

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.

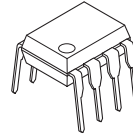
The **NJM2379** operates slave mode which synchronous external oscillation frequency, and the slave mode reduce the total noise.

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

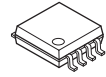
■ FEATURES

- 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



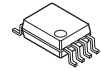
NJM2379D
(DIP8)



NJM2379M
(DMP8)

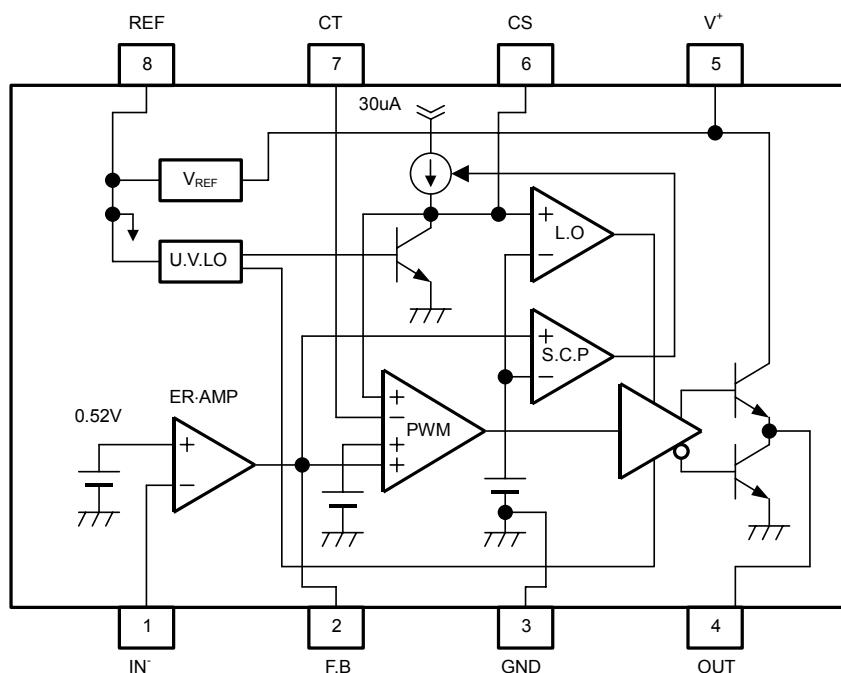


NJM2379E
(SOP8)



NJM2379V
(SSOP8)

■ BLOCK DIAGRAM



PIN FUNCTION

1. IN⁻
2. F.B
3. GND
4. OUT
5. V⁺
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_{P-P} | 0.5 | V |
| Offset Voltage | V_{OFFSET} | 0.5 | V |

■ ELECTRICAL CHARACTERISTICS

(V^+ =6V, R_T =33k Ω , 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 | μA |

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 | αM | 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 |

NJM2379

■ ELECTRICAL CHARACTERISTICS

(V^+ =6V, R_T =33k Ω , 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 | μ 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

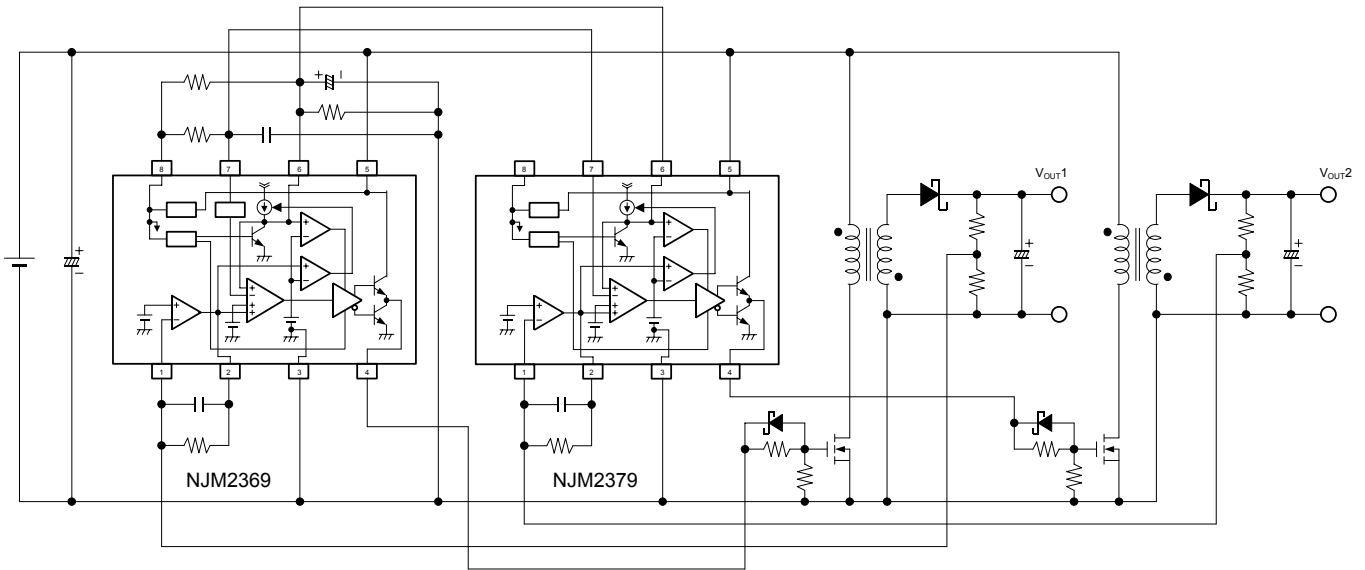
| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---------------------------------|--------------|--------------------------|------|------|------|------|
| H-Output Voltage (OUT Pin) | V_{OH} | R_L =10k Ω | 3.50 | 4.00 | - | V |
| L-Output Voltage (OUT Pin) | V_{OL} | Output Sink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

GENERAL CHARACTERISTICS

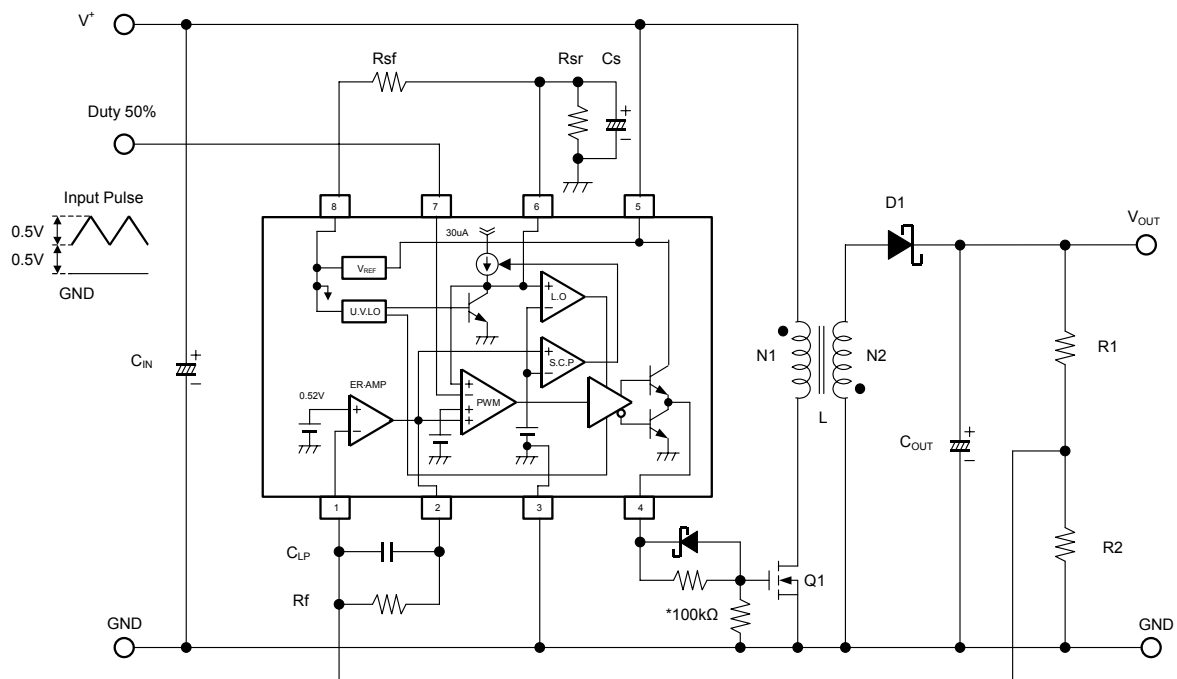
| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---------------------------|------------|-----------------------------------|------|------|------|------|
| Quiescent Current | I_{CCLA} | Latch Mode | - | 1.6 | 2.2 | mA |
| Average Quiescent Current | I_{CCAV} | R_L = ∞ , duty-cycle=50%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

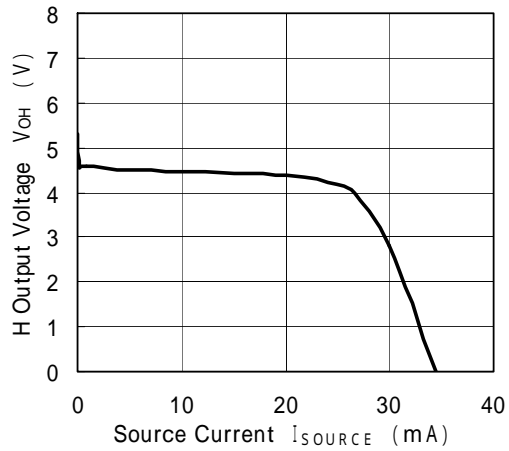
However, small leak current from Output terminal at high ambient temperature may turn on the external switching transistor causing malfunction of the SCP particularly when FET is used as a switching device.

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

■ TYPICAL CHARACTERISTICS

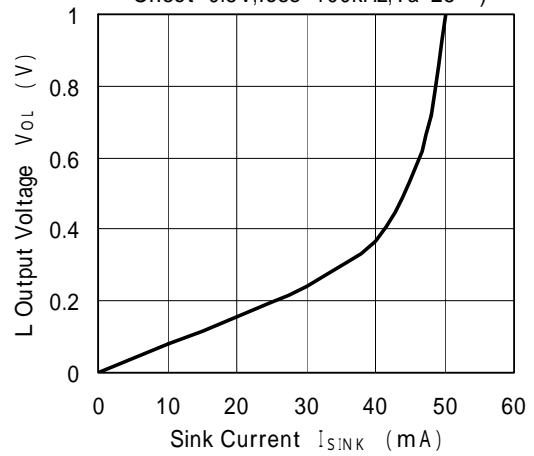
H Output Voltage(OUT Pin) vs. Source Current

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



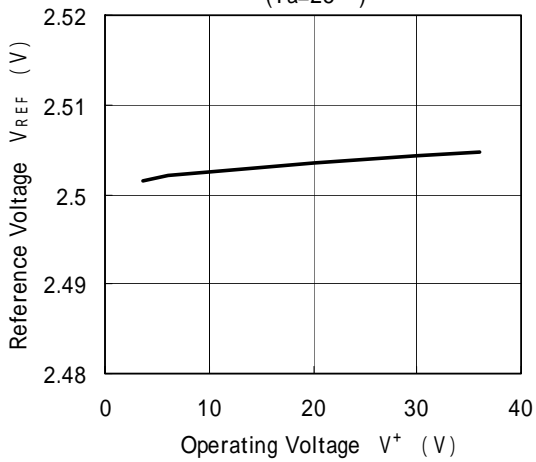
L Output Voltage(OUT Pin) vs. Sink Current

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



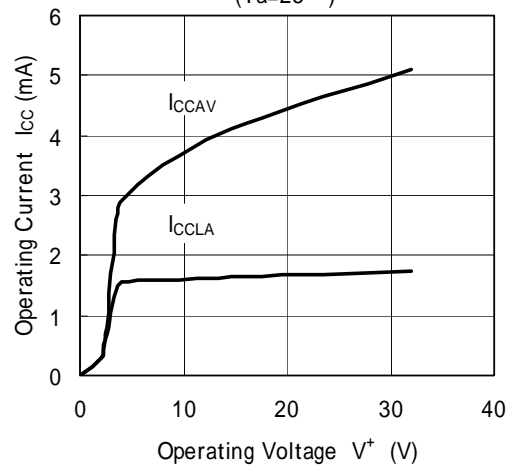
Reference Voltage vs. Operating Voltage

($T_a=25^\circ C$)



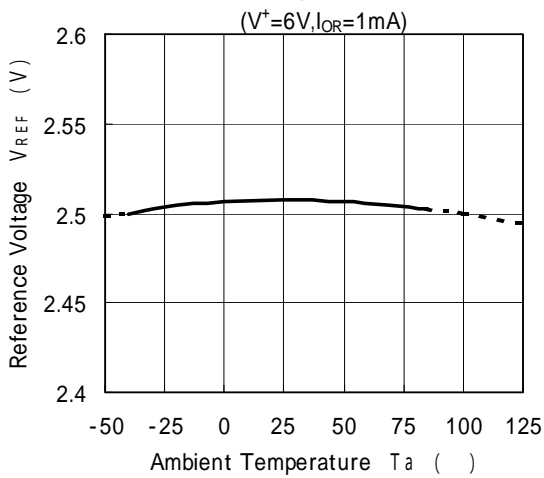
Operating Current vs. Operating Voltage

($T_a=25^\circ C$)

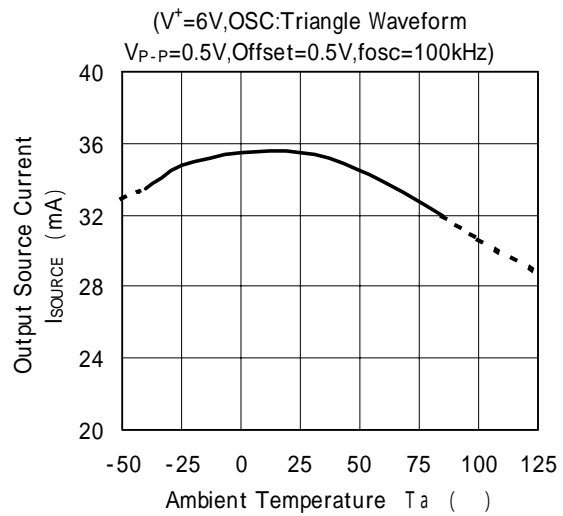


■ TYPICAL CHARACTERISTICS

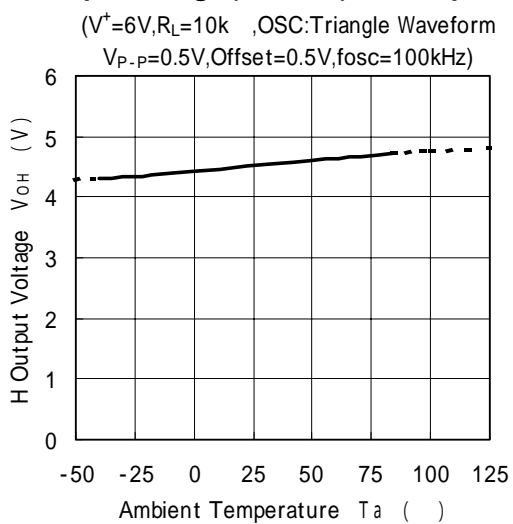
Reference Voltage vs. Temperature



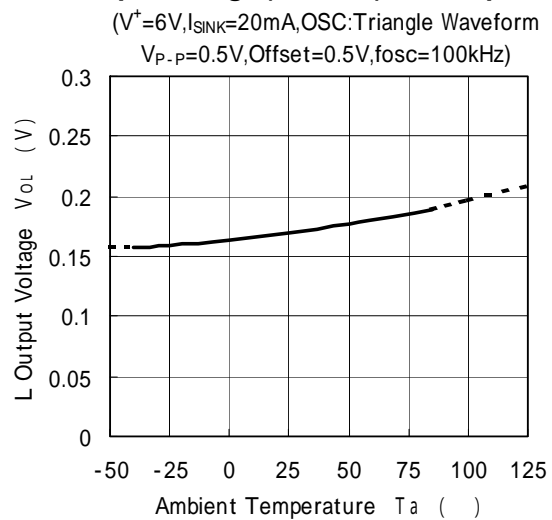
Output Source Current (OUT Pin) vs. Temperature



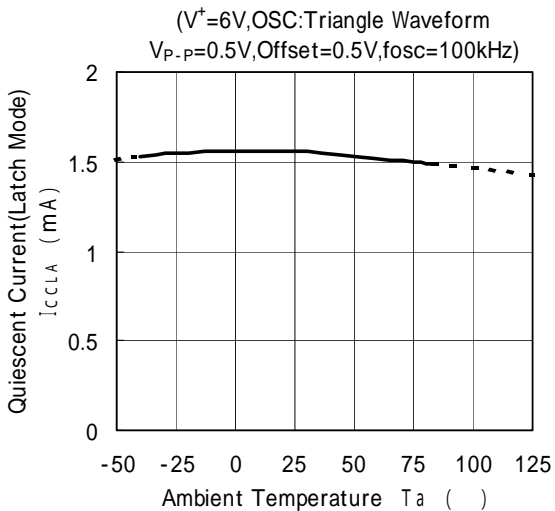
H Output Voltage (OUT Pin) vs. Temperature



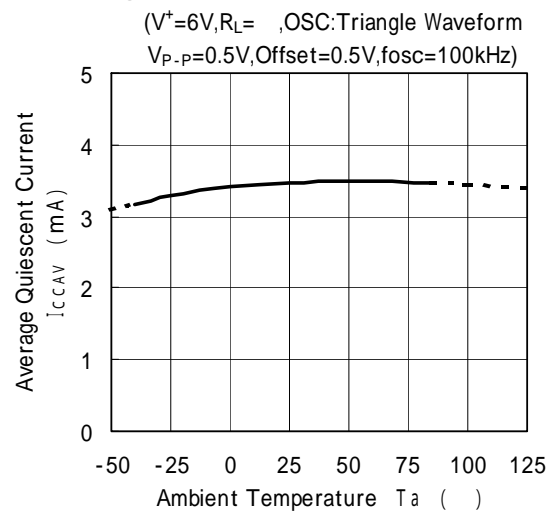
L Output Voltage (OUT Pin) vs. Temperature



Quiescent Current(Latch Mode) vs. Temperature



Average Quiescent Current vs. Temperature



[CAUTION]

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