

SWITCHING REGULATOR CONTROL IC

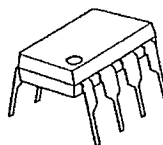
■ GENERAL DESCRIPTION

The NJM2377 is high speed switching regulator control IC which can operate at low voltage.

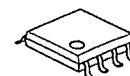
The NJM2377 consists of low power oscillation circuit, high precision reference, wide band error amplifier, under voltage lockout circuit, and a totempole output circuit; which can drive an external Bipolar transistor directly.

The NJM2377 is suitable for any portable system, TFT panel to note PC and especially power supply at video CD.

■ PACKAGE OUTLINE



NJM2377D



NJM2377M

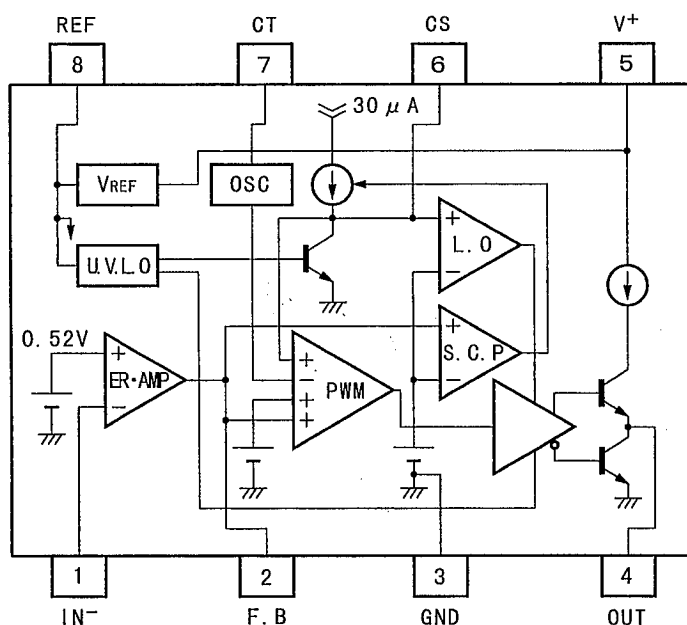


NJM2377V

■ FEATURES

- PWM Type Switching Regulator Control
- Operating Voltage (2.7~18V)
- Wide Oscillator Range (10~500kHz)
- ON/OFF Maximum Duty Cycle (Ton:Toff=9:1)
- Totem Pole Output
- Soft-Start Function
- Under Voltage Lockouts (U.V.L.O.)
- Bipolar Technology
- Package Outline DIP8, DMP8, SSOP8

■ BLOCK DIAGRAM



PIN FUNCTION

1. IN⁻
2. F. B
3. GND
4. OUT
5. V⁺
6. CS
7. CT
8. REF

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V^+	18	V
Reference Output Current	I_o	± 50	mA
Power Dissipation	P_D	(DIP8) 700 (DMP8) 300 (SSOP8) 250	mW
Operating Temperature Range	T_{OPR}	-40~+85	°C
Storage Temperature Range	T_{STG}	-50~+150	°C

■ RECOMMENDED OPERATING CONDITIONS ($V^+=3V$, Ta=25°C)

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Operating Voltage	V^+	2.7	18	V
Feed Back Resistor	R_{NF}	100	—	k Ω
Oscillator Timing Capacitor	C_T	220	22,000	pF
Oscillator Timing Resistor	R_T	5	100	k Ω
Oscillation Frequency	f_{osc}	10	500	kH z

■ ELECTRICAL CHARACTERISTICS ($V^+=3V$, $R_T=39k\Omega$, $C_T=470pF$, $T_a=25^\circ C$)

REFERENCE VOLTAGE BLOCK

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{REF}	$I_{OR}=1mA$	1.47	1.50	1.53	V
Line Regulation	$\Delta V_O - V_{IN}$	$V^+=2.7\sim 18V$, $I_{OR}=1mA$	—	3.8	11.5	mV
Load Regulation	$\Delta V_O - I_O$	$I_{OR}=0.1\sim 5.0mA$	—	5	30	mA

OSCILLATOR BLOCK

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Oscillation Frequency	f_{OSC}	$C_T=470pA$, $R_T=39k\Omega$	80	100	120	kH z
Oscillate Fluctuations1 (Line Fluctuations)	f_{dv}	$V^+=2.7\sim 18V$, $I_{OR}=1mA$	—	1	—	%
Oscillate Fluctuations2 (Temp. Fluctuations)	f_{dt}	$T_a=-40\sim +85^\circ C$	—	5	—	%

ERROR AMPLIFIER 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		—	1.0	—	MH z
Maximum Output Voltage (F.B Pin)	V_{OM+}	$R_{NF}=100k\Omega$, I_{N-} Pin=0V	1.9	2.2	2.4	V
	V_{OM-}	$R_{NF}=100k\Omega$, I_{N-} Pin=1V	—	—	200	mA
Output Source Current (F.B Pin)	I_{OM+}	$V_{OM}=1V$, I_{N-} Pin=0V	40	85	200	μA

PWM COMPARABLE BLOCK

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Bias Voltage (F.B Pin)	V_{THO}	duty cycle=0%	—	0.45	0.55	V
Input Threshold Voltage (F.B Pin)	V_{THBO}	duty cycle=80%	—	1.05	—	V
Maximum Duty Cycle	αM	F.B Pin=1.2V $C_T=470pF$, $R_T=39k\Omega$	80	90	—	%

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_{THCSO}	duty cycle=0% F.B Pin=1.2V	—	0.25	0.35	V
Input Threshold Voltage (CS Pin)	V_{THCSBO}	duty cycle=80% F.B Pin=1.2V	—	0.79	—	V

■ ELECTRICAL CHARACTERISTICS ($V^+=3V$, $R_T=39k\Omega$, $C_T=470pF$, $T_a=25^\circ C$)

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	1.30	1.50	1.80	V
Charge Current (CS Pin)	I_{CHG}		10	30	50	μA
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}		—	1.95	—	V
OFF Threshold Voltage	V_{THOFF}		—	1.78	—	V
Hysteresis Voltage	V_{HYS}		60	170	—	mV

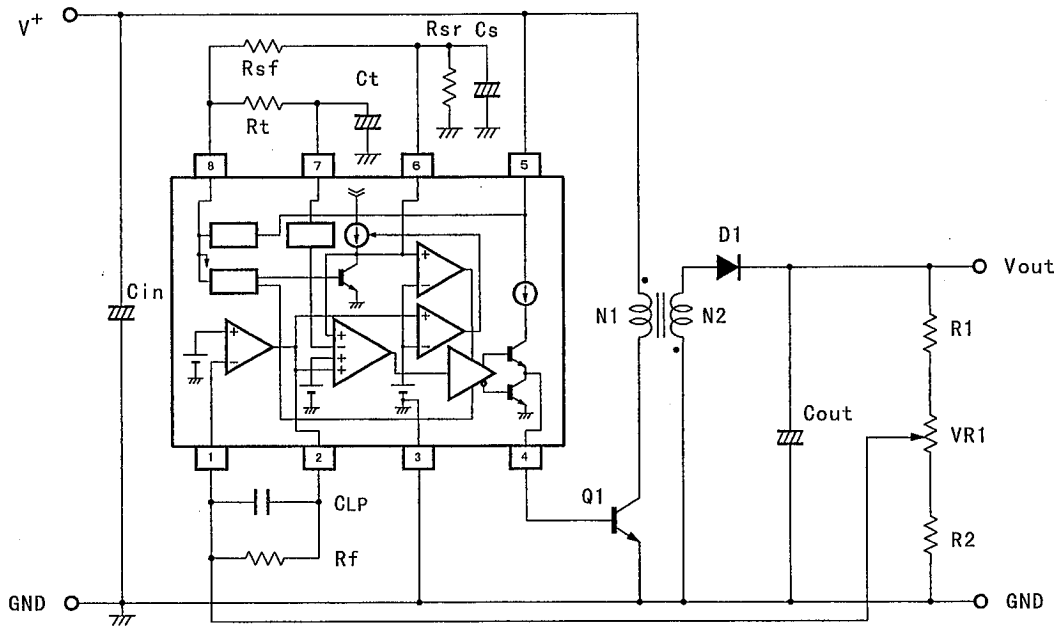
OUTPUT BLOCK

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
H-Output Voltage(OUT Pin)	V_{OH}	$R_L=10k\Omega$	1.7	2.0	—	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	23	35	—	mA

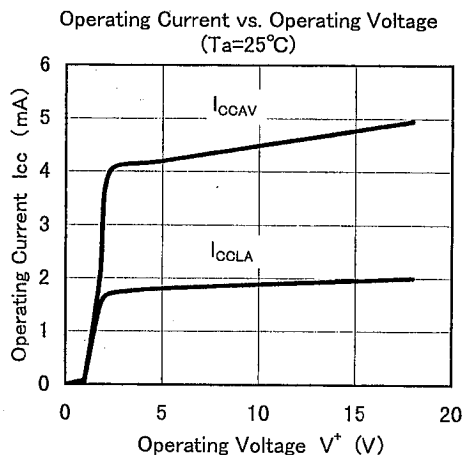
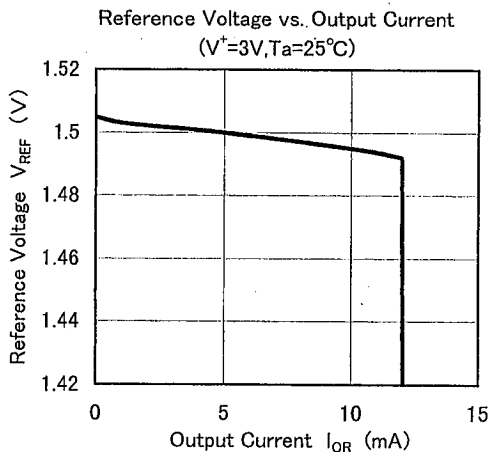
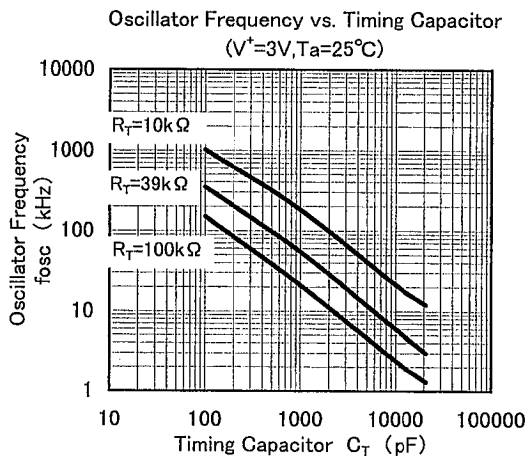
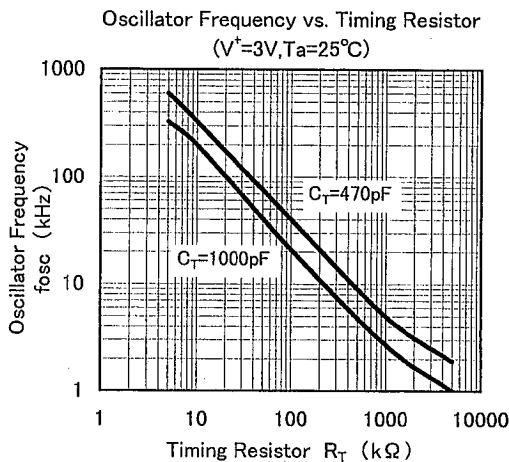
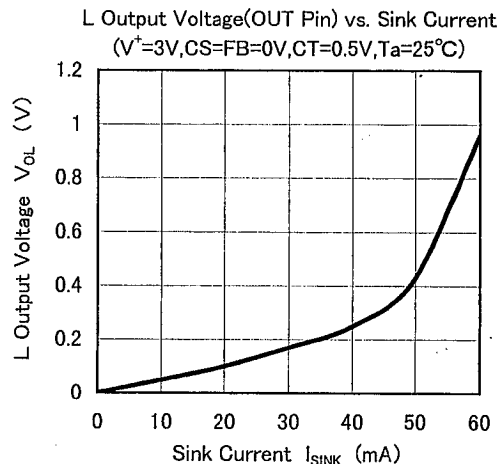
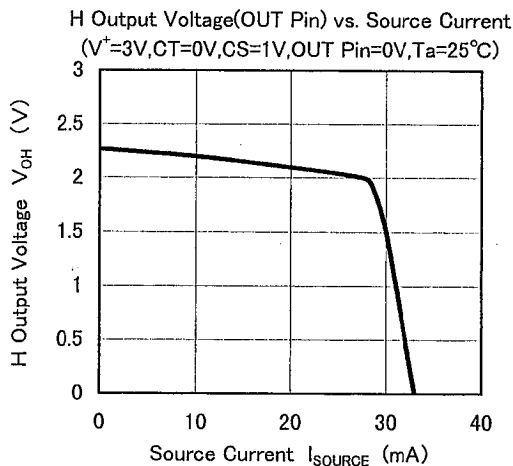
GENERAL CHARACTERISTIC

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	I_{CCLA}	Latch Mode, CS Pin=1.8V	—	1.7	2.4	mA
Average Quiescent Current	I_{CCAV}	$R_L=\infty$, duty-cycle=50%	—	5.0	6.8	mA

■ TYPICAL APPLICATION

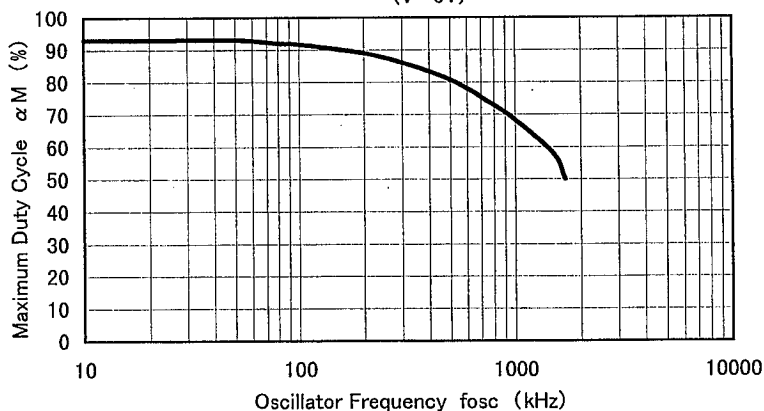


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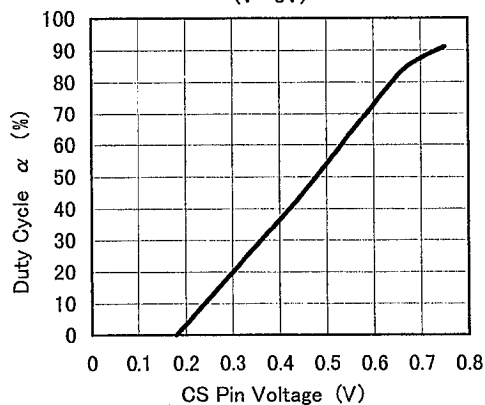


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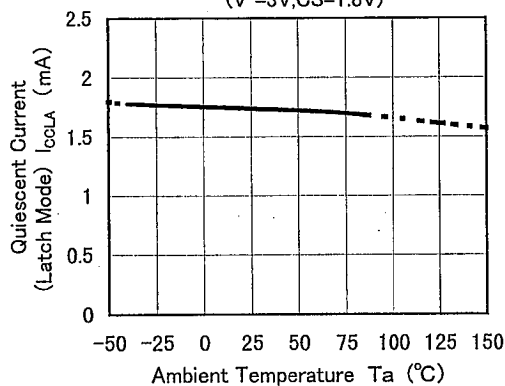
Maximum Duty Cycle vs. Oscillator Frequency
($V^+=3V$)



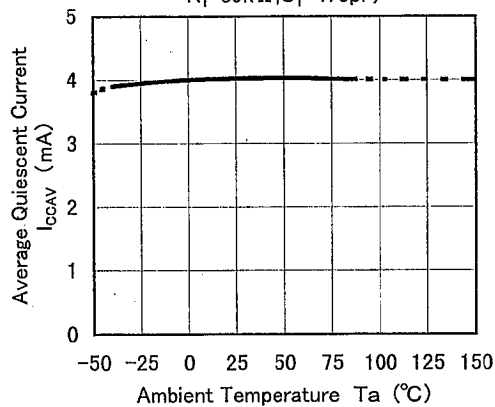
Duty Cycle vs. CS Pin Voltage
($V^+=3V$)



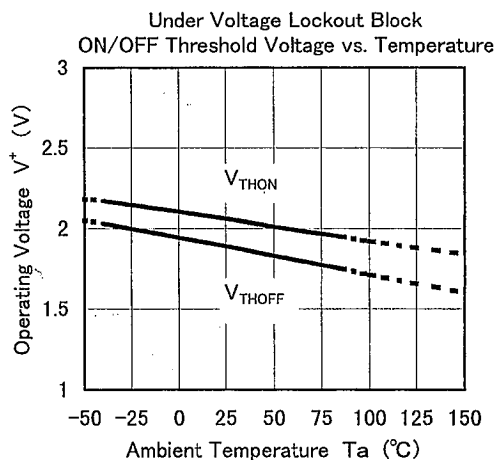
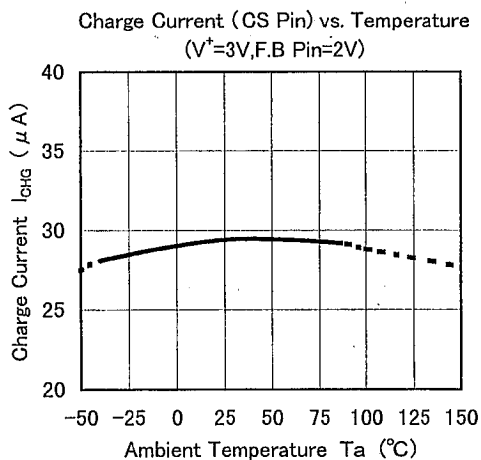
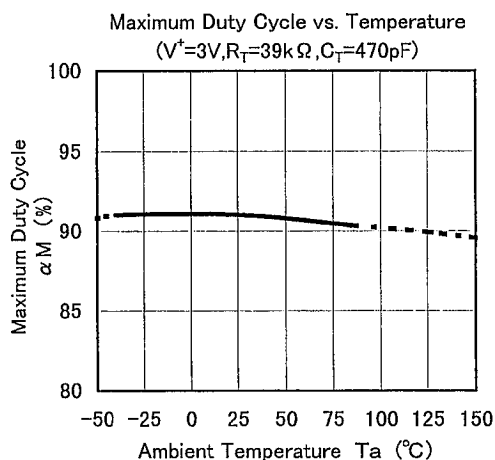
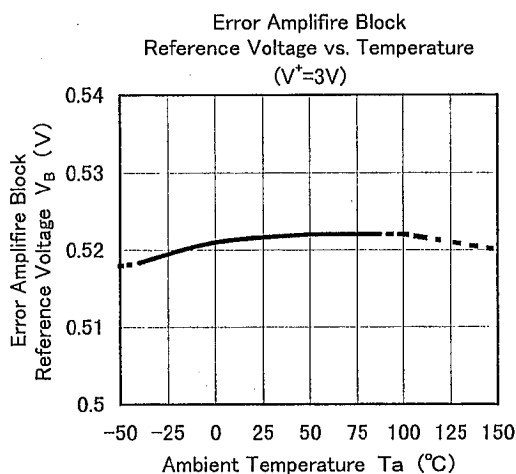
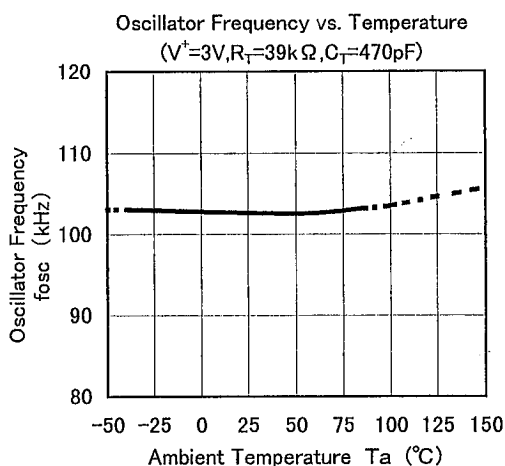
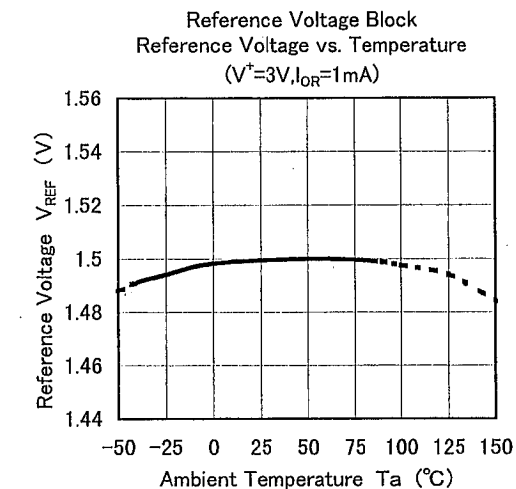
Quiescent Current (Latch Mode) vs. Temperature
($V^+=3V, CS=1.8V$)



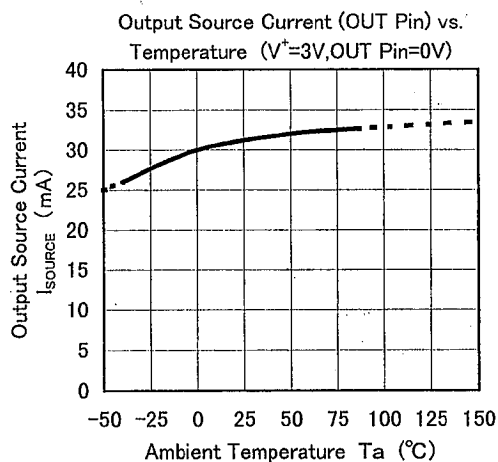
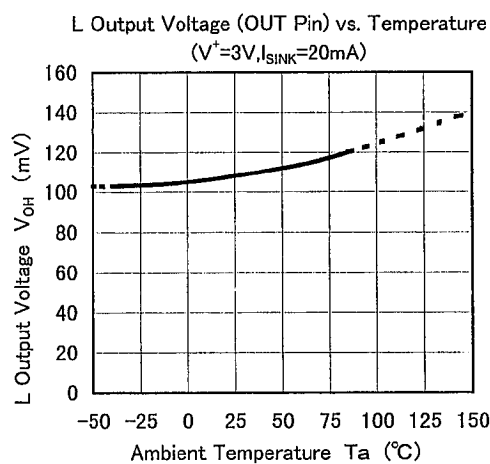
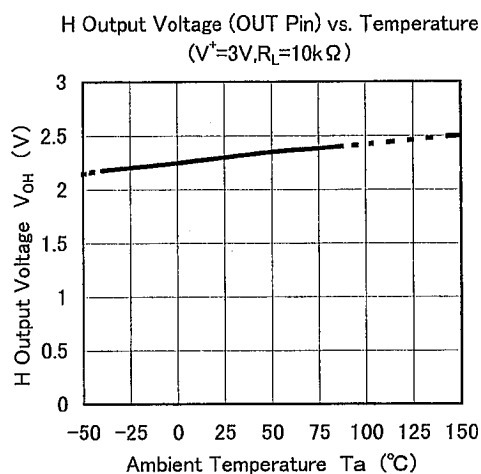
Average Quiescent Current vs. Temperature
($V^+=3V, R_L=\infty, \text{duty cycle}=50\%$
 $R_T=39k\Omega, C_T=470pF$)



TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS



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[CAUTION]

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