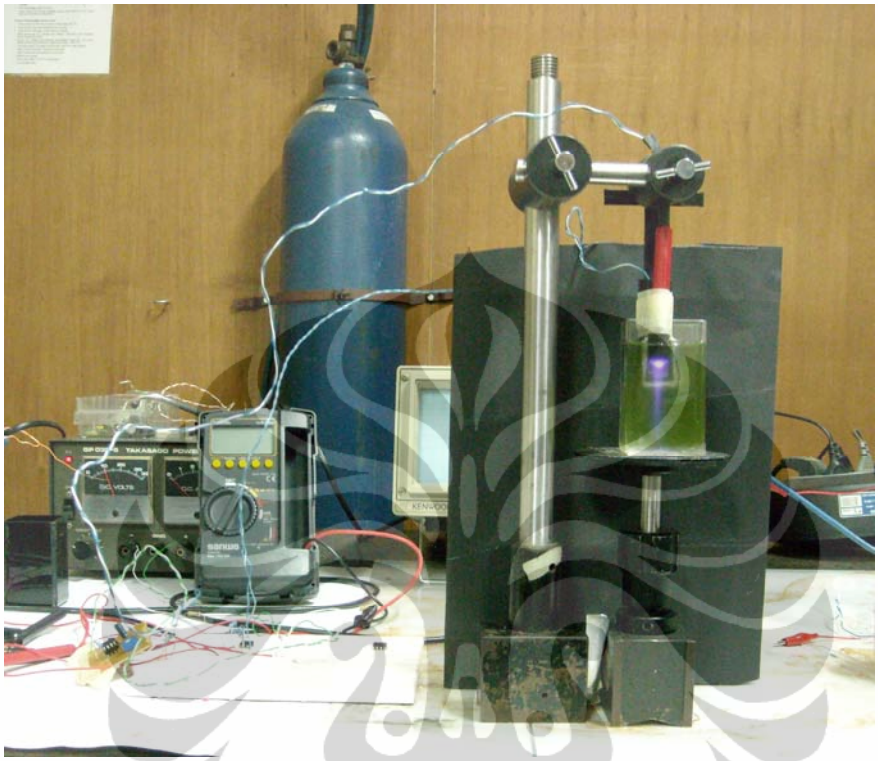
LAMPIRAN 1

FOTO SET UP EKPERIMEN



LAMPIRAN 2

FOTO INTENSITAS FLUORESENSI

Part 1. Introduction: LED405E Ultra Bright Violet LED

The LED405E emits light with a spectral output centered at 405 nm. This LED is composed of heterostructures (HS) grown on an InGaN substrate. The diode is encapsulated in a round clear epoxy casing with a 5 mm diameter.

Part 2. Specifications for an LED405E

2.1. Electrical Specifications

	Typical	Maximum Ratings
Power Dissipation		120 mW
Reverse Voltage		5.0 V
DC Forward Current		30 mA
Forward Voltage @ 20 mA	3.8 V	4.3 V
Reverse Current V_r = -5 V		10 µA
Operating Temperature		-30 ºC to 85 ºC
Storage temperature Range		-30 ºC to 100 ºC

Note: All maximum measurements specified are at 25 ºC.

2.2. Optical Specifications

	Typical
Center Wavelength	405 nm (±10 nm)
FWHM	15 nm
Half Viewing Angle	5º
Forward Optical Power	8.4 mW @ 20mA
Total Optical Power	10 mW @ 20mA

2.3. Soldering Specifications

	Conditions
Manual Soldering	295 ºC ± 5 ºC , for less than 3 seconds
Wave Soldering	260 ºC ± 5 ºC , for less than 5 seconds
Reflow Soldering	**Preheating:** 70 ºC to 80 ºC , for 30 seconds **Soldering:** 245 ºC ± 5 ºC , for less than 5 seconds

2.4. Cleaning Solvents

Solvent	Ethyl Alcohol	Isopropyl Alcohol	Propanol	Acetone	Chloroseen	Tricloroethylene	MKS
Approved	Yes	Yes	Yes	No	No	No	No

2.5. Physical Specifications

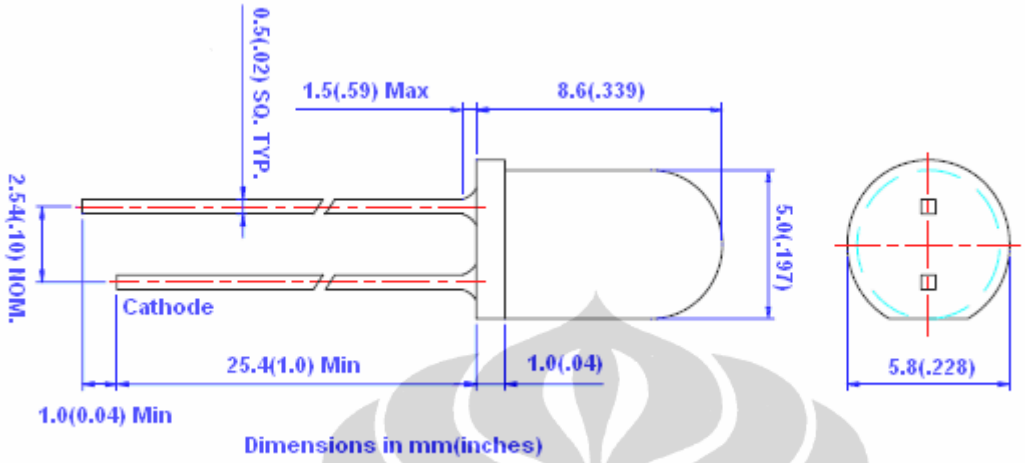
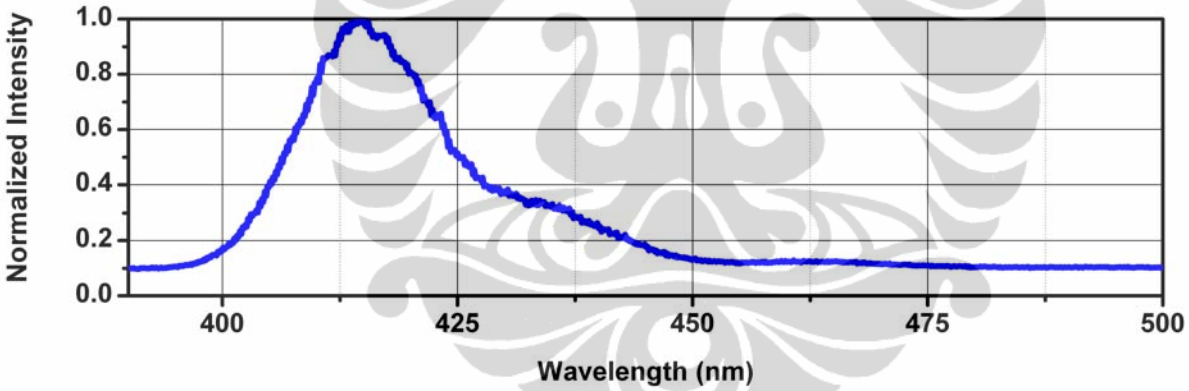
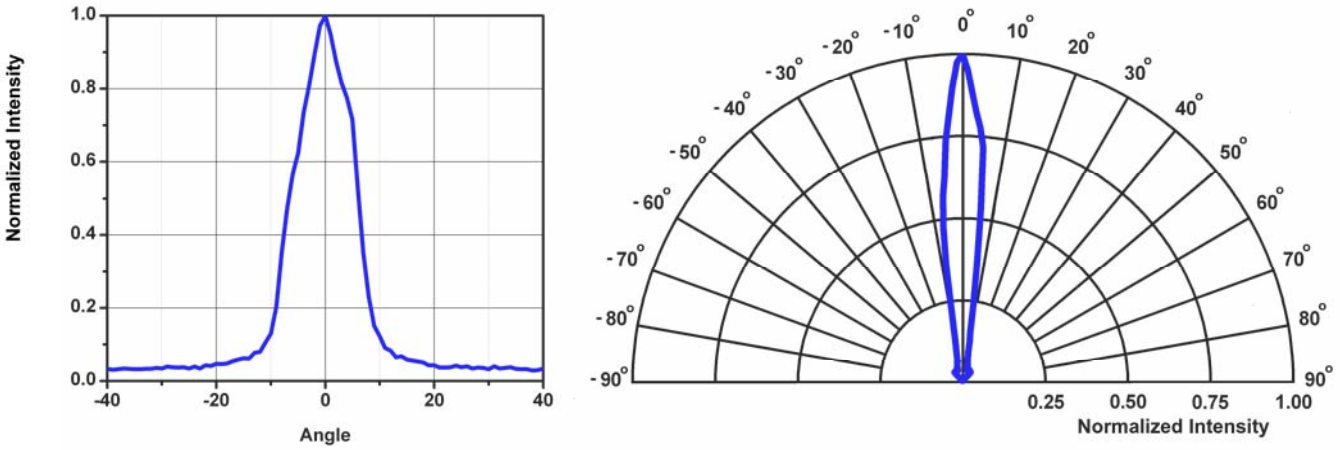


Figure 1: LED401E. The cathode is the short lead and the anode is the long lead.

2.6. Typical Spectral Intensity Distribution



2.7. Typical Radial Intensity Distribution



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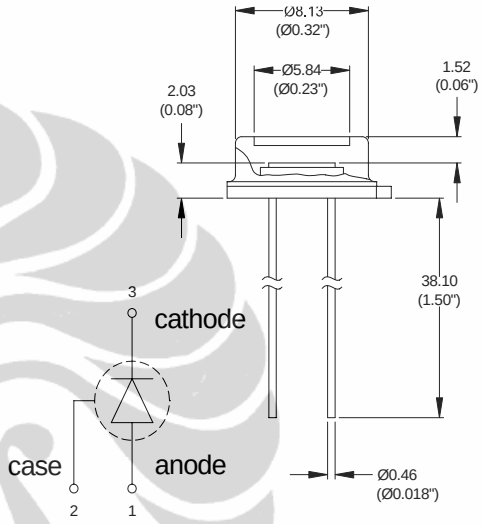
FDS100 Si Photodiode

High Speed
Large Active Area

The FDS100 is a high-speed silicon photodiode with a spectral response from 350nm to over 1100nm. This photodiode has a PIN structure that provides fast rise and fall times with a bias of 20V.

Electrical Characteristics

Spectral Response:	350-1100nm
Active Area:	13.0mm²
Rise Time (RL=50Ω):	10ns (20V bias)
Fall Time (RL=50Ω):	10ns (20V bias)
NEP@900nm:	1.2 x 10^{-14} W/√Hz (@20V bias)
Dark Current:	20nA max (20V)
Package:	T05, 0.36" can

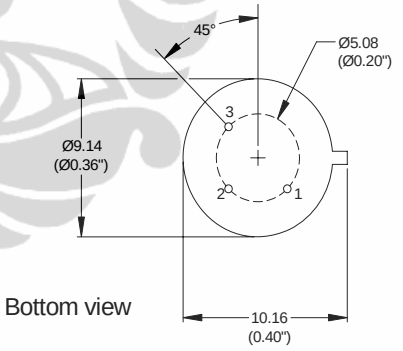


Maximum Ratings

Damage Threshold CW:	100 mW/cm^2
Damage 10ns Pulse:	500mJ/cm²
Max Bias Voltage:	25V

Pin Description

1. Detector anode
2. Detector case
3. Detector cathode



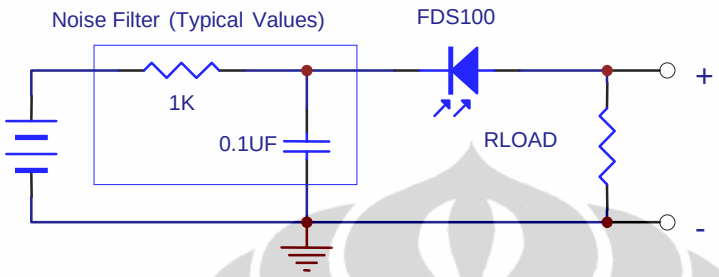
The Thorlabs FDS100 photodiode is ideal for measuring both pulsed and CW light sources, by converting the optical power to an electrical current. The Si detector is housed in a T05 can, with an anode, cathode and case connection. The photodiode anode produces a current, which is a function of the incident light power and the wavelength. The responsivity $\Re(\lambda)$, can be read from **Figure 1** to estimate the amount of photocurrent to expect. This can be converted to a voltage by placing a load resistor (R_{LOAD}) from the photodiode anode to the circuit ground. The output voltage is derived as:

$$Vo = P * \Re(\lambda) * R_{LOAD}$$

The bandwidth, f_{BW}, and the rise time response, t_R, are determined from the diode capacitance, C_J, and the load resistance, R_{LOAD}, as shown below. Placing a bias voltage from the photo diode cathode to the circuit ground can lower the photo diode capacitance.

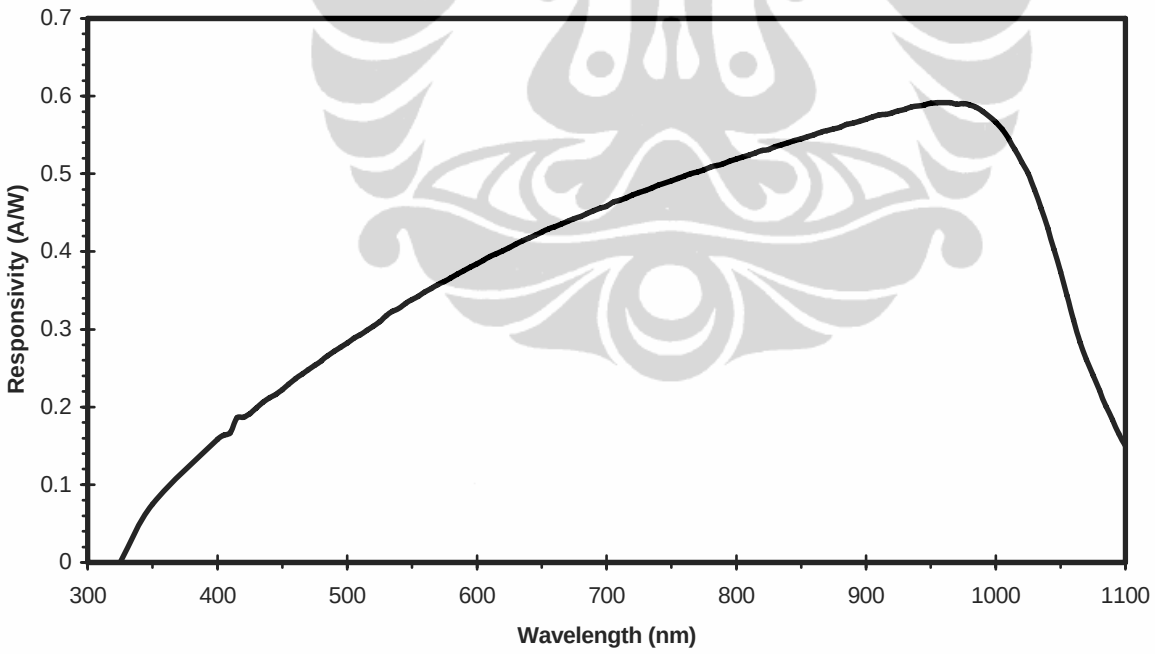
$$f_{BW} = 1/(2\pi * R_{LOAD} * CJ),\ t_R = 0.35/f_{BW}$$

Typical Circuit Diagram



Typical Plots

Figure 1 - FDS100 Spectral Responsivity Curve

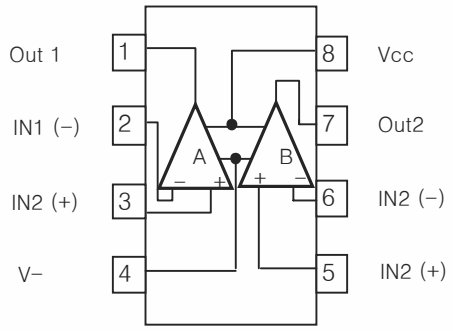


Typical Responsivity Curve using Thorlabs calibration services.

FEATURES

- Internally frequency compensated for unity gain
- Large DC voltage gain : 100dB
- Wide power supply range : 3V~32V(or±1.5V~16V)
- Input common-mode voltage range includes ground
- Large output voltage swing : 0V DC to V_{CC}-1.5V DC
- Power drain suitable for battery operation

8 SOP/ 8 DIP PIN FUNCTION



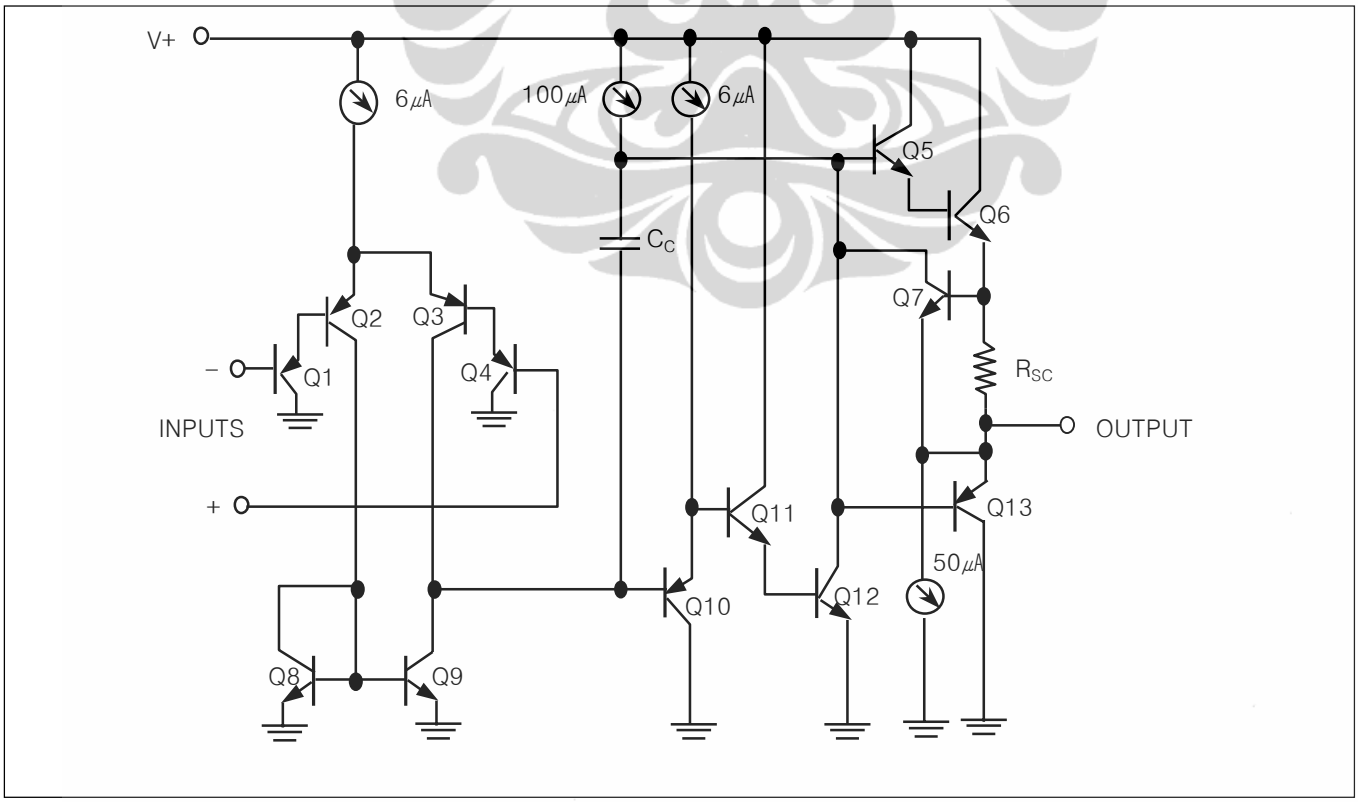
ORDERING INFORMATION

Device	Package
LM358D	8 SOP
LM358N	8 DIP

DUAL OPERATIONAL AMPLIFIERS

LM358 is consists of four independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltage. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage.
Application areas include transducer amplifier, DC gain blocks and all the conventional OP amp circuits which now can be easily implemented in single power supply systems.

EQUIVALENT CIRCUIT



ABSOLUTE MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	VALUE	UNIT
Supply Voltage	V_{CC}	±16 or 32	V
Differential Input Voltage	$V_{I(DIFF)}$	±32	V
Input Voltage	V_I	-0.3 to +32	V
Output Short Circuit to GND		Continuous	
V_{CC}≤V T_A=25℃ (One Amp)			
Operating Temperature Range	T_{OPR}	0~+70	℃
Storage Temperature Range	T_{STG}	-65 to +150	℃

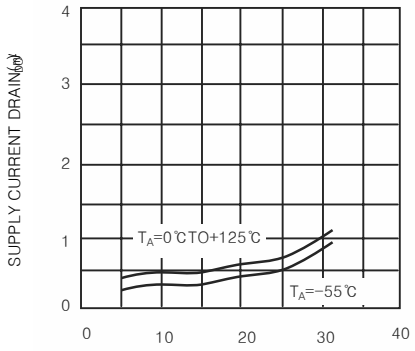
Electrical characterisitics at specified free-air temperature, V_{CC}=5V(unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM358 MIN	LM358 TYP	LM358 MAX	UNIT
V_{IO} Input Offset Voltage	V_{CC}=5V to MAX, V_{IC}=V_{ICR}MIN, V_O=1.4V	25℃		3	7	mV
		Full Range			9	
αV_{IO} Average Temperature Coefficient of Input Offset Voltage		Full Range		7		μV/℃
I_{IO} Input Offset Current	V_O=1.4V	25℃		2	50	nA
		Full Range			150	
αIIo Average Temperature Coefficient of Input Offset Current		Full Range		10		pA/℃
I_{IB} Input Bias Current	V_O=1.4V	25℃		-20	-250	nA
		Full Range			-500	
V_{ICR} Common-Mode Input Voltage Range	V_{CC}=5V to MAX	25℃	0toV_{CC}-1.5			V
		Full Range	0toV_{CC}-2			
V_{OH} High-Level Output Voltage	R_L≥2kΩ	25℃	V_{CC}-1.5			V
	V_{CC}=MAX, R_L=2kΩ	Full Range	26			
	V_{CC}=MAX, R_L≥10kΩ	Full Range	27	28		
V_{OL} Low-Level Output Voltage	R_L≥10kΩ	Full Range		5	20	mV
A_{VD} Large-Signal Differential Voltage Amplification	V_{CC}=15V, V_O=1V to 11V, R_L≥2kΩ	25℃	25	100		V/mV
		Full Range	15			
CMRR Common-Mode Rejection Ratio	V_{CC}=5V to MAX, V_{IC}=V_{ICR}MIN	25℃	65	80		dB
K_{SVR} Supply Voltage Rejection Ratio($\Delta V_{CC}/\Delta V_{IO}$)	V_{CC}=5V to MAX	25℃	65	100		dB
V_{01}/V_{02} Crosstalk Attenuation	f=1 kHz to 20kHz	25℃		120		dB
I_O Output Current	V_{CC}=15V, V_{ID}=1V, V_O=0	25℃	-20	-30		mA
		Full Range	-10			
	V_{CC}=15V, V_{ID}=-1V, V_O=15V	25℃	10	20		
		Full Range	5			
	V_{ID}=-1V, V_O=200㎷	25℃	12	30		μA
I_{OS} Short-Circuit Output Current	V_{CC} at 5V, GND at -5V, V_O=0	25℃		±40	±60	mA
I_{CC} Supply Current (Two Amplifiers)	V_O=2.5V, No Load	Full Range		0.7	1.2	mA
	V_{CC}=MAX, V_O=0.5V_{CC}, No Load	Full Range		1	2	

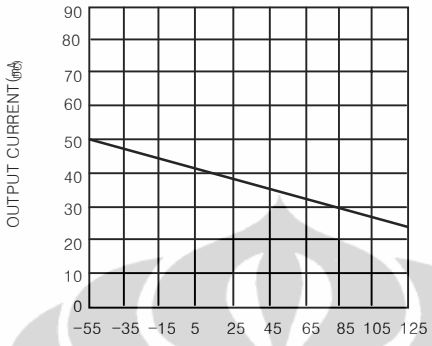
* All characteristics are measured under open-loop conditions with zero common-mode input voltage unless otherwise specified <<MAX>> V_{CC} for testing purpose is 30V. Full range is 0℃ to 70℃.

TYPICAL PERFORMANCE CHARACTERISTICS

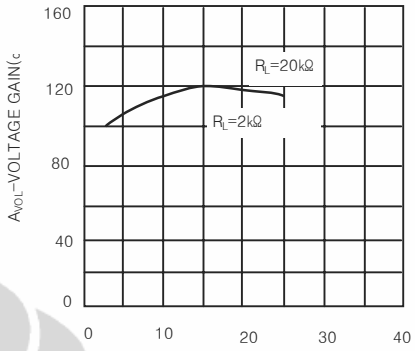
SUPPLY CURRENT



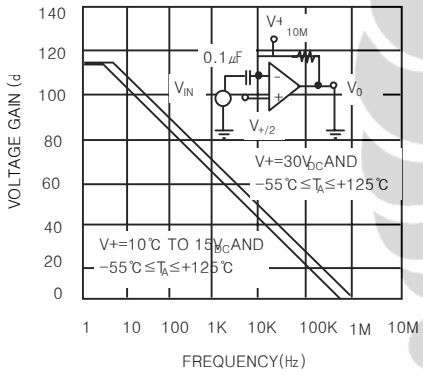
CURRENT LIMITING



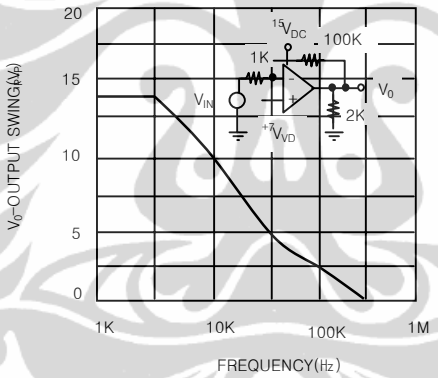
VOLTAGE GAIN



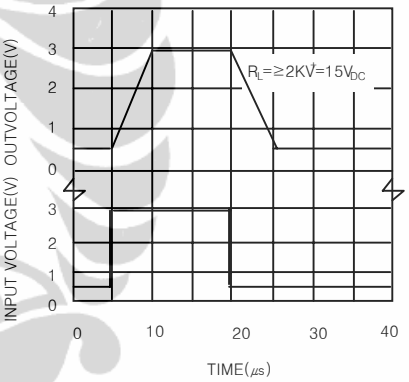
OPEN-LOOP FREQUENCY RESPONSE



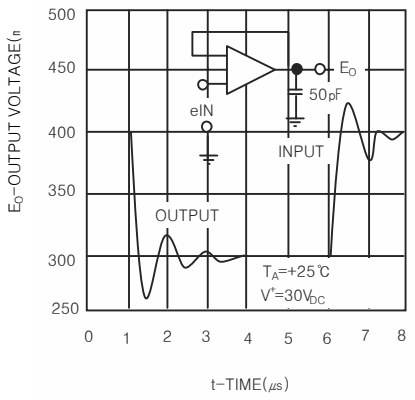
LARGE-SIGNAL FREQUENCY RESPONSE



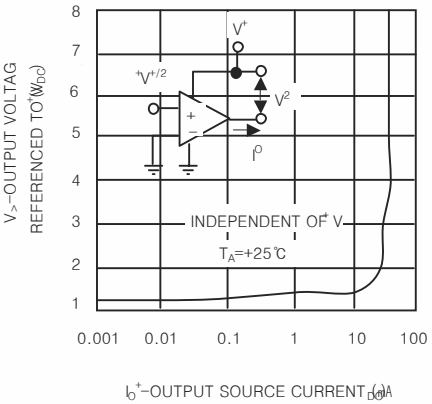
VOLTAGE-FOLLOWER PULSE RESPONSE



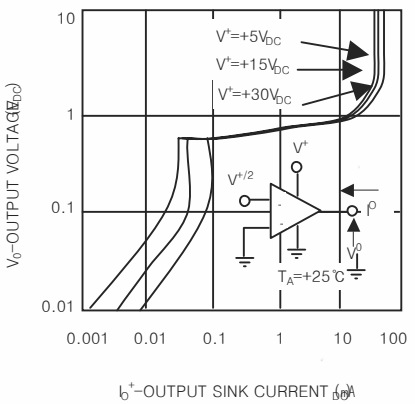
VOLTAGE-FOLLOWER PULSE RESPONSE (SMALL-SIGNAL)



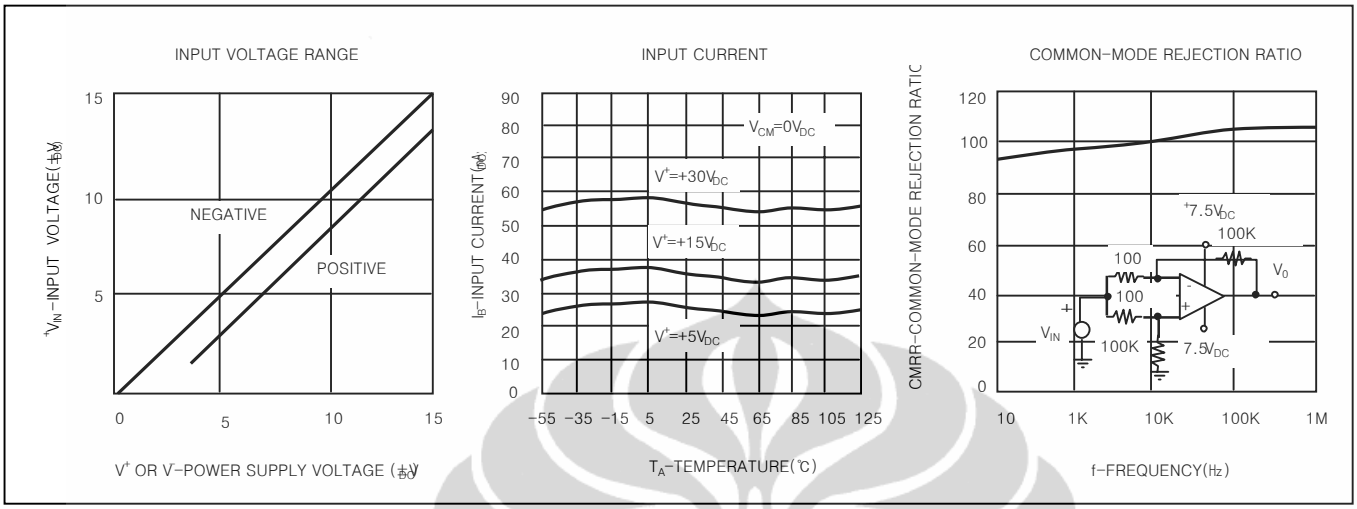
OUTPUT CHARACTERISITICS CURRENT SOURCING



OUTPUT CHARACTERISITICS CURRENT SINKING



TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUIED)



TYPICAL APPLICATIONS