

## PWM SWITCHING REGULATOR CONTROL IC FOR SLAVE TYPE

### ■ GENERAL DESCRIPTION

The **NJM2379** is a high speed switching regulator control IC, and directly drive an external power MOS-FET to use internal totempole output circuit.

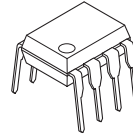
The **NJM2379** operates slave mode which synchronous external oscillation frequency, and the slave mode reduce the total noise.

The **NJM2379** is suitable for flyback type switching regulation up to 10W and several output power supply for LCD panel.

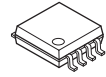
### ■ FEATURES

- Operating Voltage (3.6 to 32V)
- Reference Voltage (2.5V±2%)
- Input Outside
  - Oscillator Frequency (5 to 350 kHz)
- Output Switch Current (±8mA min.)
- Under Voltage Lockouts Circuit
- Bipolar Technology
- Package Outline DIP8, DMP8, SOP8 JEDEC 150mil SSOP8

### ■ PACKAGE OUTLINE



**NJM2379D**  
(DIP8)



**NJM2379M**  
(DMP8)

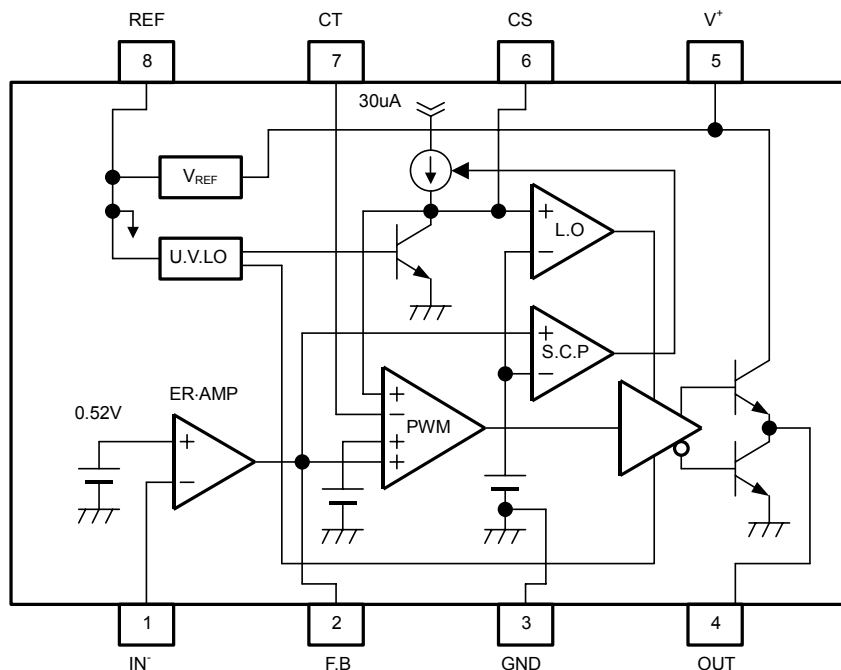


**NJM2379E**  
(SOP8)



**NJM2379V**  
(SSOP8)

### ■ BLOCK DIAGRAM



### PIN FUNCTION

1. IN<sup>-</sup>
2. F.B
3. GND
4. OUT
5. V<sup>+</sup>
6. CS
7. CT
8. REF

# NJM2379

## ■ ABSOLUTE MAXIMUM RATINGS

( $T_a=25^\circ\text{C}$ )

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V^+$	36	V
Reference Output Current	$I_{OR}$	10	mA
CT Pin Voltage	$V_{CT}$	1.5	V
Power Dissipation	$P_D$	(DIP8) 700 (DMP8) 300 (SOP8) 300 (SSOP8) 250	mW
Operating Temperature Range	$T_{OPR}$	-40 to +85	$^\circ\text{C}$
Storage Temperature Range	$T_{STG}$	-50 to +125	$^\circ\text{C}$

## ■ RECOMMENDED OPERATING CONDITIONS

( $V^+=6\text{V}$ ,  $T_a=25^\circ\text{C}$ )

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Operating Voltage	$V^+$	3.6	32	V
Feed Back Resistor	$R_{NF}$	100	-	$\text{k}\Omega$
Oscillate	$f_{OSC}$	5	350	kHz

## INPUT WAVEFORM

PARAMETER	SYMBOL	RECOMMENDED	UNIT
Triangle Waveform	$V_{PP}$	0.5	V
Offset Voltage	$V_{OFFSET}$	0.5	V

## ■ ELECTRICAL CHARACTERISTICS

( $V^+$ =6V,  $R_T$ =33k $\Omega$ ,  $C_T$ =1000pF,  $T_a$ =25°C OSC:Triangle Waveform,  $V_{P-P}$ =0.5V, Offset=0.5V,  $f_{OSC}$ =100kHz)

### REFERENCE VOLTAGE BLOCK

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_{REF}$	$I_{OR}=1mA$	2.45	2.50	2.55	v
Line Regulation	$L_{LINE}$	$V^+=3.6$ to 32V, $I_{OR}=1mA$	-	6.8	20.7	mV
Load Regulation	$L_{LOAD}$	$I_{OR}=0.1$ to 5.0mA	-	5	30	mV

### OSCILLATOR BLOCK

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Reference Voltage	$V_B$		0.51	0.52	0.53	V
Input Bias Current	$I_B$		-	5	100	nA
Open Loop Gain	$A_V$		-	90	-	dB
Gain Band width Product	$G_B$		-	0.6	-	MHz
Maximum Output Voltage	$V_{OM+}$	$R_{NF}=100k\Omega$	$V_{REF}-0.2$	-	-	V
(F.B Pin)	$V_{OM-}$	$R_{NF}=100k\Omega$	-	-	200	mV
Output Source Current	$I_{OM+}$	$V_{OM}=1V$	40	85	200	$\mu A$

### PWM COMPARATOR BLOCK

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Triangle Waveform Input Minimum Voltage (CT Pin)	$OSC_{LO}$	CT Pin Triangle Waveform Input	0	-	0.4	V
Triangle Waveform Input Maximum Voltage (CT Pin)	$OSC_{HI}$	CT Pin Triangular Wave Input	0.7	-	1.3	V
Input Threshold Voltage (F.B Pin)	$V_{TH0}$	duty-cycle=0%	-	0.55	0.65	V
Input Threshold Voltage (F.B Pin)	$V_{TH50}$	duty-cycle=50%	-	0.87	-	V
Maximum Duty Cycle	$\alpha M$	F.B Pin=1.2V	55	64	85	%

### SOFT START CIRCUIT BLOCK

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Bias Current (CS Pin)	$I_{BCS}$		-	250	650	nA
Input Threshold Voltage (CS Pin)	$V_{THCS0}$	duty-cycle=0%	-	0.25	0.35	V
Input Threshold Voltage (CS Pin)	$V_{THCS50}$	duty-cycle=50%	-	0.52	-	V

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## ■ ELECTRICAL CHARACTERISTICS

( $V^+$ =6V,  $R_T$ =33k $\Omega$ ,  $C_T$ =1000pF,  $T_a$ =25°C OSC:Triangle Waveform,  $V_{P-P}$ =0.5V, Offset=0.5V,  $f_{OSC}$ =100kHz)

### SHORT CIRCUIT PROTECTION

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Threshold Voltage (F.B Pin)	$V_{THPC}$	CS Pin=0V,F.B Pin=2V	1.20	1.50	1.80	V
Charge Current (CS Pin)	$I_{CHG}$		10	30	50	$\mu$ A
Latch mode Threshold Voltage (CS Pin)	$V_{THLA}$		1.20	1.50	1.80	V

### UNDER VOLTAGE LOCKOUT

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
ON Threshold Voltage	$V_{THON}$		-	2.70	-	V
OFF Threshold Voltage	$V_{THOFF}$		-	2.52	-	V
Hysteresis Voltage	$V_{HYS}$		60	180	-	mV

### OUTPUT

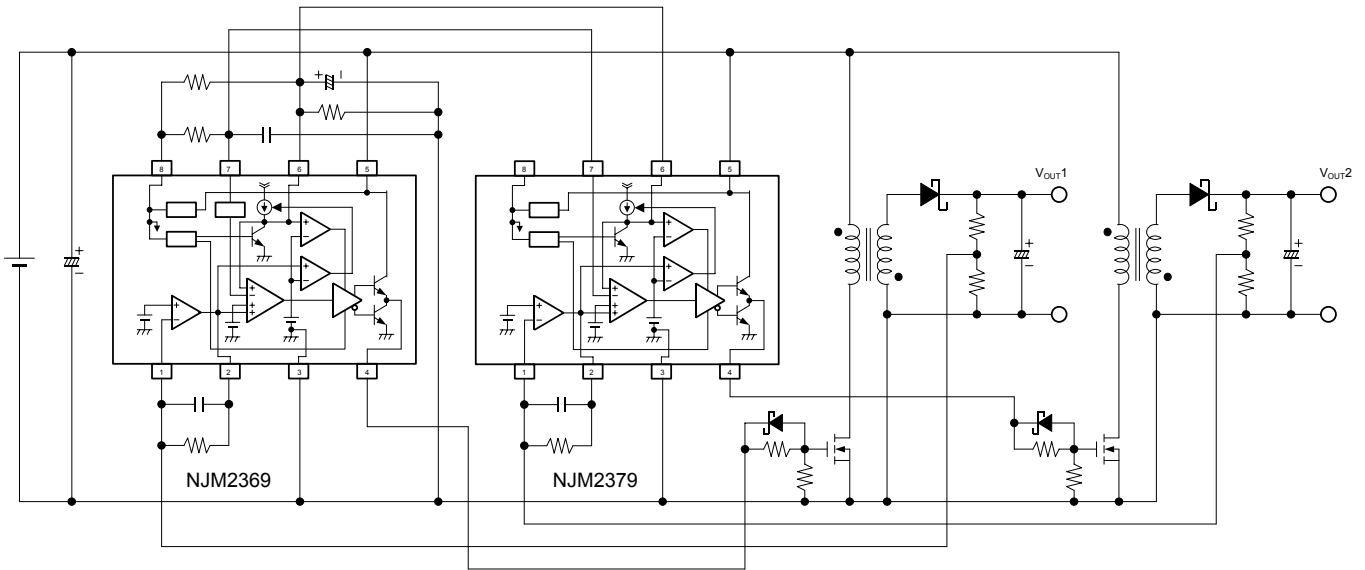
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
H-Output Voltage (OUT Pin)	$V_{OH}$	$R_L$ =10k $\Omega$	3.50	4.00	-	V
L-Output Voltage (OUT Pin)	$V_{OL}$	Output Sink Current=20mA	-	0.25	0.65	V
Output Source Current (OUT Pin)	$I_{SOURCE}$	OUT Pin=0V	-	35	-	mA

### GENERAL CHARACTERISTICS

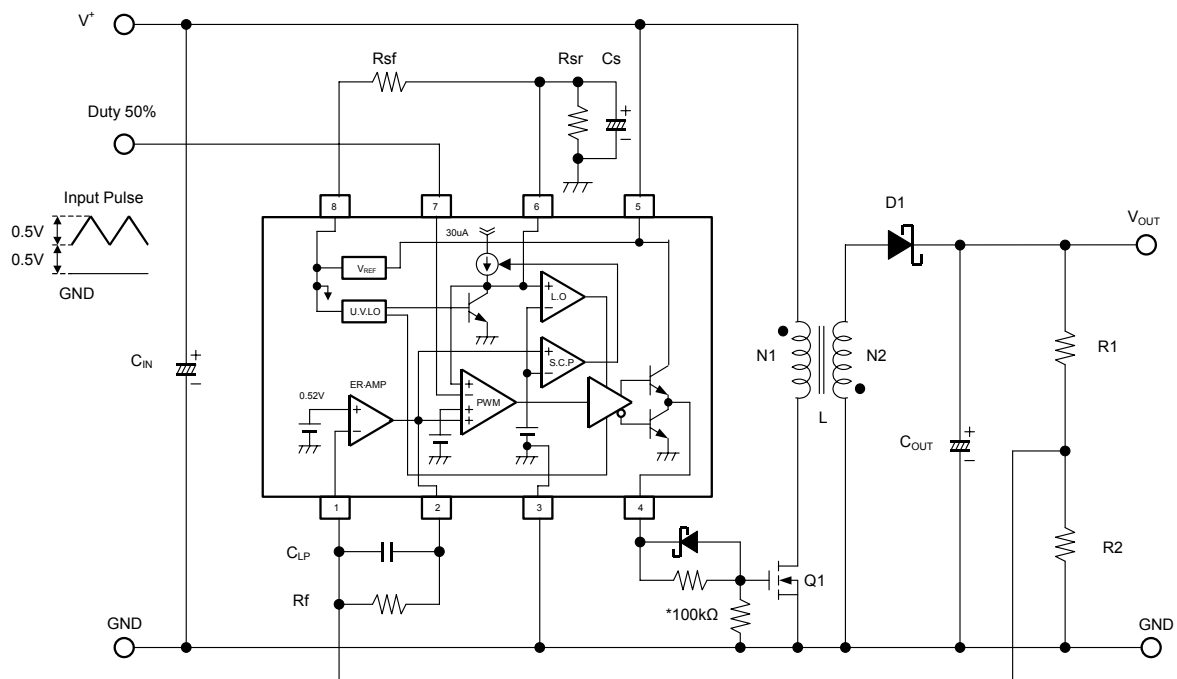
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	$I_{CCLA}$	Latch Mode	-	1.6	2.2	mA
Average Quiescent Current	$I_{CCAV}$	$R_L$ = $\infty$ , duty-cycle=50%	-	5.2	10.0	mA

## ■ TYPICAL APPLICATIONS

### Synchronous mode with NJM2369



### External pulse mode



When Short Circuit Protection (SCP) is activated, Output terminal (Pin 4) becomes high impedance and the external switching transistor (Q1) is turned off.

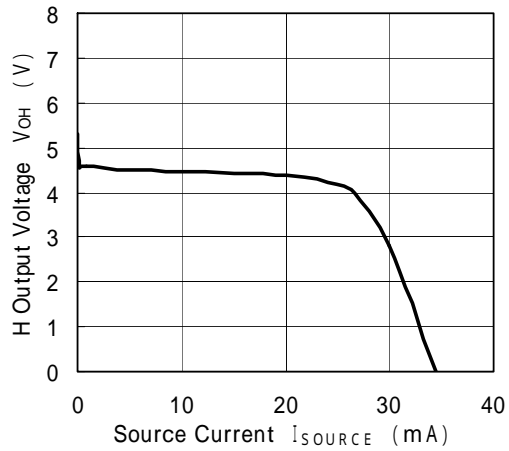
However, small leak current from Output terminal at high ambient temperature may turn on the external switching transistor causing malfunction of the SCP particularly when FET is used as a switching device.

To avoid this issue, insert a 100kΩ resistor between the Gate and the Source of the external transistor.

## ■ TYPICAL CHARACTERISTICS

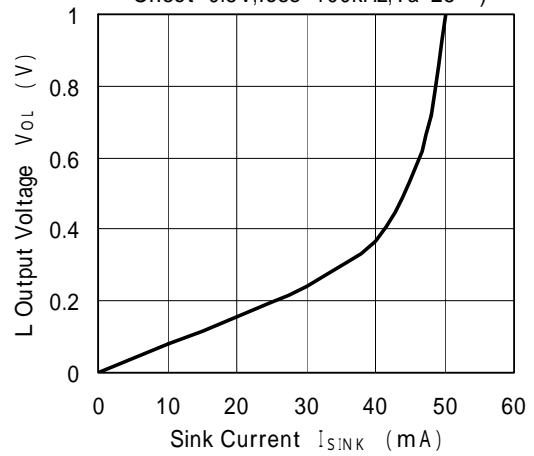
### H Output Voltage(OUT Pin) vs. Source Current

( $V^+ = 6V$ , OUT Pin = 0V, OSC: Triangle Waveform  
 $V_{p-p} = 0.5V$ , Offset = 0.5V, fosc = 100kHz,  $T_a = 25^\circ C$ )



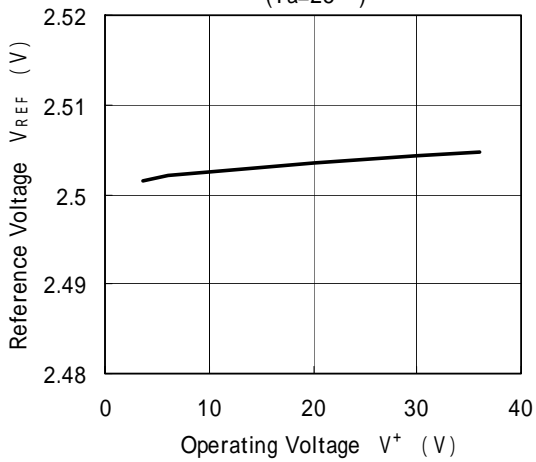
### L Output Voltage(OUT Pin) vs. Sink Current

( $V^+ = 6V$ , OSC: Triangle Waveform,  $V_{p-p} = 0.5V$   
 Offset = 0.5V, fosc = 100kHz,  $T_a = 25^\circ C$ )



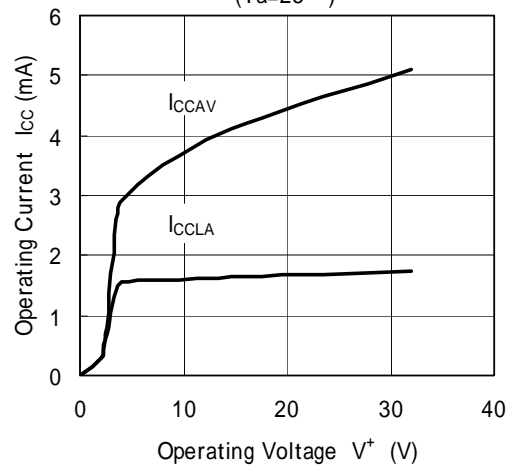
### Reference Voltage vs. Operating Voltage

( $T_a = 25^\circ C$ )

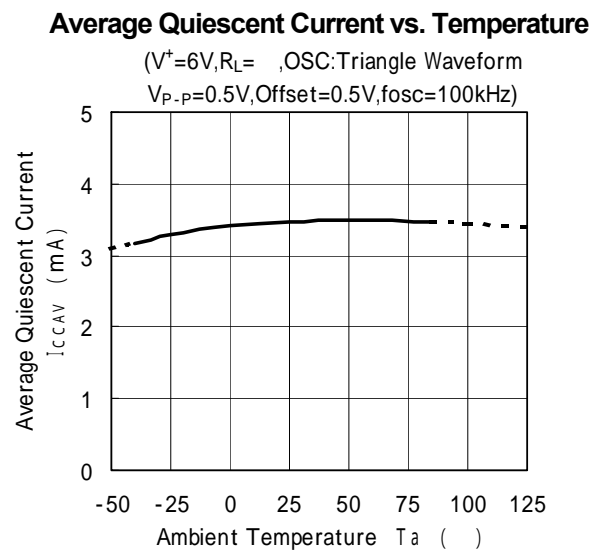
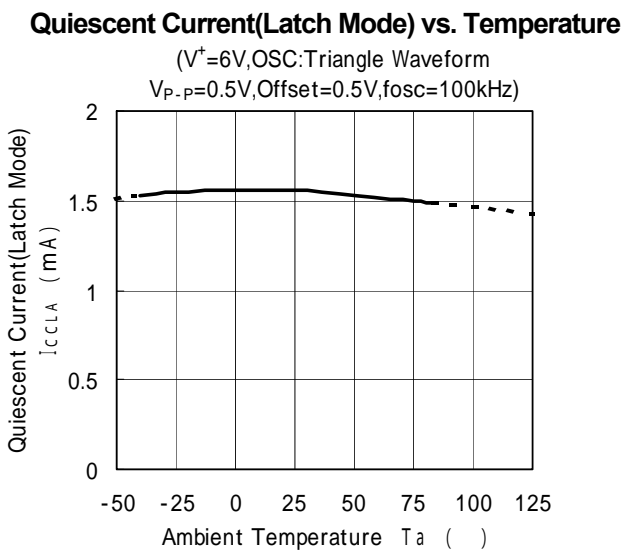
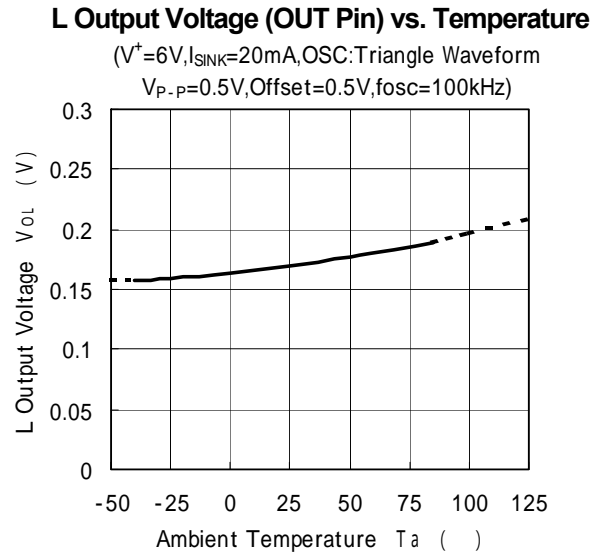
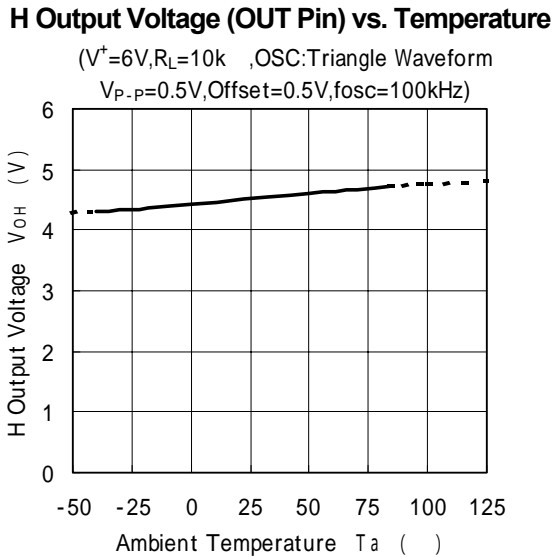
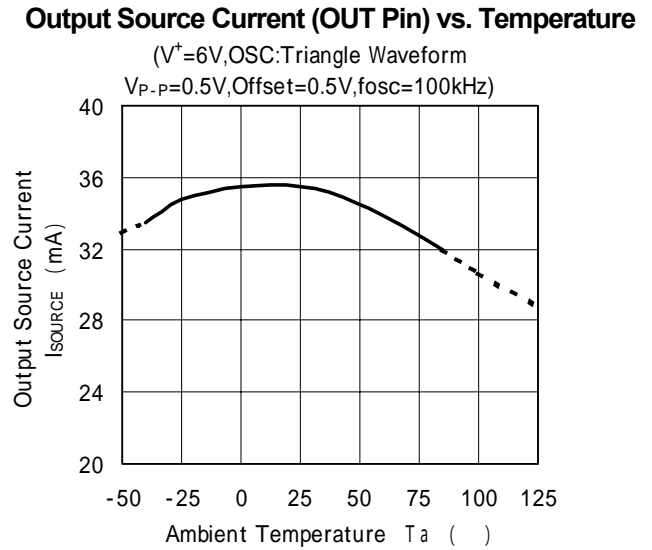
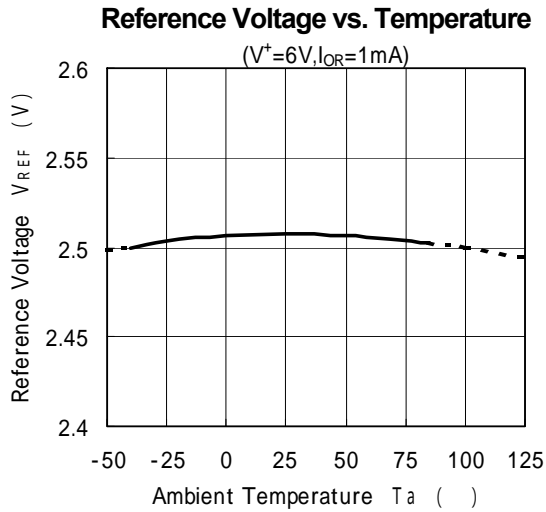


### Operating Current vs. Operating Voltage

( $T_a = 25^\circ C$ )



## ■ TYPICAL CHARACTERISTICS



[CAUTION]

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