

SWITCHING REGULATOR CONTROL IC

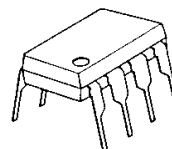
■GENERAL DESCRIPTION

The **NJM2377** is a high speed low voltage operation switching regulator control IC.

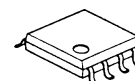
It features a totem pole driver circuit that can directly drive an external Bipolar transistor.

The **NJM2377** is suitable for portable applications, including TFT panel supply with fly-back configuration.

■PACKAGE OUTLINE



NJM2377D



NJM2377M



NJM2377V

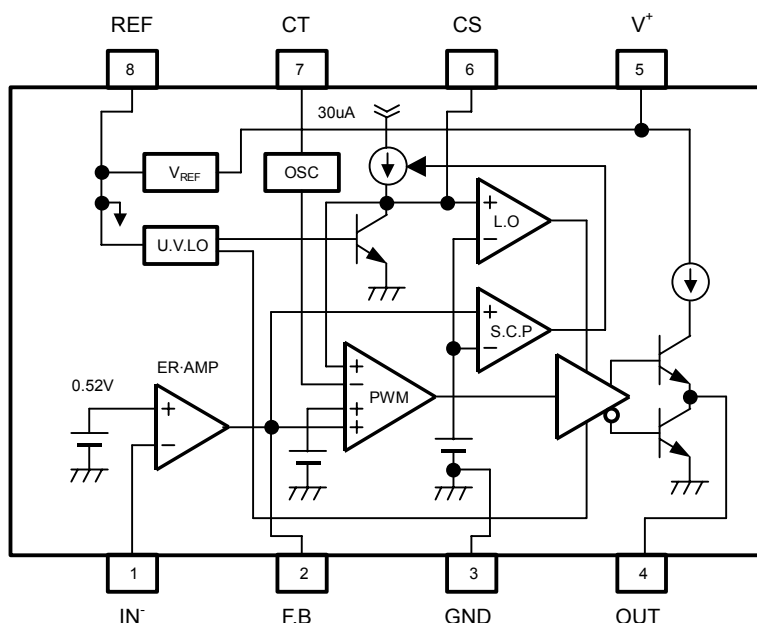


NJM2377R

■FEATURES

- PWM switching control
- Operating Voltage (2.7 to 18V)
- Wide Oscillator Range (10 to 500 kHz)
- ON/OFF Maximum Duty Cycle (Ton:Toff = 9:1)
- Totem Pole Output
- Soft-Start Function
- UVLO (Under Voltage Lockout)
- Bipolar Technology
- Package Outline DIP8, DMP8, SSOP8, VSP8

■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	MAXIMUM RATINGS	UNIT
Input Voltage	V ⁺	18	V
Output Current	I _O	±50	mA
Power Dissipation	P _D	(DIP 8) 700 (DMP 8) 300 (SSOP 8) 250 (VSP 8) 320	mW
Operating Temperature Range	T _{OPR}	-40 ~ +85	°C
Storage Temperature Range	T _{STG}	-50 ~ +125	°C

■RECOMEND 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	—	kΩ
Oscillator Timing Capacitor	C _T	220	22,000	pF
Oscillator Timing Resistor	R _T	5	100	kΩ
Oscillation Frequency	f _{OSC}	10	500	kHz

■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	ΔV_O-V_{IN}	$V^+=2.7 \sim 18V, I_{OR}=1mA$	—	3.8	11.5	mV
Load Regulation	ΔV_O-I_O	$I_{OR}=0.1 \sim 5.0mA$	—	5	30	mV

OSCILLATOR BLOCK

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Oscillation Frequency	f_{OSC}	$R_T=39k\Omega, C_T=470pF$	80	100	120	kHz
Oscillate Fluctuations1 (Line Fluctuations)	f_{dV}	$V^+=2.7 \sim 18V$	—	1	—	%
Oscillate Fluctuations2 (Temp Fluctuations)	f_{dT}	$T_a=-40^\circ C \sim +85^\circ C$	—	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 Bandwidth Product	G_B		—	1.0	—	MHz
Maximum Output Voltage (F.B Pin)	V_{OM+}	$R_{NF}=100k\Omega, IN^- Pin=0V$	1.9	2.2	2.4	V
	V_{OM-}	$R_{NF}=100k\Omega, IN^- Pin=0V$	—	—	200	mV
Output Source Current (F.B Pin)	I_{OM+}	$V_{OM}=1V, IN^- Pin=0V$	40	85	200	μA

PWM COMPARE BLOCK

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Threshold Voltage (F.B Pin)	V_{TH0}	duty·cycle=0%	—	0.45	0.65	V
Input Threshold Voltage (F.B Pin)	V_{TH80}	duty·cycle=80%	—	1.05	—	V
Maximum Duty Cycle	αM	F.B Pin=1.2V $R_T=39k\Omega, C_T=470pF$	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_{THCS0}	duty·cycle=0%, F.B Pin=1.2V	—	0.25	0.35	V
Input Threshold Voltage (CS Pin)	V_{THCS80}	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}		1.30	1.50	1.80	V
Charge Current (CS Pin)	I_{CHG}	CS Pin=0V, F.B Pin=2V	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

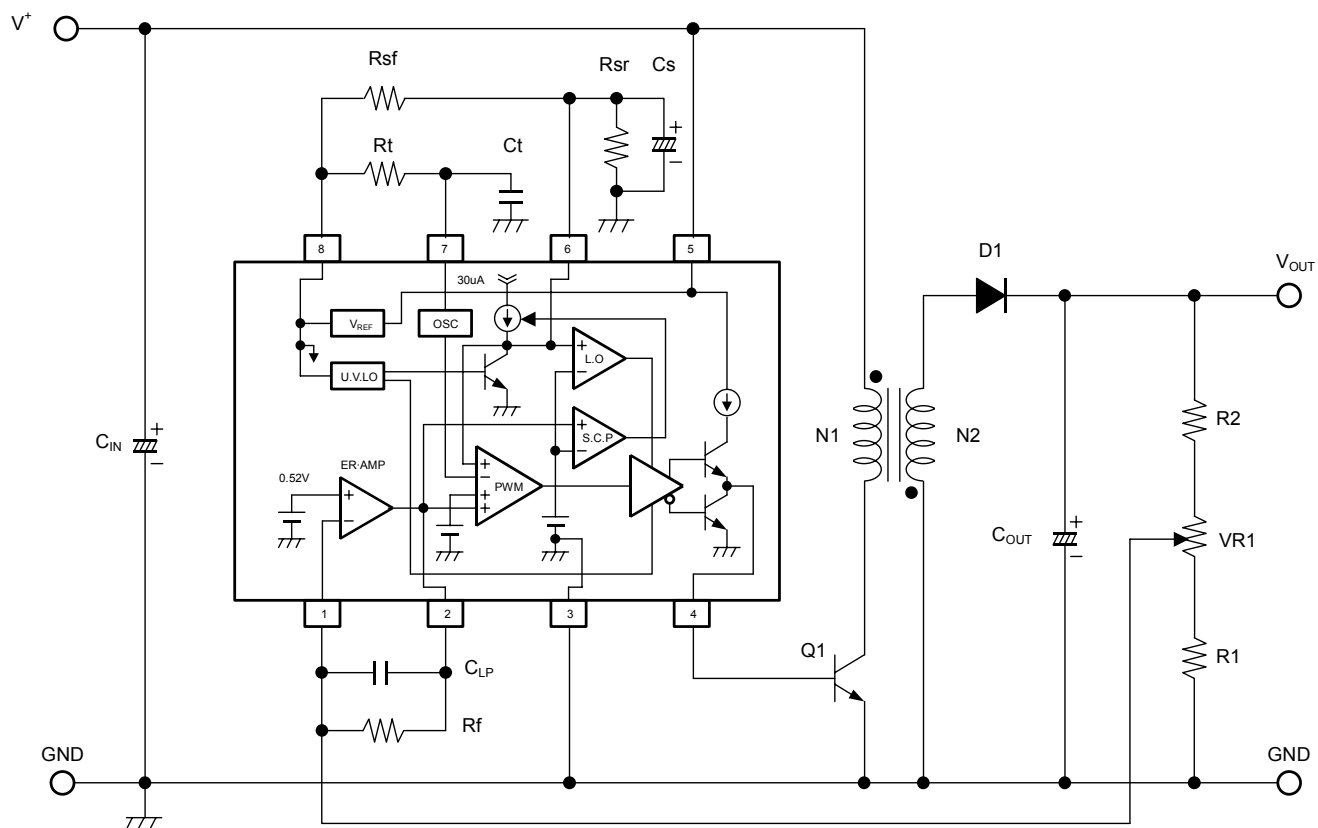
OUTPUT BLOCK

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 CHARACTERISTICS

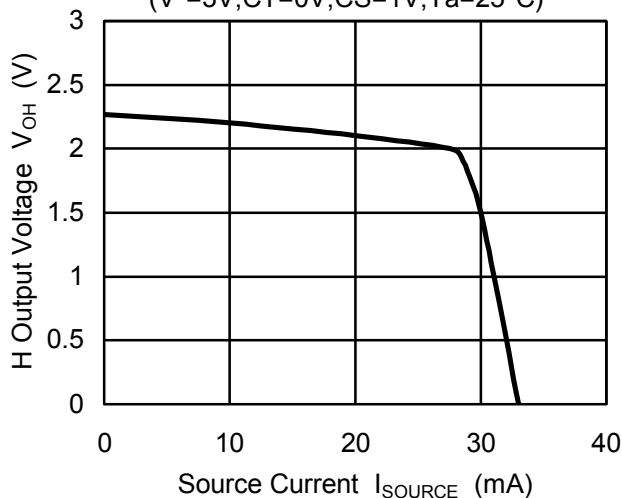
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	I_{CCLA}	Latch Mode, CS Pin=1.8V	–	1.7	2.4	mA
Average Quiescent Current	I_{CCAV}	$R_L = \infty$, duty cycle=50%	–	5.0	6.8	mA

■ TYPICAL APPLICATIONS

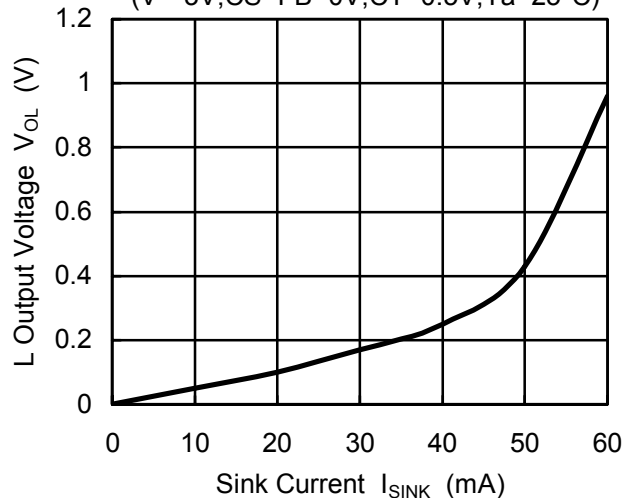


■ TYPICAL CHARACTERISTICS

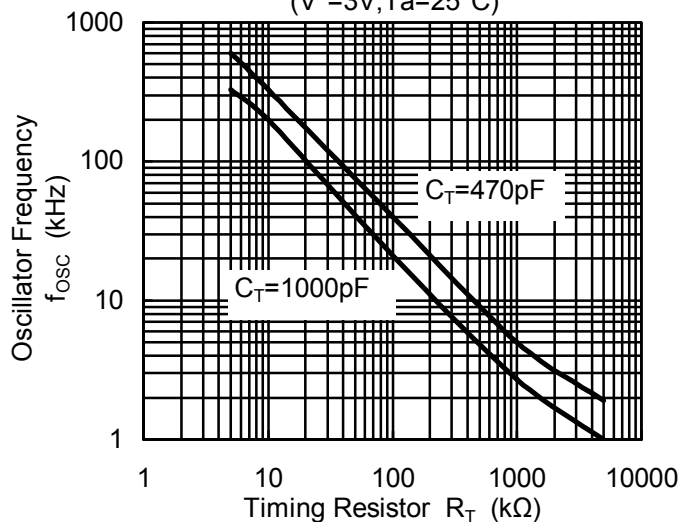
H Output Voltage(OUT Pin) vs. Source Current
($V^+=3V, C_T=0V, C_S=1V, T_a=25^\circ C$)



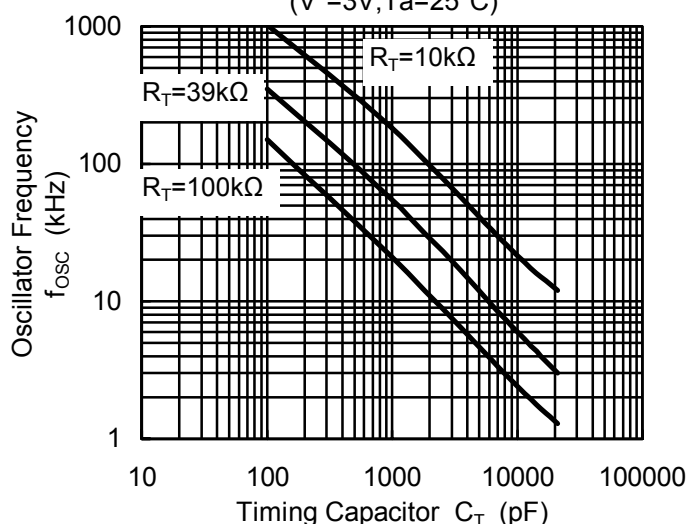
L Output Voltage(OUT Pin) vs. Sink Current
($V^+=3V, C_S=FB=0V, C_T=0.5V, T_a=25^\circ C$)



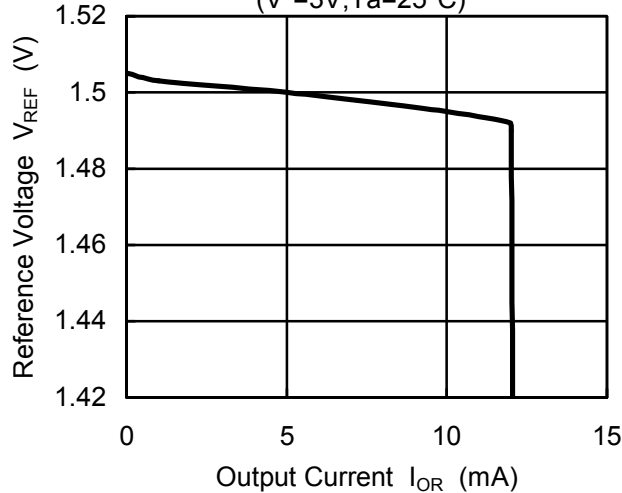
Oscillator Frequency vs. Timing Resistor
($V^+=3V, T_a=25^\circ C$)



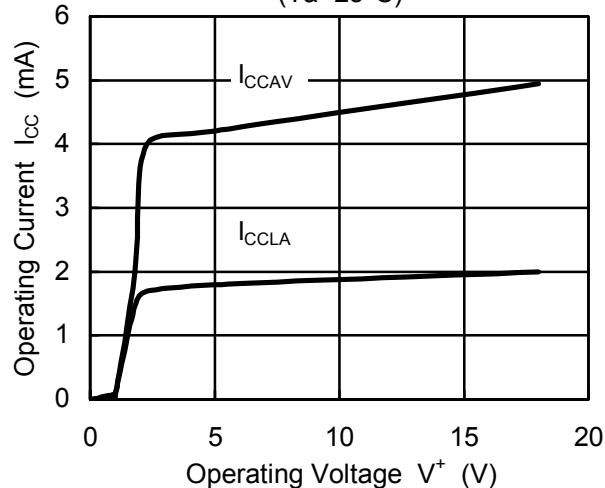
Oscillator Frequency vs. Timing Capacitor
($V^+=3V, T_a=25^\circ C$)



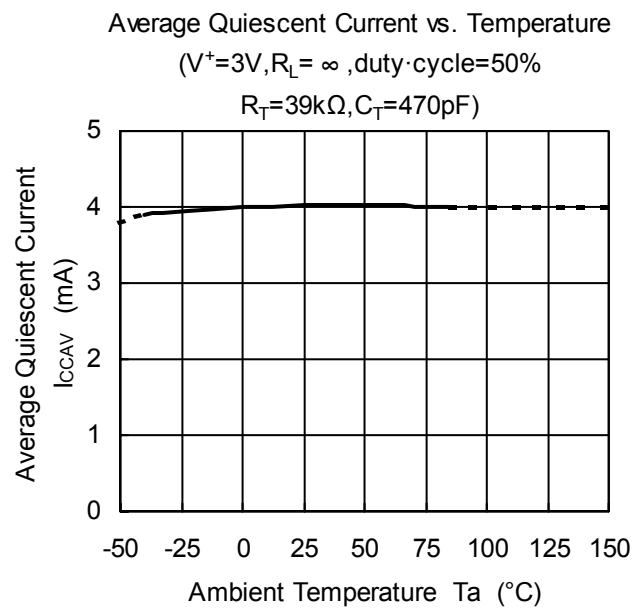
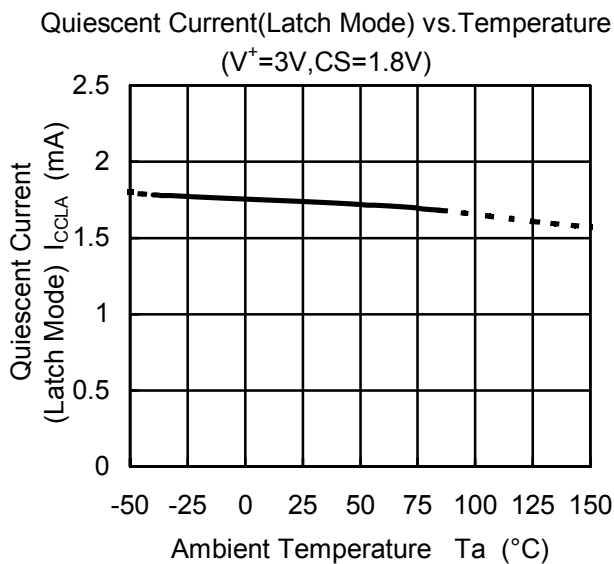
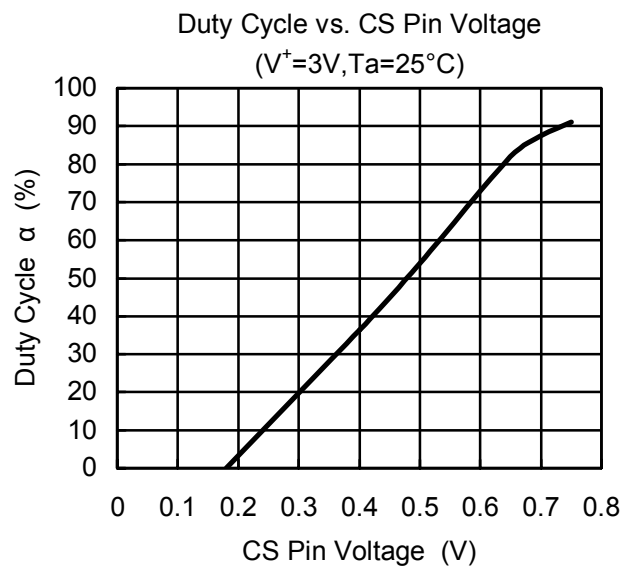
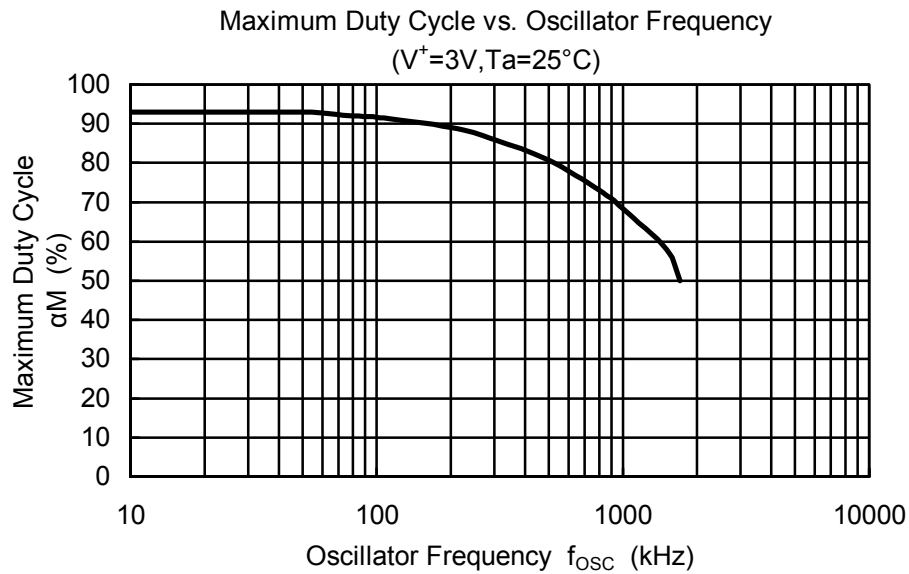
Reference Voltage vs. Output Current
($V^+=3V, T_a=25^\circ C$)



Operating Current vs. Operating Voltage
($T_a=25^\circ C$)

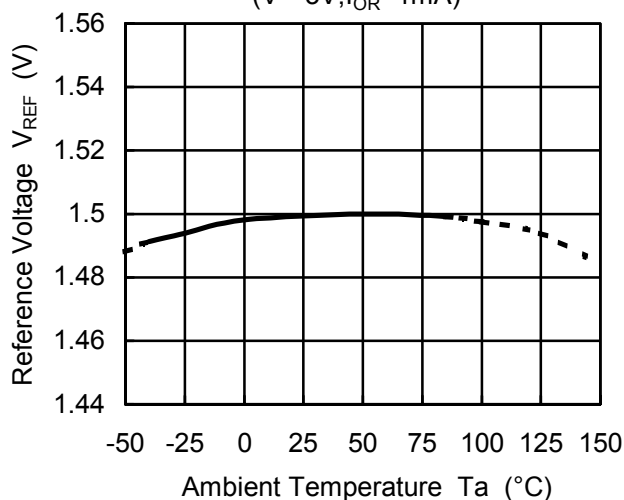


■TYPICAL CHARACTERISTICS

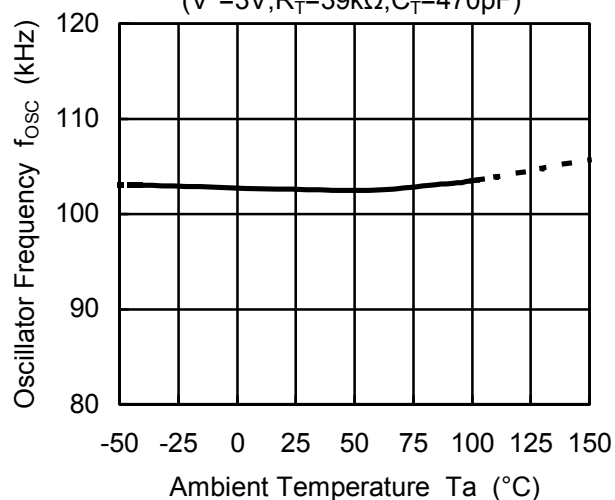


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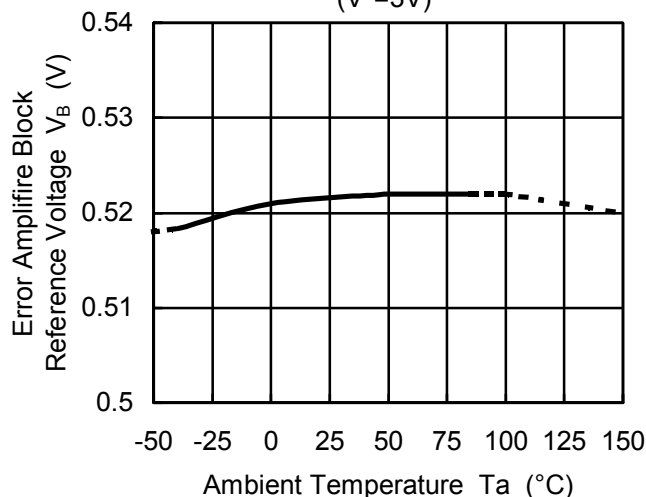
Reference Voltage Block
Reference Voltage vs. Temperature
($V^+=3V, I_{OR}=1mA$)



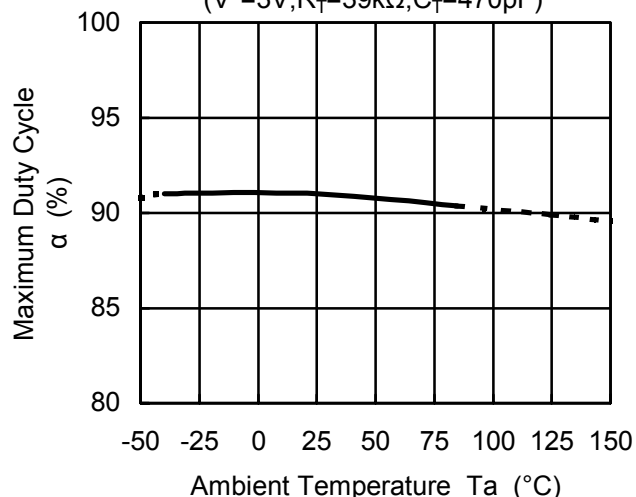
Oscillator Frequency vs. Temperature
($V^+=3V, R_T=39k\Omega, C_T=470pF$)



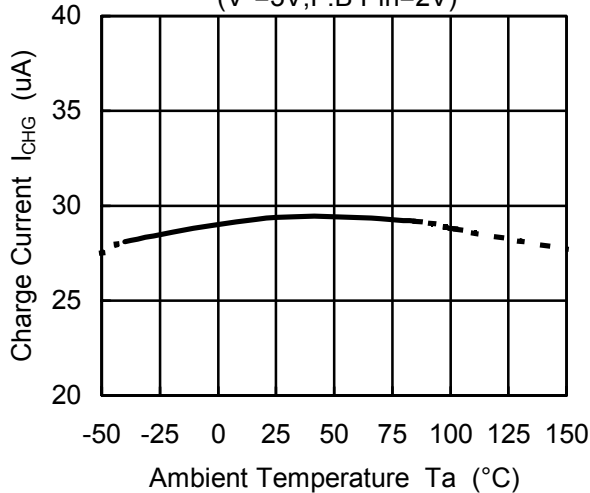
Error Amplifier Block
Reference Voltage vs. Temperature
($V^+=3V$)



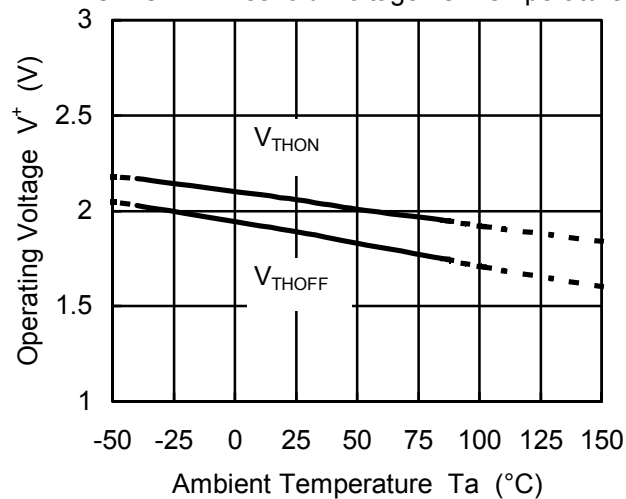
Maximum Duty Cycle vs. Temperature
($V^+=3V, R_T=39k\Omega, C_T=470pF$)



Charge Current (CS Pin) vs. Temperature
($V^+=3V, F.B \text{ Pin}=2V$)

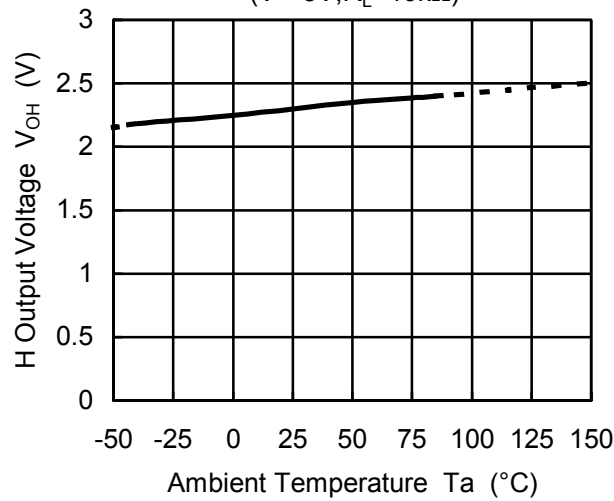


Under Voltage Lockout Block
ON/OFF Threshold Voltage vs. Temperature

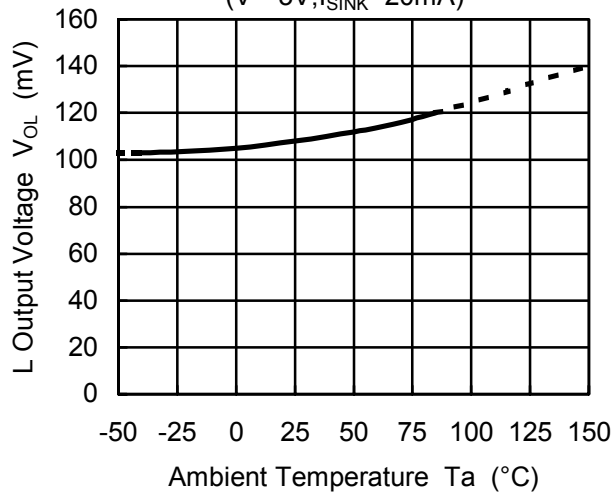


TYPICAL CHARACTERISTICS

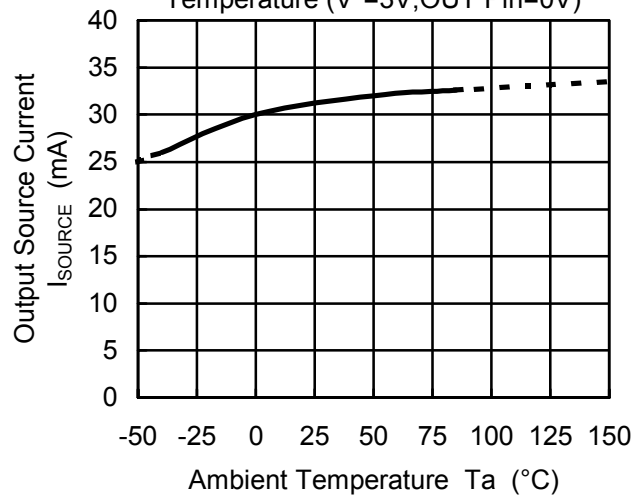
H Output Voltage (OUT Pin) vs. Temperature
($V^+=3V, R_L=10k\Omega$)



L Output Voltage (OUT Pin) vs. Temperature
($V^+=3V, I_{SINK}=20mA$)



Output Source Current (OUT Pin) vs. Temperature
($V^+=3V, OUT\ Pin=0V$)



[CAUTION]

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