



## Gate Driver with VReg and Two Point Regulator

DATASHEET

- 60mA/120mA MIN GATE DRIVE
- TWO POINT REGULATOR FOR SWITCHING CHARGE PUMP SUPPLY
- 3.3V OR 5V VOLTAGE REGULATOR
- LOW STARTUP CURRENT
- UVLO PROTECTION
- 2kV ESD PROTECTION

### DESCRIPTION

TD220 is a solution for micro-controller based off-line applications. TD220 includes a two point regulator for power supply generation, a 3.3V (TD220) or 5V (TD221) linear regulator for the microcontroller supply, and a MOSFET driver.

### APPLICATIONS

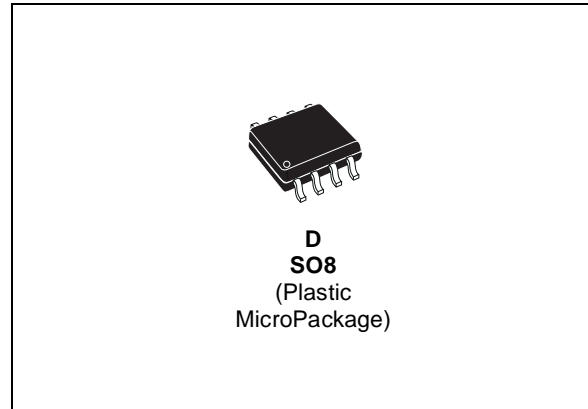
- $\mu$ C-BASED OFF-LINE APPLICATIONS

### ORDER CODE

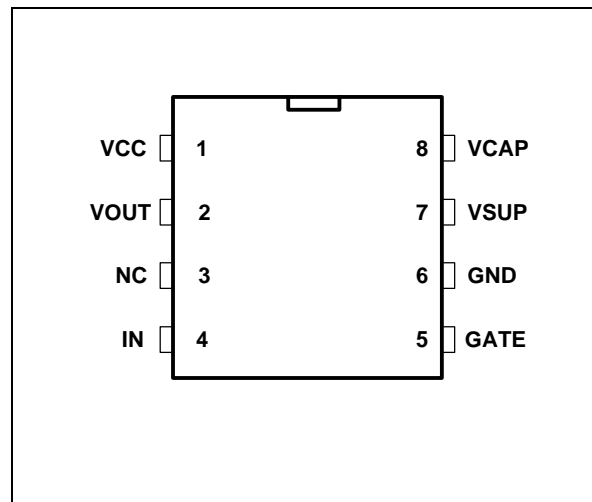
Part Number	Temperature Range	Package
		D
TD220I	-25, +125°C	•
TD221I	-25, +125°C	•

Note: D = Small Outline Package (SO) - also available in Tape & Reel (DT)

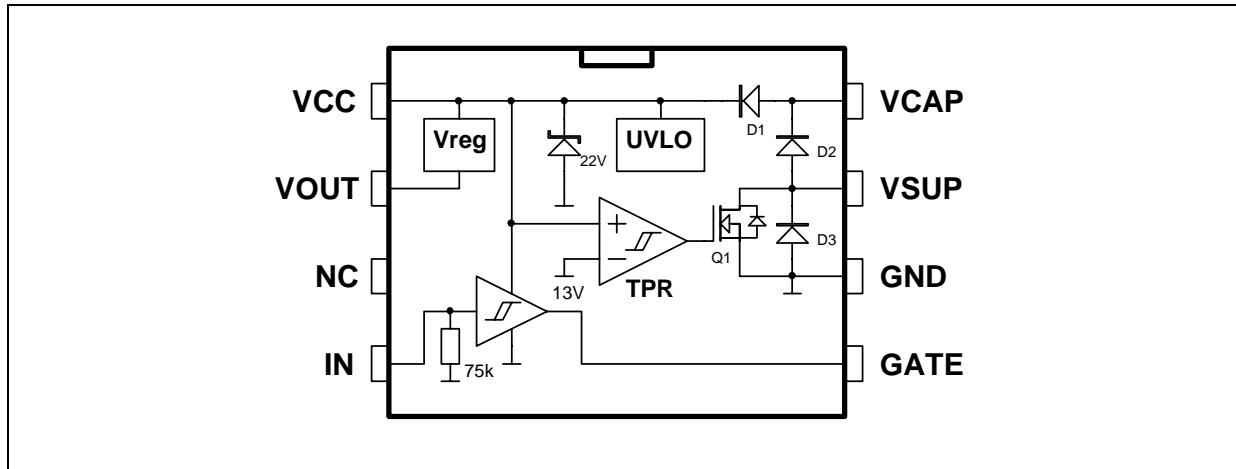
### Package Reference



### PIN CONNECTIONS (top view)



## 1 BLOCK DIAGRAM



## Pin Description

Name	Pin Number	Type	Function
VCC	1	Power supply	Supply capacitor and startup resistor
VOUT	2	Analog output	+3.3V (TD220) or +5V (TD221) voltage regulator
IN	4	Digital input	Input signal for gate drive
GATE	5	Analog output	Gate drive output
GND	6	Power supply	Signal ground
VSUP	7	Power supply	Charge pump input
VCAP	8	Power supply	Capacitor for charge pump

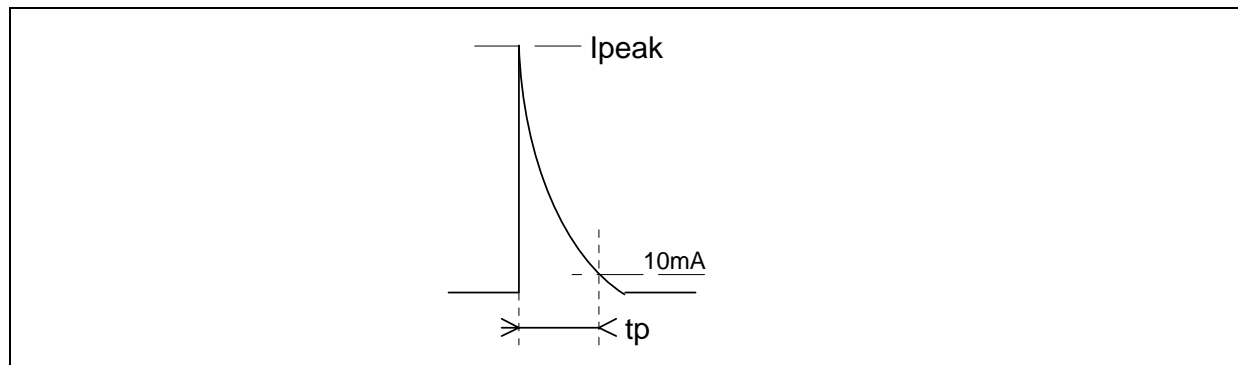
## 2 ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Value	Unit
<b>VCC</b>	DC Supply Voltage ( $I_{CC} < 5\text{mA}$ )	-0.3 to selflimit	V
<b>Vout</b>	Voltage on GATE and VCAP pins	-0.3 to VCC+0.3	V
<b>Vin</b>	Voltage on IN and VOUT pins	-0.3 to 7	V
<b>Isup</b>	Continuous current in VSUP pin	-200 to 200	mA
<b>Ipeak</b>	Peak current in VSUP pin ( $t_p \leq 1\mu\text{s}$ , $f \leq 150\text{kHz}$ , see waveform below)	-1.0 to 1.0	A
<b>Pd</b>	Power dissipation	500	mW
<b>Tstg</b>	Storage temperature	-55 to 150	°C
<b>Tj</b>	Maximum Junction Temperature	150	°C
<b>Rhja</b>	Thermal Resistance Junction-Ambient	150	°C/W
<b>Rhjc</b>	Thermal Resistance Junction-Case	40	°C/W
<b>ESD</b>	Electrostatic discharge (HBM)	2	kV

## OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
<b>VCC</b>	Supply Voltage	UVLO to 17	V
<b>Isup</b>	Continuous current in VSUP pin	0 to 200	mA
<b>Ipeak</b>	Peak current in VSUP pin ( $t_p \leq 1\mu\text{s}$ , $f \leq 150\text{kHz}$ , see waveform below)	-1.0 to 1.0	A
<b>Tj</b>	Junction Temperature	-25 to 125	°C

## Typical waveform of current in VSUP pin



### 3 ELECTRICAL CHARACTERISTICS

Tamb = 25°C, VCC=13V unless otherwise specified

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
<b>Supply</b>						
<b>Icc</b>	Supply current	no load at any pin, Vin<1V Tamb=25°C -25°C<Tj<125°C		0.7	1.0 1.2	mA mA
<b>Icc2</b>		1nF GATE load, 300kHz IN signal	4	5	6	mA
<b>Istby</b>	Standby current	UVLO active Tamb=25°C -25°C<Tj<125°C		160	230	μA μA
<b>Vclamp</b>	Clamp voltage	Icc<5mA	20	22	24	V
<b>Input</b>						
<b>Vton</b>	IN Turn-on Threshold Voltage		1.8		2.1	V
<b>Vtoff</b>	IN Turn-off Threshold Voltage		1.0		1.3	V
<b>Vh</b>	IN Hysteresis		0.5			V
<b>Iinpl</b>	IN Input current low	Vin<0.5V			20	μA
<b>Iinph</b>	IN Input current high	Vin=3.3V			100	μA
<b>Voltage regulator</b>						
<b>Vout</b>	Voltage reference	Iout=10mA TD220 TD221	3.20 4.85	3.30 5	3.40 5.15	V V
<b>RegLoad</b>		Load Regulation	Iout change from 10mA to 25mA			50
<b>Ipeak</b>	Peak output current	Vout=1V	100			mA
<b>dVout</b>	Temperature coefficient	Iout=10mA			250	ppm/°C
<b>Cout</b>	Allowed capacitive load - Note 1	Iout=10mA	0.1		1	μF
<b>Ileak</b>	Leakage current in UVLO state	Vout=1V			10	μA
<b>Vrip</b>	Ripple rejection - Note 1	f=100Hz	40			dB
		f=10kHz	20			dB
<b>Vnoise</b>	Noise voltage	100Hz<f<100kHz		1		mV
<b>tstartup</b>	Startup time (Vout>3.1V)	Cout=1μF			0.1	ms
<b>tsettle</b>	Settling time (1% final value)	Cout=1μF		2		ms
<b>Two Point Regulator (TPR)</b>						
<b>VTPROn</b>	Turn-on level				13.6	V
<b>VTPROff</b>	Turn-off level		12.4			V
<b>VTPRH</b>	Hysteresis	=VTPROn-VTPROff	0.23	0.29	0.35	V
<b>VF</b>	Forward voltage D1	IF=200mA			1.5	V

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
<b>Gate Output</b>						
<b>VOL</b>	Output low voltage	I <sub>gate</sub> =10mA			0.5	V
<b>VOH</b>	Output high voltage	I <sub>gate</sub> =-10mA	V <sub>CC</sub> -2.0			V
<b>Isink</b>	Output sink current	V <sub>gate</sub> =6V T <sub>j</sub> =25°C -25°C < T <sub>j</sub> < 125°C	120	300		mA mA
<b>Isrc</b>	Output source current	V <sub>gate</sub> =3V T <sub>j</sub> =25°C -25°C < T <sub>j</sub> < 125°C	60	150		mA mA
<b>VOL2</b>	Output low voltage in UVLO state	V <sub>cc</sub> =6V, I <sub>gate</sub> =1mA			2	V
<b>tgmin</b>	Minimum output pulse width <sup>1</sup>	C <sub>gate</sub> =10pF			80	ns
<b>tpd</b>	IN to GATE propagation delay			200		ns
<b>Under Voltage Lockout (UVLO)</b>						
<b>UVLOH</b>	UVLO top threshold				15	V
<b>UVLOL</b>	UVLO bottom threshold		7.8		8.7	V
<b>Vhyst</b>	UVLO Hysteresis	V <sub>hyst</sub> =UVLOH-UVLOL	5			V

1) Not 100% tested. Guaranteed by design.

4 TIMING DIAGRAMS

Fig. 1: Power up and power down

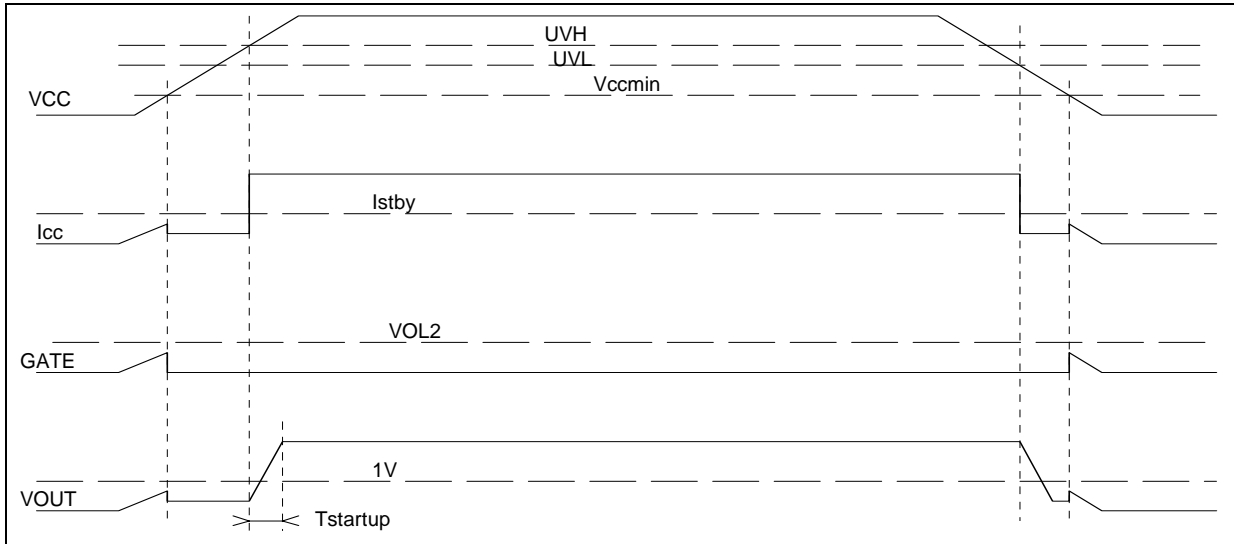
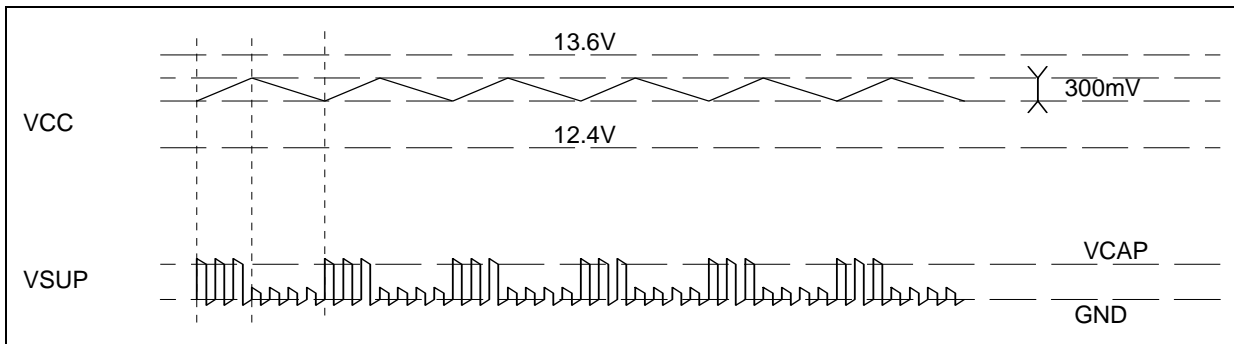
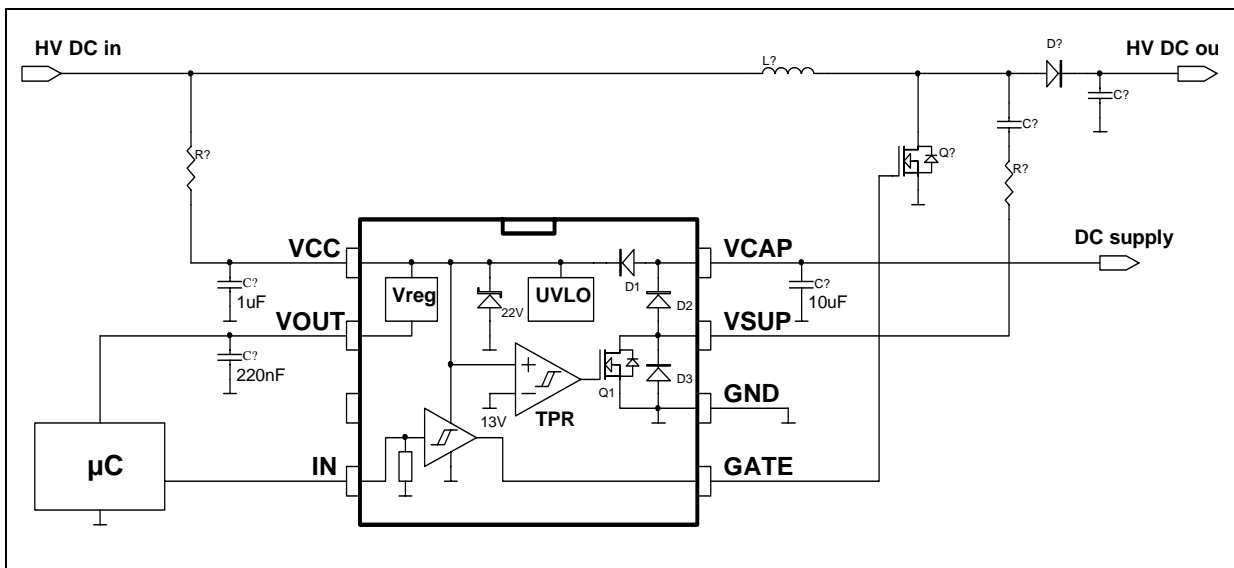


Fig. 2: Two point regulator



APPLICATION DIAGRAM



5 TYPICAL PERFORMANCE CURVES

Fig. 3: Supply Current vs Temperature

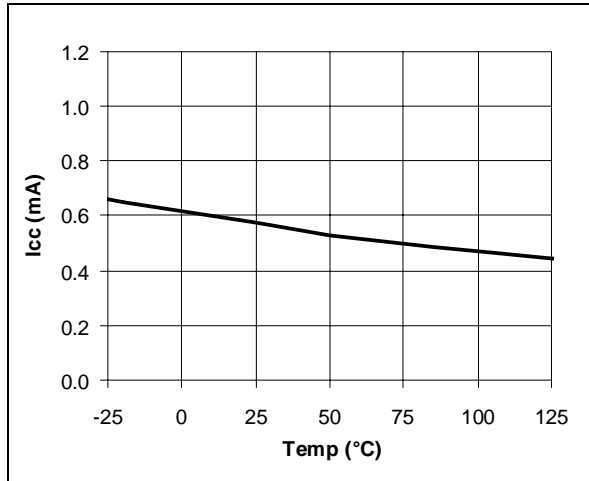


Fig. 6: Standby Current vs Temperature

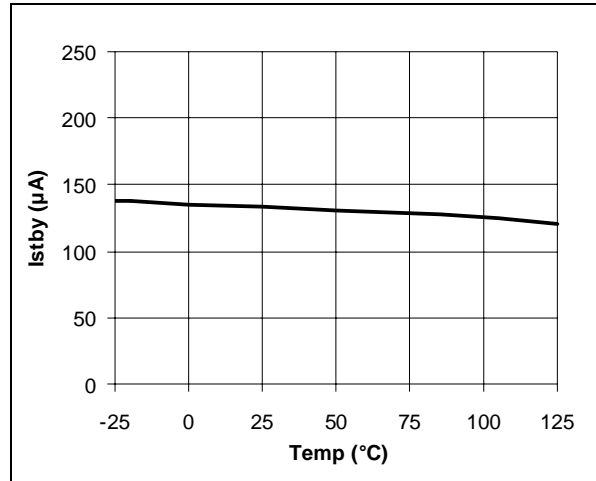


Fig. 4: Gate Drive Sink Current vs Temperature

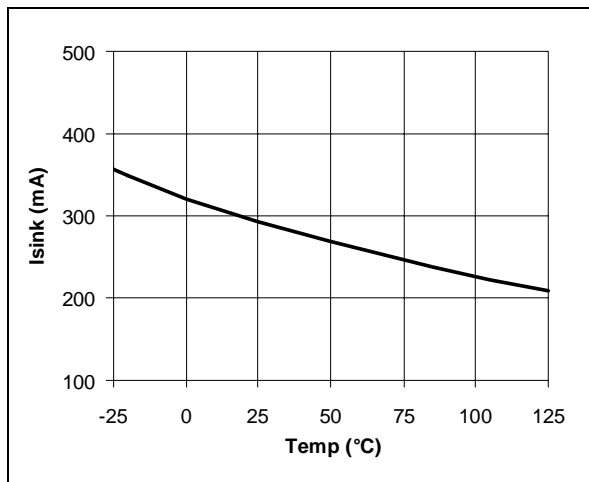


Fig. 7: Gate Drive Source Current vs Temp.

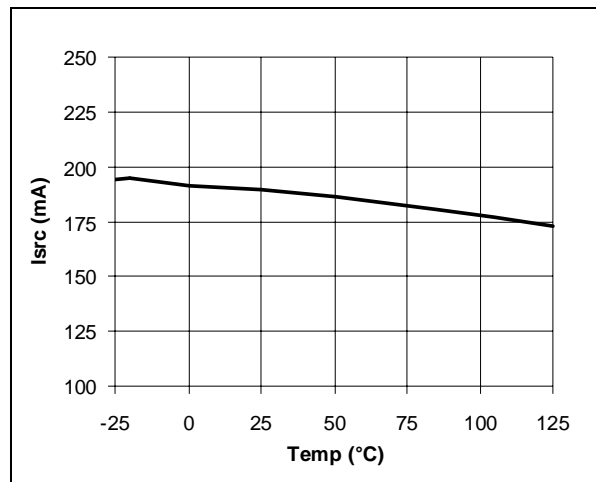
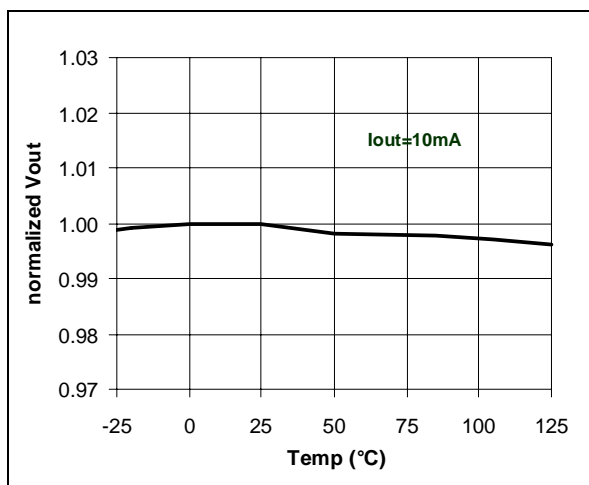
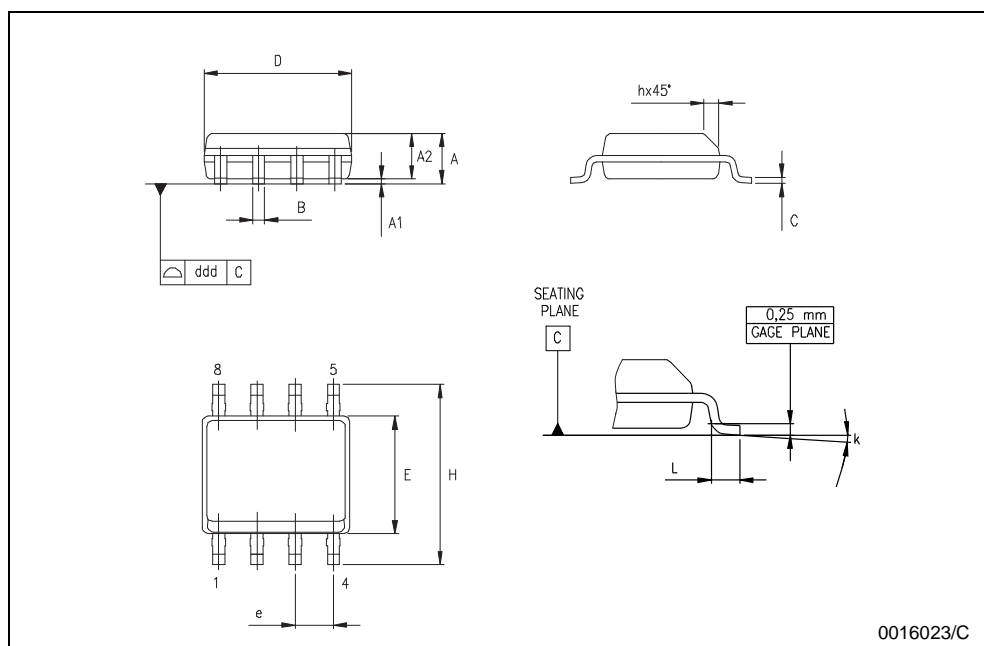


Fig. 5: Vreg Output Voltage vs Temperature



## 6 PACKAGE MECHANICAL DATA

SO-8 MECHANICAL DATA						
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	1.35		1.75	0.053		0.069
A1	0.10		0.25	0.04		0.010
A2	1.10		1.65	0.043		0.065
B	0.33		0.51	0.013		0.020
C	0.19		0.25	0.007		0.010
D	4.80		5.00	0.189		0.197
E	3.80		4.00	0.150		0.157
e		1.27			0.050	
H	5.80		6.20	0.228		0.244
h	0.25		0.50	0.010		0.020
L	0.40		1.27	0.016		0.050
k	8° (max.)					
ddd			0.1			0.04



Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a registered trademark of STMicroelectronics

© 2003 STMicroelectronics - All Rights Reserved  
STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - China - Finland - France - Germany - Hong Kong - India - Italy - Japan - Malaysia - Malta - Morocco  
Singapore - Spain - Sweden - Switzerland - United Kingdom  
<http://www.st.com>



## X-ON Electronics

Largest Supplier of Electrical and Electronic Components

*Click to view similar products for [Gate Drivers](#) category:*

*Click to view products by [STMicroelectronics](#) manufacturer:*

Other Similar products are found below :

[00028](#) [00053P0231](#) [8967380000](#) [56956](#) [CR7E-30DB-3.96E\(72\)](#) [57.404.7355.5](#) [LT4936](#) [57.904.0755.0](#) [5801-0903](#) [5803-0901](#) [5811-0902](#)  
[5813-0901](#) [58410](#) [00576P0030](#) [00581P0070](#) [5882900001](#) [00103P0020](#) [00600P0005](#) [00-9050-LRPP](#) [00-9090-RDPP](#) [5951900000](#) [01-](#)  
[1003W-10/32-15](#) [LTI LA6E-1S-WH-RC-FN12VXCR1](#) [0131700000](#) [00-2240](#) [LTP70N06](#) [LVP640](#) [0158-624-00](#) [5J0-1000LG-SIL](#) [020017-13](#)  
[LY1D-2-5S-AC120](#) [LY2-0-US-AC120](#) [LY2-US-AC240](#) [LY3-UA-DC24](#) [00-5150](#) [00576P0020](#) [00600P0010](#) [LZNQ2M-US-DC5](#) [LZNQ2-](#)  
[US-DC12](#) [LZP40N10](#) [00-8196-RDPP](#) [00-8274-RDPP](#) [00-8275-RDNP](#) [00-8609-RDPP](#) [00-8722-RDPP](#) [00-8728-WHPP](#) [00-8869-RDPP](#) [00-](#)  
[9051-RDPP](#) [00-9091-LRPP](#) [00-9291-RDPP](#)