- ◆ **Large Output Current Step-up/down DC/DC**
- ◆ **Fast Response**
- ◆ **Input Voltage Range: 0.9~10.0V**
- ◆ **Output Voltage Range: 2.5~6.0V(2%)**
- ◆ **Oscillator Frequency: 180kHz**
- ◆ **High Efficiency: 75% (typ.)**
- ◆ **SOP-8 Package**

Applications

- Electronic Information Organizers
- Palmtops
- Cellular and portable phones
- Portable Audio Systems
- Various Multi-function Power Supplies

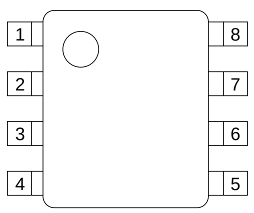
General Description

The XC6361/62 series are step-up/down DC/DC converters.
With a N-Channel Power MOSFET built-in, the series comprises of PWM (/PFM switching) controlled, step-up switching regulator types (SWR) and series regulator types with externally connected transistors (VR).
A highly efficient, low ripple, step-up/down DC/DC converter can be realized using an externally connected coil, diode, 2 capacitors and a PNP transistor.
From a wide input voltage range of between 0.9V to 10V, a stable power output can be supplied through the series regulator. Output voltage is programmable in 0.1V steps betwen 2.5V to 6.0V. (±2.0% accuracy)
Since the difference between the SWR output voltage (V_{UP}) and the VR output voltage (V_{OUT}) is only 0.4V, losses with the VR type during step up/down operations is minimised.
With the SWR type, an output current of 200mA (V_{OUT}=3.0V, V_{IN}=2.04V) is possible through the use of the built-in N-channel power MOSFET. Further, using an external transistor, an output current of more than 300mA is possible. With a 180kHz switching frequency, the size of the external components can be reduced.
As control switches to PFM during light loads with the XC6362, the series is highly efficient from light loads through to large output currents.
It is possible to adjust soft-start time by connecting a capacitor externally.
During stand-by, current consumption can be reduced to less than 1.0μA.

Features

Input voltage range: 0.9V~10V
Output voltage range: 2.5V~6.0V programmable in 0.1V steps (±2.0%)
Oscillator frequency: 180kHz (±15%)
Max. output current: 200mA (V_{IN}=2.04V, V_{OUT}=3.0V)
: More than 300mA possible (external Tr connected to SWR)
High Efficiency: 75% (typ.) (V_{IN}=1.8V, V_{OUT}=3.0V)
Stand-by capability: I_{STB}=1.0μA (max.)
Fast Response(input change, load change)
Soft-start time set-up possible
Integral protection circuit built-in
N-ch Power MOSFET built-in (SWR step-up switch)
Package: SOP-8

Pin Configuration

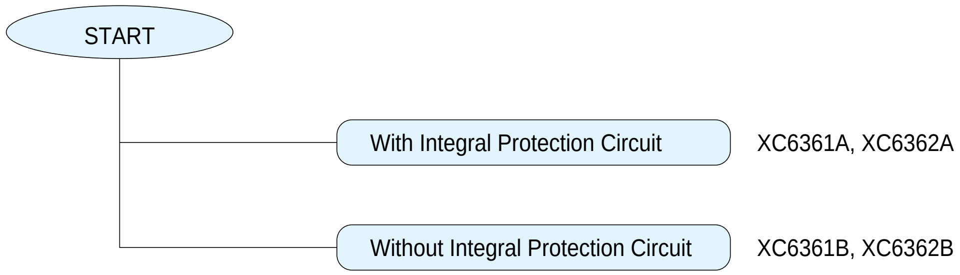


SOP-8
(TOP VIEW)

Pin Assignment

PIN NUMBER	PIN NAME	FUNCTION
1	GND	Ground
2	V_{OUT}	Regulator output
3	VR_EXT	PNP Transistor drive
4	C_{SS}	Soft-start capacitor connection
5	V_{UP}	SWR output, Power supply
6	CE	Chip enable
7	SWR_EXT	SWR external switch transistor drive (CMOS output)
8	LX	SWR switch

■ Selection Guide



■ Ordering Information

XC6361①②③④⑤⑥

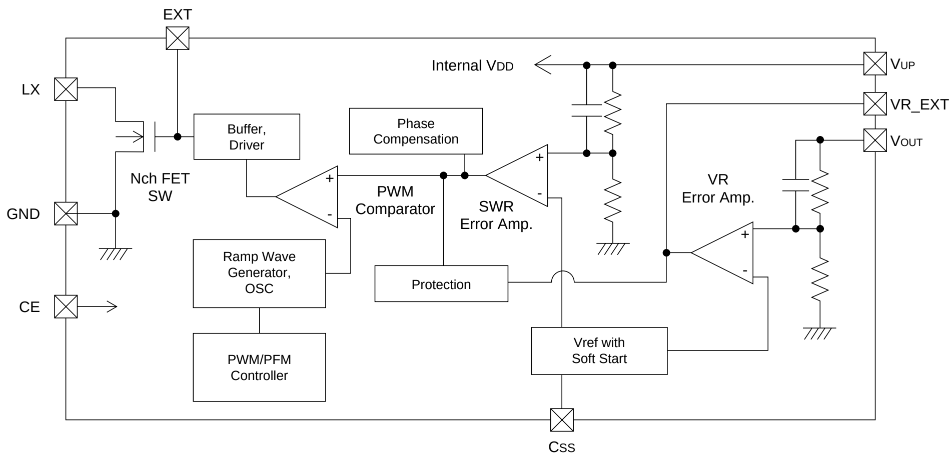
XC6361 Series PWM Control

①	A	Integral protection - Yes
	B	Integral protection - No
② ③		Output voltage e.g. 3.0V output : (②=3, ③=0)
④	2	Oscillator frequency 180kHz
⑤	S	Package SOP-8
⑥	R	Embossed Tape : standard loading
	L	: reverse loading

XC6362①②③④⑤⑥

XC6362 Series PWM/PFM switching control
(same as XC6361 series)

■ Block Diagram



TOREX

3

Absolute Maximum Ratings

Ta=25℃

PARAMETER	SYMBOL	RATINGS	UNITS
VUP Pin Voltage	VUP	-0.3 ~ 12	V
LX Pin Voltage	VLX	-0.3 ~ 12	V
EXT Pin Voltage	VEXT	-0.3 ~ VUP +0.3	V
LX Pin Current	ILX	700	mA
EXT Pin Current	IEXT	±50	mA
VOUT Pin Voltage	VOUT	-0.3 ~ 12	V
VR_EXT Pin Voltage	VVREXT	-0.3 ~ VUP +0.3	V
VR_EXT Pin Current	IVREXT	50	mA
CSS Pin Voltage	VCSS	-0.3 ~ VUP +0.3	V
CE Pin Voltage	VCE	-0.3 ~ VUP +0.3	V
Continuous Total Power Dissipation	Pd	300	mW
Operating Ambient Temperature	Topr	-30 ~ +80	℃
Storage Temperature	Tstg	-40 ~ +125	℃

Electrical Characteristics

XC6361A332SR, XC6362A332SR VOUT=3.3V Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Overall						
Output Voltage	VOUT	VIN=Output voltage x 0.6	3.234	3.300	3.366	V
Output Voltage 2	VOUT2	VIN=Output voltage + 1.0V	3.234	3.300	3.366	V
Maximum Input Voltage	VIN		10.0			V
Operation Start-up Voltage	VST1	IOUT=1.0mA, RB=1kΩ		0.8	0.9	V
Oscillation Start-up Voltage	VST2	No external components, Apply voltage to VUP			0.8	V
Oscillation Hold Voltage	VHLD	IOUT=1.0mA	0.7			V
Supply Current 1	IDD1	No external components, VUP=(output voltage + 0.4V)x0.95		590	900	µA
Supply Current 2	IDD2	No external components, VUP=output voltage + 1.0V		42	64	µA
Stand-by Current	ISTB	Same as IDD1, VCE=0V			1.0	µA
Soft-Start Time	Tss		3.0	6.0	12.0	msec
CE "High" Voltage	VCEH	Same as IDD1, Existence of EXT oscillation	0.75			V
CE "Low" Voltage	VCEL	Same as IDD1, Disappearance of EXT oscillation			0.20	V
Circuit Protection Integer Time	TPRO	Only Css connected, UVP=output voltage +1.0V, VOUT=output voltage 1.0V, Apply VR protection base current. Time taken for the Css pin to become "L" after VUP has been decreased by VUP x0.95	1.5	3.0	6.0	msec
Efficiency	EFFI	VIN=Output voltage x 0.6		76		%
SWR						
VUP Output Voltage	VUP	VIN=Output voltage x 0.6		3.7		V
Lx Switch-on Resistance	RSWON	Same as IDD1, VLX=0.1V		0.49	0.90	Ω
Lx Leak Current	ILXL	No external components, VUP=VLX=10V			1.0	µA
EXT "High" ON Resistance	REXTH	Same as IDD1, VEXT=VUP-0.4V		24	45	Ω
EXT "Low" ON Resistance	REXTL	Same as IDD1, VEXT=0.4V		16	30	Ω
Maximum Duty Ratio	MAXDTY	Same as IDD1, measuring of EXT waveform	78	85	93	%
PFM Duty Ratio	PFMDTY	VIN=VOUT, no load (XC6362 only)	10	20	30	%
Oscillator Frequency	FOSC	Same as IDD1, measuring of EXT waveform	153	180	207	kHz
VR						
VOUT Output Current	IVOUT	Apply VUP=output voltage + 1.0V	1.0			A
VR Protection Base Current	IVREXT	Css only connected, VUP=output voltage +1.0V	10	20	30	mA

Measuring conditions: Unless otherwise specified, connect CE to VUP, IOUT=66mA

Note: During step up/down operations, output voltage 2 represents the voltage during step down.

XC6361B332SR, XC6362B332SR

The following parameters are not applicable in the about table: Circuit Protection Integer Time (TPRO) , VR Protection Base Current (IVREXT)

Electrical Characteristics

XC6361A502SR, XC6362A502SR V_{OUT}=5.0V

Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Overall						
Output Voltage	V_{OUT}	V_{IN}=Output voltage x 0.6	4.900	5.000	5.100	V
Output Voltage 2	V_{OUT}2	V_{IN}=Output voltage + 1.0V	4.900	5.000	5.100	V
Maximum Input Voltage	V_{IN}		10.0			V
Operation Start-up Voltage	V_{ST}1	I_{OUT}=1.0mA, R_B=1kΩ		0.8	0.9	V
Oscillation Start-up Voltage	V_{ST}2	No external components, Apply voltage to V_{UP}			0.8	V
Oscillation Hold Voltage	V_{HLD}	I_{OUT}=1.0mA	0.7			V
Supply Current 1	I_{DD}1	No external components, V_{UP}=(output voltage + 0.4V)x0.95		1000	1600	μA
Supply Current 2	I_{DD}2	No external components, V_{UP}=output voltage + 1.0V		43	65	μA
Stand-by Current	I_{STB}	Same as I_{DD}1, V_{CE}=0V			1.0	μA
Soft-Start Time	T_{SS}		3.0	6.0	12.0	msec
CE "High" Voltage	V_{CEH}	Same as I_{DD}1, Existence of EXT oscillation	0.75			V
CE "Low" Voltage	V_{CEL}	Same as I_{DD}1, Disappearance of EXT oscillation			0.20	V
Circuit Protection Integer Time	T_{PRO}	Only C_{SS} connected, U_{VP}=output voltage +1.0V, V_{OUT}=output voltage 1.0V, Apply VR protection base current. Time taken for the C_{SS} pin to become "L" after V_{UP} has been decreased by V_{UP} x0.95	1.5	3.0	6.0	msec
Efficiency	EFFI	V_{IN}=Output voltage x 0.6		79		%
SWR						
V_{UP} Output Voltage	V_{UP}	V_{IN}=Output voltage x 0.6		5.4		V
Lx Switch-on Resistance	R_{SWON}	Same as I_{DD}1, V_{LX}=0.1V		0.41	0.80	Ω
Lx Leak Current	I_{LXL}	No external components, V_{UP}=V_{LX}=10V			1.0	μA
EXT "High" ON Resistance	R_{EXTH}	Same as I_{DD}1, V_{EXT}=V_{UP}-0.4V		18	33	Ω
EXT "Low" ON Resistance	R_{EXTL}	Same as I_{DD}1, V_{EXT}=0.4V		12	23	Ω
Maximum Duty Ratio	MAXDTY	Same as I_{DD}1, measuring of EXT waveform	78	85	93	%
PFM Duty Ratio	PFMDTY	V_{IN}=V_{OUT}, no load (XC6362 only)	10	20	30	%
Oscillator Frequency	F_{OSC}	Same as I_{DD}1, measuring of EXT waveform	153	180	207	kHz
VR						
V_{OUT} Output Current	I_{VOUT}	Apply V_{UP}=output voltage + 1.0V	1.0			A
VR Protection Base Current	I_{VREXT}	C_{SS} only connected, V_{UP}=output voltage +1.0V	10	20	30	mA

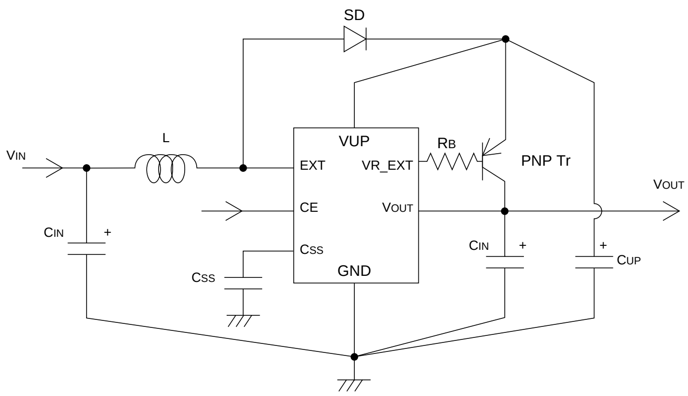
Measuring conditions: Unless otherwise specified, connect CE to V_{UP}, I_{OUT}=100mA

Note: During step up/down operations, output voltage 2 represents the voltage during step down.

XC6361B502SR, XC6362B502SR

The following parameters are not applicable in the about table: Circuit Protection Integer Time (T_{PRO}) , VR Protection Base Current (I_{VREXT})

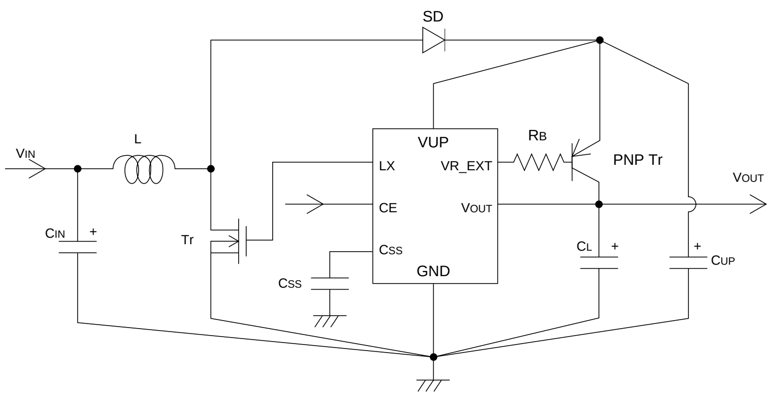
Standard Circuit



L	: 47µH (Sumida CD75)
SD	: MA735 (Schottky Diode, Matsushita)
CUP	: 10V 47µF (Tantalum capacitor, Nichicon F93)
C:	: 10V 10µF (Aluminium electrolytic capacitor)
PNP Tr	: 2SA1213 (Toshiba)
CSS	: 2200pF (ceramic capacitor)
RB	: 0Ω

Typical Application Circuit

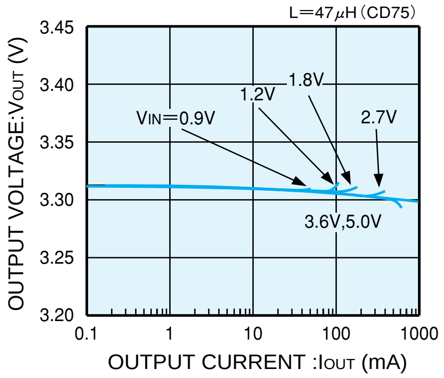
1. Large current output circuit
   (for use with externally connected N-channel Power MOSFETs)



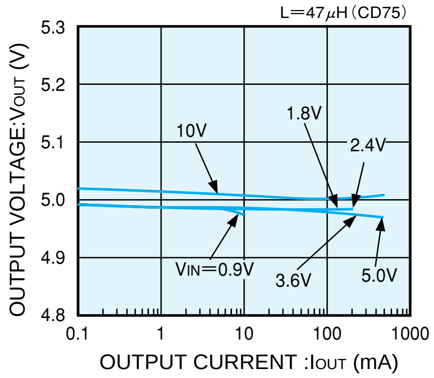
■ STANDARD CIRCUIT CHARACTERISTICS

(1) OUTPUT VOLTAGE vs. OUTPUT CURRENT

XC6362A332

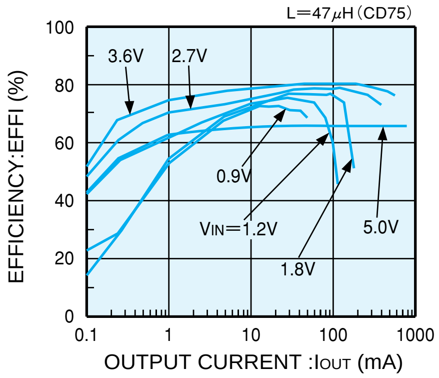


XC6362A502

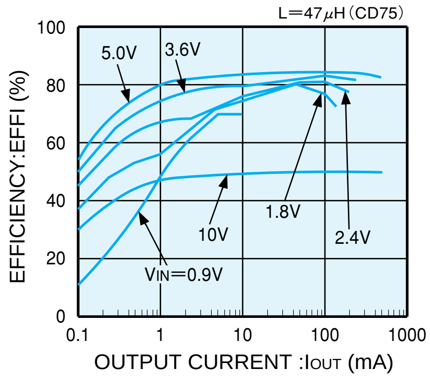


(2) EFFICIENCY vs. OUTPUT CURRENT

XC6362A332

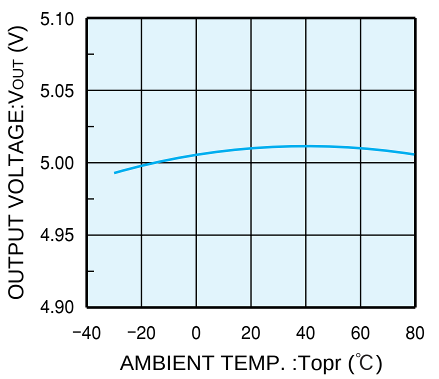


XC6362A502



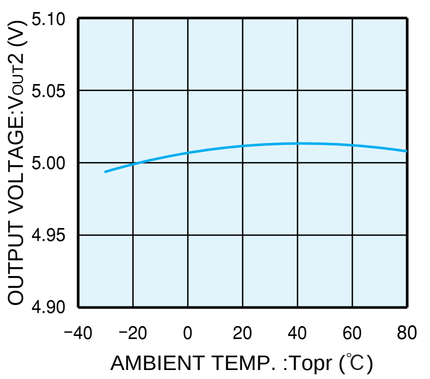
(3) OUTPUT VOLTAGE vs. AMBIENT TEMP.

XC6362A502



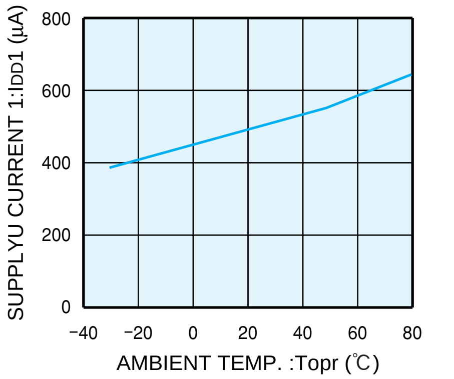
(4) OUTPUT VOLTAGE 2 vs. AMBIENT TEMP.

XC6362A502



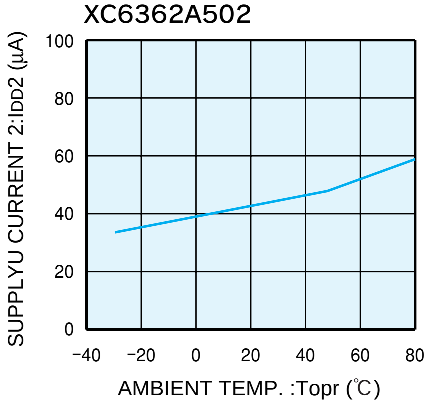
(5) SUPPLY CURRENT 1 vs. AMBIENT TEMP.

XC6362A502



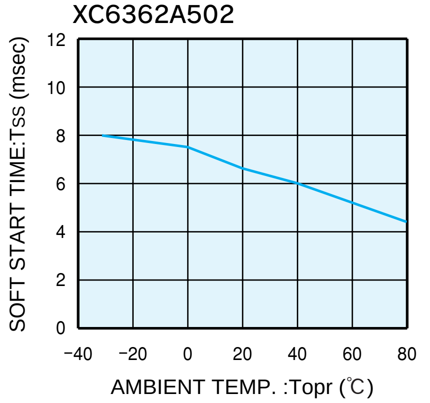
(6) SUPPLY CURRENT 2 vs. AMBIENT TEMP.

XC6362A502



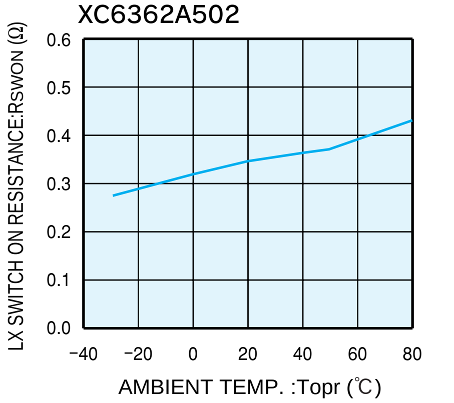
(7) SOFT START TIME vs. AMBIENT TEMP.

XC6362A502



(8) LX SWITCH ON RESISTANCE vs. AMBIENT TEMP.

XC6362A502



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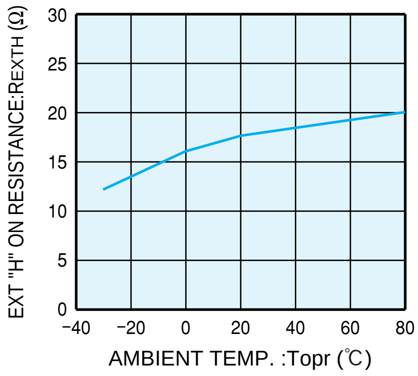
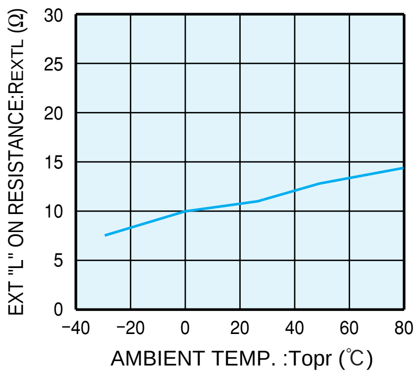
(9) EXT "H" ON RESISTANCE vs. AMBIENT TEMP.

XC6362A502



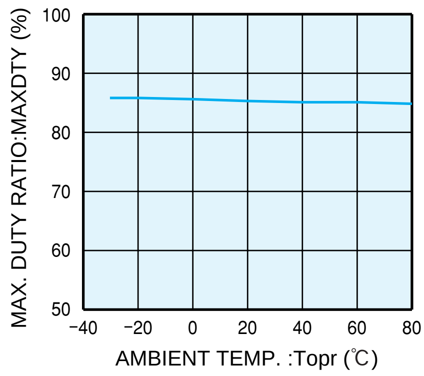
(10) EXT "L" ON RESISTANCE vs. AMBIENT TEMP.

XC6362A502



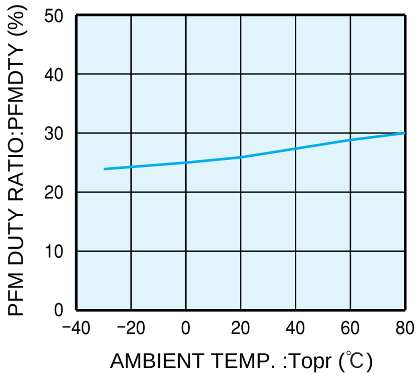
(11) MAX. DUTY RATIO vs. AMBIENT TEMP.

XC6362A502



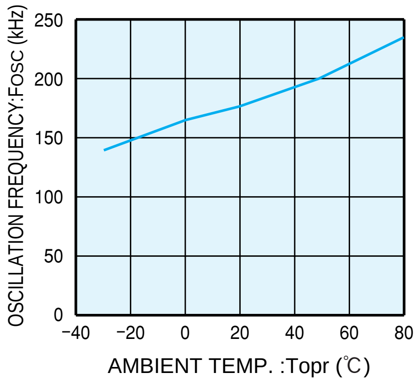
(12) PFM DUTY RATIO vs. AMBIENT TEMP.

XC6362A502



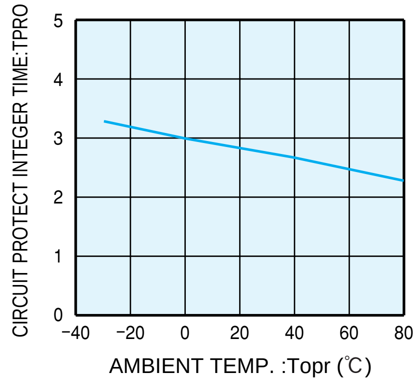
(13) OSCILLATION FREQUENCY vs. AMBIENT TEMP.

XC6362A502



(14) CIRCUIT PROTECT INTEGER TIME vs. AMBIENT TEMP.

XC6362A502

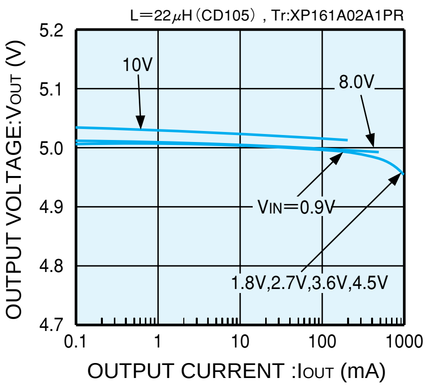


■ TYPICAL APPLICATION CIRCUIT CHARACTERISTICS

LARGE CURRENT OUTPUT CIRCUIT EXAMPLE

(1) OUTPUT VOLTAGE vs. OUTPUT CURRENT

XC6362A502



(2) EFFICIENCY vs. OUTPUT CURRENT

XC6362A502