TPMCP6001UT-I/OT

1MHz, 1.8V, CMOS, Rail-to-Rail Operational Amplifier

www.sot23.com.tw

General Description

THis Production is a single supply, low power CMOS operational amplifier; these amplifiers offer bandwidth of 1MHz, rail-to-rail inputs and outputs, and single-supply operation from 1.8V to 5.5V. Typical low quiescent supply current of 55μA in one operational amplifier within one chip and very low input bias current of 10pA make the devices an ideal choice for low offset, low power consumption and high impedance applications such as smoke detectors, photodiode amplifiers, and other sensors.

THis Production is available in SOT23-5L packages.

The extended temperature range of -40 ℃ to +125 ℃ over all supply voltages offers additional design flexibility.

Features

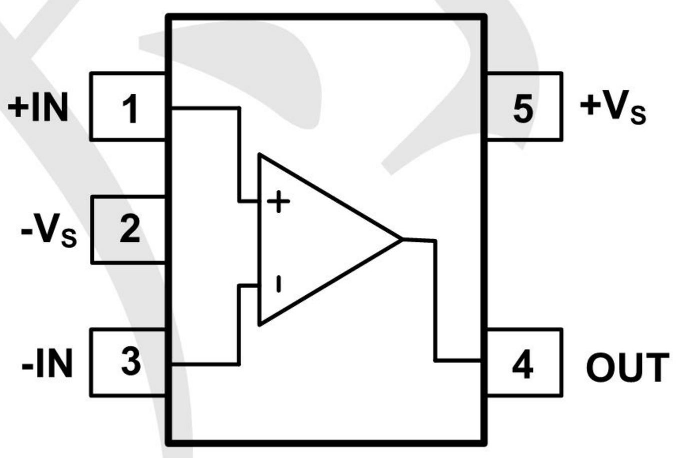
- Single-Supply Operation from +1.8V ~ +5.5V
- Rail-to-Rail Input / Output
- Gain-Bandwidth Product: 1MHz (Typ.)
- Low Input Bias Current: 10pA (Typ.)
- Low Offset Voltage: 5mV (Max.)
- Quiescent Current: 55μA per Amplifier (Typ.)
- Operating Temperature: -40℃ ~ +125℃
- Available in SOT23-5L Packages
- Shipping Qty : 3000pcs/7Inch Tape & Reel

Applications

- Portable Equipment
- Smoke Detector
- Medical Instrumentation
- Battery-Powered Instruments
- Mobile Communications
- Sensor Interface
- Handheld Test Equipment

Pin Assignments

SOT23- 5



SOT23-5

Electrical Characteristics

Absolute Maximum Ratings

Condition	Min	Max
Power Supply Voltage (V_{DD} to Vss)	-0.5V	+7V
Analog Input Voltage (IN+ or IN-)	Vss-0.5V	V_{DD}+0.5V
PDB Input Voltage	Vss-0.5V	+7V
Operating Temperature Range	-40℃	+125℃
Junction Temperature	+150℃	
Storage Temperature Range	-65℃	+150℃
Lead Temperature (soldering, 10sec)	+300℃	
Package Thermal Resistance (T_A=+25℃)		
SOT23-5L, θ_{JA}	190℃	
SOP-8L, θ_{JA}	130℃	

Electrical Characteristics

(V_{DD} = +5V, Vss = 0V, V_{CM} = 0V, V_{OUT} = V_{DD}/2, R_L=100K tied to V_{DD}/2, SHDNB = V_{DD}, T_A = -40℃ to +125℃, unless otherwise noted. Typical values are at T_A =+25℃.) (Notes 1)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Supply-Voltage Range	V_{DD}	Guaranteed by the PSRR test	1.8	-	5.5	V
Quiescent Supply Current (per Amplifier)	I_Q	V_{DD} = 5V	-	55	80	μA
Input Offset Voltage	V_{OS}		-	0.5	±5	mV
Input Offset Voltage Tempco	$\Delta V_{OS}/\Delta T$		-	2	-	μV/℃
Input Bias Current	I_B	(Note 2)	-	10	-	pA
Input Offset Current	I_{OS}	(Note 2)	-	10	-	pA
Input Common-Mode Voltage Range	V_{CM}		-0.1	-	V_{DD}+0.1	V
Common-Mode Rejection Ratio	CMRR	V_{DD}=5.5 Vss-0.1V≦V_{CM}≦V_{DD}+0.1V	60	75	-	dB
		Vss≦V_{CM}≦5V	65	80	-	dB
Power-Supply Rejection Ratio	PSRR	V_{DD} = +1.8V to +5.5V	75	90	-	dB
Open-Loop Voltage Gain	A_V	V_{DD}=5V, R_L=100kΩ, 0.05V≦V_O≦4.95V	90	100	-	dB
		V_{DD}=5V, R_L=5kΩ, 0.05V≦V_O≦4.95V	65	75	-	dB
Output Voltage Swing	V_{OUT}	|V_{IN+}-V_{IN-}|≧10mV V_{DD}-V_{OH}	-	6	-	mV
		R_L = 100kΩ to V_{DD}/2 V_{OL}-V_{SS}	-	6	-	mV
		|V_{IN+}-V_{IN-}|≧10mV V_{DD}-V_{OH}	-	60	-	mV
		R_L = 5kΩ to V_{DD}/2 V_{OL}-V_{SS}	-	60	-	mV
Output Short-Circuit Current	I_{SC}	Sinking or Sourcing	-	±20	-	mA
Gain Bandwidth Product	GBW	A_V = +1V/V	-	1	-	MHz
Slew Rate	SR	A_V = +1V/V	-	0.6	-	V/μs
Settling Time	ts	To 0.1%, V_{OUT} = 2V step A_V = +1V/V	-	5	-	μs
Over Load Recovery Time		V_{INX} Gain=Vs	-	2	-	μs
Input Voltage Noise Density	e_n	f = 1kHz	-	50	-	nV/√Hz
		f = 10kHz	-	20	-	nV/√Hz

Note 1: All devices are 100% production tested at T_A = +25℃; all specifications over the automotive temperature range is guaranteed by design, not production tested.

Note 2: Parameter is guaranteed by design.

		R_L = 500Ω to $V_{DD}/2$ V_{OL}-V_{SS}		80	260	
Output Short-Circuit Current	I_{SC}	Sinking or Sourcing	-	±50	-	mA
PDB Logic Low	V_{IL}		-	-	0.8	V
PDB Logic High	V_{IH}		2	-	-	V
Turn-On Time	T_{ON}		-	2.2	-	μs
Turn-Off Time	T_{OFF}		-	0.8	-	μs
Output Leakage Current	I_{LEAK}	Shutdown Mode (PDB = V_{SS}), V_{OUT} = V_{SS} to V_{DD}	-	±0.001	±1.0	μA
Input Capacitance	C_{IN}			10		pF
Gain Bandwidth Product	GBW	A_V = +1V/V	-	10	-	MHz
Slew Rate	SR	A_V = +1V/V	-	4.5	-	V/μs
Full Power Bandwidth		Av = +1V/V	-	0.4	-	MHz
Phase Margin	φ_m	Av = +1V/V	-	55	-	deg
Gain Margin	G_m	Av = +1V/V	-	12	-	dB
Settling Time	ts	To 0.01%, V_{OUT} = 2V step A_V = +1V/V	-	1	-	μs
Capacitive-Load Stability	C_{LOAD}	No sustained oscillations. A_V = +1V/V	-	200	-	pF
Peak-to-Peak Input Noise Voltage (Note 5)	e_n(p-p)	f = 0.1Hz to 10Hz	-	5	-	μVp-p
Input Voltage Noise Density	e_n	f = 10Hz f = 1kHz f = 30kHz	- - -	60 30 15	- - -	nV/√Hz
Input Current Noise Density	i_n	f = 1kHz				fA/√Hz
Total Harmonic Distortion plus Noise	THD+N	V_{OUT} = 2Vp-p, A_V = +1V/V, f = 1kHz RL = 10kΩ to GND f = 20kHz V_{OUT} = 2Vp-p, A_V = +1V/V, f = 1kHz RL = 1kΩ to GND f = 20kHz	- - - -	0.0001 0.002 0.0002 0.004	- - - -	%

Note 1: All devices are 100% production tested at TA = +25℃; all specifications over the automotive temperature range is guaranteed by design, not production tested.

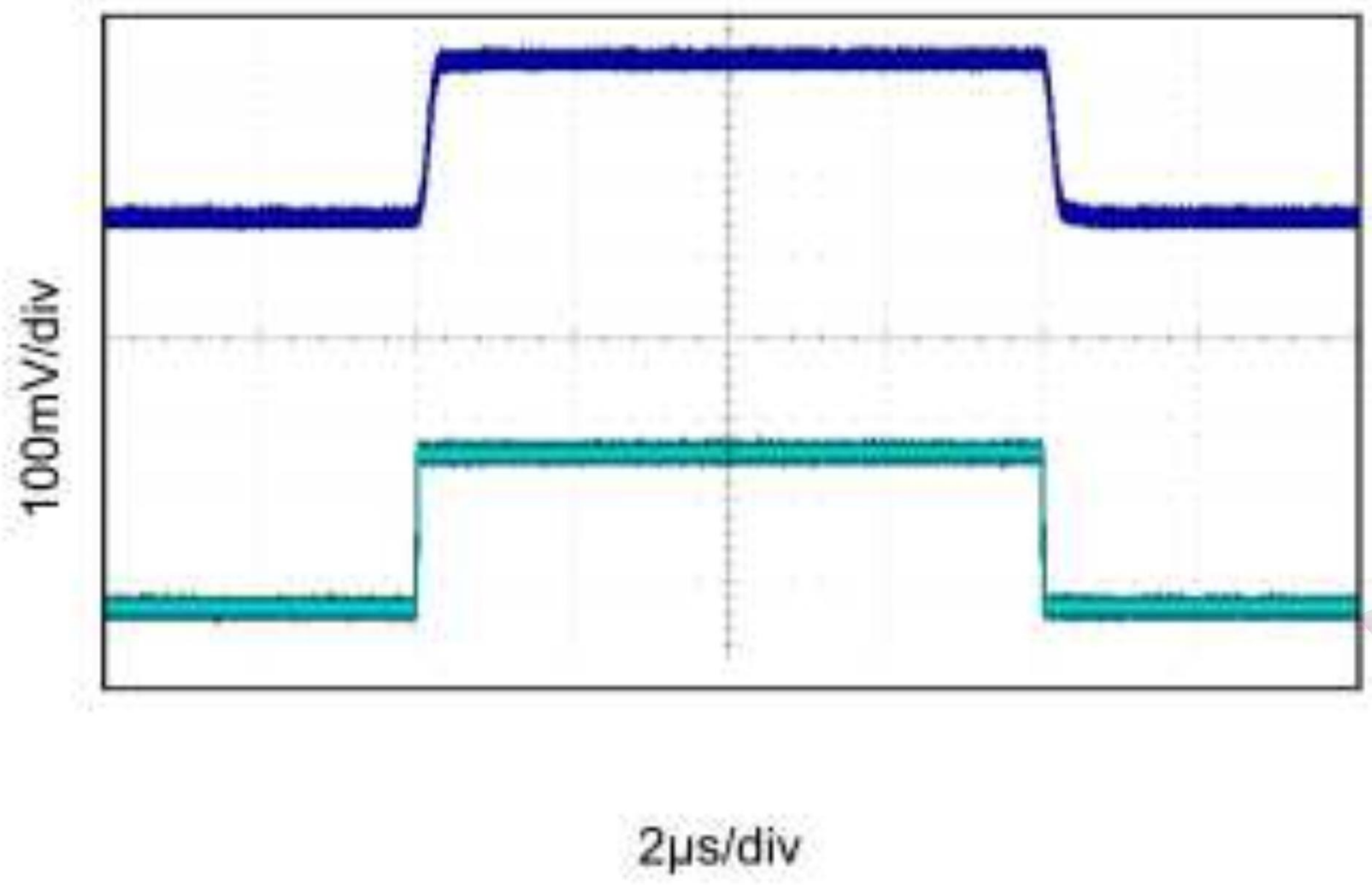
Note 2: Parameter is guaranteed by design.

Note 3: Peak-to-peak input noise voltage is defined as six times RMS value of input noise voltage.

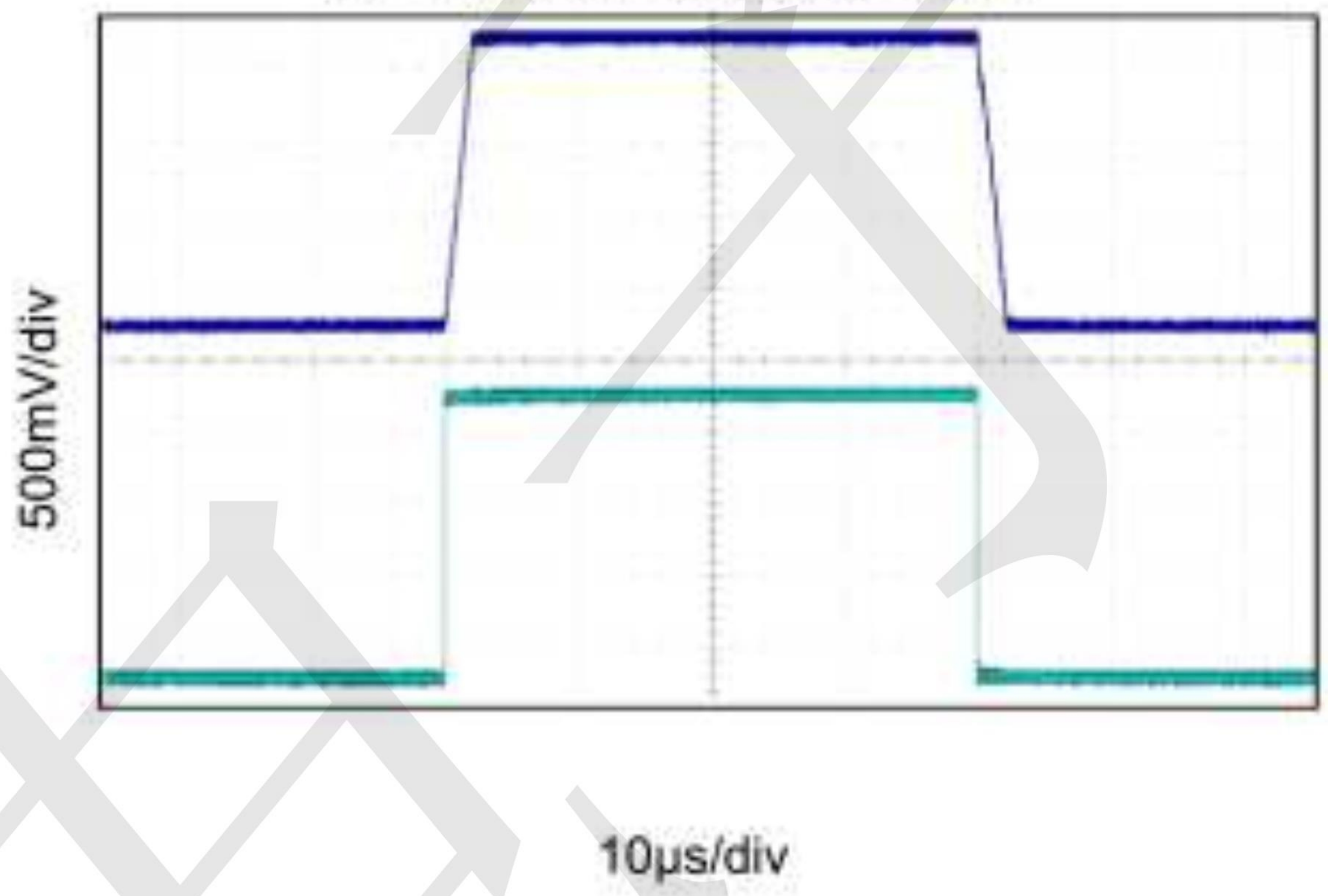
Typical characteristics

At T_A=+25℃, R_L=100 kΩ connected to V_S/2 and V_{OUT}= V_S/2, unless otherwise noted.

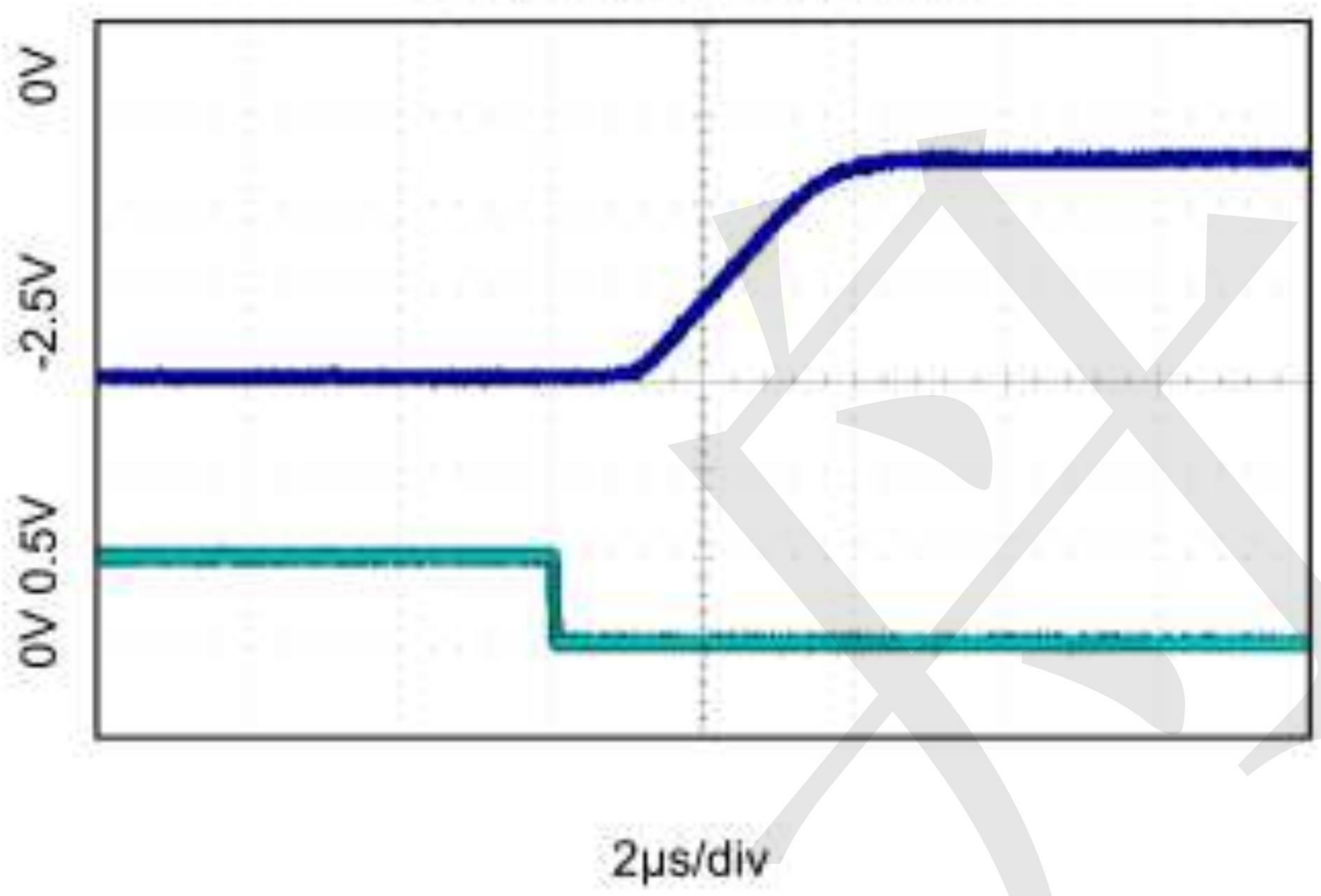
Small Signal Step Response
G=+1V/V,R_L=100kΩ,C_L=100pF



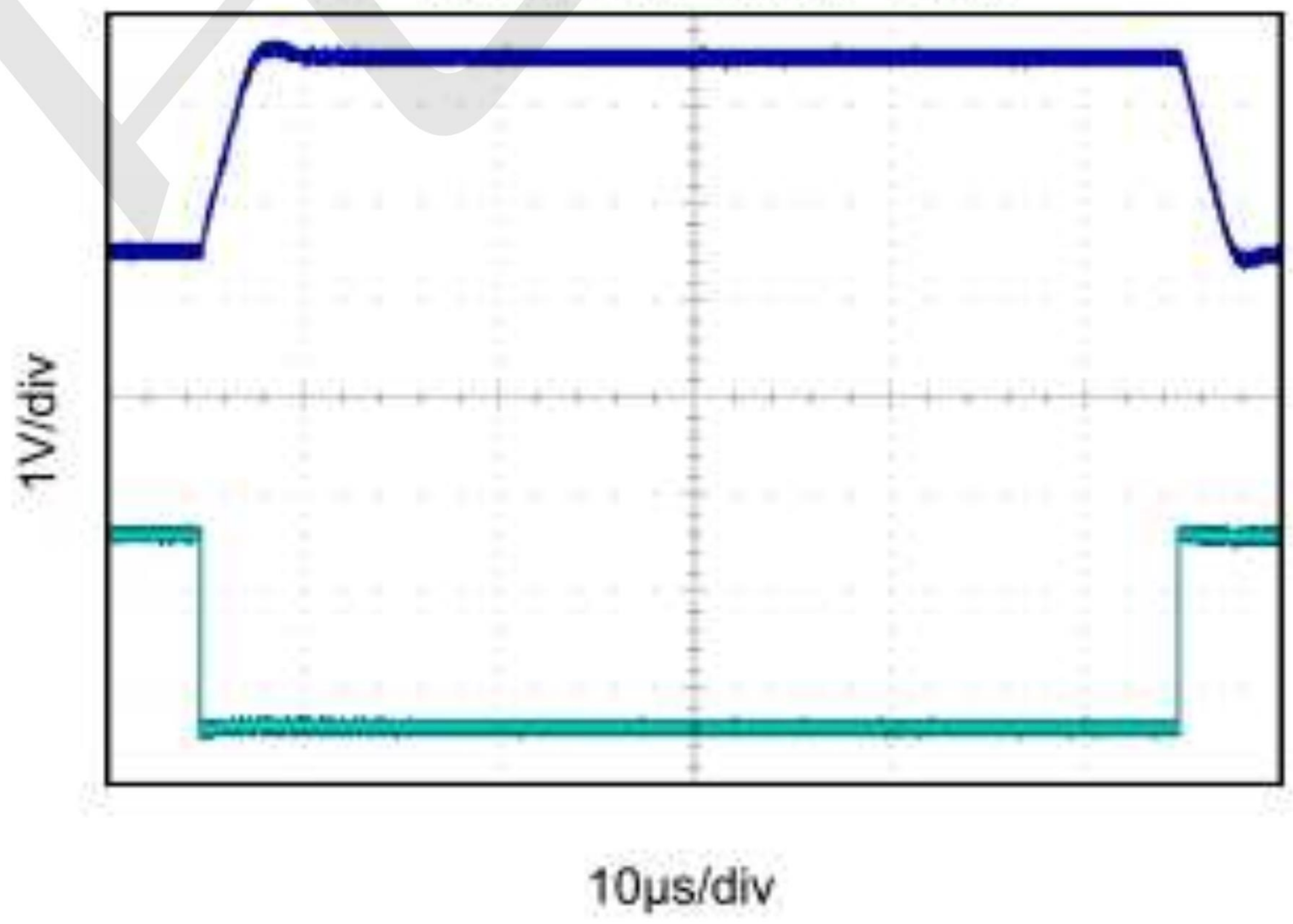
Large Signal Step Response
G=+1V/V,R_L=100kΩ,C_L=100pF



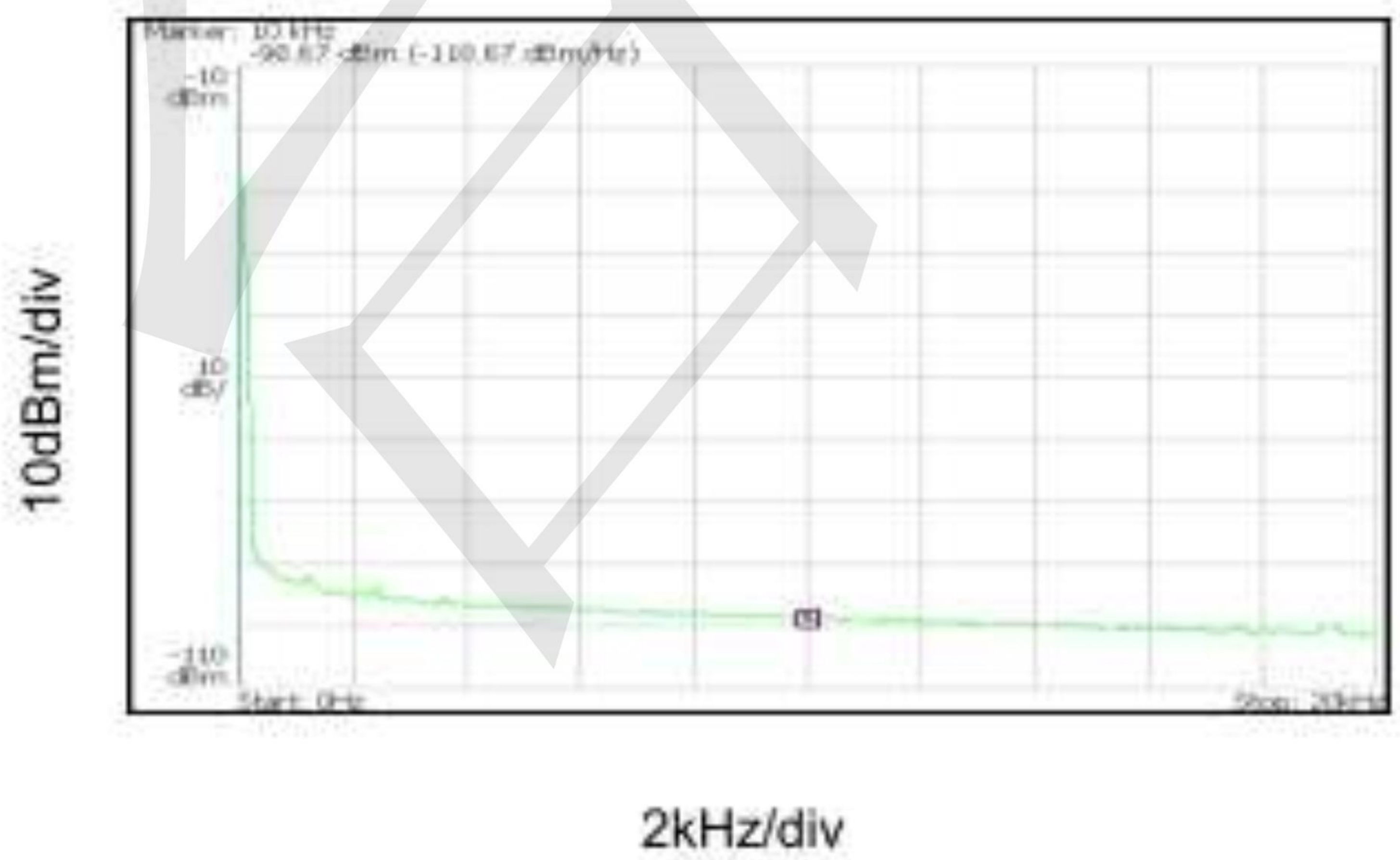
Overload Recovery Time



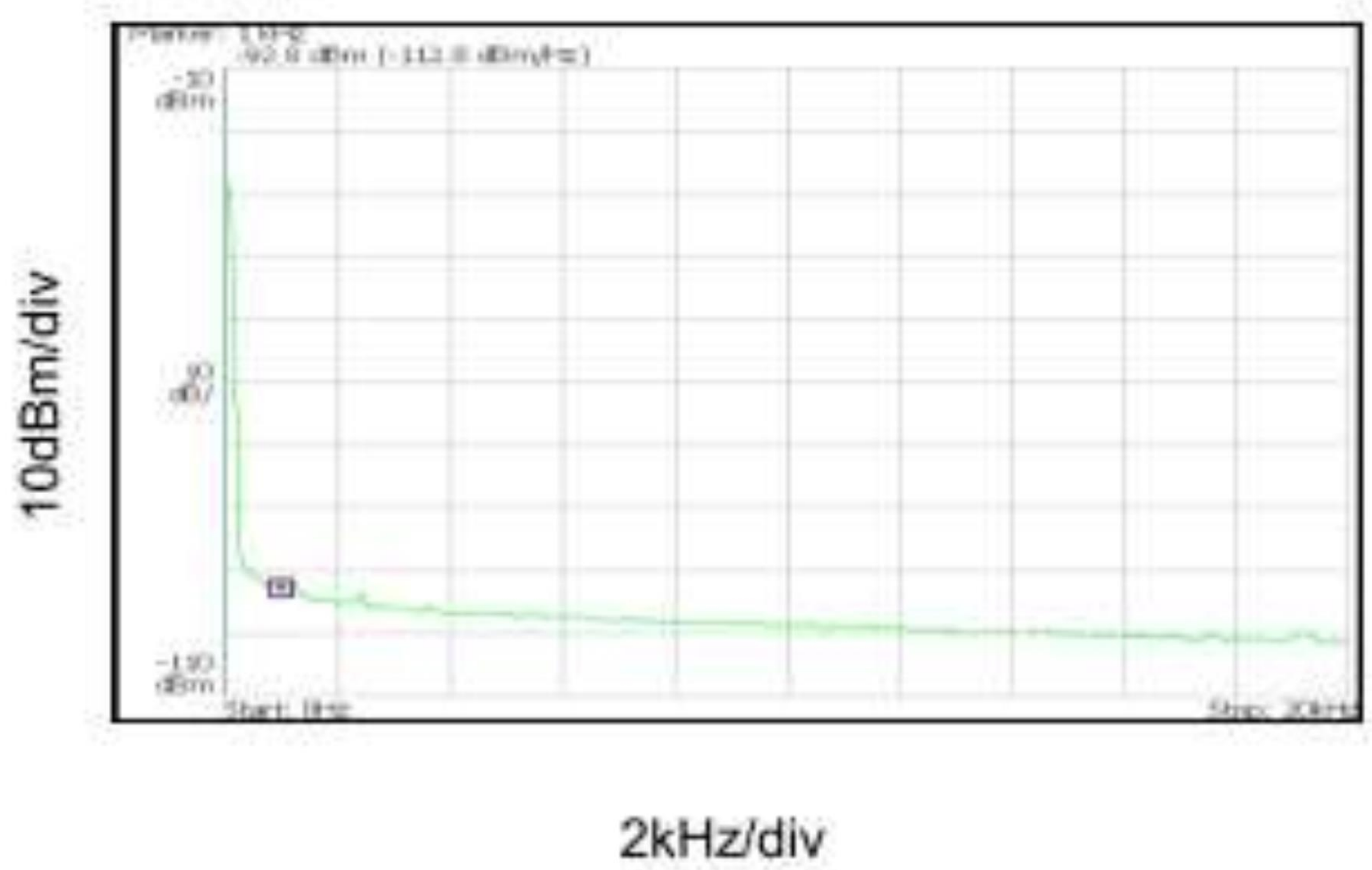
Large Signal Step Response
G=-1V/V,R_L=100 kΩ,C_L=100pF



Input Voltage noise Spectral Density VS. Frequency
Noise Gain=+10,V_n=26(nV/√HZ)@10kHz

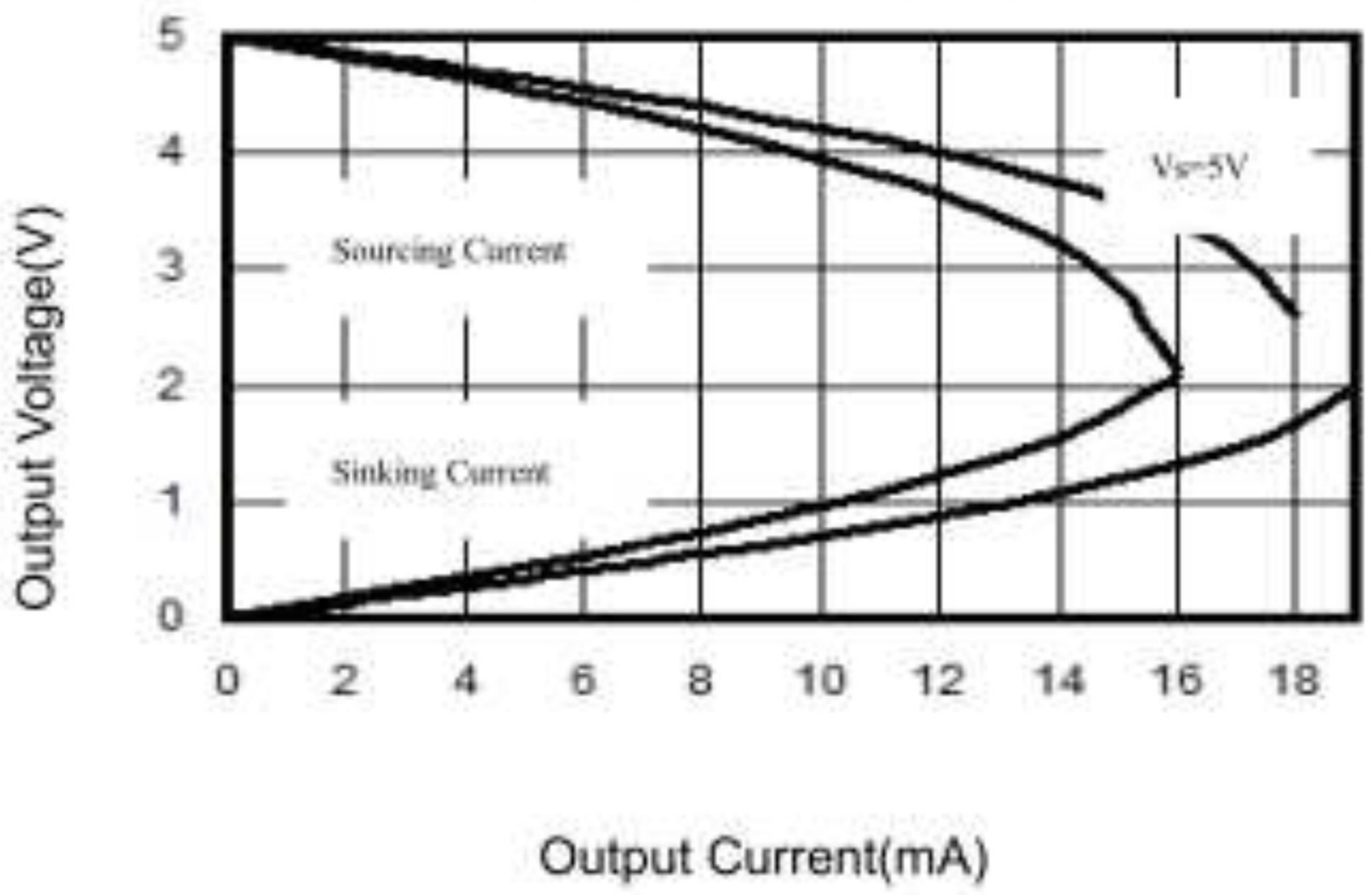


Input Voltage noise Spectral Density VS. Frequency
Noise Gain=+10,V_n=51(nV/√HZ)@1kHz

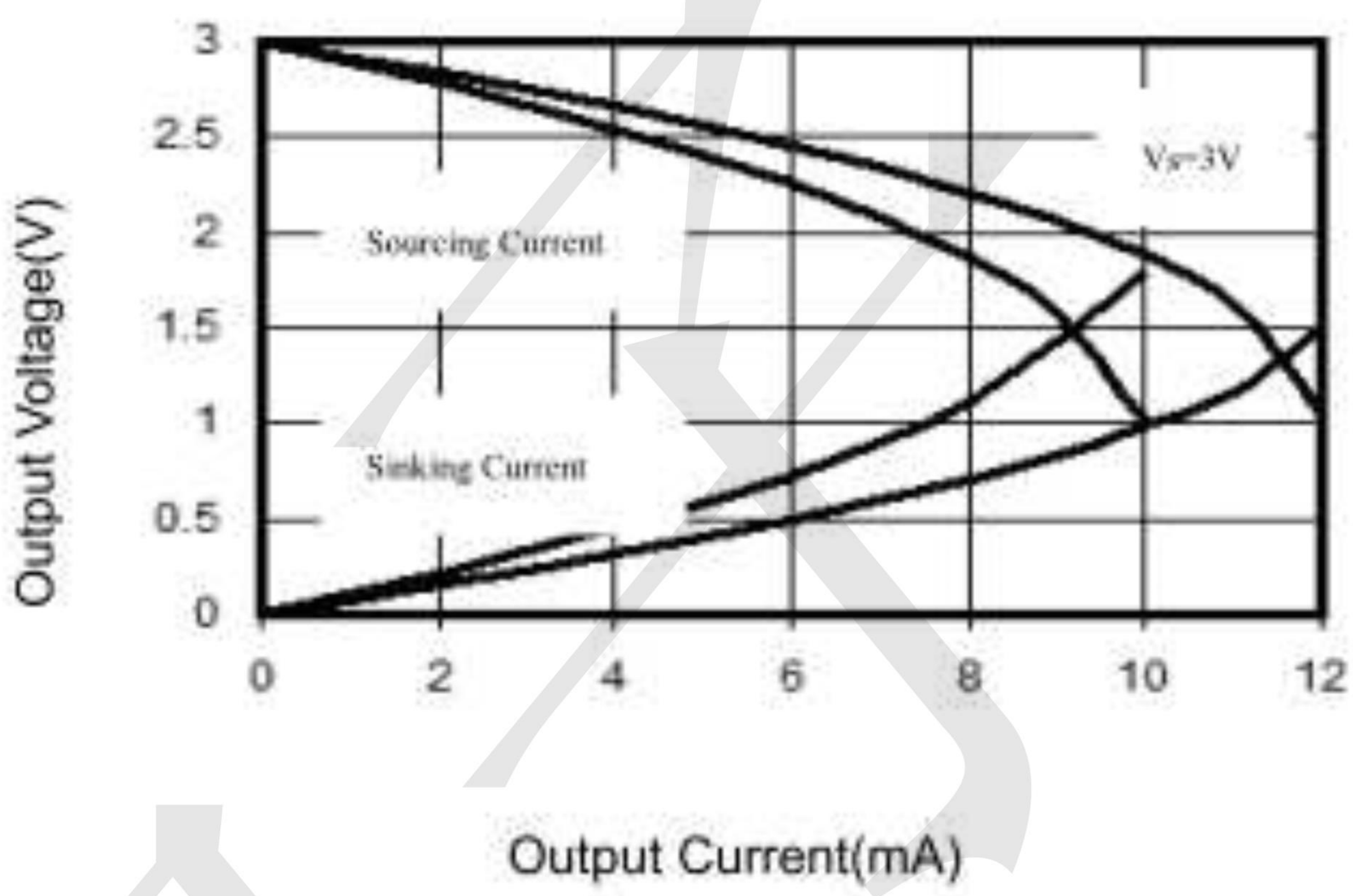


At T_A=+25℃, R_L=100 kΩ connected to V_S/2 and V_{OUT}= V_S/2, unless otherwise noted.

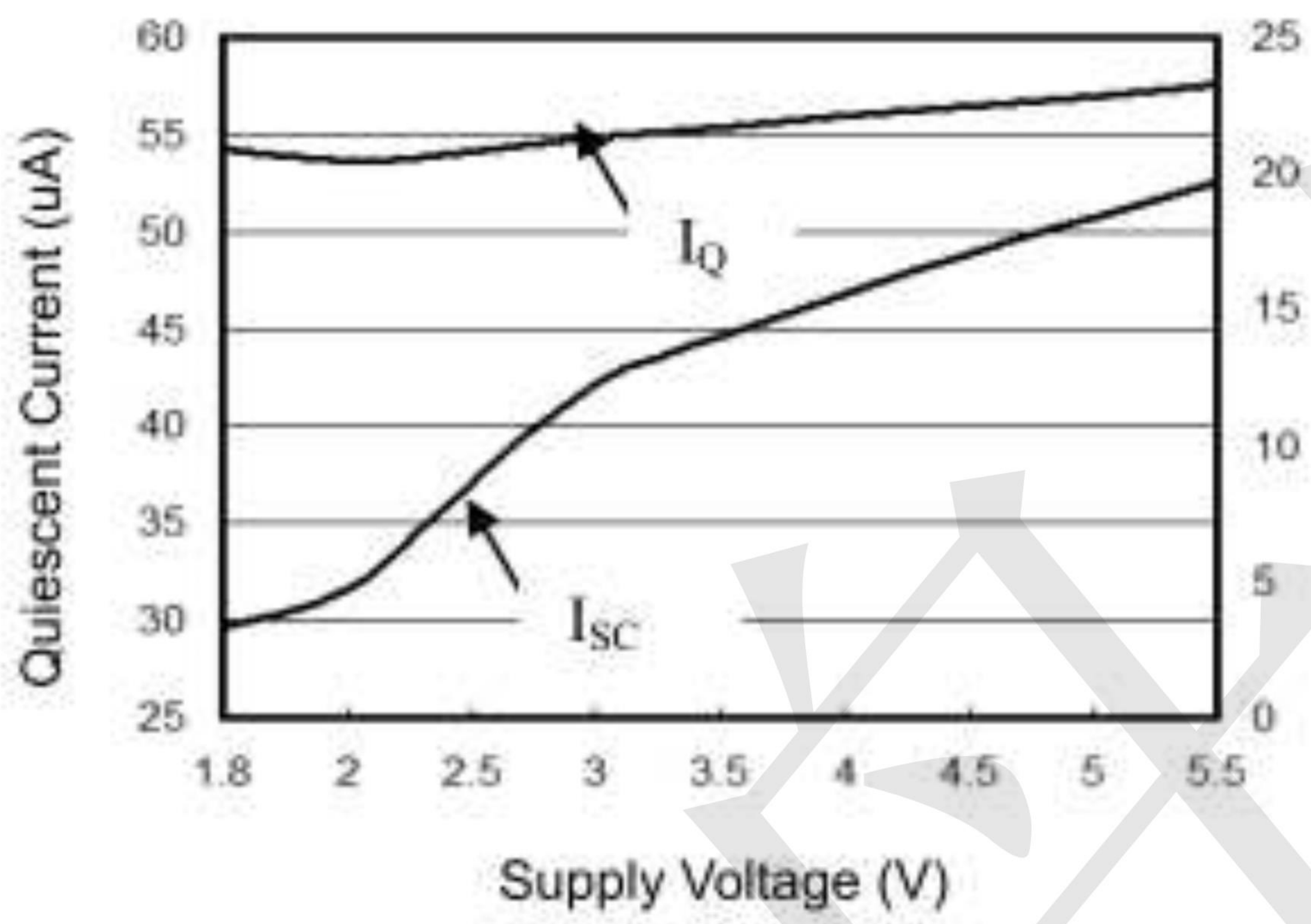
Output Voltage Swing vs. Output Current



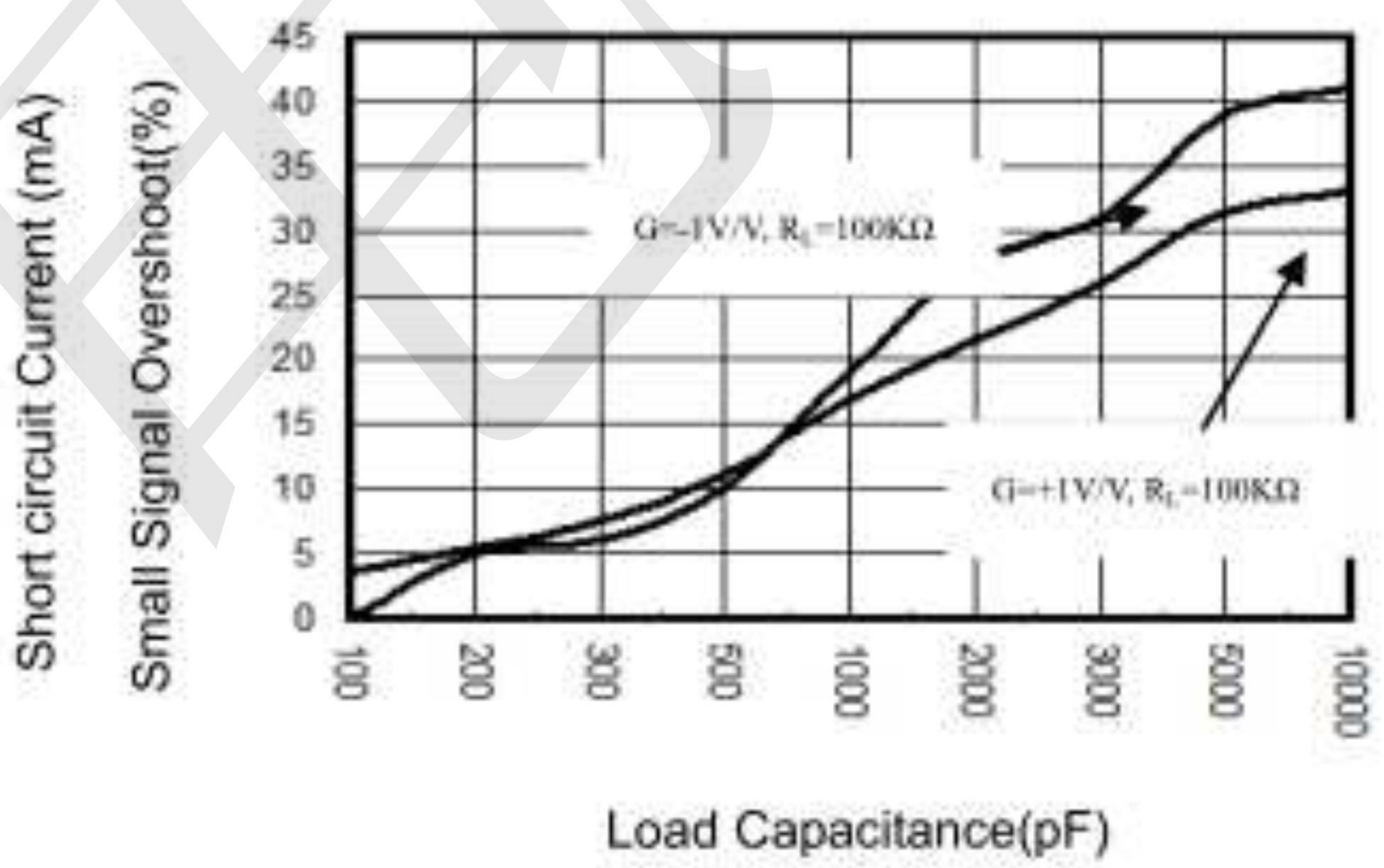
Output Voltage Swing vs. Output Current



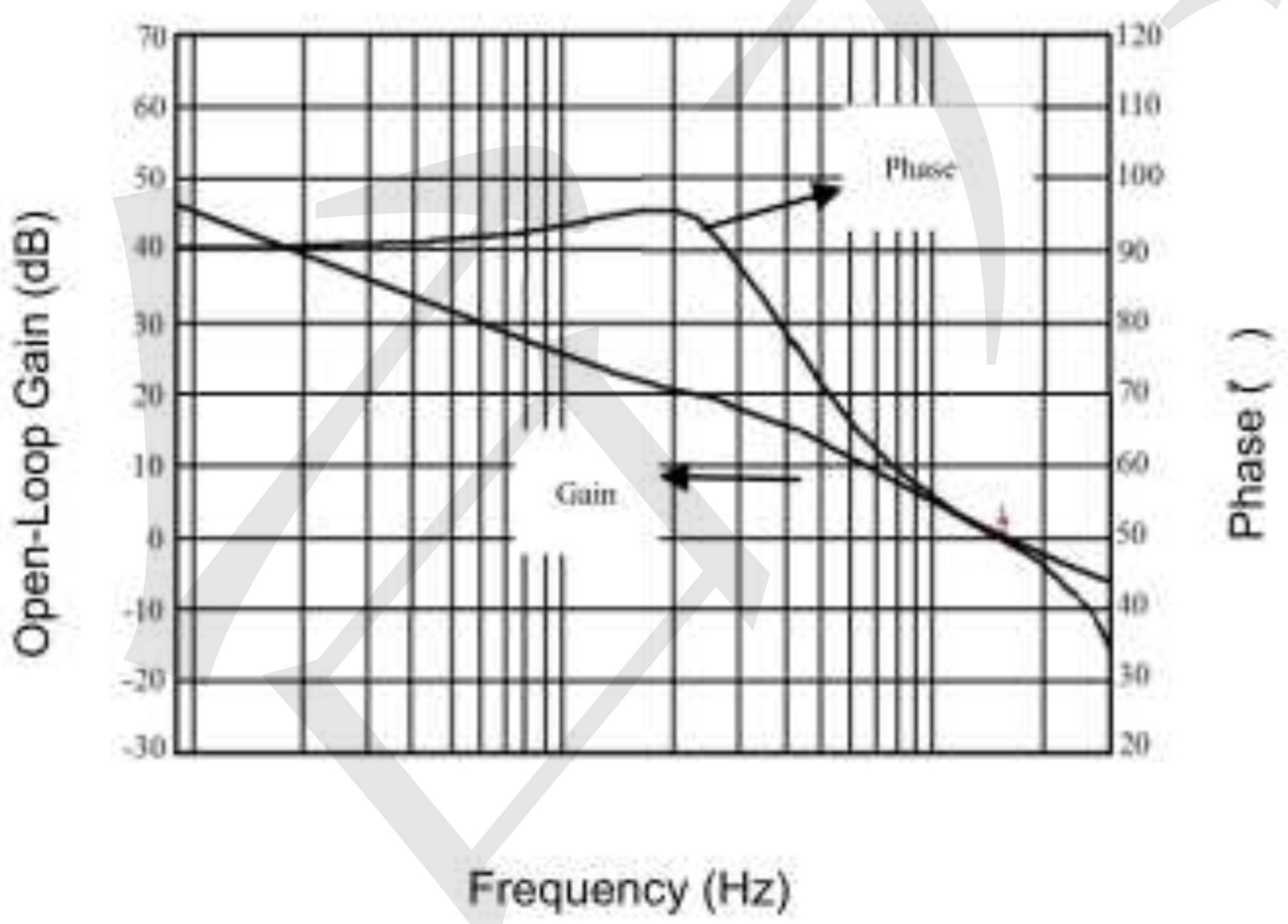
Quiescent and Short-Circuit Current Vs. Supply Voltage



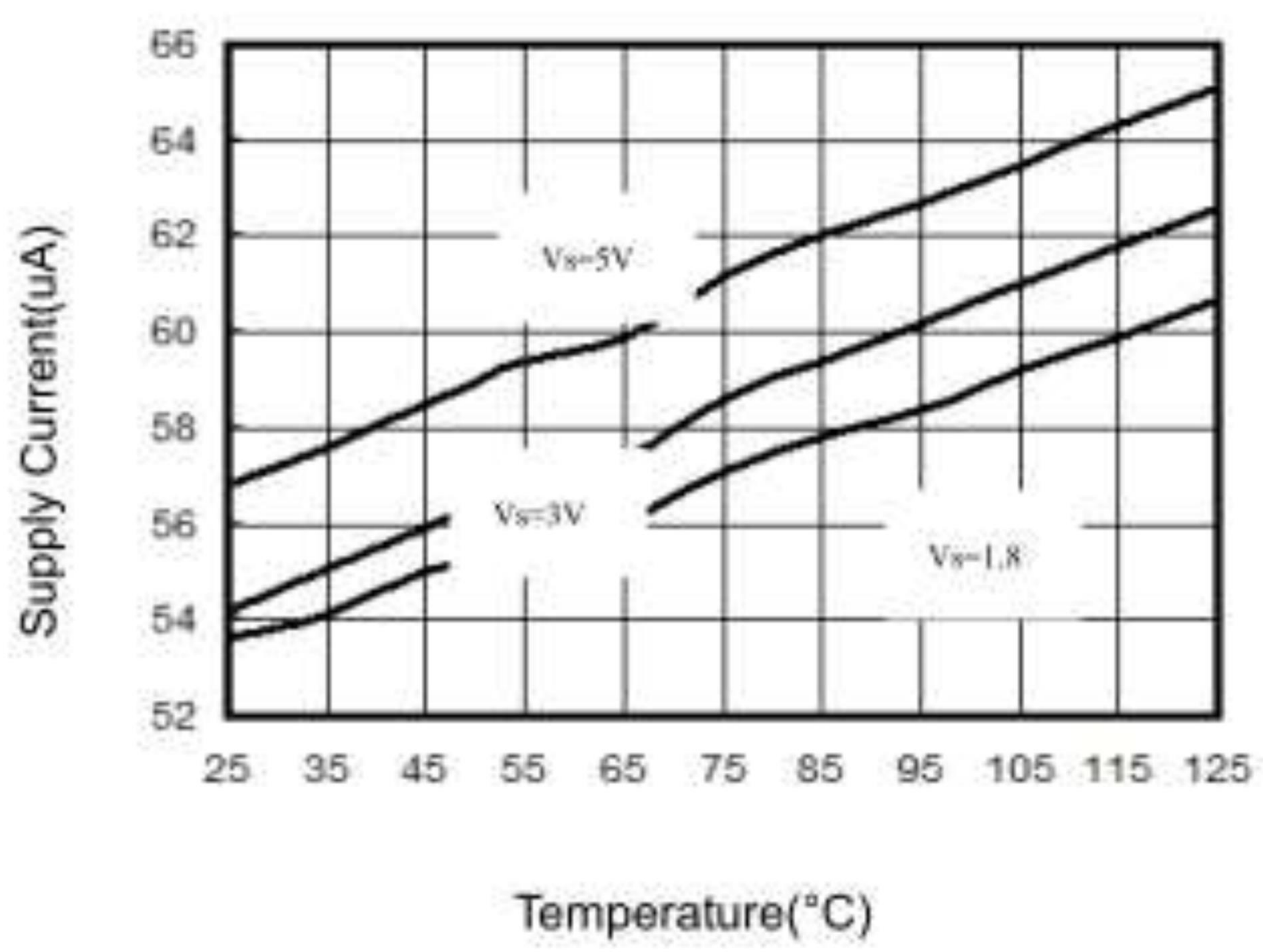
Small Signal Overshoot vs. Load Capacitance



Open-Loop Gain And Phase VS. Frequency

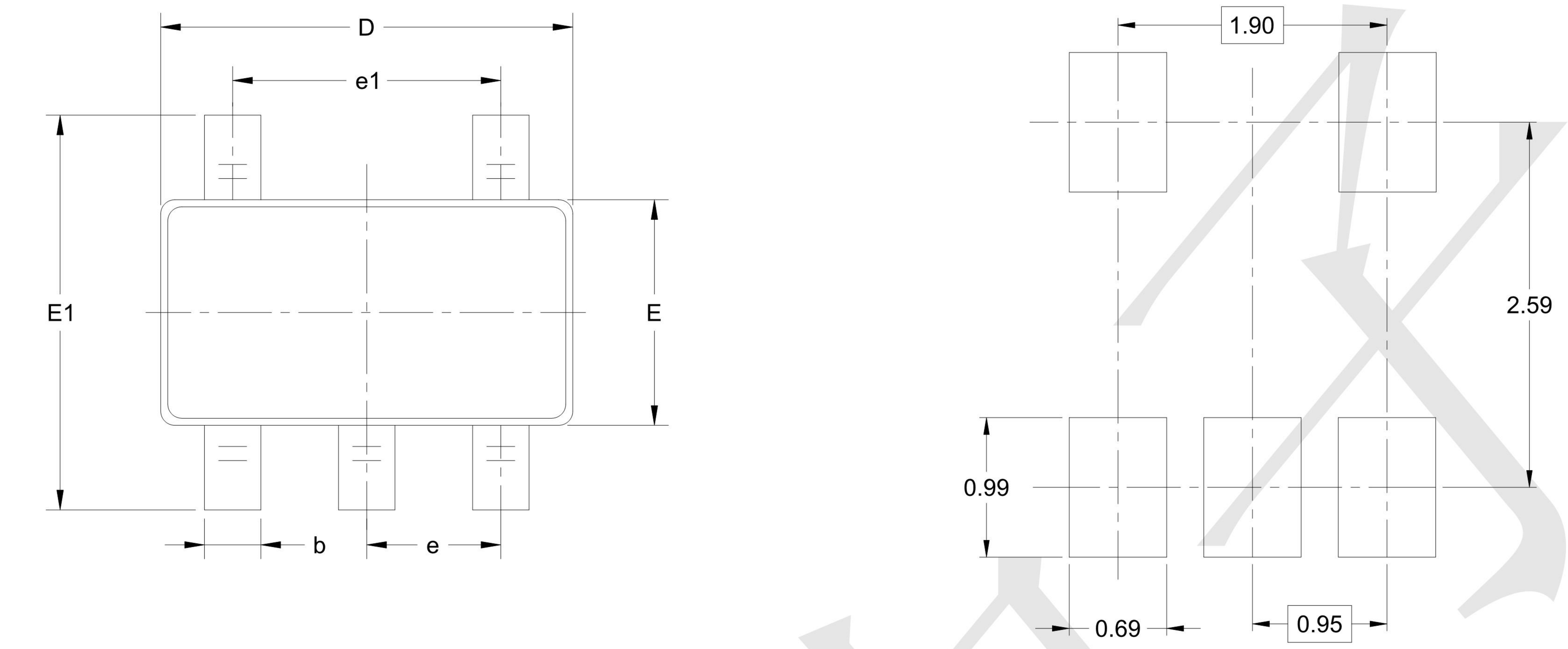


Supply Current vs. Temmperature

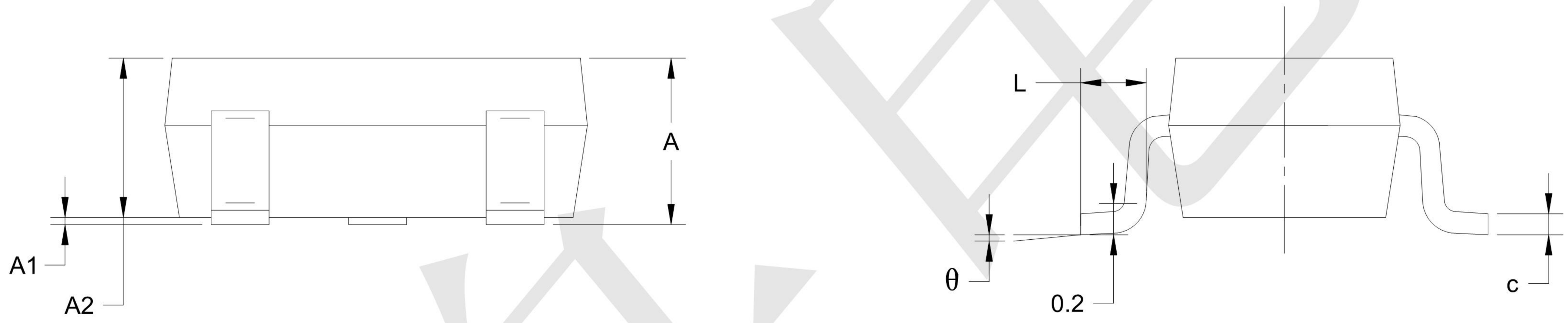


Package Information

SOT-23-5



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°