SWITCHING REGULATOR CONTROL IC FOR FLYBACK

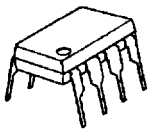
■ GENERAL DESCRIPTION

The NJM2368 is a high speed switching regulator control IC which can operate at low voltage.

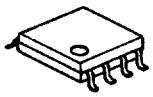
It uses a totempole output circuit , so that it can drive an external Bipolar Transistor directly.

It is suitable for applications of flyback type switching regulation of up to 10W.

■ PACKAGE OUTLINE



NJM2368D



NJM2368M

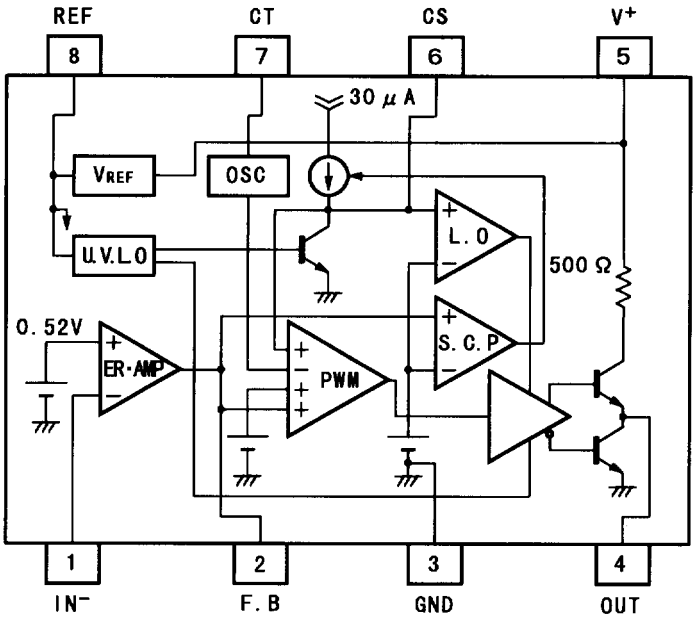
NJM2368E

NJM2368V

■ FEATURES

- Operating Voltage (3.6~32V)
- Wide Oscillator Range (5~350 kHz)
- Soft-Start Function.
- Under Voltage Lockouts (U.V.L.O.)
- Bipolar Technology
- Package Outline DIP8, DMP8, EMP8, SSOP8

■ BLOCK DIAGRAM



PIN FUNCTION

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

6

■ ABSOLUTE MAXIMUM RATINGS (Ta＝25℃)

PARAMETER	SYMBOL	MAXIMUM RATINGS	UNIT
Input Voltage	V^+	36	V
Reference Output Current	I_{OR}	10	mA
Output Current	I_O	±50	mA
Power Dissipation	P_D	(DIP8) 700 (DMP8) 300 (EMP8) 300 (SSOP8) 250	mW
Operating Temperature Range	T_{OPR}	-40～+85	℃
Storage Temperature Range	T_{STG}	-50～+125	℃

■ RECOMMENDED OPERATING CONDITIONS (V^+＝6V, Ta＝25℃)

PARAMETER	SYMBOL	RATINGS	MIN.	MAX.	UNIT
Operating Voltage	V^+		3.6	32	V
Feed Back Resistor	R_{NF}		100	—	kΩ
Oscillator Timing Capacitor	C_T		220	22000	pF
Oscillator Timing Resistor	R_T		10	100	kΩ
Oscillate	f_{OSC}		5	350	kHz

■ ELECTRICAL CHARACTERISTICS
(V^+＝6V, R_T＝33kΩ, C_T＝1000pF, Ta＝25℃)

REFERENCE VOLTAGE BLOCK

PARAMETER	SYMBOL	RATINGS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{REF}	I_{OR}=1mA	2.45	2.50	2.55	V
Line Regulation	L_{INE}	V^+=3.6～32V, I_{OR}=1mA	—	6.8	20.7	mV
Load Regulation	L_{OAD}	I_{OR}=0.1～5.0mA	—	5	30	mV

OSCILLATOR BLOCK

PARAMETER	SYMBOL	RATINGS	MIN.	TYP.	MAX.	UNIT
Oscillate	f_{OSC}	C_T=1000pF, R_T=33kΩ	85	105	125	kHz
Oscillate Fluctuations1 (Line Fluctuations)	f_{dv}	V^+=3.6～32V	—	1	—	%
Oscillate Fluctuations2 (Temp Fluctuations)	f_{dt}	Ta=-40～+85℃	—	5	—	%

■ ELECTRICAL CHARACTERISTICS

(V^+=6V, R_T=33kΩ, C_T=1000pF, Ta=25℃)

ERROR AMPLIFIER BLOCK

PARAMETER	SYMBOL	RATINGS	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}=100kΩ	V_{REF}-0.2	—	—	V
(F.B Pin)	V_{OM-}	R_{NF}=100kΩ	—	—	200	mV
Output Source Current (F.B Pin)	I_{OM+}	V_{OM}=1V	40	85	200	μA

PWM COMPARATE BLOCK

PARAMETER	SYMBOL	RATINGS	MIN.	TYP.	MAX.	UNIT
Input Bias 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	RATINGS	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

SHORT CIRCUIT PROTECTION

PARAMETER	SYMBOL	RATINGS	MIN.	TYP.	MAX.	UNIT
Input Threshold Voltage (F.B Pin)	V_{THPC}		1.20	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	RATINGS	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

■ ELECTRICAL CHARACTERISTICS

(V^+=6V, R_T=33kΩ, C_T=1000pF, Ta=25℃)

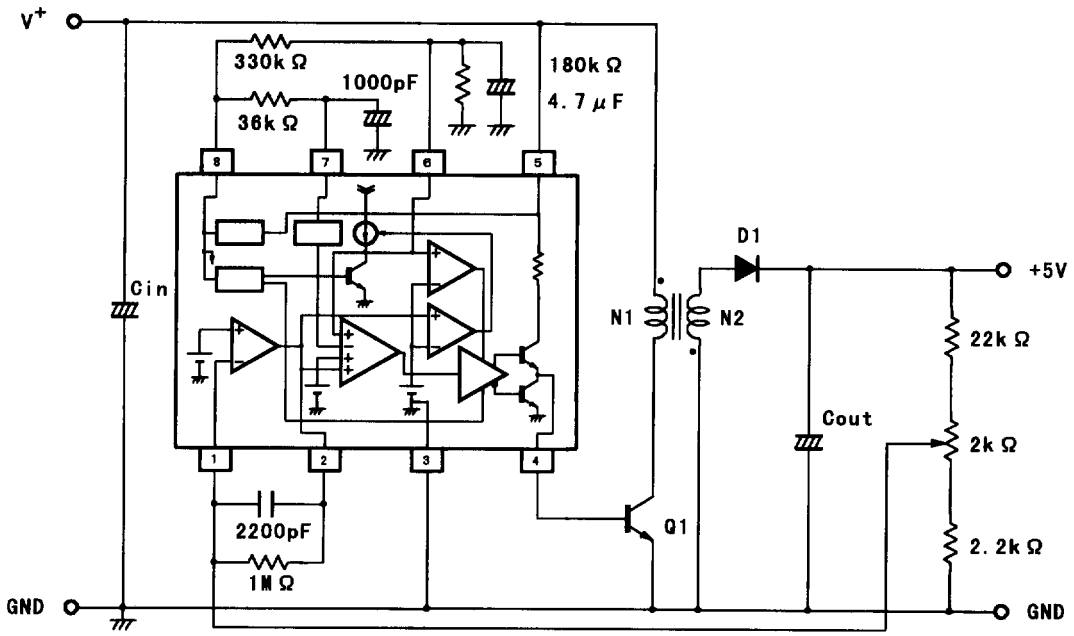
OUTPUT

PARAMETER	SYMBOL	RATINGS	MIN.	TYP.	MAX.	UNIT
H-Output Voltage (OUT Pin)	V_{OH}	R_L=10kΩ	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	8	11	—	mA

GENERAL CHARACTERISTIC

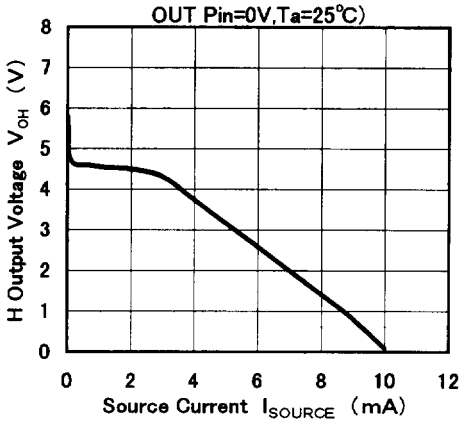
PARAMETER	SYMBOL	RATINGS	MIN.	TYP.	MAX.	UNIT
Quiescent Current	I_{CCLA}	Latch	—	1.6	2.2	mA
Average Quiescent Current	I_{CCAV}	R_L=∞, duty·cycle=50%	—	3.5	4.8	mA

■ APPLICATION

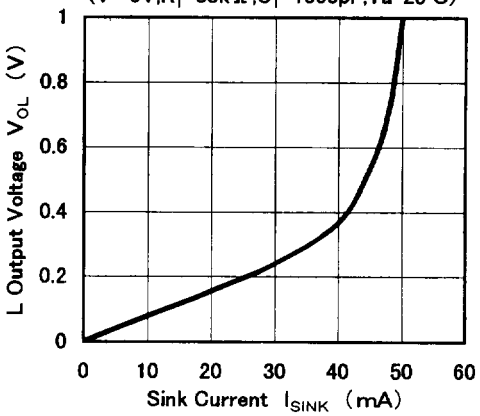


■ TYPICAL CHARACTERISTICS

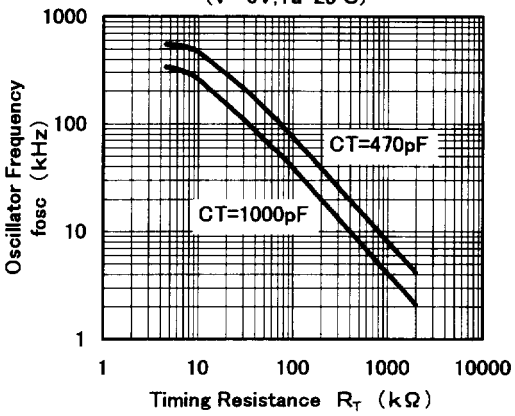
H Output Voltage vs. Source Current
(V^+=6V,R_T=33kΩ,C_T=1000pF,
OUT Pin=0V,Ta=25°C)



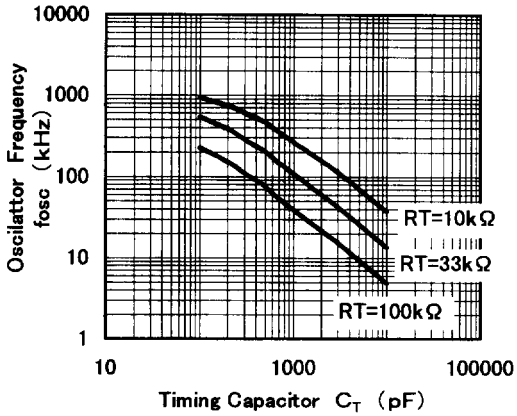
L Output Voltage vs. Sink Current
(V^+=6V,R_T=33kΩ,C_T=1000pF,Ta=25°C)



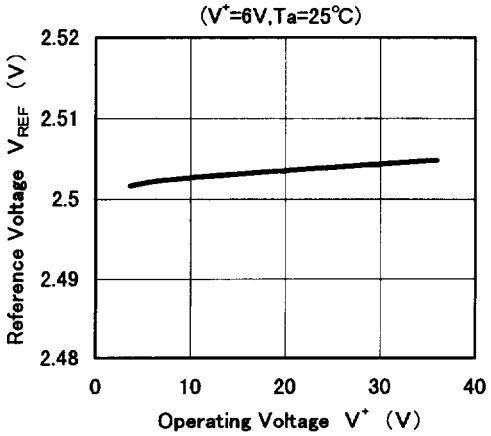
Oscillator Frequency vs. Timing Resistor
(V^+=6V,Ta=25°C)



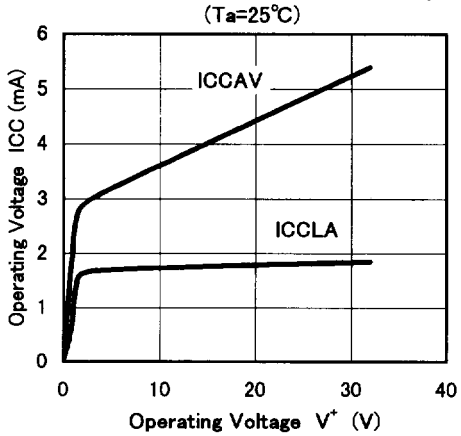
Oscillator Frequency vs. Timing Capacitor
(V^+=6V,Ta=25°C)



Reference Voltage vs. Operating Voltage
(V^+=6V,Ta=25°C)



Operating Current vs. Operating Voltage
(Ta=25°C)



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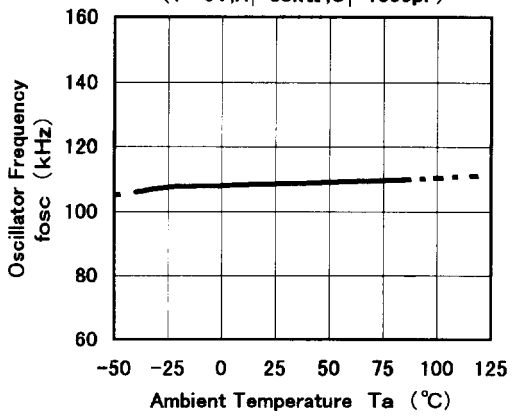
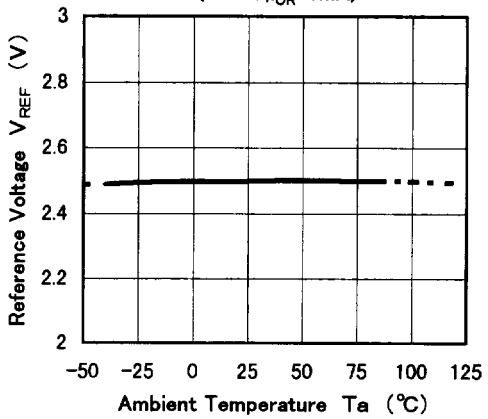
■ TYPICAL CHARACTERISTICS

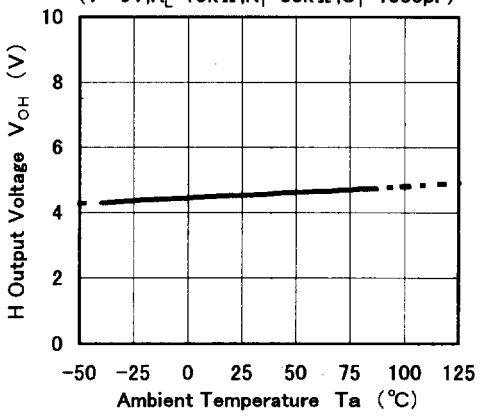
Oscillator Frequency vs. Temperature
(V^+=6V,R_T=33kΩ,C_T=1000pF)



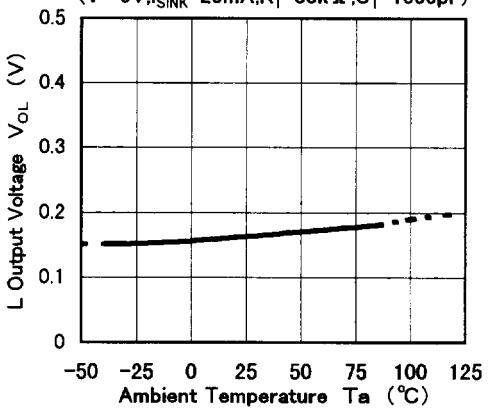
Reference Voltage vs. Temperature
(V^+=6V,I_{OR}=1mA)



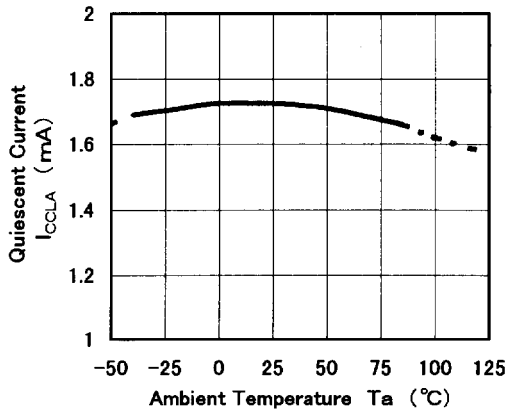
H Output Voltage vs. Temperature
(V^+=6V,R_L=10kΩ,R_T=33kΩ,C_T=1000pF)



L Output Voltage vs. Temperature
(V^+=6V,I_{SINK}=20mA,R_T=33kΩ,C_T=1000pF)



Quiescent Current vs. Temperature
(Latch Mode,V^+=6V,R_T=33kΩ,C_T=1000pF)



Average Quiescent Current vs. Temperature
(V^+=6V,R_L=∞,duty・cycle=50%,
R_T=33kΩ,C_T=1000pF)