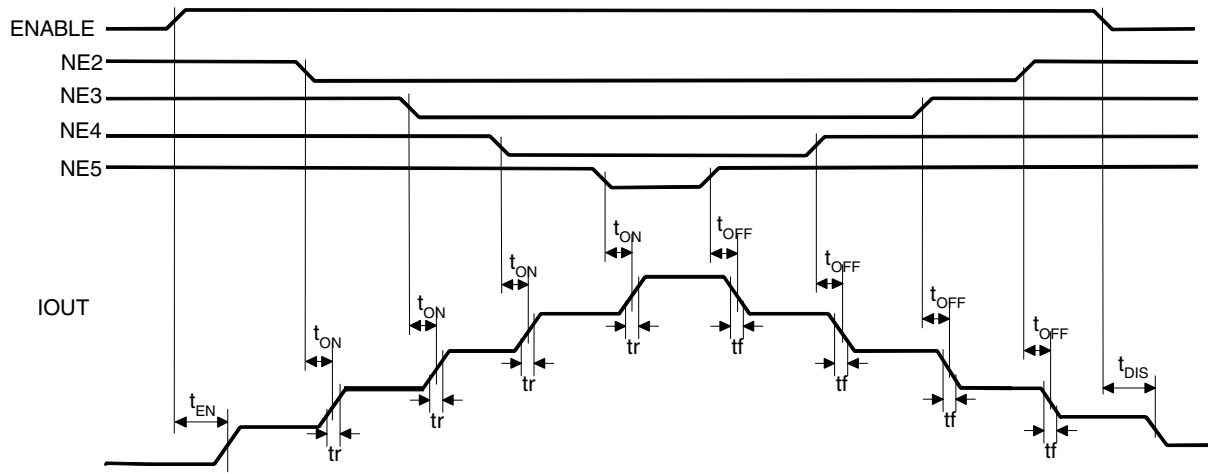
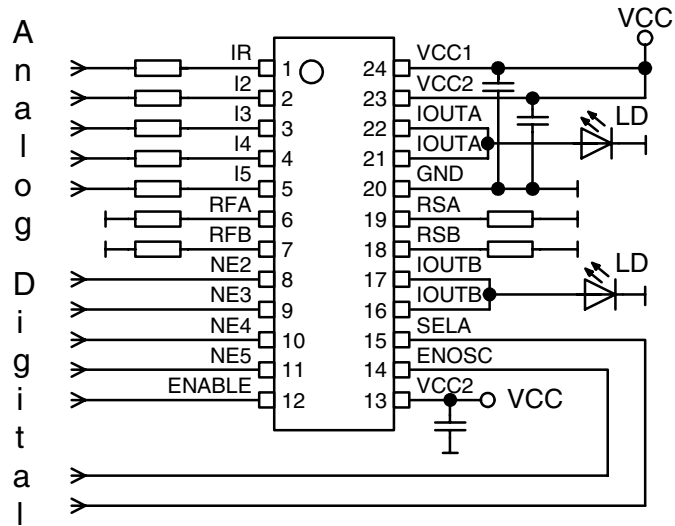


Figure 9-8. Application Circuit

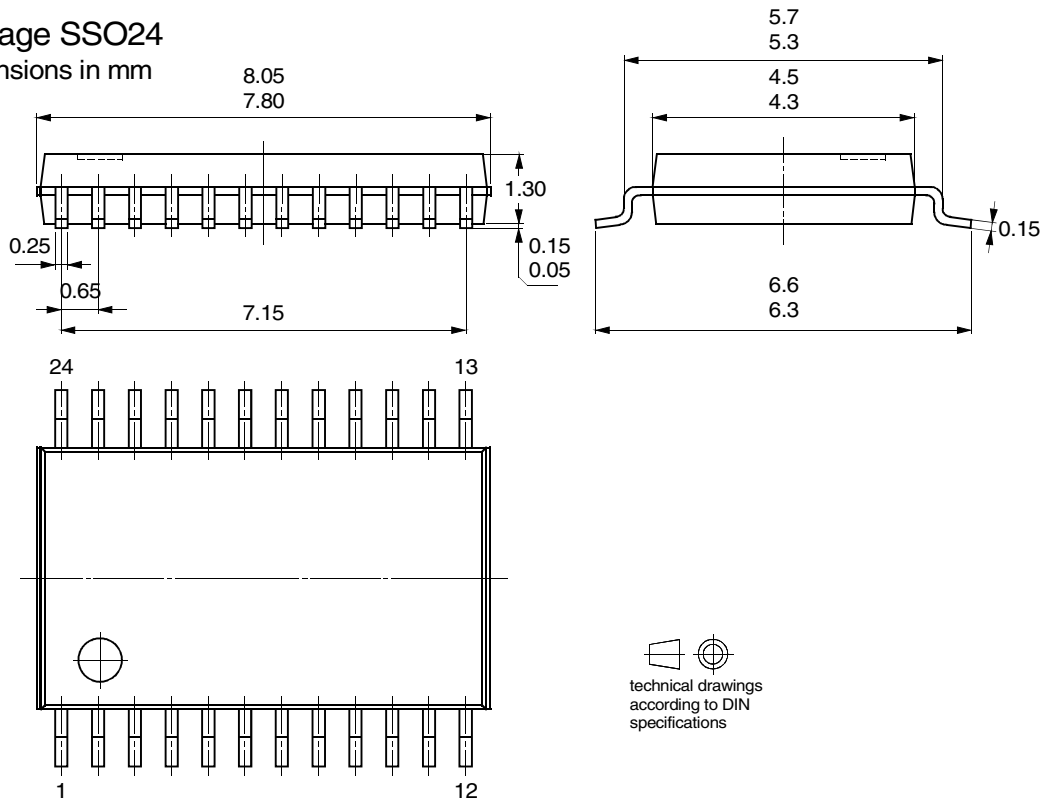


## 10. Ordering Information

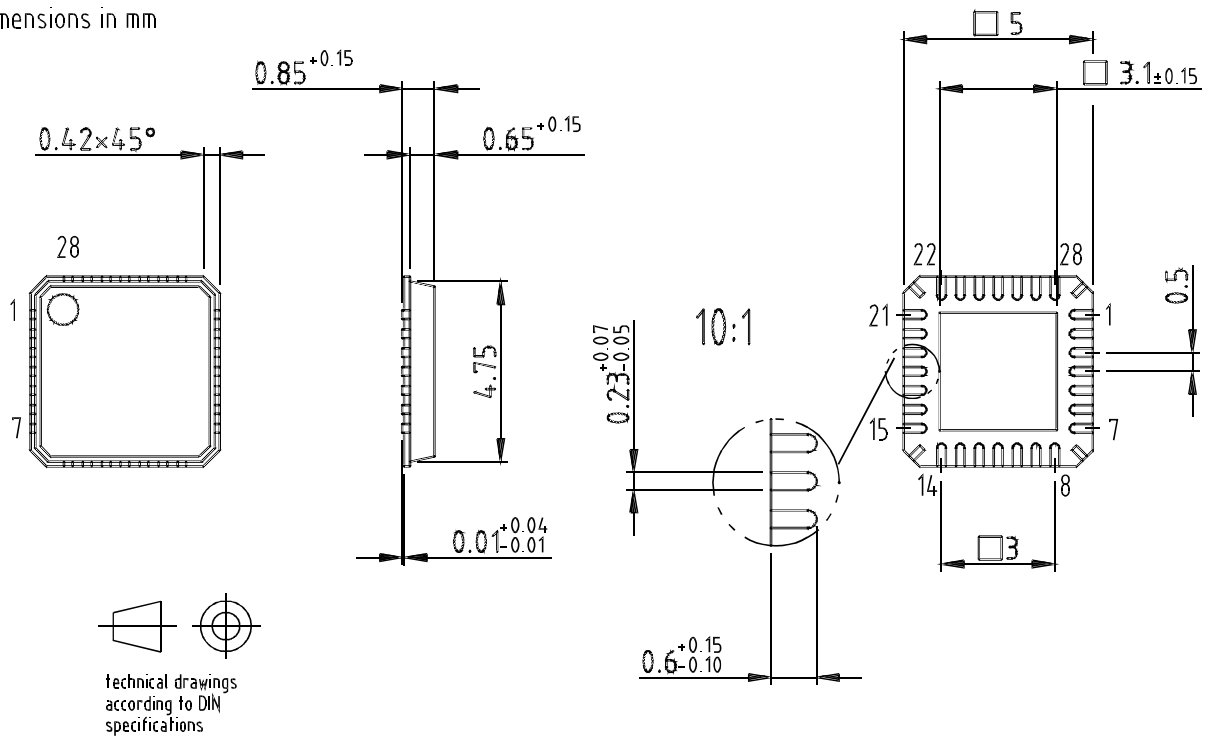
Extended Type Number	Package	Remarks
T0800-TNQ	SSO24	Taped and reeled
T0800-PJQ	QFN28	Taped and reeled

## 11. Package Information

Package SSO24  
Dimensions in mm



Package: QFN 28 - 5x5  
 Exposed pad 3.1x3.1  
 (acc. JEDEC OUTLINE No. MO-220)  
 Dimensions in mm



Drawing-No.: 6.543-5081.01-4  
 Issue: 3; 24.01.03



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1150 East Cheyenne Mtn. Blvd.  
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