TD220/221

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

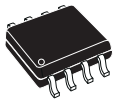
- **µC-BASED OFF-LINE APPLICATIONS**

ORDER CODE

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

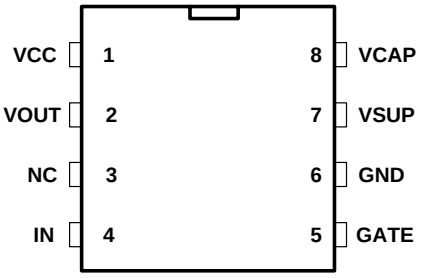
Note: **D =** Small Outline Package (SO) - also available in Tape & Reel (DT)

Package Reference

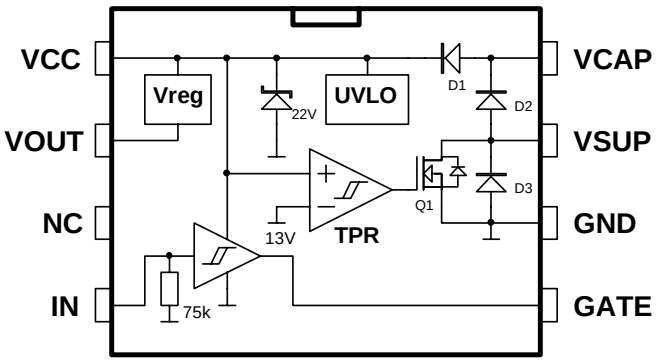


D
SO8
(Plastic MicroPackage)

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

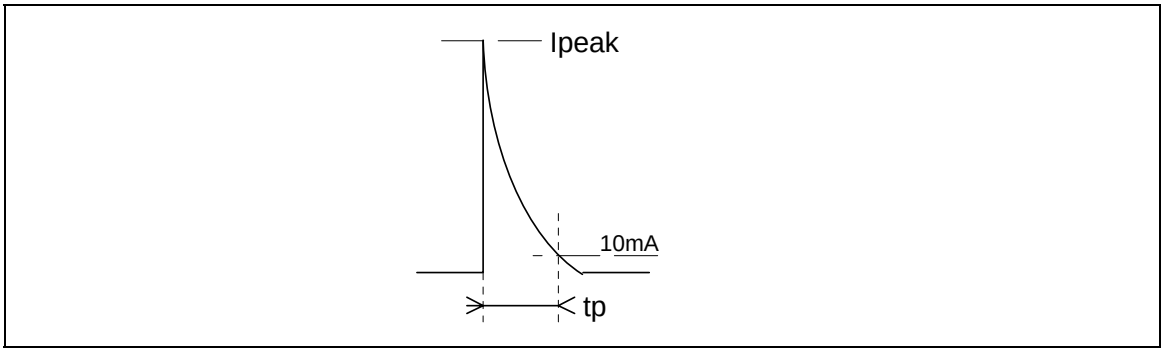
2 ABSOLUTE MAXIMUM RATING

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

OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
VCC	Supply Voltage	UVLO to 17	V
Isup	Continuous current in VSUP pin	0 to 200	mA
Ipeak	Peak current in VSUP pin (tp≤1µs, f≤150kHz, see waveform below)	-1.0 to 1.0	A
Tj	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
Supply						
Icc	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
Icc2		1nF GATE load, 300kHz IN signal	4	5	6	mA
Istby	Standby current	UVLO active Tamb=25°C -25°C<Tj<125°C		160	 230	µA µA
Vclamp	Clamp voltage	Icc<5mA	20	22	24	V
Input						
Vton	IN Turn-on Threshold Voltage		1.8		2.1	V
Vtoff	IN Turn-off Threshold Voltage		1.0		1.3	V
Vh	IN Hysteresis		0.5			V
Iinpl	IN Input current low	Vin<0.5V			20	µA
Iinph	IN Input current high	Vin=3.3V			100	µA
Voltage regulator						
Vout	Voltage reference	Iout=10mA TD220 TD221	 3.20 4.85	 3.30 5	 3.40 5.15	 V V
RegLoad	Load Regulation	Iout change from 10mA to 25mA			50	mV
Ipeak	Peak output current	Vout=1V	100			mA
dVout	Temperature coefficent	Iout=10mA			250	ppm/°C
Cout	Allowed capacitive load - Note 1	Iout=10mA	0.1		1	µF
Ileak	Leakage current in UVLO state	Vout=1V			10	µA
Vrip	Ripple rejection - Note 1	f=100Hz f=10kHz	40 20			dB dB
Vnoise	Noise voltage	100Hz<f<100kHz		1		mV
tstartup	Startup time (Vout>3.1V)	Cout=1µF			0.1	ms
tsettle	Settling time (1% final value)	Cout=1µF		2		ms
Two Point Regulator (TPR)						
VTPROn	Turn-on level				13.6	V
VTPROff	Turn-off level		12.4			V
VTPRH	Hysteresis	=VTPROn-VTPROff	0.23	0.29	0.35	V
VF	Forward voltage D1	IF=200mA			1.5	V

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
Gate Output						
VOL	Output low voltage	Igate=10mA			0.5	V
VOH	Output high voltage	Igate=-10mA	VCC-2.0			V
Isink	Output sink current	Vgate=6V Tj=25°C -25°C < Tj < 125°C	 120	300		 mA mA
Isrc	Output source current	Vgate=3V Tj=25°C -25°C < Tj < 125°C	 60	150		 mA mA
VOL2	Output low voltage in UVLO state	Vcc=6V, Igate=1mA			2	V
tgmin	Minimum output pulse width [1]	Cgate=10pF			80	ns
tpd	IN to GATE propagation delay			200		ns
Under Voltage Lockout (UVLO)						
UVLOH	UVLO top threshold				15	V
UVLOL	UVLO bottom threshold		7.8		8.7	V
Vhyst	UVLO Hysteresis	Vhyst=UVLOH-UVLOL	5			V

1) Not 100% tested. Guaranteed by design.

4 TIMING DIAGRAMS

Fig. 1: Power up and power down

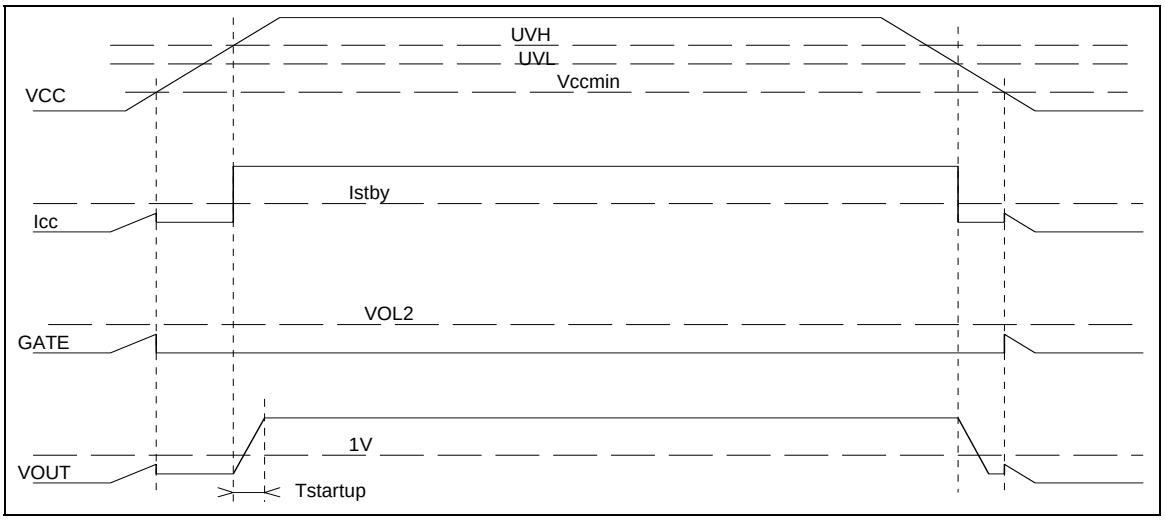
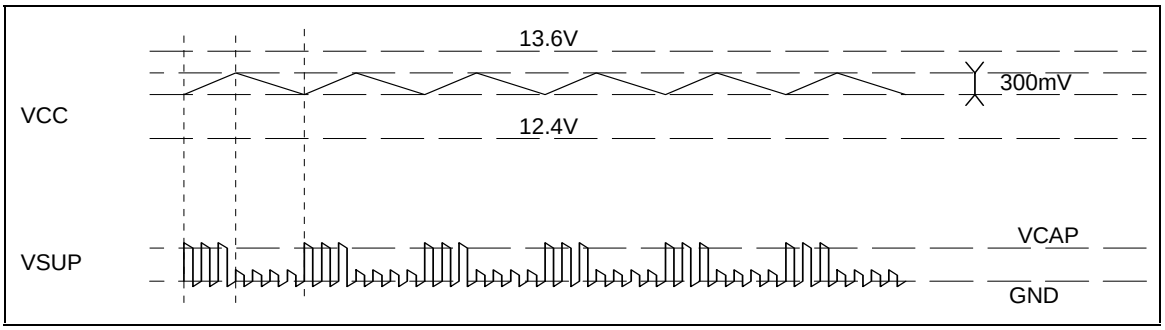
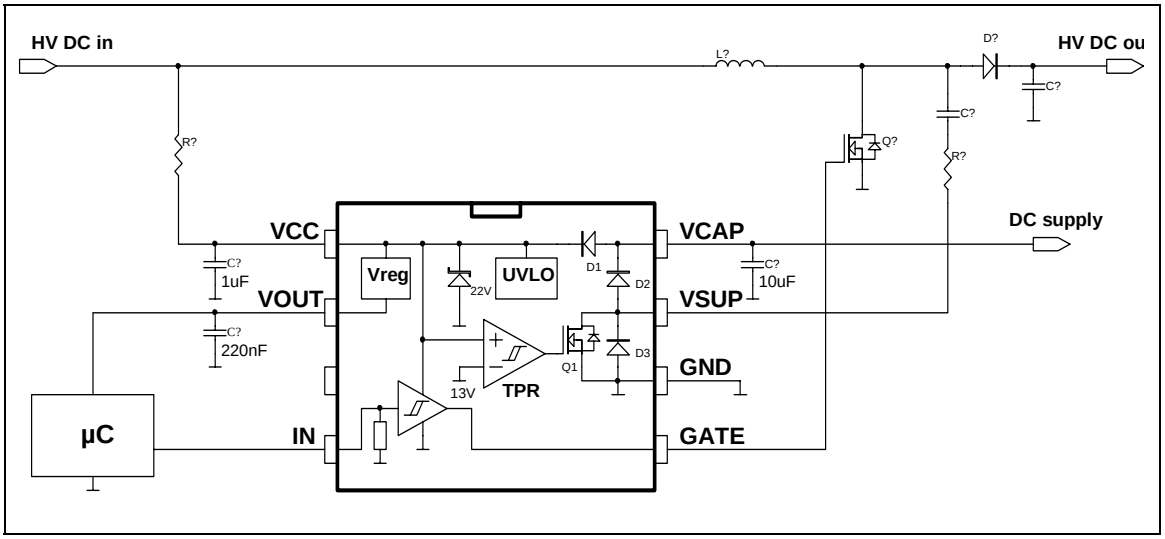


Fig. 2: Two point regulator



APPLICATION DIAGRAM



5 TYPICAL PERFORMANCE CURVES

Fig. 3: Supply Current vs Temperature

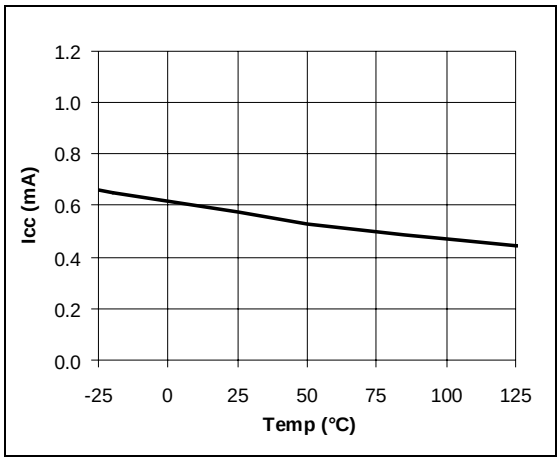


Fig. 6: Standby Current vs Temperature

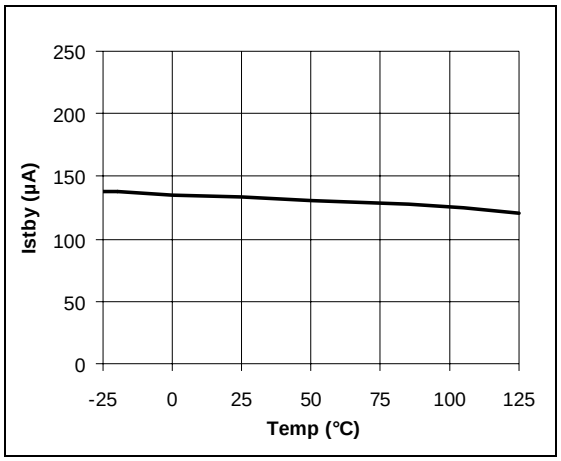


Fig. 4: Gate Drive Sink Current vs Temperature

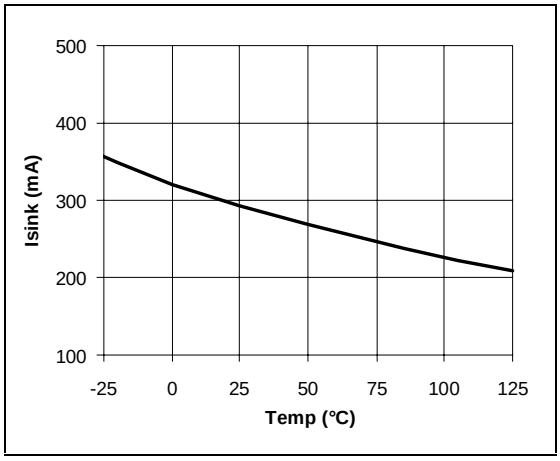


Fig. 7: Gate Drive Source Current vs Temp.

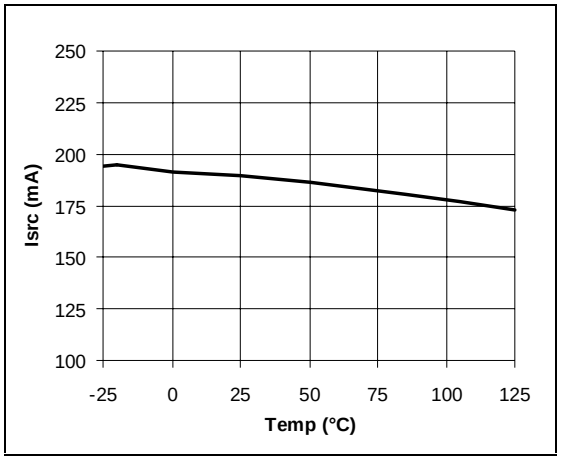
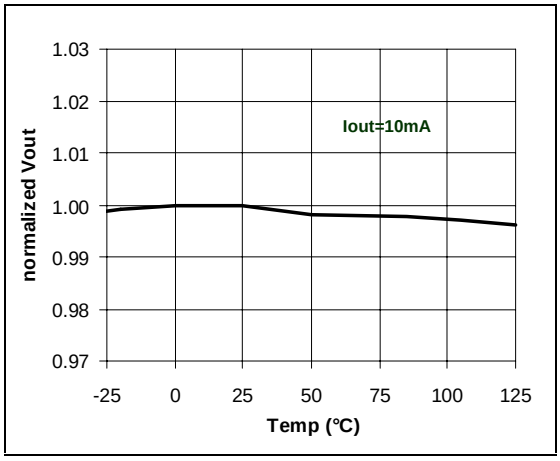


Fig. 5: Vreg Output Voltage vs Temperature



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