

SWITCHING REGULATOR CONTROL IC FOR FLYBACK

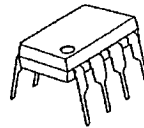
■ GENERAL DESCRIPTION

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

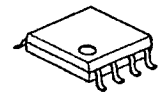
It uses a totempole output circuit, so that it can drive an external Bipolar Transistor directly.

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

■ PACKAGE OUTLINE



NJM2368D



NJM2368M

■ 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

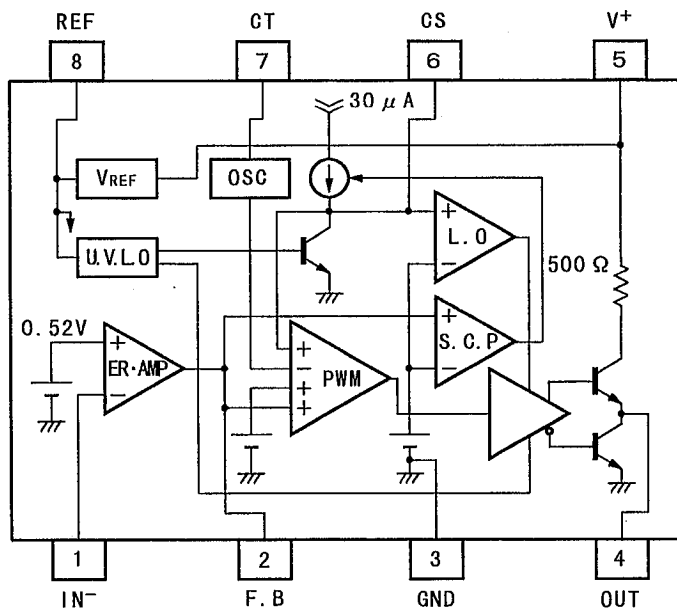


NJM2368E



NJM2368V

■ BLOCK DIAGRAM



PIN FUNCTION

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

■ ABSOLUTE MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

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}	$-40 \sim +85$	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	$-50 \sim +125$	$^\circ\text{C}$

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

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

■ ELECTRICAL CHARACTERISTICS

($V^+ = 6\text{V}$, $R_T = 33\text{k}\Omega$, $C_T = 1000\text{pF}$, $T_a = 25^\circ\text{C}$)

REFERENCE VOLTAGE BLOCK

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

OSCILLATOR BLOCK

PARAMETER	SYMBOL	RATINGS	MIN.	TYP.	MAX.	UNIT
Oscillate	f_{OSC}	$C_T = 1000\text{pF}$, $R_T = 33\text{k}\Omega$	85	105	125	kHz
Oscillate Fluctuations1 (Line Fluctuations)	f_{dv}	$V^+ = 3.6 \sim 32\text{V}$	—	1	—	%
Oscillate Fluctuations2 (Temp Fluctuations)	f_{dt}	$T_a = -40 \sim +85^\circ\text{C}$	—	5	—	%

■ ELECTRICAL CHARACTERISTICS

($V^+ = 6V$, $R_T = 33k\Omega$, $C_T = 1000pF$, $T_a = 25^\circ C$)

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 (F.B Pin)	V_{OM+}	$R_{NF}=100k\Omega$	$V_{REF}-0.2$	—	—	V
	V_{OM-}	$R_{NF}=100k\Omega$	—	—	200	mV
Output Source Current (F.B Pin)	I_{OM+}	$V_{OM}=1V$	40	85	200	μA

PWM COMPARE BLOCK

PARAMETER	SYMBOL	RATINGS	MIN.	TYP.	MAX.	UNIT
Input Bias Voltage (F.B Pin)	V_{THO}	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

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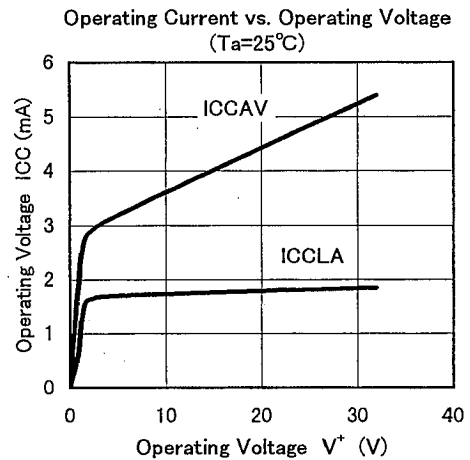
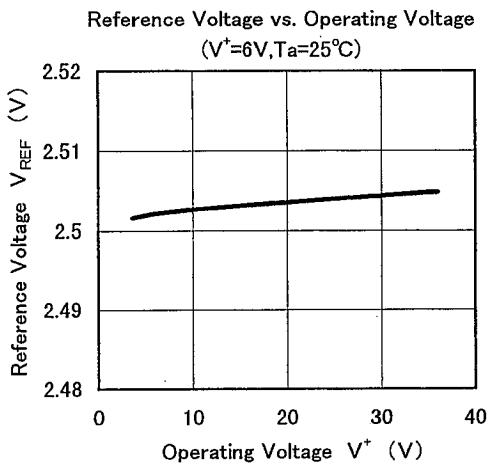
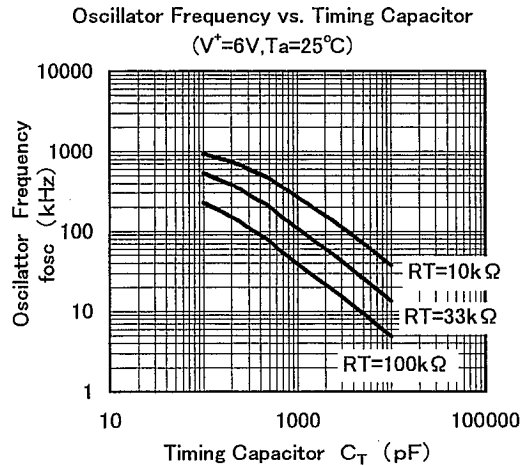
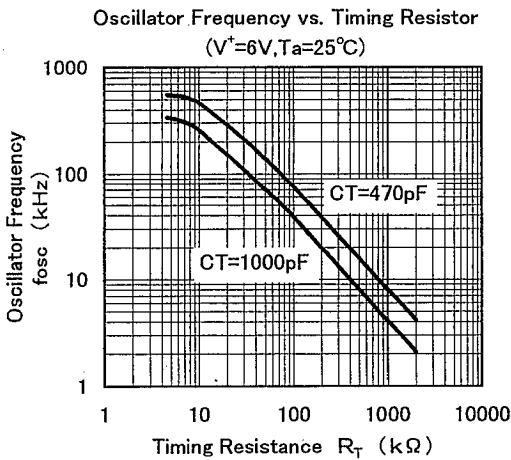
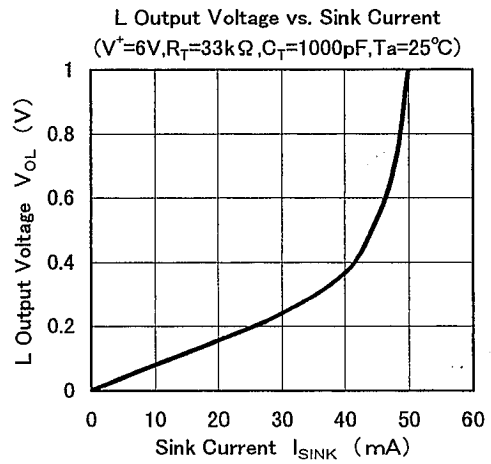
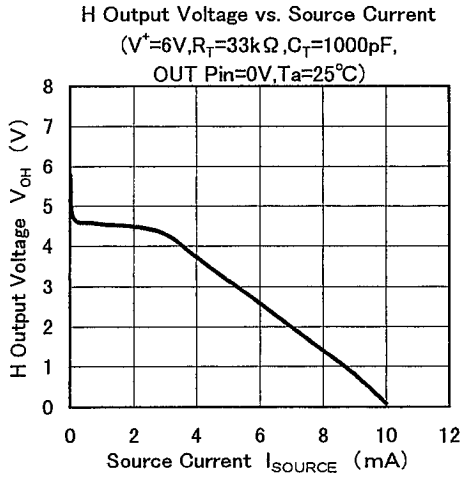
$$(V^+ = 6\text{ V}, R_T = 33\text{ k}\Omega, C_T = 1000\text{ pF}, T_a = 25^\circ\text{C})$$

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

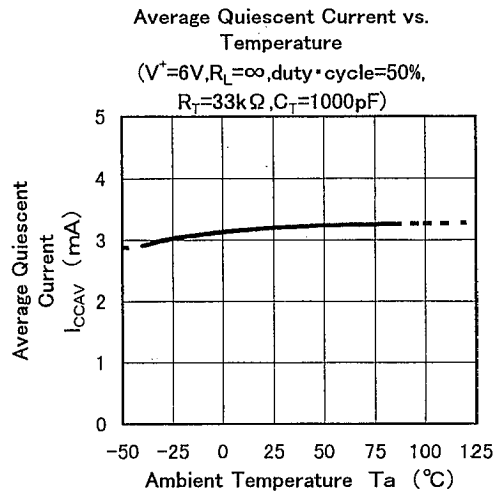
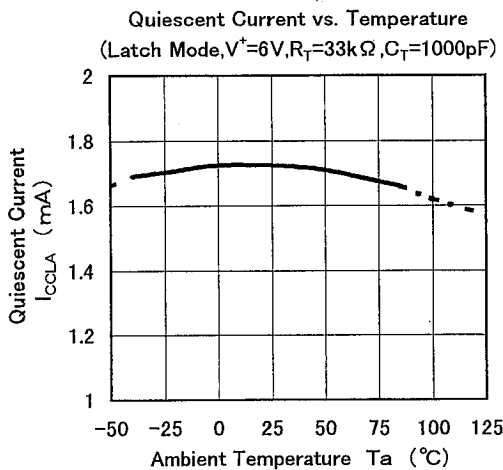
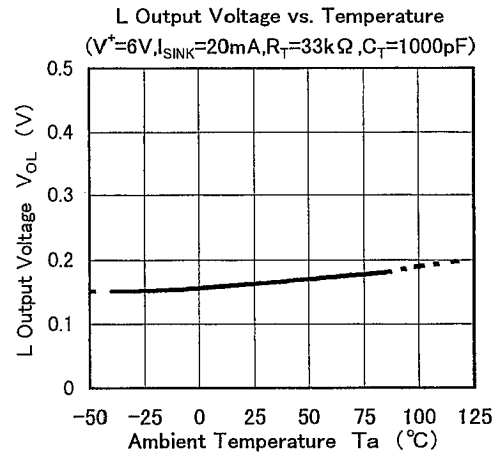
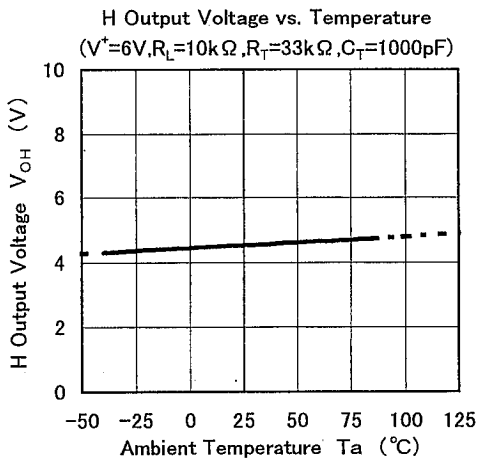
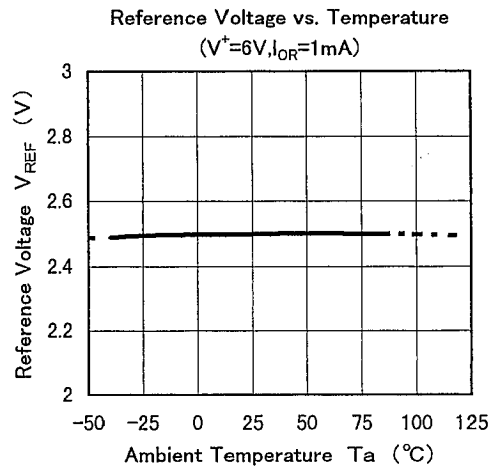
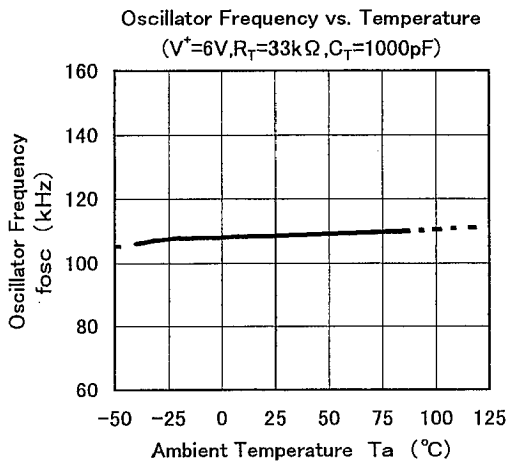
PARAMETER	SYMBOL	RATINGS	MIN.	TYP.	MAX.	UNIT
Quiescent Current	I _{CC(L)}	Latch	—	1.6	2.2	mA
Average Quiescent Current	I _{CC(AV)}	R _L =∞, duty·cycle=50%	—	3.5	4.8	mA

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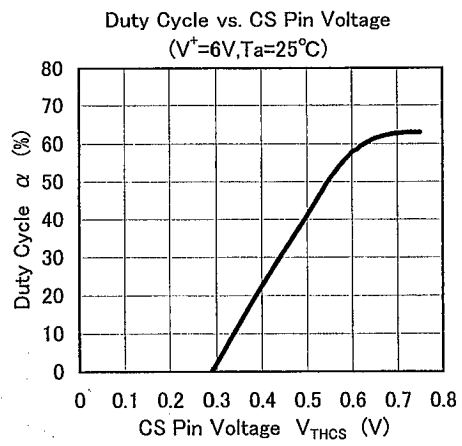
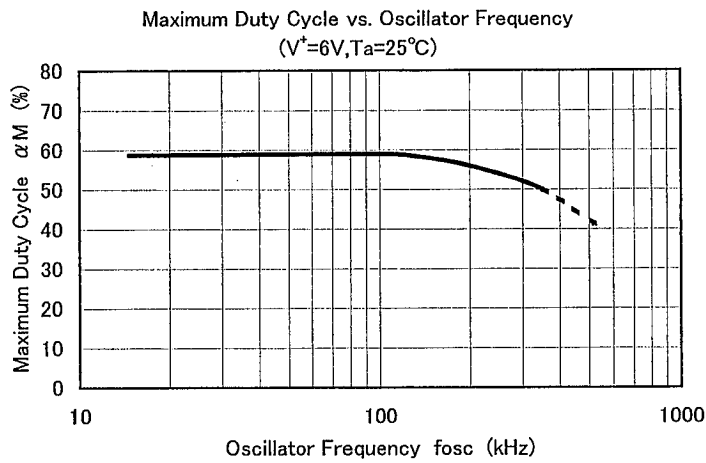
■ TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS



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