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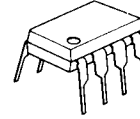
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DC/DC CONVERTER CONTROL IC

■ GENERAL DESCRIPTION

The NJM2360 is a DC to DC converter control IC. Due to the internalization of a high current output switch, 1.5A switching operations are available. The NJM2360 is designed to be incorporated in step-up, step-down and inverting applications with a minimum number of external components. Output current is limited by an external resistor.

■ PACKAGE OUTLINE



NJM2360D



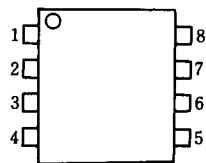
NJM2360M

■ FEATURES

- Output Switch Current 1.5A(MAX)
- Operating Voltage 2.5V* to 40V
- Internal Over Current Limit Circuit
- Supply Voltage V^+ 2.5V* to 40V
- Output Voltage V_{OR} 1.25V to 40V
- Oscillator Frequency f_{OSC} 100Hz to 100kHz
- Package Outline DIP8, DMP8

* $T_a = 25^\circ\text{C}$. At low temperature, the minimum voltage is 3.0V.

■ PIN CONFIGURATION



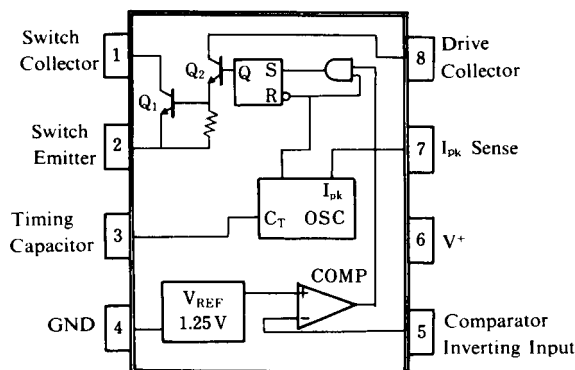
NJM2360D

NJM2360M

PIN FUNCTION

1. C_S
2. E_S
3. C_T
4. GND
5. INV_{IN}
6. V^+
7. S_1
8. C_D

■ BLOCK DIAGRAM



NJM2360

■ ABSOLUTE MAXIMUM RATINGS

(T_a = 25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V ⁺	40	V
Comparator Input Voltage Range	V _{IR}	-0.3 to V ⁺	V
Power Dissipation	P _D	(DIP8) 700 (DMP8) 600 (note1)	mW mW
Switch Current	I _{SW}	1.5	A
Operating Temperature Range	T _{opr}	-40 to +85	°C
Storage Temperature Range	T _{stg}	-40 to +125	°C

(note 1) At on PC board

■ ELECTRICAL CHARACTERISTICS

● DC Characteristics (V⁺ = 5V, T_a = 25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	I _{CC}	5V ≤ V ⁺ ≤ 40V, C _T = 0.001μF S _I = V ⁺ , INV _{IN} > V _{th} , E _S = GND	-	2.4	3.5	mA

Oscillator

Charge Current	I _{chg}	5V ≤ V ⁺ ≤ 40V	20	35	50	μA
Discharge Current	I _{dischg}	5V ≤ V ⁺ ≤ 40V	150	200	250	μA
Voltage Swing	V _{OSC}		-	0.5	-	V _{P-P}
Discharge to Charge Current Ratio	I _{dischg} /I _{chg}	S _I = V ⁺	-	6	-	-
Peak Current Sense Voltage	V _{IPK(sense)}	I _{chg} = I _{dischg}	250	300	350	mV

Output Switch (Note 2)

Saturation Voltage 1	V _{CE(sat) 1}	Darlington Connection (C _S = C _D) I _{SW} = 1.0A	-	1.0	1.3	V
Saturation Voltage 2	V _{CE(sat) 2}	I _{SW} = 1.0A, I _{C(driver)} = 50mA (Forced β ≐ 20)	-	0.5	0.7	V
DC Current Gain	h _{FE}	I _{SW} = 1.0A, V _{CE} = 5.0V	35	120	-	-
Collector Off-State Current	I _{C(off)}	V _{CE} = 40V	-	10	-	nA

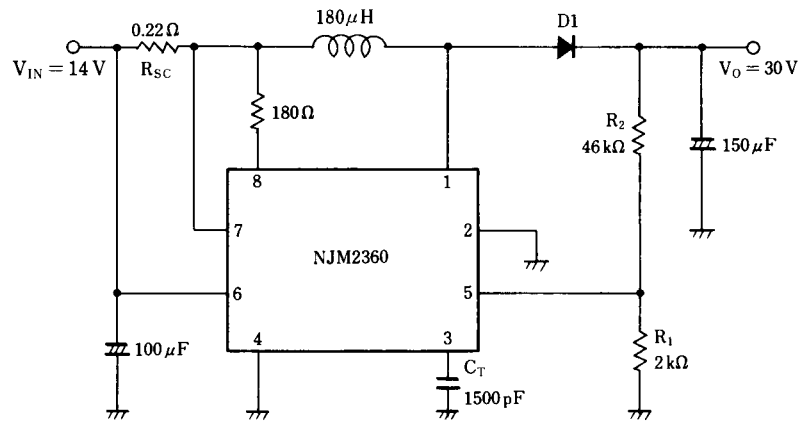
Comparator

Threshold Voltage	V _{th}		1.18	1.25	1.32	V
Input Bias Current	I _{IB}	V _{IN} = 0V	-	40	400	nA

Note 2 : Output switch tests are performed under pulsed conditions to minimize power dissipation.

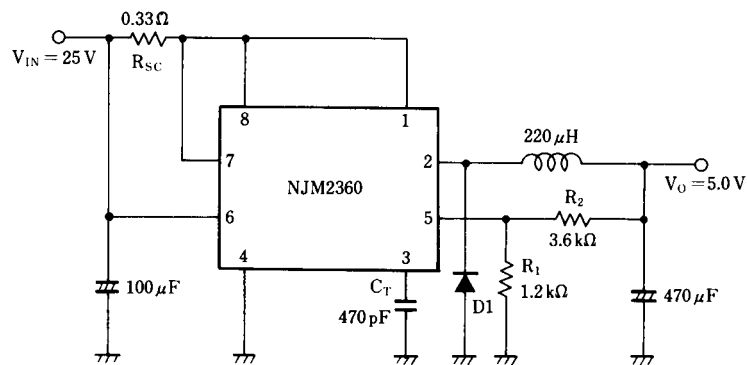
■ TYPICAL APPLICATION

1. Step-Up Converter



*D1 : SBD (EK14)

2. Step-Down Converter

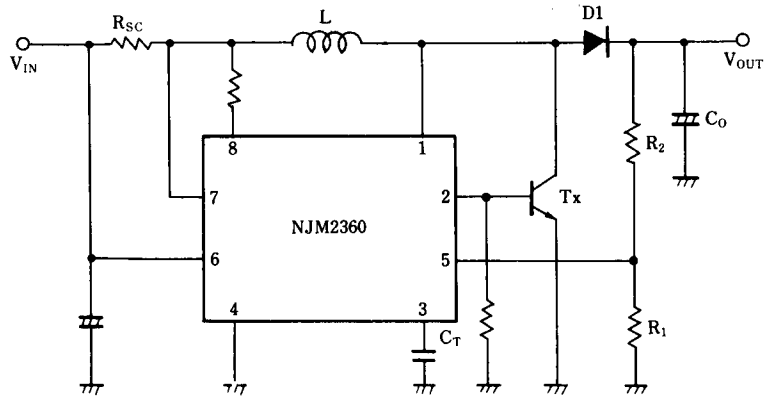


*D1 : SBD (EK14)

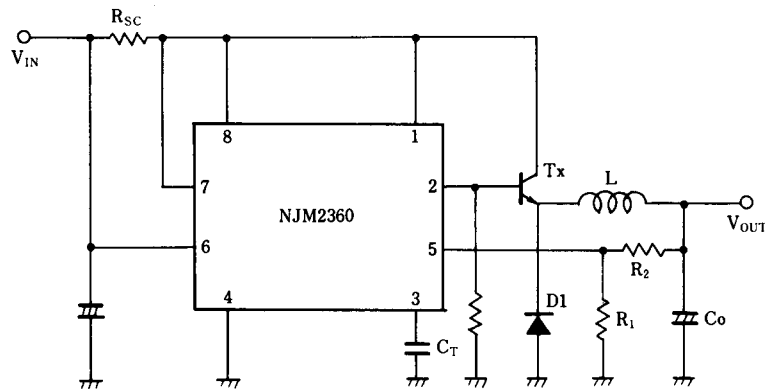
NJM2360

■ TYPICAL APPLICATIONS

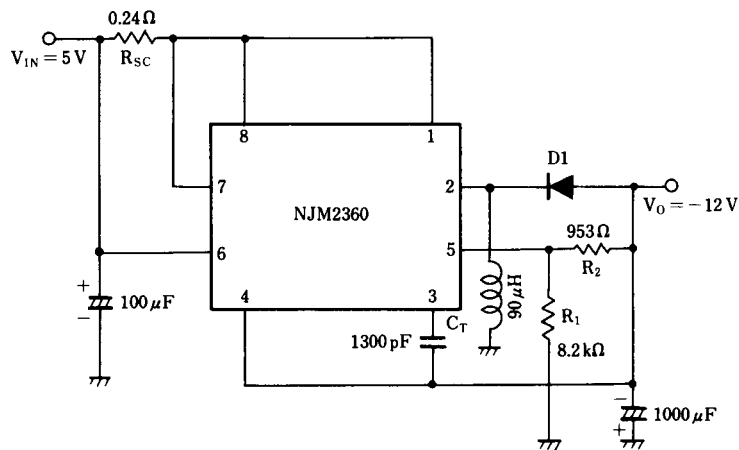
3. Step-Up Converter (High Current)



4. Step-Down Converter (High Current)



5. Inverting Converter



*D1 : SBD (EK14)

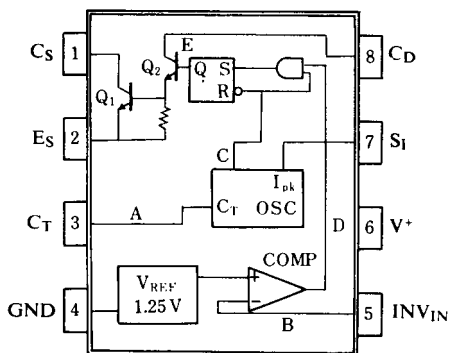


Fig. 1 Block Diagram

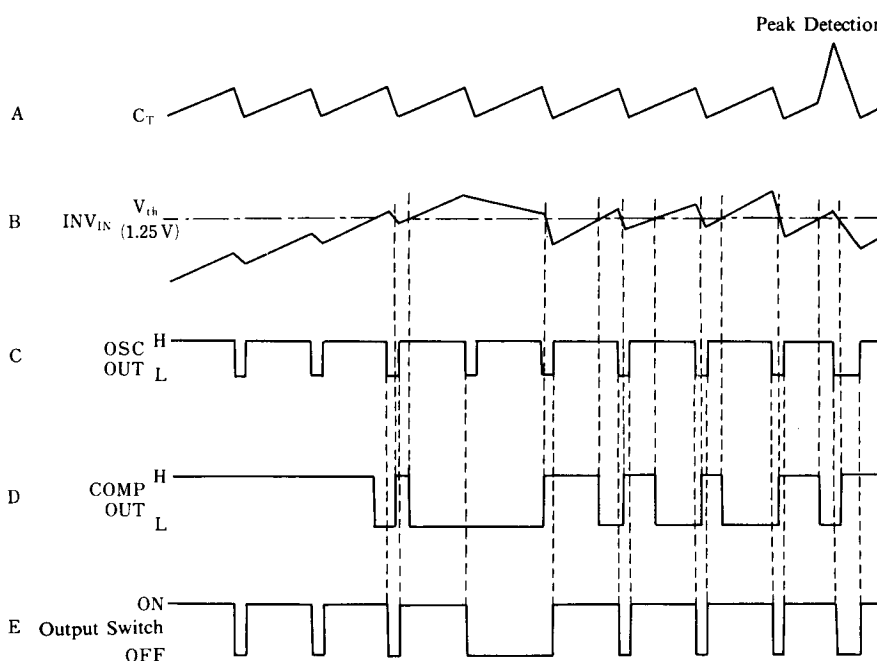
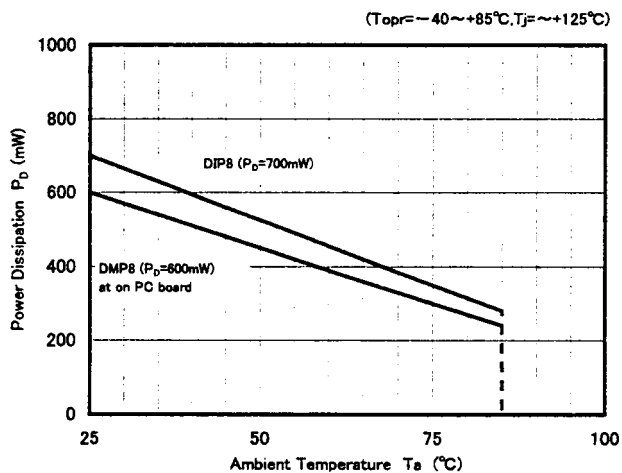


Fig. 2 Timing Chart

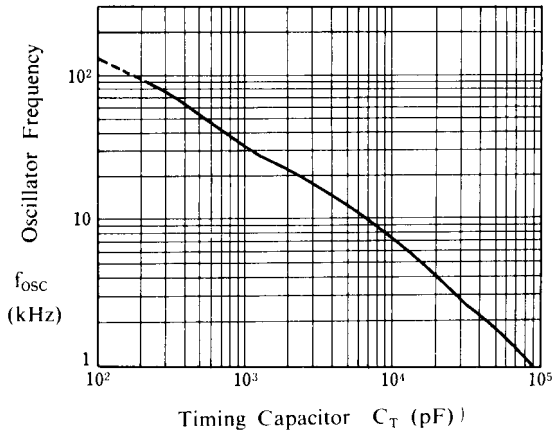
■ POWER DISSIPATION VS. TEMPERATURE



■ TYPICAL CHARACTERISTICS

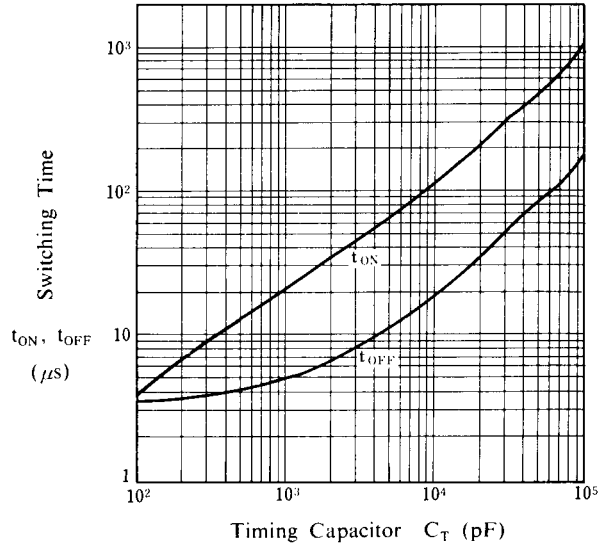
Oscillator Frequency vs. Timing Capacitor

($V_{IN} = 5V, S_1 = V^+, Pin5 = GND, T_a = 25^\circ C$)



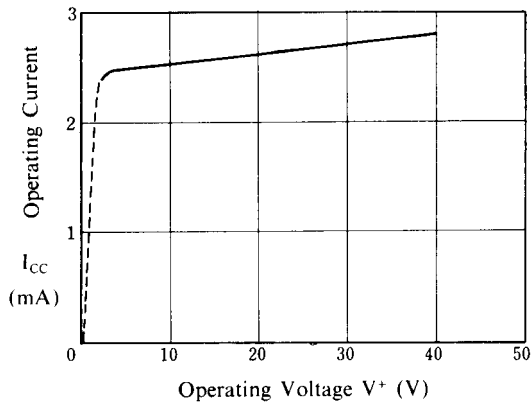
Switching Time vs. Timing Capacitor

($V_{IN} = 5V, S_1 = V^+, Pin5 = GND, T_a = 25^\circ C$)



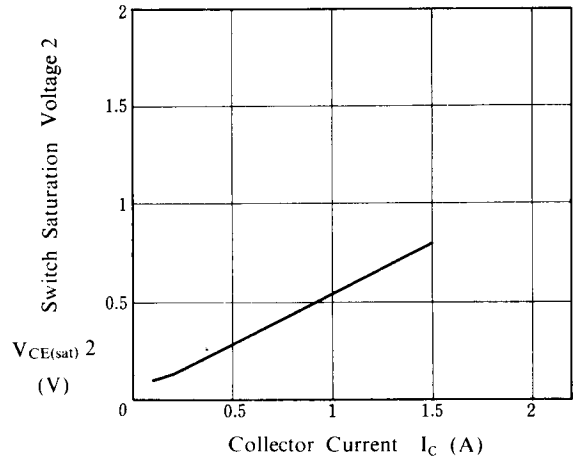
Operating Current vs. Operating Voltage

($C_T = 0.001 \mu F, S_1 = V^+, Pin2 = GND, T_a = 25^\circ C$)



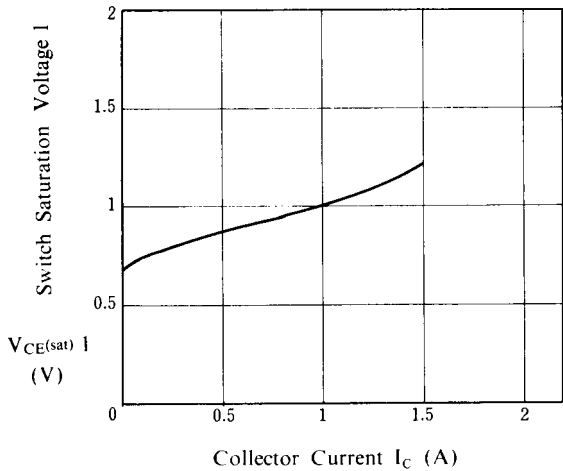
Switch Saturation Voltage 2 vs. Collector Current ($\beta \approx 20$)

($V_{CE} = 5V, Pin7 = V^+, Pin2 \cdot 3 \cdot 5 = GND, T_a = 25^\circ C$)



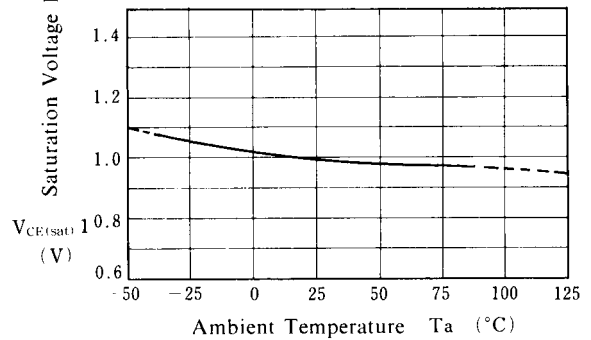
Switch Saturation Voltage 1 vs. Collector Current (Darlington)

($V_{CE} = 5V, Pin7 = V^+, Pin2 \cdot 3 \cdot 5 = GND, T_a = 25^\circ C$)



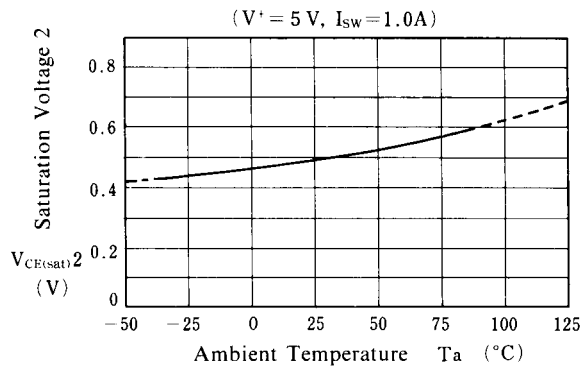
Saturation Voltage 1 vs. Temperature

($V^+ = 5V, I_{sw} = 1.0A, Darlington$)

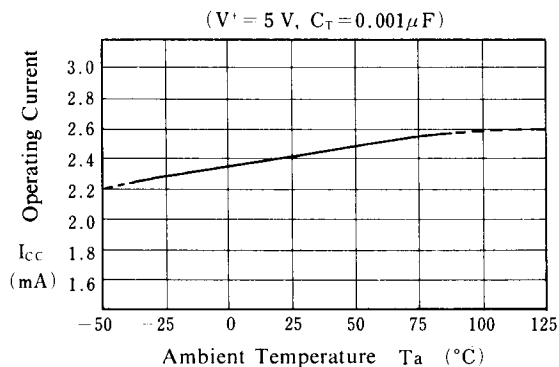


■ TYPICAL CHARACTERISTICS

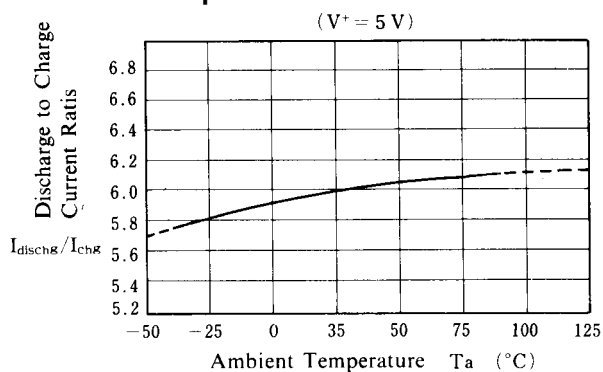
Saturation Voltage 2 vs. Temperature



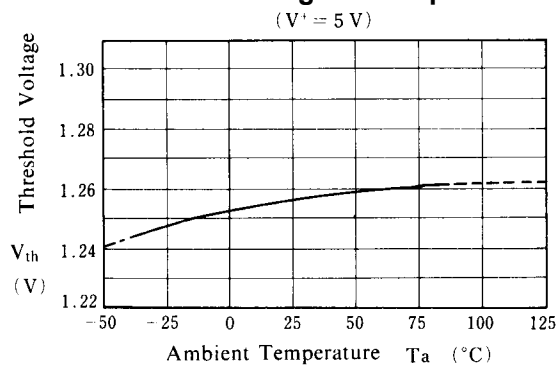
Operating Current vs. Temperature



Discharge to Charge Current Ratio vs. Temperature



Threshold Voltage vs. Temperature

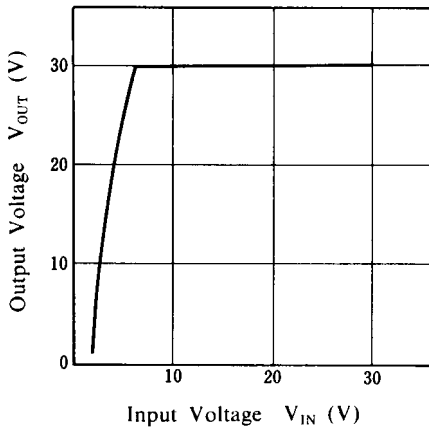


■ TYPICAL CHARACTERISTICS (Application)

1. Step-Up Converter

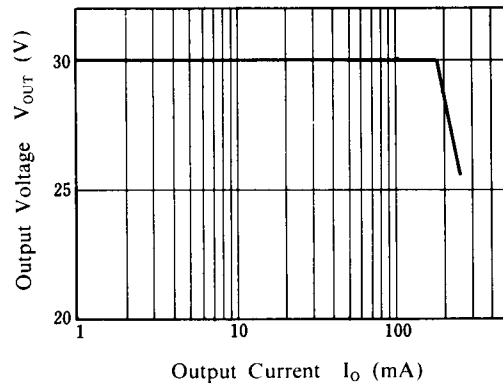
Output Voltage vs. Input Voltage

($V_O = 30\text{ V}$, $I_O = 100\text{ mA}$, $C_T = 1500\text{ pF}$,
 $L = 180\text{ }\mu\text{H}$, $T_a = 25\text{ }^\circ\text{C}$)



Output Voltage vs. Output Current

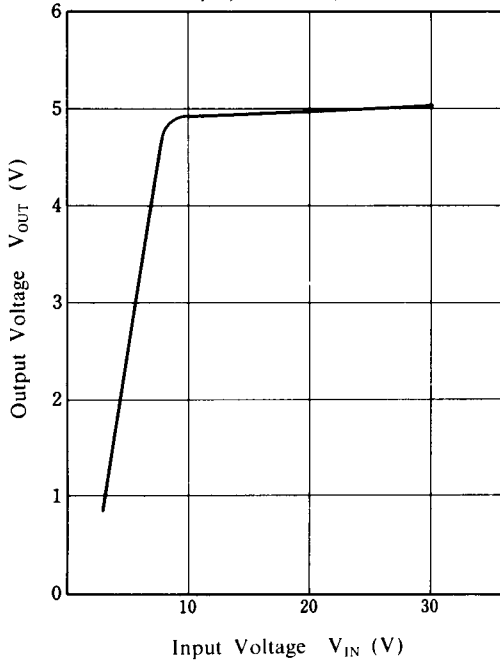
($V_{IN} = 14\text{ V}$, $V_O = 30\text{ V}$, $C_T = 1500\text{ pF}$,
 $L = 180\text{ }\mu\text{H}$, $T_a = 25\text{ }^\circ\text{C}$)



2. Step-Down Converter

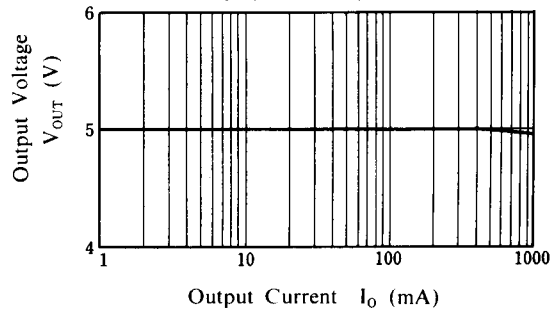
Output Voltage vs. Input Voltage

($V_O = 5\text{ V}$, $I_O = 500\text{ mA}$, $C_T = 470\text{ pF}$,
 $L = 220\text{ }\mu\text{H}$, $T_a = 25\text{ }^\circ\text{C}$)



Output Voltage vs. Output Current

($V_{IN} = 25\text{ V}$, $V_O = 5\text{ V}$, $C_T = 470\text{ pF}$,
 $L = 220\text{ }\mu\text{H}$, $T_a = 25\text{ }^\circ\text{C}$)



[CAUTION]

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