

SWITCHING REGULATOR CONTROL IC FOR FLYBACK

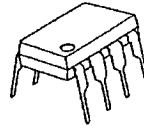
■ GENERAL DESCRIPTION

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

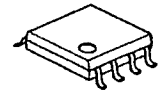
It uses a totempole output circuit, so that it can drive an external Bipolar Transistor directly.

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

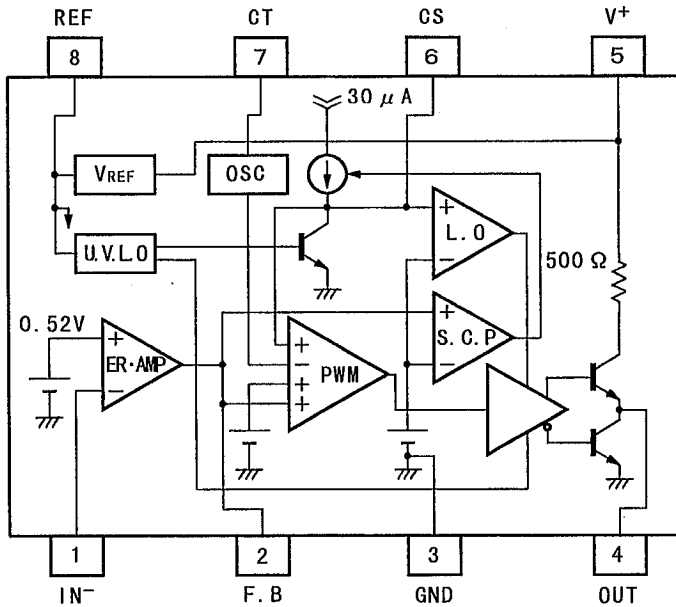


NJM2368E



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°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~+85	°C
Storage Temperature Range	T _{STG}	-50~+125	°C

■ RECOMMENDED OPERATING CONDITIONS (V⁺ = 6V, T_a = 25°C)

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, T_a = 25°C)

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 _{LINE}	V ⁺ = 3.6~32V, I _{OR} = 1mA	—	6.8	20.7	mV
Load Regulation	L _{LOAD}	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}	T _a = -40~+85°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 COMPARATE 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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NJM2368

ELECTRICAL CHARACTERISTICS

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

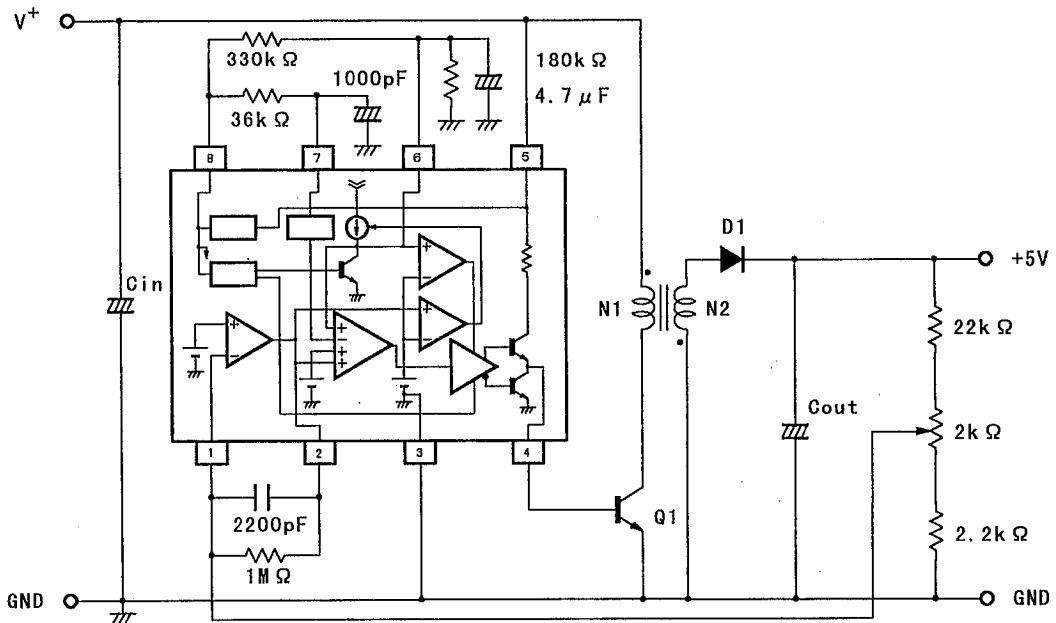
OUTPUT

PARAMETER	SYMBOL	RATINGS	MIN.	TYP.	MAX.	UNIT
H-Output Voltage(OUT Pin)	V_{OH}	$R_L = 10k\Omega$	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

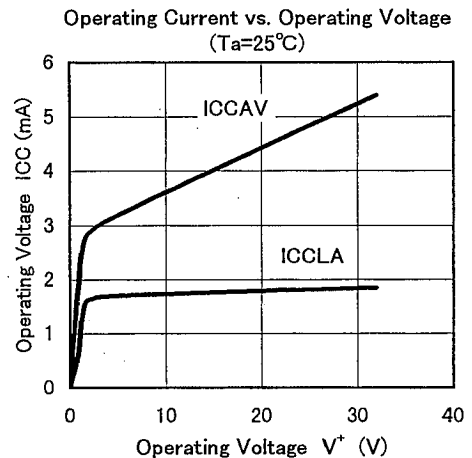
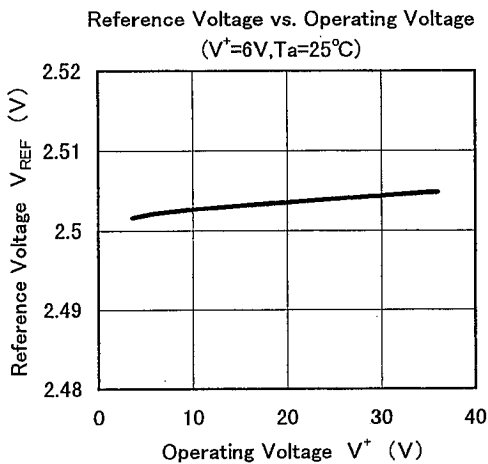
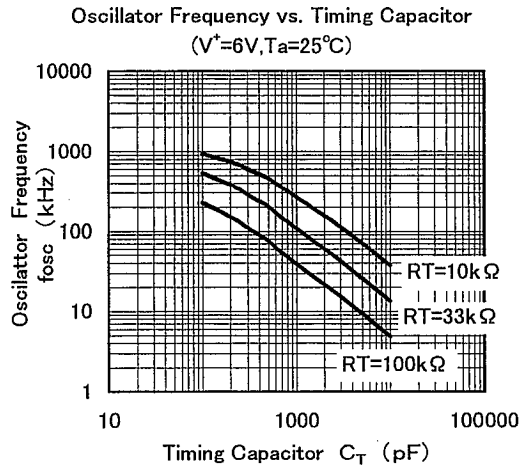
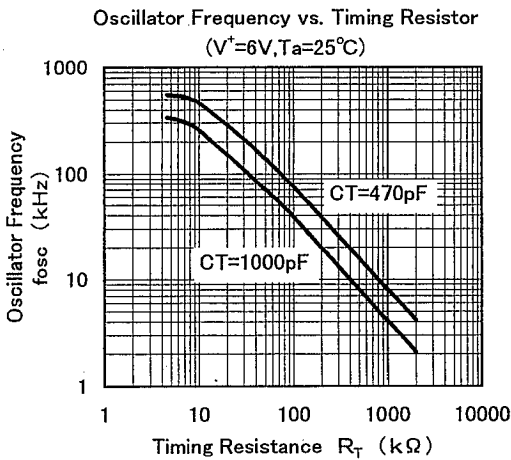
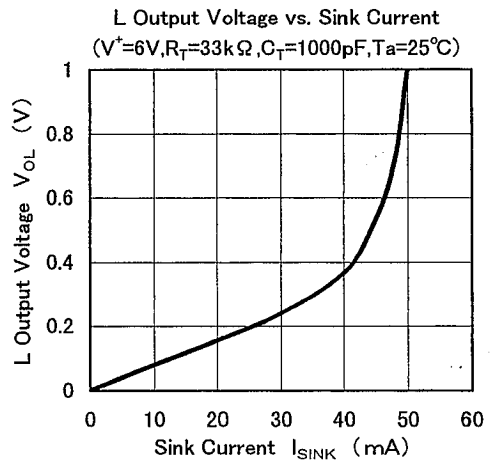
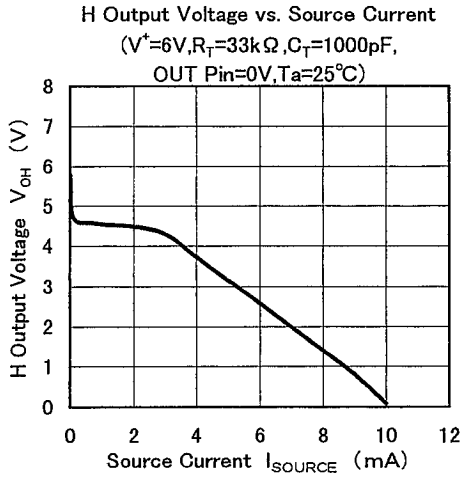
GENERAL CHARACTERISTIC

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

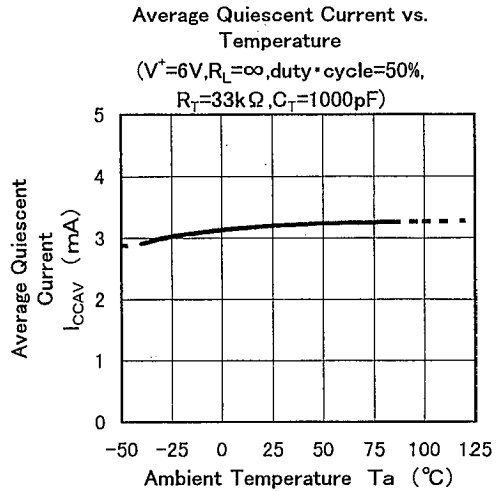
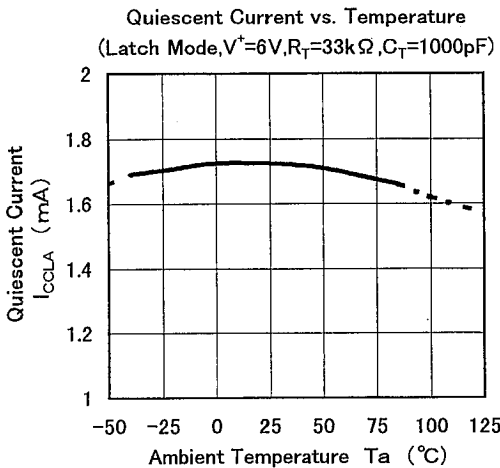
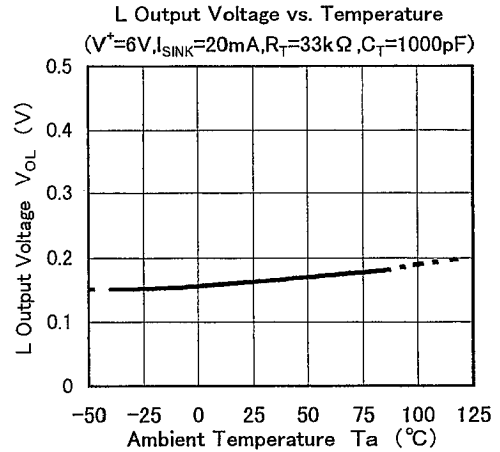
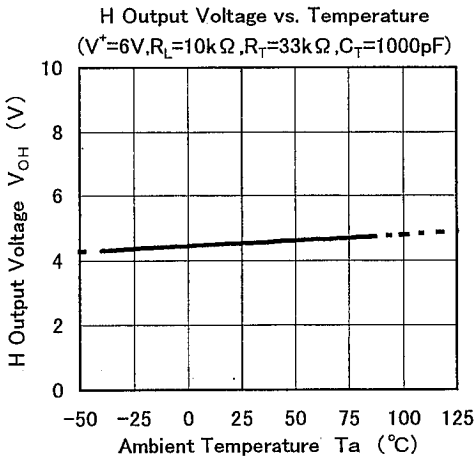
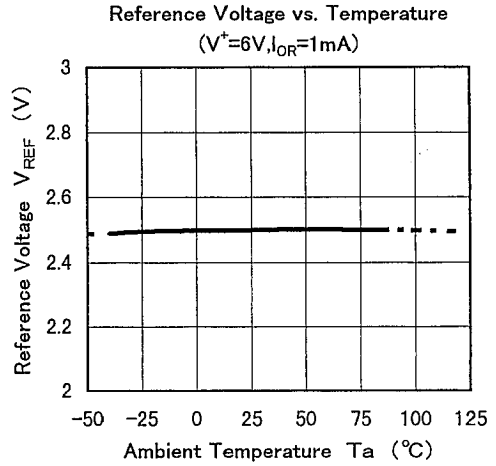
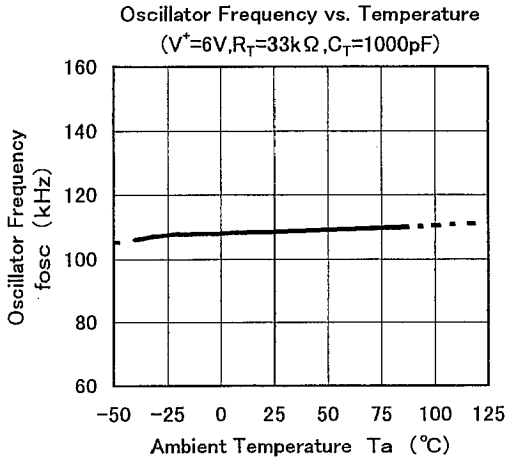
APPLICATION



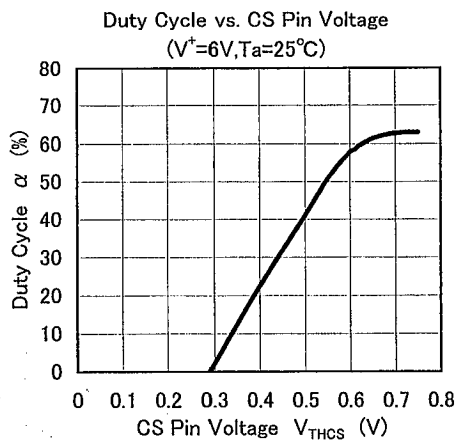
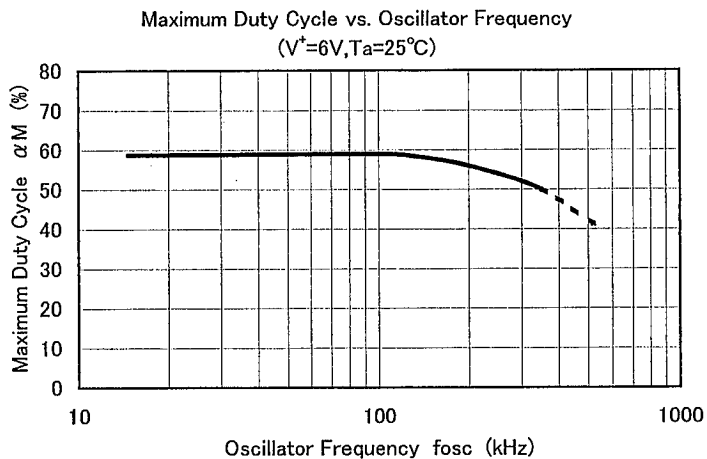
■ TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS



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