19-3777; Rev 2; 10/06

Overvoltage Protection Controllers with Current Limit in TDFN

General Description

The MAX4881–MAX4884/MAX4893B overvoltage protection (OVP) controllers with built-in current-limited switch, protect low-voltage systems against voltages of up to 28V. When the input voltage exceeds the overvoltage trip level of 5.6V (MAX4881/MAX4883/MAX4893B) or 4.5V (MAX4882/MAX4884), the external n-channel MOSFET is turned off to prevent damage to the protected components. An undervoltage/overvoltage flag indicator ($\overline{OV}$) notifies the processor that an undervoltage/overvoltage fault condition is present.

The MAX4881/MAX4882 feature an internal 1.1A current-limited switch, while the MAX4883B/MAX4883C/MAX4884B/MAX4884C include an internal 0.7A current-limited switch. The MAX4893B includes a 0.9A current-limited switch. When the load current is at the current limit for longer than the blanking time, the switch of the MAX4881/MAX4882/MAX4883B/MAX4884B/MAX4893B latches off and does not turn back on until $\overline{EN}$, CB, or IN is cycled. A current-limit flag ($\overline{FLAGI}$) asserts to indicate a current fault condition.

The MAX4883C/MAX4884C limit the current to 0.7A indefinitely until the thermal protection trips. An overcurrent flag output asserts to indicate a current fault condition after the blanking time has elapsed.

The MAX4881–MAX4884/MAX4893B have a control input (CB) that is used to turn on and off the internal current-limited switch. Other features include a shutdown function ($\overline{EN}$) to disable the external n-channel MOSFET, and a built-in startup delay to allow the adapter voltage to settle down before turning on the MOSFET.

The MAX4881–MAX4884/MAX4893B are offered in a space-saving 10-pin TDFN package and operate over the extended -40°C to +85°C temperature range.

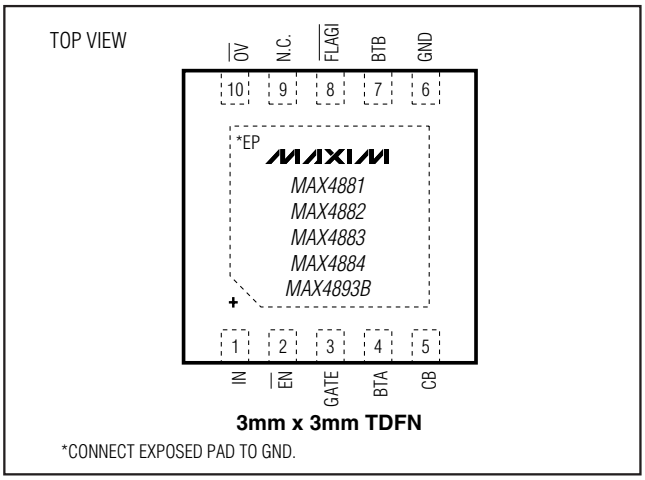
Applications

Cell Phones
Digital Still Cameras
PDAs and Palmtop Devices
MP3 Players

Features

- **Overvoltage Protection Up to 28V**
- **Preset Overvoltage Trip Level**
  - **5.6V (MAX4881/MAX4883/MAX4893B)**
  - **4.5V (MAX4882/MAX4884)**
- **Internal Current-Limited Switch**
  - **1.1A (MAX4881/MAX4882)**
  - **0.7A (MAX4883/MAX4884)**
  - **0.9A (MAX4893B)**
- **Drives Low-Cost n-Channel MOSFET**
- **Internal 50ms Startup Delay**
- **Overvoltage Fault $\overline{OV}$ Indicator**
- **Current-Limit Fault $\overline{FLAGI}$ Indicator**
- **Undervoltage Lockout**
- **Thermal Shutdown Protection**
- **Tiny 10-Pin TDFN Package**

Pin Configuration



3mm x 3mm TDFN

*CONNECT EXPOSED PAD TO GND.

Ordering Information

PART	TEMP RANGE	PIN-PACKAGE	$\overline{OV}$ TRIP LEVEL (V)	CURRENT LIMIT (A)	CURRENT-LIMIT MODE	TOP MARK	PKG CODE
MAX4881ETB	-40°C to +85°C	10 TDFN-EP*	5.6	1.1	LATCHOFF	APK	T1033-1
MAX4882ETB	-40°C to +85°C	10 TDFN-EP*	4.5	1.1	LATCHOFF	APL	T1033-1
MAX4883BETB	-40°C to +85°C	10 TDFN-EP*	5.6	0.7	LATCHOFF	APM	T1033-1
MAX4883CETB	-40°C to +85°C	10 TDFN-EP*	5.6	0.7	CONTINUOUS	APN	T1033-1
MAX4884BETB**	-40°C to +85°C	10 TDFN-EP*	4.5	0.7	LATCHOFF	APO	T1033-1
MAX4884CETB**	-40°C to +85°C	10 TDFN-EP*	4.5	0.7	CONTINUOUS	APP	T1033-1
MAX4893BETB	-40°C to +85°C	10 TDFN-EP*	5.6	0.9	LATCHOFF	ATF	T1033-1

** EP = Exposed pad.*

***Future product—contact factory for availability.*

Overvoltage Protection Controllers with Current Limit in TDFN

ABSOLUTE MAXIMUM RATINGS

(All voltages referenced to GND.)
IN .....-0.3V to +30V
GATE .....-0.3V to +12V
$\overline{EN}$, CB, $\overline{OV}$, $\overline{FLAGI}$, BTA, BTB .....-0.3V to +6V
Continuous Power Dissipation (T_A = +70°C)
10-Pin TDFN (derate 18.5mW/°C above +70°C) 1481.5mW

Operating Temperature Range .....-40°C to +85°C
Junction Temperature.....+150°C
Storage Temperature Range .....-65°C to +150°C
Lead Temperature (soldering, 10s) .....+300°C

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

(V_{IN} = +5V (MAX4881/MAX4883/MAX4893B), V_{IN} = +4V (MAX4882/MAX4884), T_A = -40°C to +85°C, unless otherwise noted. Typical values are at T_A = +25°C.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
INPUT VOLTAGE (IN)							
Input Voltage Range	V_{IN}			1.2		28.0	V
Overvoltage Trip Level	OVLO	V_{IN} rising	MAX4881/MAX4883/MAX4893B	5.5	5.6	5.7	V
			MAX4882/MAX4884	4.4	4.5	4.6	
Overvoltage-Trip-Level Hysteresis					50		mV
Undervoltage Lockout Threshold	UVLO	V_{IN} falling	MAX4881/MAX4883/MAX4893B	4.2	4.35	4.5	V
			MAX4882/MAX4884	2.4	2.55	2.7	
Undervoltage Lockout Hysteresis					50		mV
Supply Current	I_{IN} + I_{BTA}	No load, $V_{\overline{EN}}$ = 0 or 5.5V, V_{IN} = $V_{OVLO\ (MIN)}$ - 0.1V, V_{CB} = V_{IN}			240	380	µA
INTERNAL SWITCH							
BTA Input Range	V_{BTA}			2.8		5.7	V
BTA Undervoltage Lockout	BTA_{UVLO}	V_{BTA} falling		2.4		2.7	V
BTA-Undervoltage-Lockout Hysteresis					50		mV
Switch-Forward Current Limit	I_{FWD}	MAX4881/MAX4882, V_{BTB} = GND		1.00	1.1	1.25	A
		MAX4883/MAX4884, V_{BTB} = GND		0.600	0.7	0.775	
		MAX4893B, V_{BTB} = GND		0.800		1	
Switch-Reverse Current Limit	I_{REV}	MAX4881/MAX4882				1.25	A
		MAX4883/MAX4884				0.775	
		MAX4893B				1	
Voltage Drop (V_{BTA} - V_{BTB})		I_L = 400mA	V_{BTA} = 5V (MAX4881/MAX4883/MAX4893B)			110	mV
			V_{BTA} = 4V (MAX4882/MAX4884)			110	
Blanking Time	t_{BLANK}			20	50	80	ms
BTB Off Current	$I_{BTB-OFF}$	$V_{\overline{EN}}$ = 0, V_{CB} = 0				1	µA

ELECTRICAL CHARACTERISTICS (continued)

(V_{IN} = +5V (MAX4881/MAX4883/MAX4893B), V_{IN} = +4V (MAX4882/MAX4884), T_A = -40°C to +85°C, unless otherwise noted. Typical values are at T_A = +25°C.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
GATE							
GATE Voltage	V_{GATE}	I_{GATE} sourcing 1µA	V_{IN} = 5V (MAX4881/MAX4883/MAX4893B)	9		10	V
			V_{IN} = 4.3V (MAX4882/MAX4884)	7.6		8.6	
GATE Pulldown Current	I_{PD}	V_{IN} > V_{OVLO}, V_{GATE} = 5.5V			60		mA
TIMING							
Startup Delay	t_{START}	V_{IN} > V_{UVLO}, V_{GATE} > 0.3V (Figure 1)		20	50	80	ms
$\overline{OV}$ Blanking Time	$t_{OV-BLANK}$	V_{GATE} = 0.3V, $V_{\overline{OV}}$ = 2.4V (Figure 1)		20	50	80	ms
GATE Turn-On Time	t_{GON}	V_{GATE} = 0.3V to 7V, C_{GATE} = 1500pF (Figure 1)			7		ms
GATE Turn-Off Time	t_{GOFF}	V_{IN} increasing from 5V to 8V at 3V/µs, V_{GATE} = 0.3V, C_{GATE} = 1500pF (Figure 2) (MAX4881/MAX4883/MAX4893B)			6	20	µs
		V_{IN} increasing from 4V to 7V at 3V/µs, V_{GATE} = 0.3V, C_{GATE} = 1500pF (Figure 2) (MAX4882/MAX4884)			6	20	
$\overline{OV}$ Assertion Delay	$t_{\overline{OV}}$	V_{IN} increasing from 5V to 8V at 3V/µs, V_{OV} = 0.4V (Figure 2) (MAX4881/MAX4883/MAX4893B)			5.8		µs
		V_{IN} increasing from 4V to 7V at 3V/µs, V_{OV} = 0.4V (Figure 2) (MAX4882/MAX4884)			5.8		
Initial Overvoltage Fault Delay	t_{OVP}	V_{IN} increasing from 0 to 8V, I_{GATE} = 80% of I_{PD} (Figure 3)			100		ns
Disable Time	t_{DIS}	V_{EN} = 2.4V, V_{GATE} = 0.3V (Figure 4)			580		ns
$\overline{EN}$, CB INPUTS							
Input-High Voltage	V_{IH}			1.4			V
Input-Low Voltage	V_{IL}					0.5	V
Input Leakage						1	µA
$\overline{OV}$, $\overline{FLAGI}$ OUTPUTS							
Output Voltage Low	V_{OL}	I_{SINK} = 1mA, $\overline{OV}$, $\overline{FLAGI}$ assert				0.4	V
Leakage Current		$V_{\overline{FLAGI}}$ = $V_{\overline{OV}}$ = 5.5V				1	µA
THERMAL PROTECTION							
Thermal Shutdown					150		°C
Thermal Hysteresis					40		°C

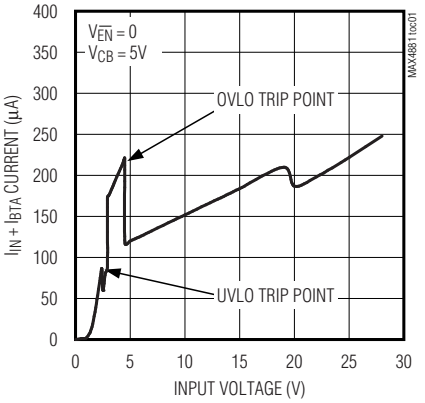
Note 1: All devices are 100% tested at T_A = +25°C. Electrical limits over the full temperature range are guaranteed by design.

Overvoltage Protection Controllers with Current Limit in TDFN

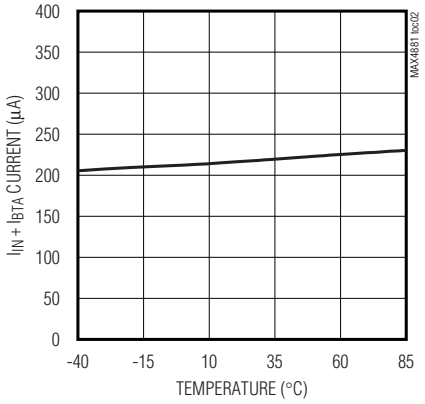
Typical Operating Characteristics

(V_{IN} = 5V, T_A = +25°C, unless otherwise noted.)

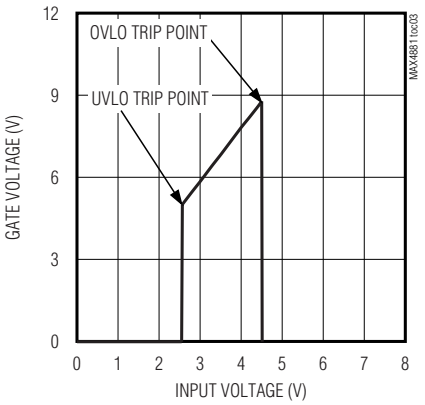
I_{IN} + I_{BTA} CURRENT vs. INPUT VOLTAGE



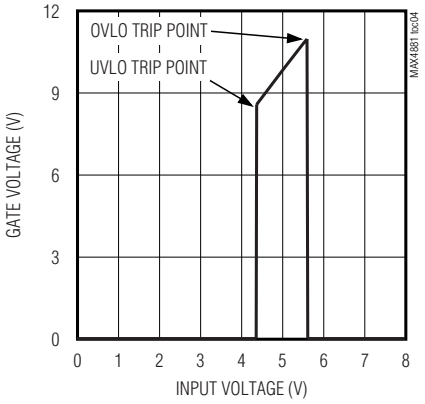
I_{IN} + I_{BTA} CURRENT vs. TEMPERATURE



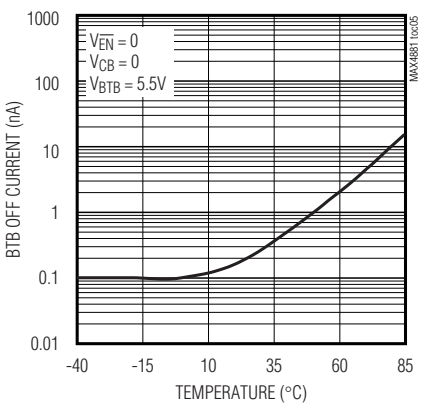
GATE VOLTAGE vs. INPUT VOLTAGE (MAX4884)



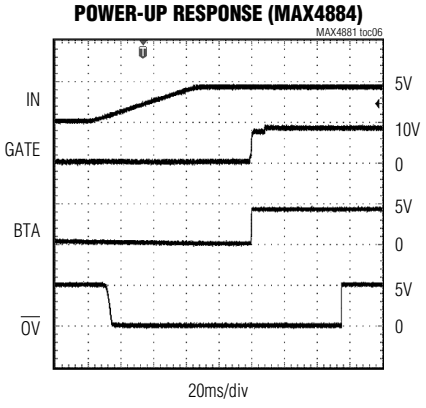
GATE VOLTAGE vs. INPUT VOLTAGE (MAX4881)



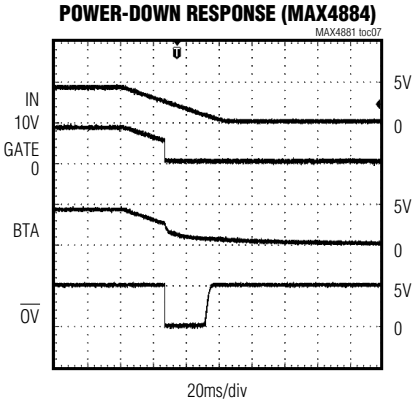
BTB OFF CURRENT vs. TEMPERATURE



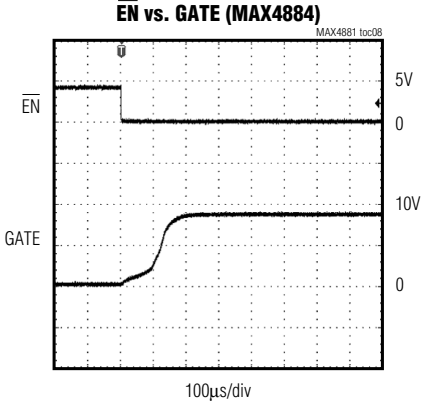
POWER-UP RESPONSE (MAX4884)



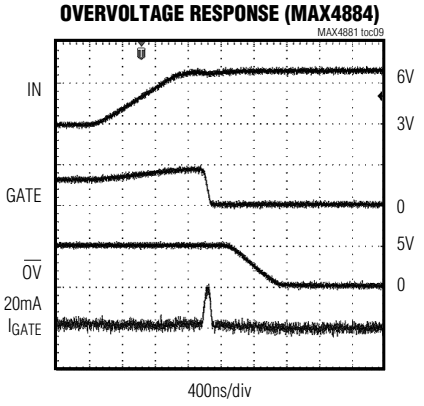
POWER-DOWN RESPONSE (MAX4884)



$\overline{EN}$ vs. GATE (MAX4884)



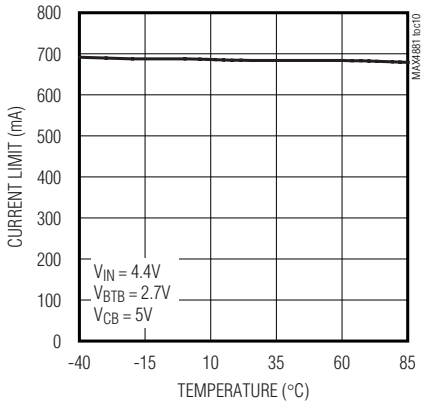
OVERVOLTAGE RESPONSE (MAX4884)



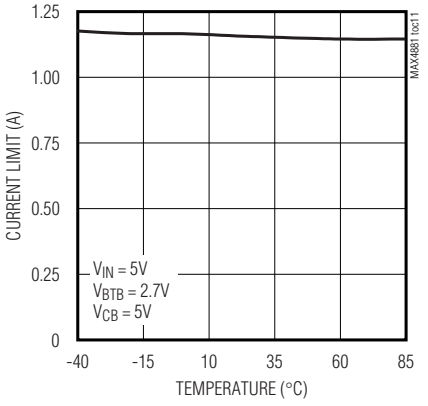
Typical Operating Characteristics (continued)

(V_{IN} = 5V, T_A = +25°C, unless otherwise noted.)

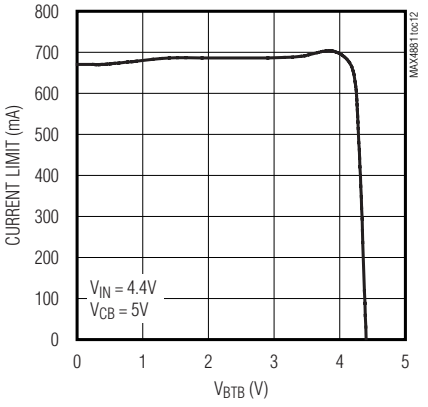
CURRENT LIMIT vs. TEMPERATURE (MAX4884)



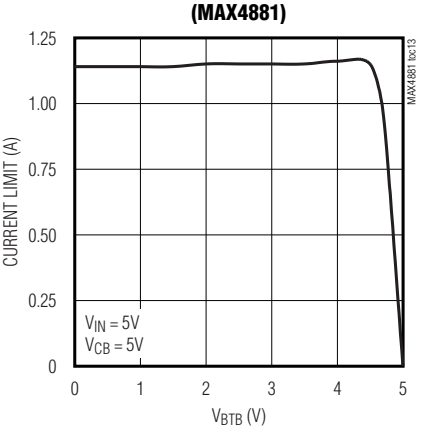
CURRENT LIMIT vs. TEMPERATURE (MAX4881)



CURRENT LIMIT vs. V_{BTB} (MAX4884)



CURRENT LIMIT vs. V_{BTB} (MAX4881)



Overvoltage Protection Controllers with Current Limit in TDFN

Pin Description

PIN	NAME	FUNCTION
1	IN	Input. IN is the power input for the OVP charge pump. Bypass IN to GND with a 1µF or larger capacitor.
2	$\overline{EN}$	Active-Low Enable Input. Drive $\overline{EN}$ high to turn off the external MOSFET. Driving $\overline{EN}$ low activates the OVP circuitry and turns on the external MOSFET.
3	GATE	Gate Drive Output. GATE is the output of an on-chip OVP charge pump. When $V_{UVLO} < V_{IN} < V_{OVLO}$, GATE is driven high to turn on the external n-channel MOSFET.
4	BTA	Internal Current-Limited Switch Terminal. Connect BTA to the source of the external n-channel MOSFET. BTA is the power input for the entire device (except the OVP charge pump). Bypass BTA to GND with a 0.1µF capacitor as close to the device as possible for proper operation.
5	CB	Active-Low Internal Current-Limited-Switch Control Input. Drive CB high to turn on the internal switch, pull CB low to turn off the internal switch.
6	GND	Ground
7	BTB	Internal Current-Limited-Switch Output. Bypass BTB to GND with 0.1µF capacitor as close to the device as possible.
8	$\overline{FLAGI}$	Active-Low Open-Drain Internal Current-Limited Flag Output. $\overline{FLAGI}$ asserts low when the current is at the limit for longer than the blanking time. $\overline{FLAGI}$ is disabled when $\overline{EN}$ goes high.
9	N.C.	No Connection. Not internally connected.
10	$\overline{OV}$	Active-Low Open-Drain IN-Overvoltage Flag Output. $\overline{OV}$ goes low when an undervoltage/overvoltage fault occurs at IN. $\overline{OV}$ is disabled when $\overline{EN}$ goes high.
—	EP	Exposed Pad. EP is internally connected to GND. Correct EP to a large ground plane to act as a heat sink, but do not use EP as the only electrical ground connection.

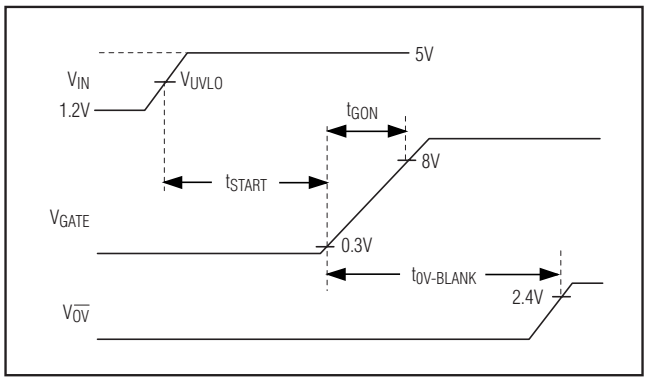


Figure 1. Startup Timing Diagram

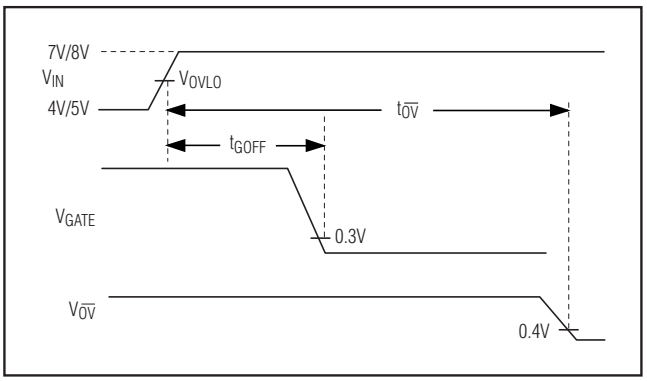


Figure 2. Shutdown Timing Diagram

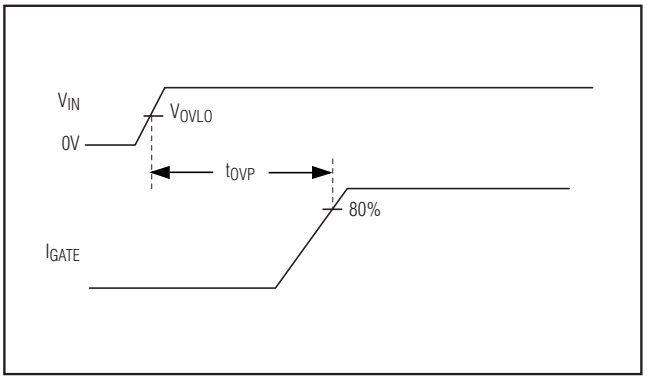


Figure 3. Power-Up Overvoltage Timing Diagram

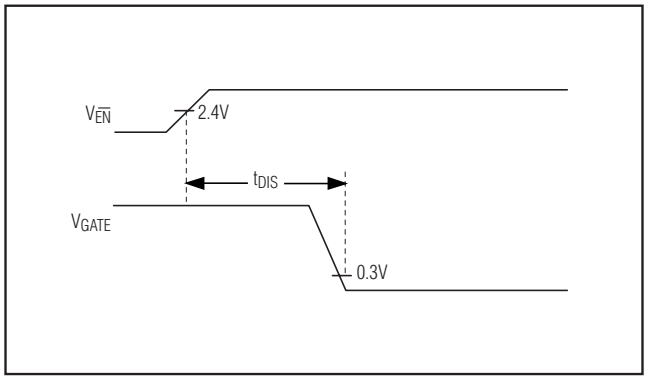


Figure 4. Disable Timing Diagram

Detailed Description

The MAX4881–MAX4884/MAX4893B provide up to +28V overvoltage protection for low-voltage systems. When the input voltage at IN exceeds the overvoltage trip level (OVLO), the MAX4881–MAX4884/MAX4893B turn off the low-cost external n-channel FET to prevent damage to the protected components and issue an overvoltage fault flag.

The MAX4881–MAX4884 feature a built-in current-limited switch that limits the load current to 1.1A (MAX4881/MAX4882), 0.7A (MAX4883B/MAX4883C/MAX4884B/MAX4884C), and 0.9A (MAX4893B). When the load current is at the current limit for longer than the blanking time, the switch of the MAX4881/MAX4882/MAX4883B/MAX4884B/MAX4893B latches off and does not turn back on until $\overline{EN}$ or CB or IN is cycled. A current-limit flag ($\overline{FLAGI}$) asserts to indicate a current fault condition. The MAX4883C/MAX4884C limit the current to 0.7A indefinitely until the thermal protection trips. An overcurrent flag output asserts to indicate a current fault condition after the blanking time has elapsed.

IN-Undervoltage Lockout (UVLO)

The MAX4881/MAX4883/MAX4893B have a fixed 4.35V undervoltage lockout level (UVLO) while the MAX4882/MAX4884 have a fixed UVLO of 2.55V. GATE goes low when V_{IN} is below V_{UVLO}, turning off the external n-channel FET.

IN-Overvoltage Lockout (OVLO)

The MAX4881/MAX4883/MAX4893B have a fixed 5.6V overvoltage threshold (OVLO), while the MAX4882/MAX4884 have a fixed OVLO of 4.5V. GATE goes low when V_{IN} is higher than V_{OVLO}, turning off the external n-channel FET.

Fault Flag Output ($\overline{OV}$)

The $\overline{OV}$ output signals the host system that there is a fault with the input voltage. $\overline{OV}$ asserts low in response to either an overvoltage or undervoltage fault. $\overline{OV}$ stays low for 50ms after GATE turns on, before deasserting high.

$\overline{OV}$ is an open-drain active-low output. Connect a pullup resistor from $\overline{OV}$ to the logic I/O voltage of the host system or to any voltage source up to 6V. Driving $\overline{EN}$ high disables $\overline{OV}$.

Overvoltage Protection Controllers with Current Limit in TDFN

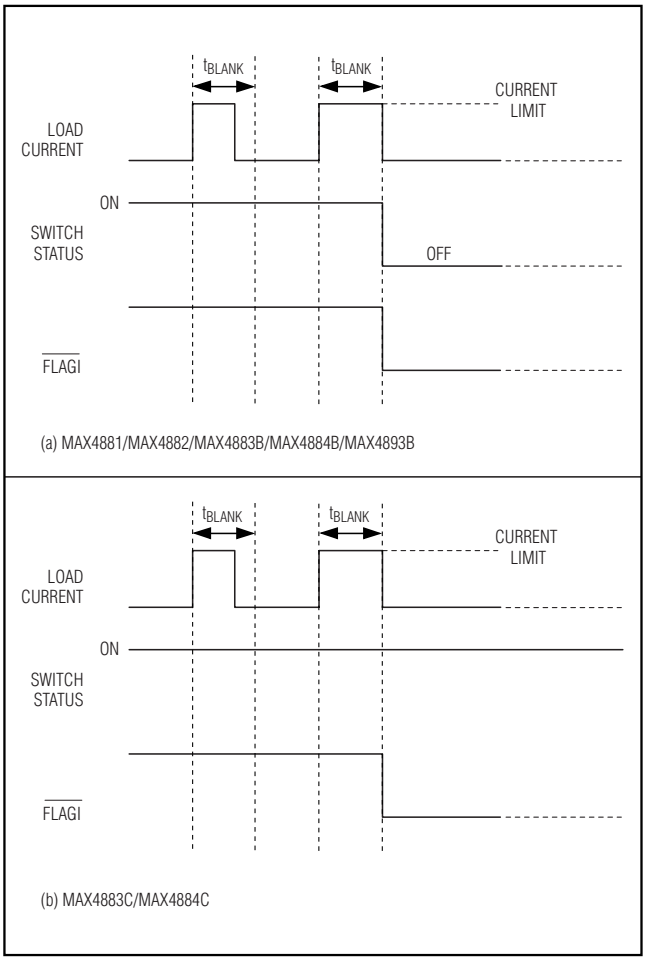


Figure 5. Current-Limit Fault Timing

Overcurrent Flag Output (FLAGI)

The MAX4881–MAX4884/MAX4893B have an overcurrent-fault flag output (FLAGI) to indicate a current fault condition. FLAGI asserts low to indicate a fault when the current reaches the current limit for longer than the 50ms blanking time. Toggle IN or CB or EN to release FLAGI latched condition. FLAGI does not assert if the current-limit fault occurs for less than the blanking time (Figure 5).

FLAGI is disabled when EN goes high. When CB is low, the switch opens, but FLAGI is not active.

FLAGI is an open-drain active-low output. Connect a pullup resistor from FLAGI to the logic I/O voltage of the host system or to any voltage source up to 6V.

Current-Limit Switch

When the forward- or reverse-current-limit threshold is exceeded, t_{BLANK} timer begins counting. The timer

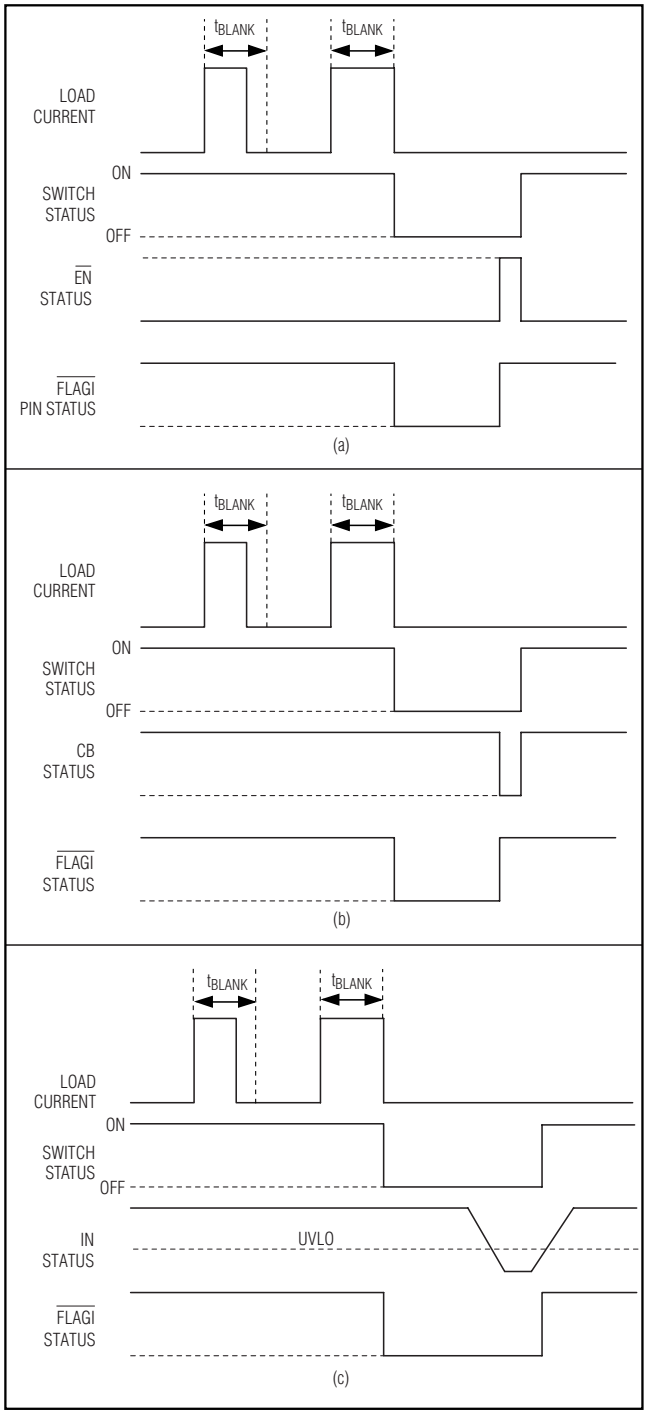


Figure 6. Latchoff Fault Blanking (MAX4881/MAX4882/ MAX4883B/MAX4884B/MAX4893B

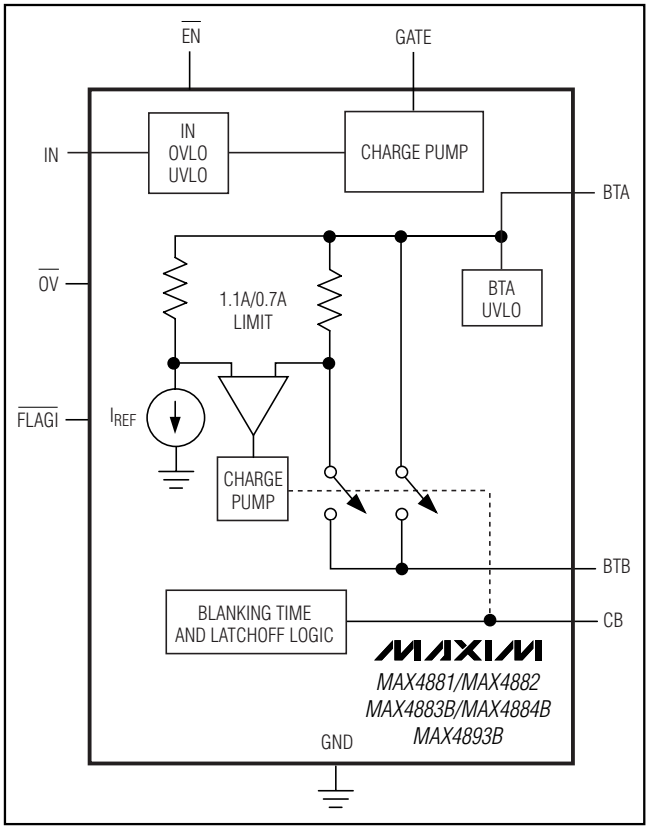


Figure 7a. MAX4881/MAX4882/MAX4883B/MAX4884B/ MAX4893B Functional Diagram

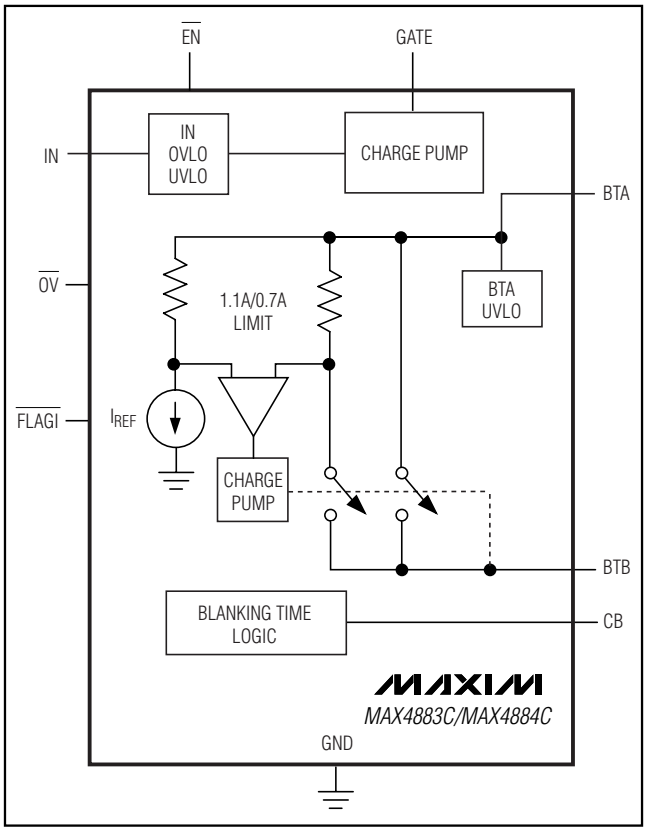


Figure 7b. MAX4883C/MAX4884C Functional Diagram

resets if the overcurrent condition disappears before t_{BLANK} has elapsed. The internal switch is latched off if the overcurrent condition continues up to the end of the blanking time (MAX4881/MAX4882/MAX4883B/ MAX4884B/MAX4893B). The MAX4883C/MAX4884C limit the current infinitely until the thermal trip point occurs. Reset the switch by toggling $\overline{EN}$ or CB or IN (Figure 6).

$\overline{EN}$ Input

The MAX4881–MAX4884/MAX4893B feature an active-low enable input ($\overline{EN}$). Drive $\overline{EN}$ low or connect to ground for normal operation. Drive $\overline{EN}$ high to force the external n-channel MOSFET off, and to disable $\overline{OV}$ and $\overline{FLAGI}$.

GATE Driver

An on-chip charge pump drives the GATE voltage to about twice above V_{IN}, allowing the use of a low-cost n-channel MOSFET (Figure 7). The actual GATE output voltage tracks approximately 2 x V_{IN} until V_{IN} exceeds the OVLO trip level, 5.6V (MAX4881/MAX4883/ MAX4893B) and 4.5V (MAX4882/MAX4884) typically. The GATE output voltage, as a function of input voltage, is shown in the *Typical Operating Characteristics*.

Applications Information

MOSFET Selection

The MAX4881–MAX4884/MAX4893B are designed for use with an n-channel MOSFET. MOSFETs with $R_{DS(ON)}$, specified for a V_{GS} of 4.5V or less, work well. If the input supply is near the UVLO minimum of 4.2V (MAX4881/ MAX4883/MAX4893B), or of 2.4V (MAX4882/ MAX4884), consider using a MOSFET specified for a lower V_{GS} voltage. Also, the V_{DS} should be 30V for the MOSFET to withstand the full 28V IN range of the MAX4881–MAX4884/MAX4893B. Table 1 shows a selection of MOSFETs appropriate for use with the MAX4881–MAX4884/MAX4893B.

IN Bypass Considerations

Bypass IN to GND with a 1µF ceramic capacitor to achieve 15kV ESD-protected input. When the power source has significant inductance due to long lead

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Table 1. MOSFET Suggestions

PART	CONFIGURATION/ PACKAGE	V_{DS} MAX (V)	R_{ON} AT 4.5V (mΩ)	MANUFACTURER
Si1426DH	Single/SC70-6	30	115	Vishay Siliconix http://www.vishay.com (402) 563-6866
FDG315N	Single/SC70-6	30	160	Fairchild Semiconductor http://www.fairchildsemi.com (207) 775-8100

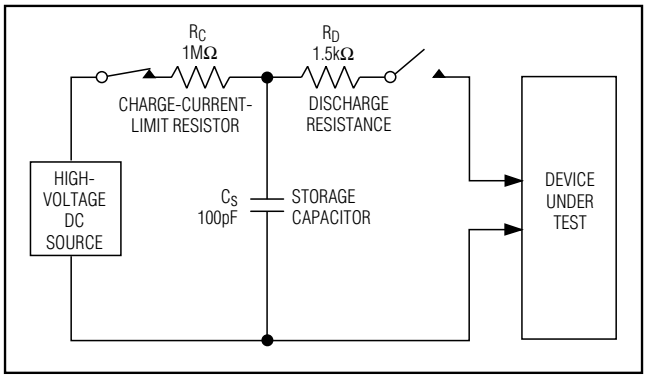

Figure 8. Human Body ESD Test Model

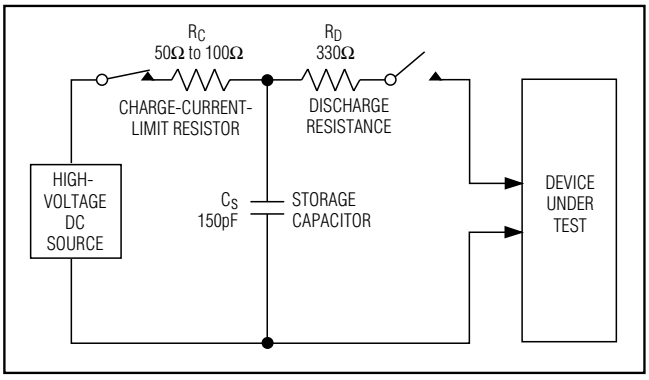

Figure 10. IEC 61000-4-2 ESD Test Model

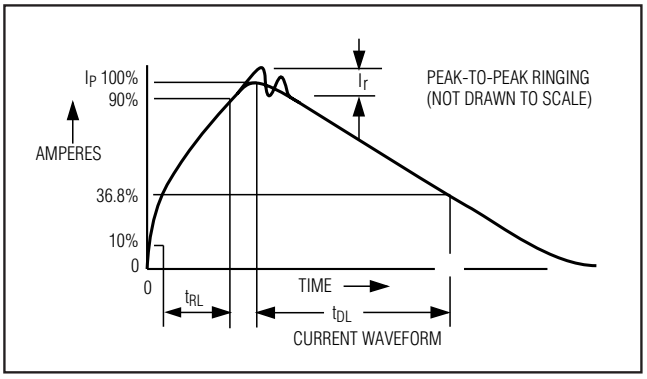

Figure 9. Human Body Model Current Waveform

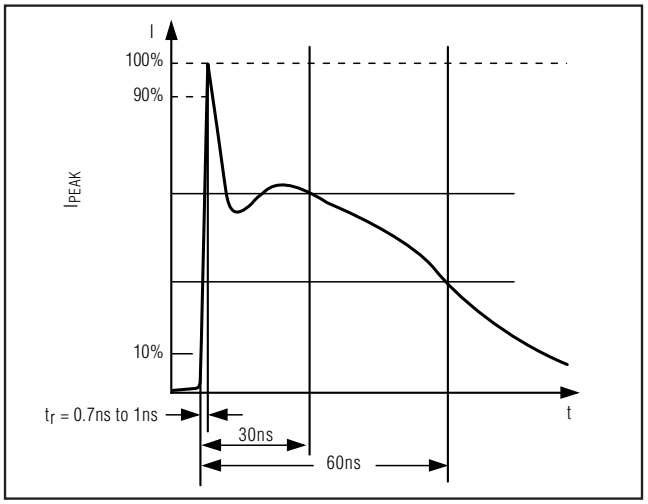

Figure 11. IEC 61000-4-2 ESD Generator Current

length, take care to prevent overshoots due to the LC tank circuit, and provide protection if necessary to prevent exceeding the 30V absolute maximum rating on IN.

The MAX4881–MAX4884/MAX4893B provide protection against voltage faults up to 28V, but this does not include negative voltages. If negative voltages are a concern, connect a Schottky diode from IN to GND to clamp negative input voltages.

Exposed Pad

The MAX4881–MAX4884/MAX4893B provide an exposed pad on the bottom of the package. This pad is internally connected to GND. For the best thermal conductivity and higher power dissipation, solder the exposed pad to the ground plane. Do not use the

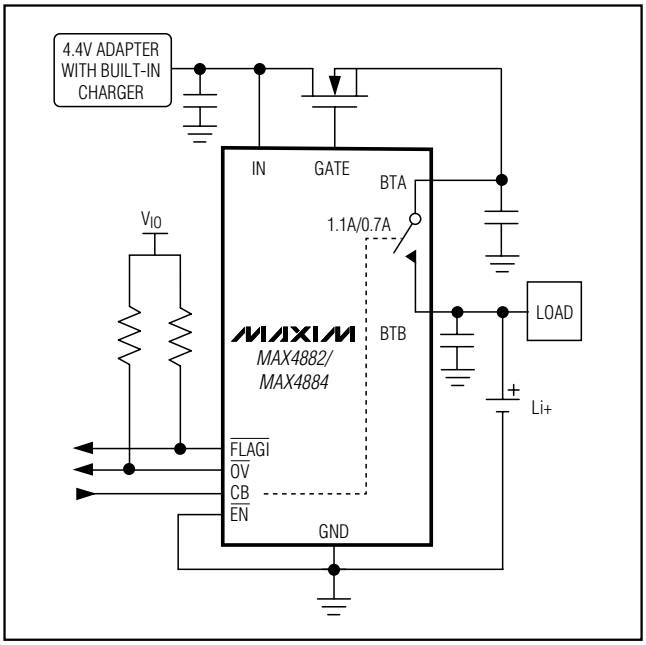

Figure 12. Connection to an AC-DC Adapter without a Built-In Battery Charger

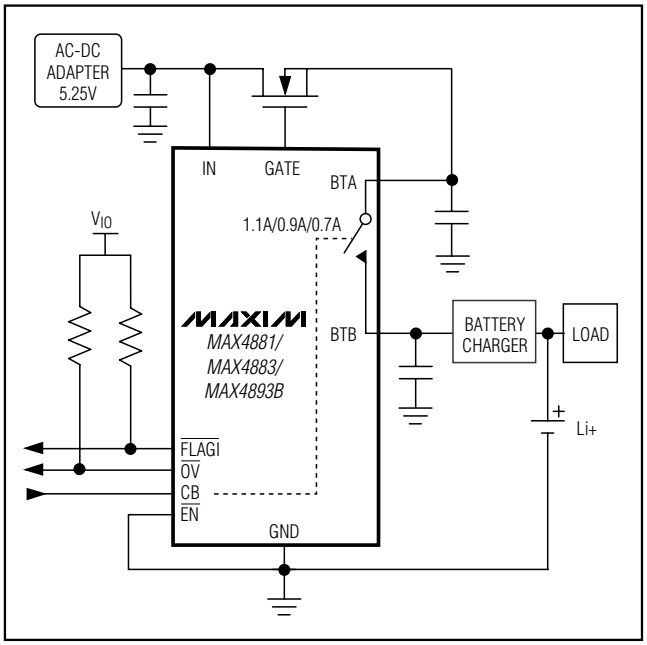

Figure 13. Connection to an AC-DC Adapter with a Built-In Battery Charger

ground-connected pad as the only electrical ground connection or ground return. Use GND (pin 6) as the only electrical ground connection.

ESD Test Conditions

ESD performance depends on a number of conditions. The MAX4881–MAX4884/MAX4893B is specified for 15kV typical ESD resistance on IN when IN is bypassed to ground with a 1µF low-ESR ceramic capacitor. Contact Maxim for a reliability report that documents test setup, methodology, and results.

Human Body Model

Figure 8 shows the Human Body Model and Figure 9 shows the current waveform it generates when discharged into a low impedance. This model consists of a 100pF capacitor charged to the ESD voltage of interest, which is then discharged into the device through a 1.5kΩ resistor.

IEC 61000-4-2

Since January 1996, all equipment manufactured and/or sold in the European community has been required to meet the stringent IEC 61000-4-2 specification. The IEC 61000-4-2 standard covers ESD testing and performance of finished equipment; it does not specifically refer to integrated circuits. The MAX4881–MAX4884/MAX4893B help users design equipment that meets Level 3 of IEC 61000-4-2, without additional ESD-protection components.

The main difference between tests done using the Human Body Model and IEC 61000-4-2 is higher peak current in IEC 61000-4-2. Because series resistance is lower in the IEC 61000-4-2 ESD test model (Figure 10), the ESD-withstand voltage measured to this standard is generally lower than that measured using the Human Body Model. Figure 11 shows the current waveform for the ±8kV, IEC 61000-4-2, Level 4, ESD Contact Discharge test. The Air-Gap test involves approaching the device with a charger probe. The Contact Discharge method connects the probe to the device before the probe is energized.

Typical Operating Circuits

Figures 12 and 13 depict some typical connections to the MAX4881–MAX4884/MAX4893B. Figure 12 shows a battery charger application where the source power is an 4.4V adapter with a built-in charger, while Figure 13 shows an application where the battery charger is external.

Chip Information

TRANSISTOR COUNT: 2391

PROCESS: BiCMOS

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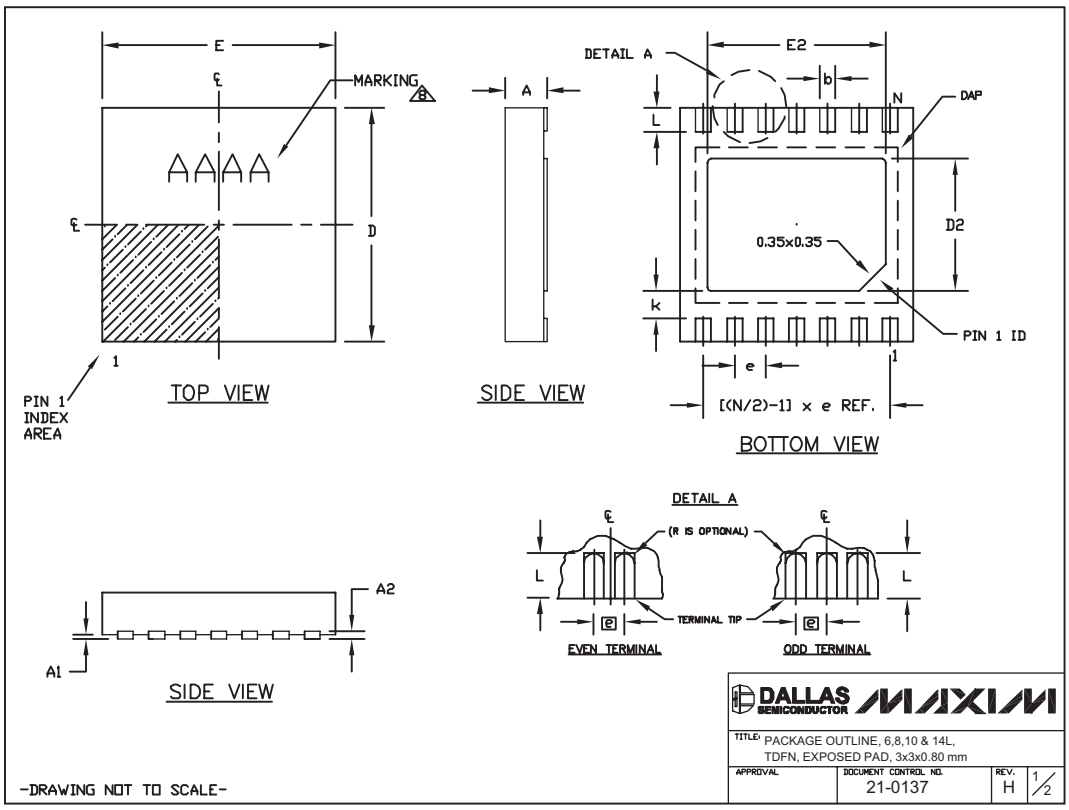
Package Information

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information go to **www.maxim-ic.com/packages**.)



Overvoltage Protection Controllers with Current Limit in TDFN

Package Information (continued)

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information go to **www.maxim-ic.com/packages**.)

COMMON DIMENSIONS		
SYMBOL	MIN.	MAX.
A	0.70	0.80
D	2.90	3.10
E	2.90	3.10
A1	0.00	0.05
L	0.20	0.40
k	0.25 MIN.	
A2	0.20 REF.	

PACKAGE VARIATIONS							
PKG. CODE	N	D2	E2	e	JEDEC SPEC	b	[(N/2)-1] x e
T633-1	6	1.50–0.10	2.30–0.10	0.95 BSC	MO229 / WEEA	0.40–0.05	1.90 REF
T633-2	6	1.50–0.10	2.30–0.10	0.95 BSC	MO229 / WEEA	0.40–0.05	1.90 REF
T833-1	8	1.50–0.10	2.30–0.10	0.65 BSC	MO229 / WEEC	0.30–0.05	1.95 REF
T833-2	8	1.50–0.10	2.30–0.10	0.65 BSC	MO229 / WEEC	0.30–0.05	1.95 REF
T833-3	8	1.50–0.10	2.30–0.10	0.65 BSC	MO229 / WEEC	0.30–0.05	1.95 REF
T1033-1	10	1.50–0.10	2.30–0.10	0.50 BSC	MO229 / WEED-3	0.25–0.05	2.00 REF
T1033-2	10	1.50–0.10	2.30–0.10	0.50 BSC	MO229 / WEED-3	0.25–0.05	2.00 REF
T1433-1	14	1.70–0.10	2.30–0.10	0.40 BSC	- - - -	0.20–0.05	2.40 REF
T1433-2	14	1.70–0.10	2.30–0.10	0.40 BSC	- - - -	0.20–0.05	2.40 REF

NOTES:
1. ALL DIMENSIONS ARE IN mm. ANGLES IN DEGREES.
2. COPLANARITY SHALL NOT EXCEED 0.08 mm.
3. WARPAGE SHALL NOT EXCEED 0.10 mm.
4. PACKAGE LENGTH/PACKAGE WIDTH ARE CONSIDERED AS SPECIAL CHARACTERISTIC(S).
5. DRAWING CONFORMS TO JEDEC MO229, EXCEPT DIMENSIONS "D2" AND "E2", AND T1433-1 & T1433-2.
6. "N" IS THE TOTAL NUMBER OF LEADS.
7. NUMBER OF LEADS SHOWN ARE FOR REFERENCE ONLY.
8. MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY.

-DRAWING NOT TO SCALE-

DALLAS SEMICONDUCTOR MAXIM

TITLE: PACKAGE OUTLINE, 6,8,10 & 14L, TDFN, EXPOSED PAD, 3x3x0.80 mm

APPROVAL	DOCUMENT CONTROL NO.	REV.	
	21-0137	H	2/2

Revision History

All pages changed at Rev 2.