

# IC for CMOS Regulator+Reset

## Monolithic IC MM3018

### Outline

This is a reset + regulator composite IC developed using the CMOS process.

The CMOS process is used to achieve ultra-low current consumption, aiming at use in memory cards and portable devices. Further, this exceptional IC can be used even when board mounting space is limited, due to the wafer level package, WLCSP-6.

### Features

1. Built-in thermal shutdown circuit
2. Built-in current limit circuit
3. Low current consumption 15µA typ.
4. Series with reset detection voltage in 0.1V steps
5. Delay time from voltage detection to reset release can be set easily.

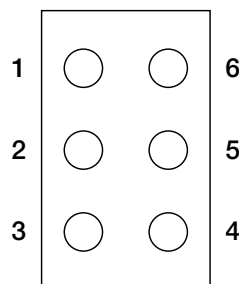
### Package

WLCSP-6

### Applications

1. Microcomputer, CPU and MPU reset circuit
2. Logic circuit reset circuit
3. Battery voltage check
4. Back-up circuit switching circuit
5. Level detection circuit
6. Mechanical system reset circuit

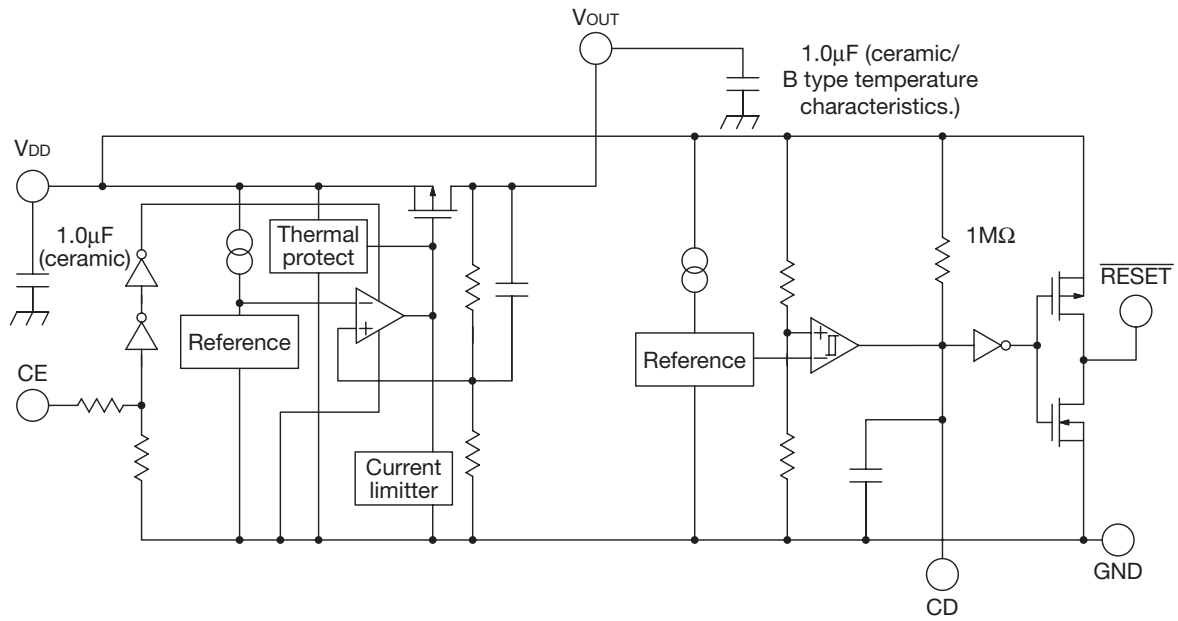
### Pin Assignment



WLCSP-6  
(TOP VIEW)

1	V <sub>DD</sub>
2	CE
3	RESET
4	CD
5	GND
6	V <sub>OUT</sub>

Block Diagram



Pin Description

Pin no.	Pin name	Functions						
1	V <sub>DD</sub>	Voltage-supply pin						
2	CE	V <sub>OUT</sub> ON/OFF control pin <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>CONT</th> <th>V<sub>OUT</sub></th> </tr> </thead> <tbody> <tr> <td>L</td> <td>OFF</td> </tr> <tr> <td>H</td> <td>ON</td> </tr> </tbody> </table> <p>Connect CONT-TERMINAL with V<sub>DD</sub>, When it is not used.</p>	CONT	V <sub>OUT</sub>	L	OFF	H	ON
CONT	V <sub>OUT</sub>							
L	OFF							
H	ON							
3	RESET	RESET-output pin RESET pin logic <table border="1" style="margin-left: 20px;"> <thead> <tr> <th></th> <th>RESET</th> </tr> </thead> <tbody> <tr> <td>V<sub>DD</sub>&lt;V<sub>S</sub></td> <td>L</td> </tr> <tr> <td>V<sub>DD</sub>&gt;V<sub>S</sub></td> <td>H</td> </tr> </tbody> </table>		RESET	V <sub>DD</sub> <V <sub>S</sub>	L	V <sub>DD</sub> >V <sub>S</sub>	H
	RESET							
V <sub>DD</sub> <V <sub>S</sub>	L							
V <sub>DD</sub> >V <sub>S</sub>	H							
4	CD	Capacitor connect pin with delay						
5	GND	GND pin						
6	V <sub>OUT</sub>	V <sub>OUT</sub> pin (100mA)						

**Absolute Maximum Ratings** (Ta=25°C)

Item	Symbol	Ratings	Units
Storage temperature	T <sub>STG</sub>	-55~+125	°C
Supply voltage for V <sub>DD</sub>	V <sub>DD</sub>	-0.3~+8	V
Supply voltage for CE	V <sub>CE</sub>	-0.3~V <sub>DD</sub> +0.3	V
Supply voltage for CD	V <sub>CD</sub>	-0.3~V <sub>DD</sub> +0.3	V
Allowable loss	P <sub>d</sub>	600*	mW

Note: \* With the double Bided PC Board of glass epoxy.  
(Copper plane 80% 25X25X1.0<sup>t</sup> mm)

**Recommended Operating Conditions** (Ta=25°C)

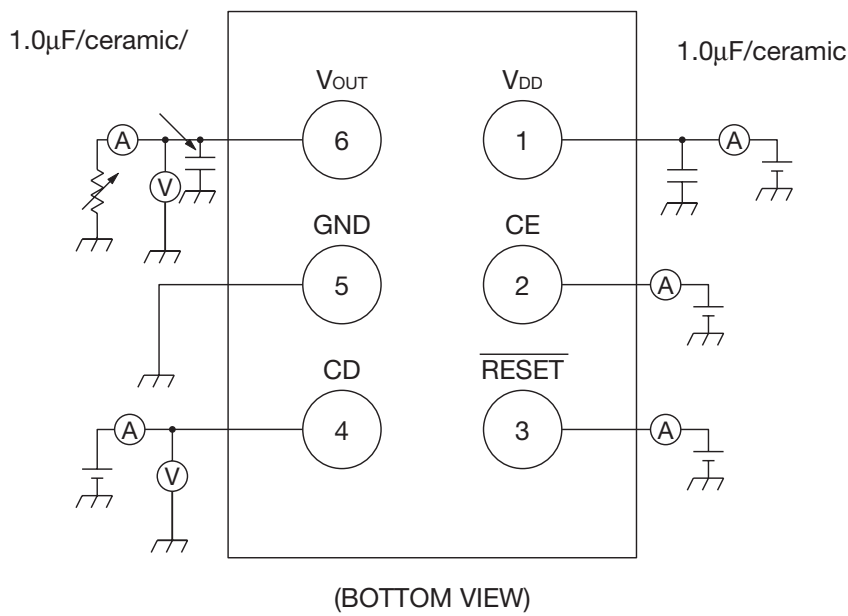
Item	Symbol	Ratings	Units
Operating temperature	T <sub>OPR</sub>	-40~+85	°C
Operating supply voltage when regulator works	V <sub>OP-REG</sub>	2.5~3.6	V
Operating supply voltage when reset works	V <sub>OP-RES</sub>	0.7~3.6	V
Output current	I <sub>OUT</sub>	100	mA

**Electrical Characteristics** (Except where noted otherwise, Ta=25°C, CE=3.6V) (Represent model MM3018A)

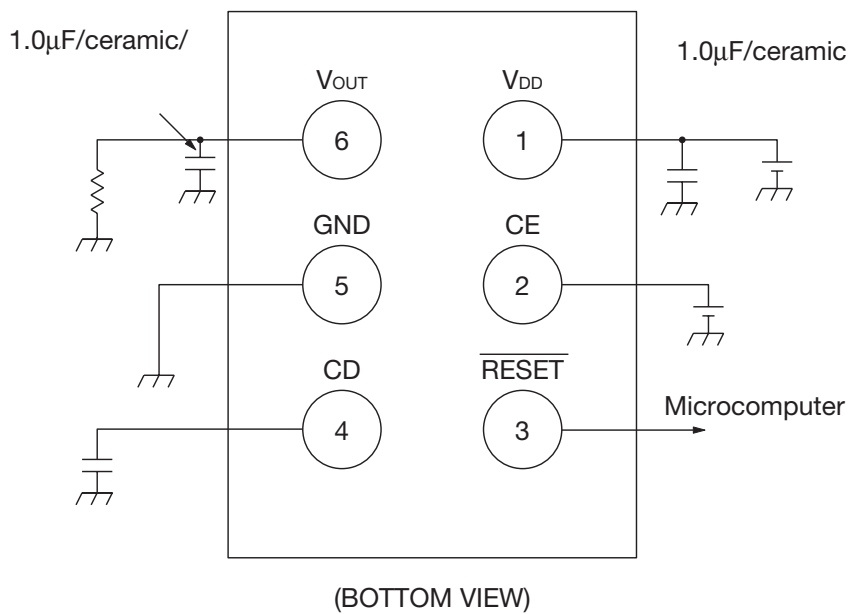
Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
<b>Current consumption</b>						
V <sub>IN</sub> input current 1	I <sub>ccq1</sub>	V <sub>DD</sub> =3.6V, I <sub>OUT</sub> =0mA		15	30	μA
Input current when regulator is OFF	I <sub>ccq2</sub>	V <sub>DD</sub> =3.6V, I <sub>OUT</sub> =0mA, CE=0.5V		2	5	μA
Input current when reset works	I <sub>ccq3</sub>	V <sub>DD</sub> =CE=2.2V, I <sub>OUT</sub> =0mA		18	35	μA
<b>Regulator</b>						
Output Voltage 1	V <sub>OUT1</sub>	V <sub>DD</sub> =3.6V, I <sub>OUT</sub> =50mA	1.764	1.8	1.836	V
Drop voltage	V <sub>IO</sub>	V <sub>DD</sub> =1.7V, I <sub>OUT</sub> =50mA		120	250	mV
Line regulation	ΔV <sub>1</sub>	V <sub>DD</sub> =2.5~3.6V, I <sub>OUT</sub> =50mA		10	30	mV
Load regulation	ΔV <sub>2</sub>	V <sub>DD</sub> =3.6V, I <sub>OUT</sub> =0~100mA		30	90	mV
V <sub>OUT</sub> temperature coefficient *	ΔV <sub>OUT</sub> /ΔT	T <sub>j</sub> =-40~+85°C		±100		ppm/°C
CE terminal current	I <sub>ON</sub>	V <sub>DD</sub> =3.6V		0.5	1.0	μA
High threshold voltage	H		V <sub>DD</sub> -0.5		V <sub>DD</sub>	V
Low threshold voltage	L				0.5	V
<b>V<sub>DD</sub> reset</b>						
Detecting voltage	V <sub>S</sub>	V <sub>DD</sub> =H→L	2.254	2.3	2.346	V
V <sub>S</sub> temperature coefficient *	ΔV <sub>S</sub> /ΔT	T <sub>j</sub> =-40~+85°C, V <sub>DD</sub> =H→L		±100		ppm/°C
Hysteresis voltage	ΔV <sub>S</sub>	V <sub>DD</sub> =H→L→H	69	115	161	mV
Output current 1	I <sub>OUT1</sub>	Nch V <sub>DS</sub> =0.05V, V <sub>DD</sub> =0.7V	0.01	0.05		mA
Output current 2	I <sub>OUT2</sub>	Nch V <sub>DS</sub> =0.5V, V <sub>DD</sub> =1.5V	1	2		mA
Output current 3	I <sub>OUT3</sub>	Pch V <sub>DS</sub> =-2.1V, V <sub>DD</sub> =3.6V	1	2		mA
CD pin threshold voltage	V <sub>TCD</sub>	V <sub>DD</sub> =2.53V	1.012	1.265	1.518	V
CD pin resistance	R <sub>D</sub>		0.7	1.0	1.3	MΩ
CD pin resistance temperature coefficient *	R <sub>D</sub>	T <sub>j</sub> =-40~+85°C		-4500		ppm/°C
Threshold operating voltage	V <sub>OPL</sub>	V <sub>DS</sub> ≤ 0.1V			0.7	V

Note: \* design guaranteed

Measuring Circuit



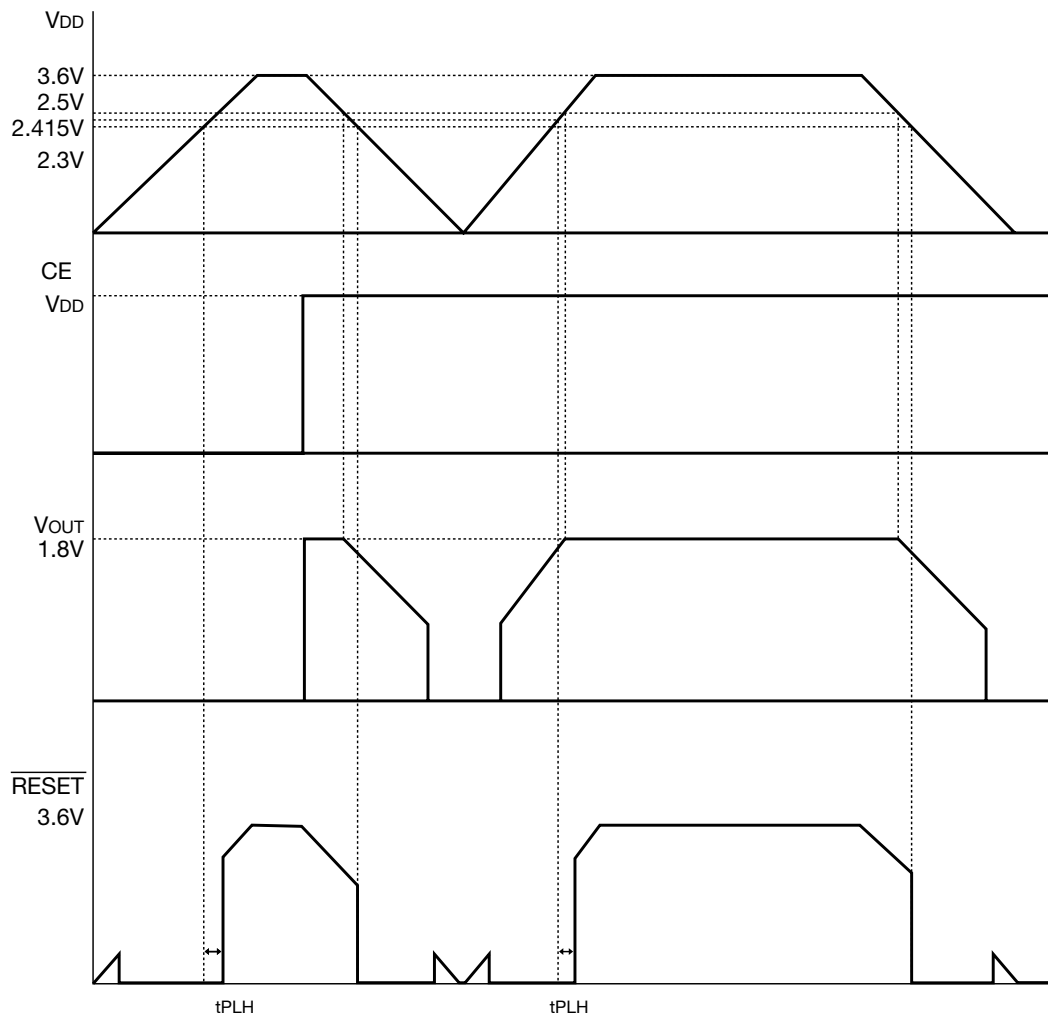
Application Circuit



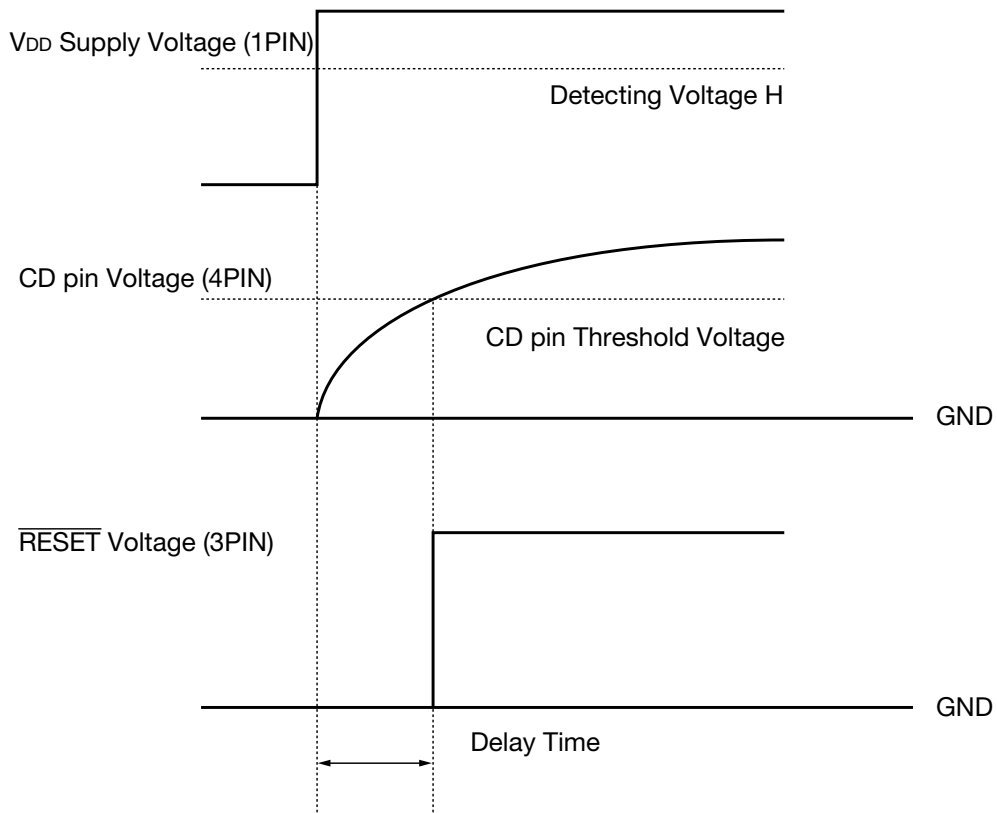
Note

1. An output-capacitor recommended the capacitor with more than 1.0µF and B type temperature characteristics.
2. The wire of V<sub>DD</sub> and GND is required to print full ground plane for noise and stability.
3. The input capacitor must be connected a distance of less than 1cm from input pin.
4. In case the output voltage is above the input voltage, the overcurrent flow by internal parasitic diode from output to input.

# Timing Chart



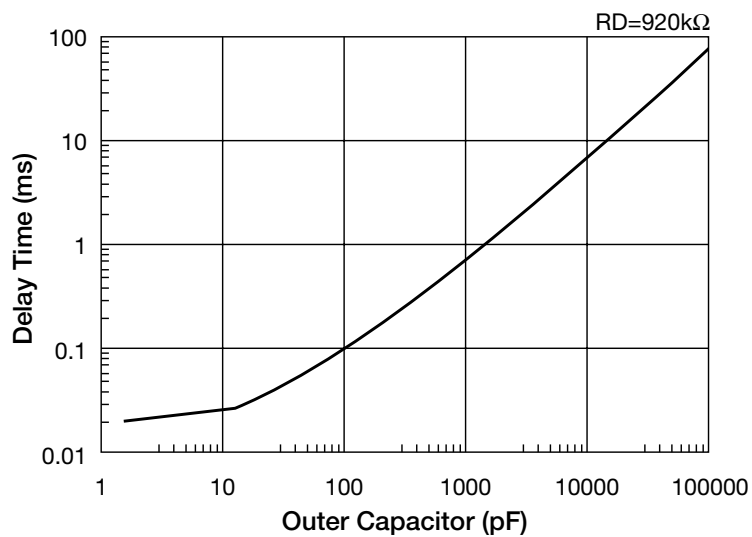
Delay Time



Delay Time (t<sub>PLH</sub>)  $t_{PLH} \approx 0.77 \times RD (\Omega) \times CD (F)$

RD: CD pin resistance  
 CD: Outer capacitor

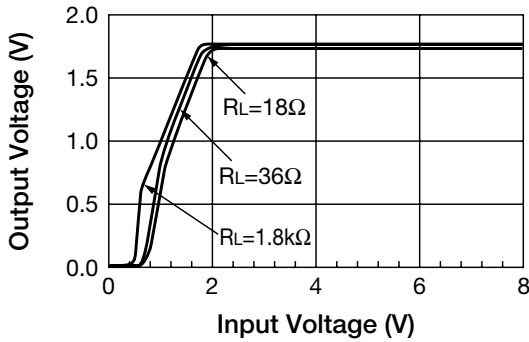
■ Outer Capacitor Vs Delay Time



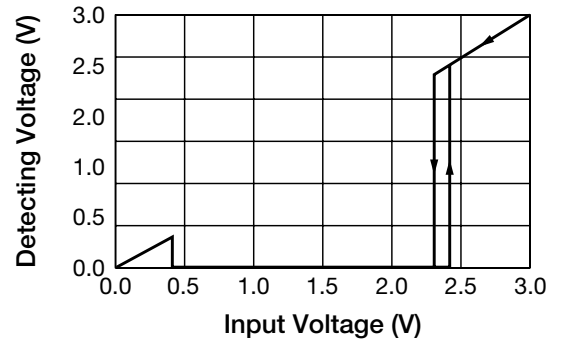
note: These are typical characteristics.

**Characteristics** (Except where noted otherwise,  $T_a=25^\circ\text{C}$ ,  $V_{DD}=3.6\text{V}$ ,  $V_{CE}=V_{DD}$ ,  $C_{IN}=1.0\mu\text{F}$ ,  $C_O=1.0\mu\text{F}$ ) (Represent model MM3018A)

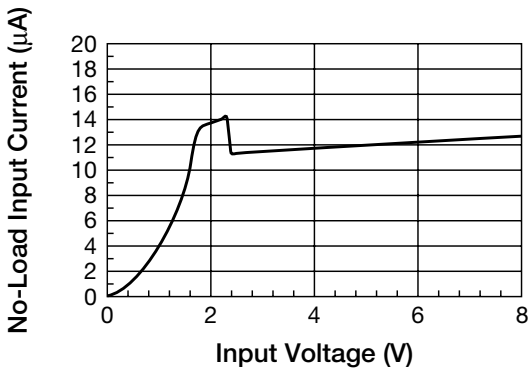
**Output Voltage**



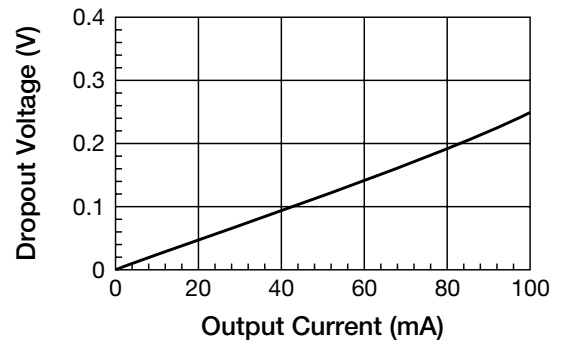
**Detecting Voltage**



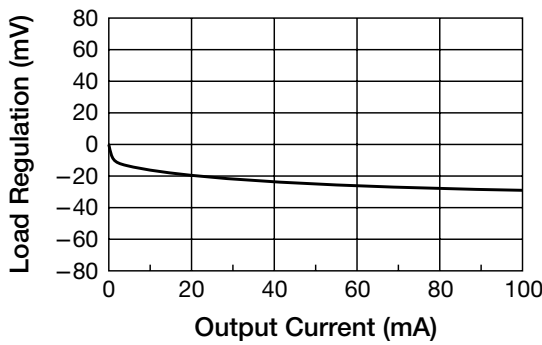
**No-Load Input Current**



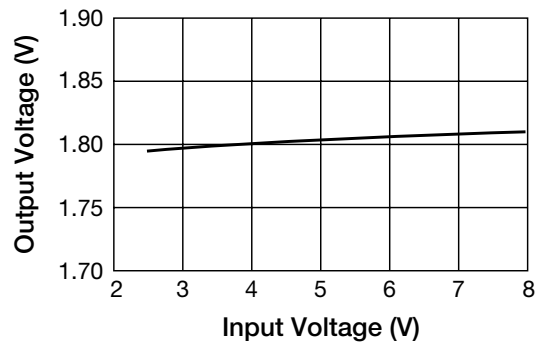
**Dropout Voltage**



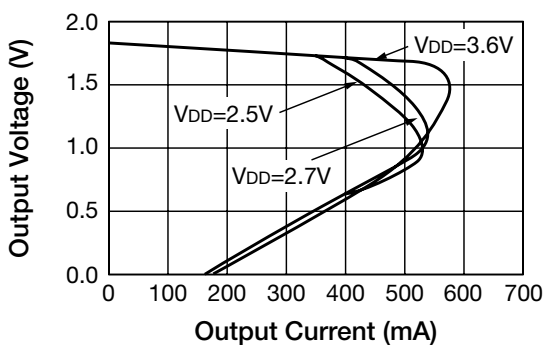
**Load Regulation**



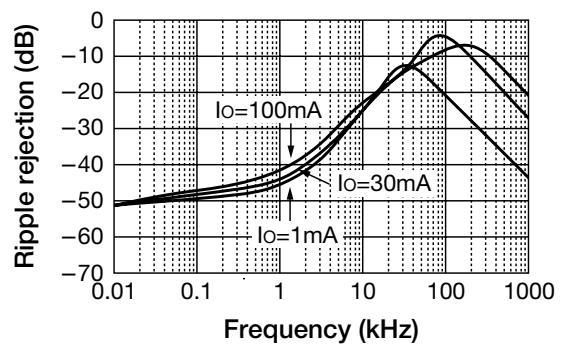
**Line Regulation**



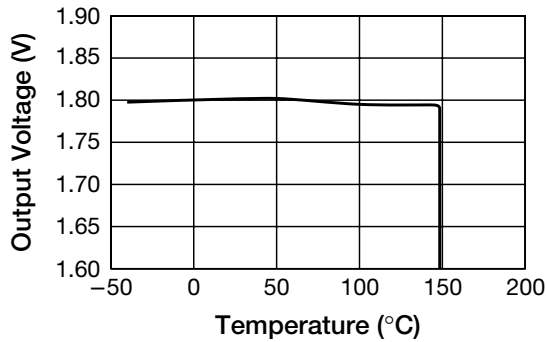
**Current Limit**



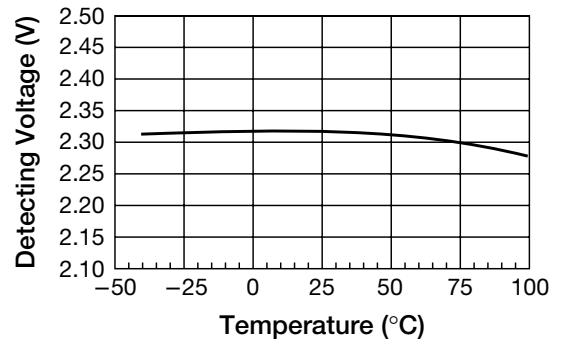
**Ripple rejection**



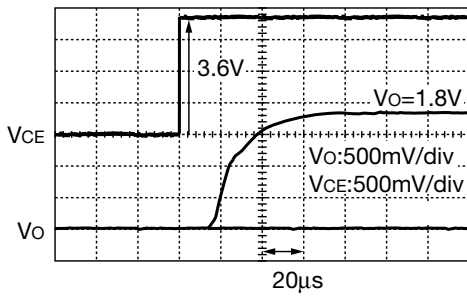
■ Temperature - Output Voltage



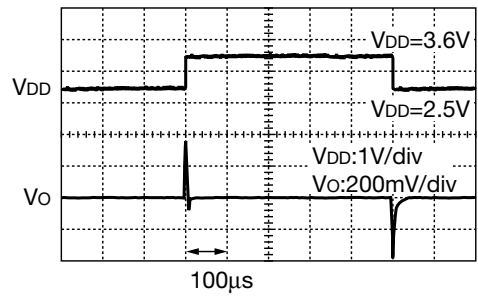
■ Temperature - Detecting Voltage



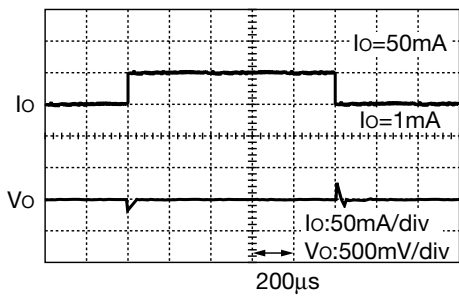
■ Regulator rise (V<sub>DD</sub>=3.6V, V<sub>CE</sub>=0→2.0V, I<sub>o</sub>=50mA)



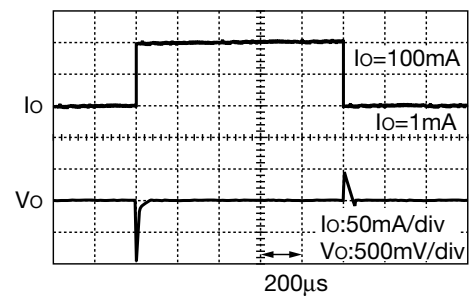
■ Input transient response (V<sub>DD</sub>=2.5V→3.6V, I<sub>o</sub>=50mA, C<sub>o</sub>=0.1µF)



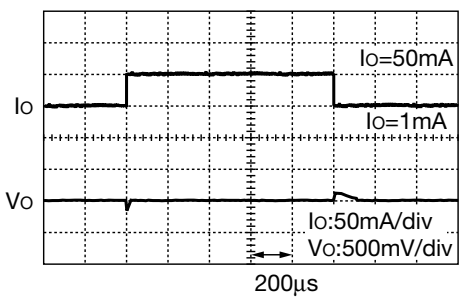
■ Load transient response (I<sub>o</sub>=1mA→50mA, C<sub>o</sub>=0.1µF)



■ Load transient response (I<sub>o</sub>=1mA→100mA, C<sub>o</sub>=0.1µF)



■ Load transient response (I<sub>o</sub>=1mA→50mA, C<sub>o</sub>=1.0µF)



■ Load transient response (I<sub>o</sub>=1mA→100mA, C<sub>o</sub>=1.0µF)

