



FAN3989

USB/Charger Detection Device with Load Switch

Features

- Charger/USB Detection Device with Load Switch
- Charger/USB Device Detection Flag
- Over/Under-Voltage Detection Flag
- Load Switch Output, Up to 1.5A Charge Current
- V_{BUS} Supply: 2.7V to 20V
- C_{ON} of 1.5pF
- Package: 8 MLP

Applications

- Mobile Phones
- Handheld Devices

Description

The FAN3989 is a USB-connection-monitoring device used to determine if a standard USB device is connected or a battery charging device is connected.

The FAN3989 sets the FLAG1 pin to logic HIGH or LOW as an indicator to the system controller that a standard USB device or a charger is connected to the USB port. The FAN3989 also monitors the V_{BUS} for over- or under-voltage conditions. The FLAG2 pin is set LOW if V_{BUS} is less than 3.3V or greater than 6.0V. The internal LS CTRL (load switch control) pin is set HIGH if V_{BUS} is less than 3.3V or greater than 6.0V, turning off the PMOS switch.

The FAN3989 is packaged in a very small 8-lead MLP package suitable for small board space applications, like mobile phones.

Ordering Information

Part Number	Operating Temperature Range	Eco Status	Package	Packing Method	Quantity
FAN3989MLP8X	-40°C to +85°C	Green	8-Lead Molded Leadless Package (MLP)	Reel	3000

For Fairchild's definition of "green" Eco Status, please visit: http://www.fairchildsemi.com/company/green/rohs_green.html.

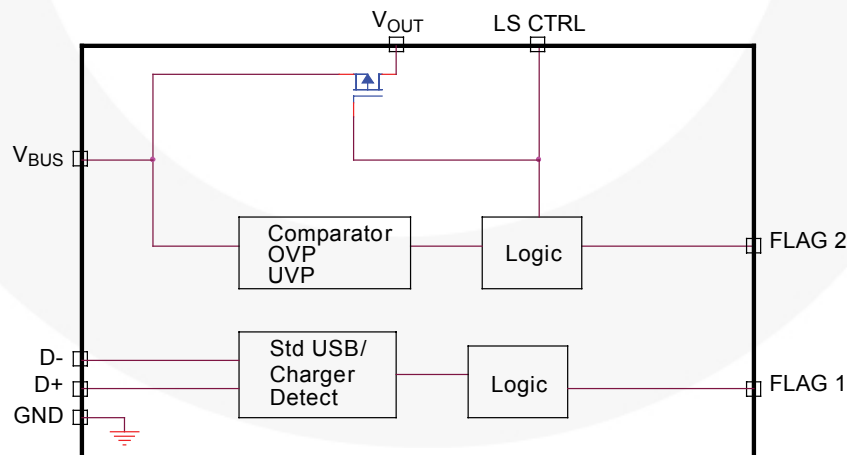


Figure 1. Block Diagram

Pin Configuration

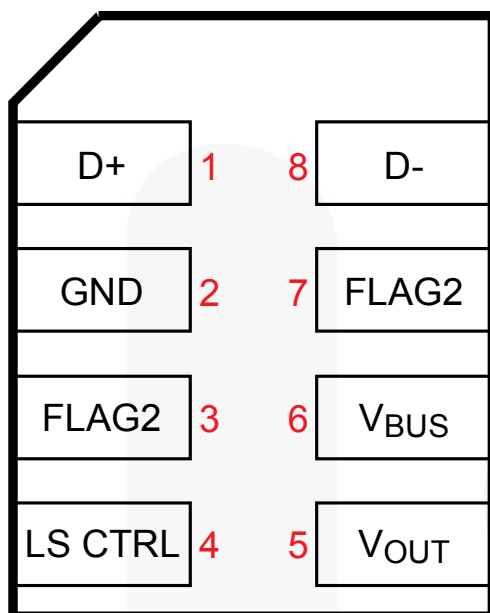


Figure 2. Pin Configuration (Top View)

Pin Definitions

Pin#	Name	Type	Description
1	D+	Input	USB data input
2	GND	Input	Device ground
3	Flag2	Output	Over/under-voltage flag output
4	LSctrl	Output	PMOS switch control – pull-up connection to V_{BUS}
5	Vout	Output	Voltage out
6	V_{BUS}	Input	Power input from charger, USB device, or handheld battery
7	Flag1	Output	Charger/standard USB device detect flag
8	D-	Input	USB data input

Truth Table

Connection State	V_{BUS}	D-	D+	FLAG1	FLAG2	LS CTRL	Description
STD USB Device	0V	R to GND	R to GND	LOW	LOW	HIGH	Load switch open
USB Charger	5V	Short to D+	Short to D-	HIGH	HIGH	LOW	Normal state, load switch closed
V_{BUS} GT 6V	GT 6V	Short to D+	Short to D-	HIGH	LOW	HIGH	Load switch open
V_{BUS} LT 3.3V	LT 3.3V	Short to D+	Short to D-	HIGH	LOW	HIGH	Load switch open
PC Data/Charger	5V	Open	Open	LOW	HIGH	LOW	Load switch closed

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Min.	Max.	Unit
V_S	DC Supply Voltage	-0.3	20.0	V
V_{IO}	Analog and Digital I/O	-0.3	$V_{CC}+0.3$	V

Reliability Information

Symbol	Parameter	Min.	Typ.	Max.	Unit
T_J	Junction Temperature			+150	°C
T_{STG}	Storage Temperature Range	-65		+150	°C
Θ_{JA}	Thermal Resistance, JEDEC Standard, Multilayer Test Boards, Still Air		41		°C/W

ESD Information

Symbol	Parameter	Max.	Unit
ESD	Human Body Model, JESD22-A114	3	kV
	Charged Device Model, JESD22-C101	2	kV

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Min.	Typ.	Max.	Unit
T_A	Operating Temperature Range	-40		+85	°C
V_{CC}	Supply Voltage Range	2.7	5.0	20.0	V

DC Electrical Characteristics

$T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$, unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
Supply						
V_S	Supply Voltage Range	V_S Range	2.7	5.0	20.0	V
I_{CC}	Quiescent Supply Current	$V_S = +5.0\text{V}$, D+ D- Shorted		1.2	2.0	mA
t_{SUPPLY}	Power-Up Stabilization Time	$V_S = +5.0\text{V}$, D+ D- Shorted		10		ms
Input Characteristics						
C_{D+}	Input Capacitance			1.5	2.0	pF
C_{D-}	Input Capacitance			1.5	2.0	pF
$I_{off\ D+}$	Off leakage current	$V_{BUS} = 0\text{V}$ or 5V V_{IN} on D+ = 5V		1		μA
$I_{off\ D-}$	Off leakage current	$V_{BUS} = 0\text{V}$ or 5V V_{IN} on D- = 5V		1		μA
Output Characteristics						
OV_{DETECT}	Over-Voltage Threshold Detect	$V_S = +5.0\text{V}$, Flag2 = LOW	5.8	6.0	6.2	V
OV_{HYST}	Over-Voltage Hysteresis	Voltage Sweep through Upper and Lower Trip Points		100		mV
UV_{DETECT}	Under-Voltage Threshold Detect	$V_S = +5.0\text{V}$, Flag2 = LOW	3.0	3.3	3.6	V
UV_{HYST}	Under-Voltage Hysteresis	Voltage Sweep through Upper and Lower Trip Points		100		mV
$V_{OH\ FLAG1/FLAG2}$	Minimum HIGH Output Voltage	$V_S = +5.0\text{V}$, $I_{OH} = -20\mu\text{A}$	2.4			V
$V_{OL\ FLAG1/FLAG2}$	Maximum LOW Output Voltage	$V_S = +5.0\text{V}$, $I_{OL} = 20\mu\text{A}$			0.3	V
$V_{OL\ LS_CTRL}$	Maximum LOW Output Voltage	$V_S = +5.0\text{V}$, $I_{OL} = 100\mu\text{A}$			0.3	V
V_{BDSS}	Drain Source Breakdown Voltage	$V_{GS} = 0\text{V}$, $I_D = -250\mu\text{A}$	-20			V
R_{DSON}	Static Drain-Source On Resistance	$V_{GS} = -5.0\text{V}$, $I_P = 1\text{A}$		67		m Ω
C_{iss}	Input Capacitance	$V_{DS} = -10\text{V}$, $V_{GS} = 0\text{V}$, $f = 1.0\text{MHz}$		330		pF
C_{oss}	Output Capacitance			80		pF
$t_{d(on)}$	PMOS Turn-On Delay Time	$V_{DD} = -5\text{V}$, $I_P = -0.5\text{A}$, $V_{GS} = -4.5\text{V}$, $R_{GEN} = 6\Omega$		5		μs
$t_{d(off)}$	PMOS Turn-Off Delay Time			14		μs

Typical Performance Characteristics

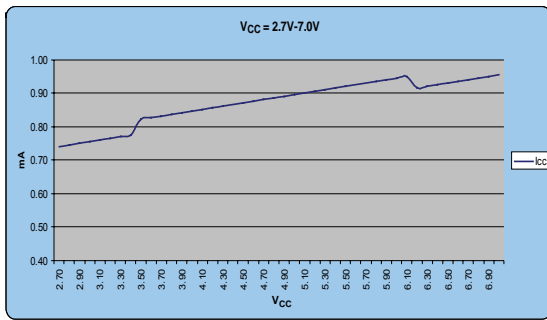


Figure 3. I_{CC} vs. V_{CC} (2.7V-7.0V) No Load

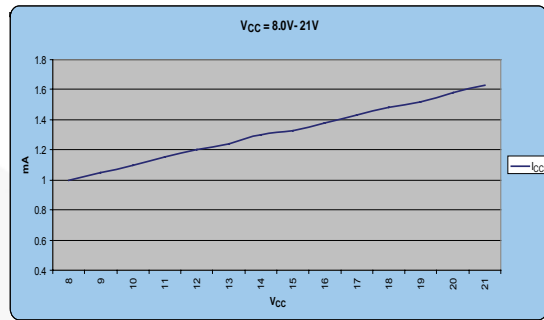


Figure 4. I_{CC} vs. V_{CC} (8.0V-21V) No Load

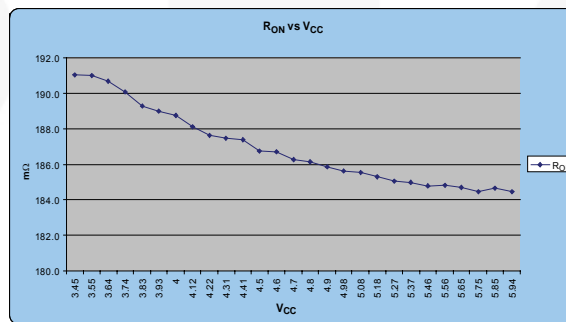


Figure 5. R_{ON} vs. V_{CC} (10Ω Load)

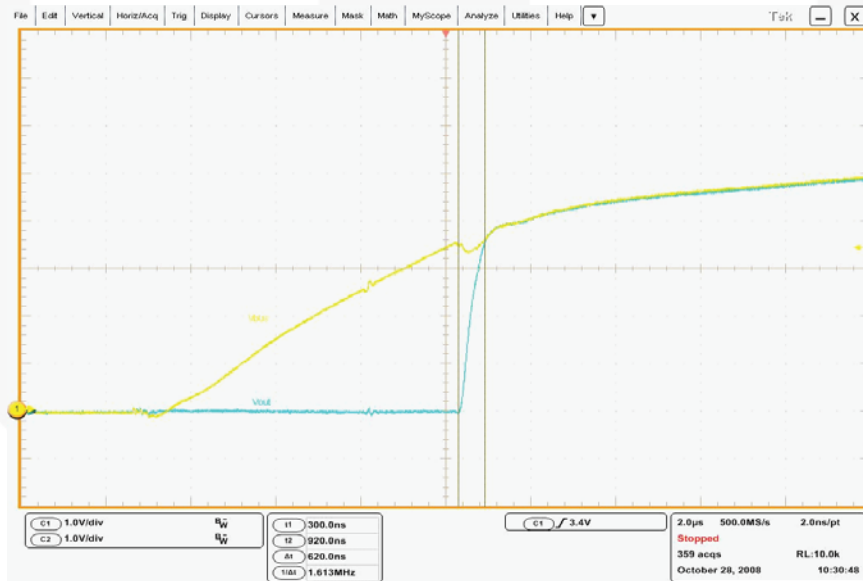


Figure 6. Turn On Time

Typical Performance Characteristics (Continued)

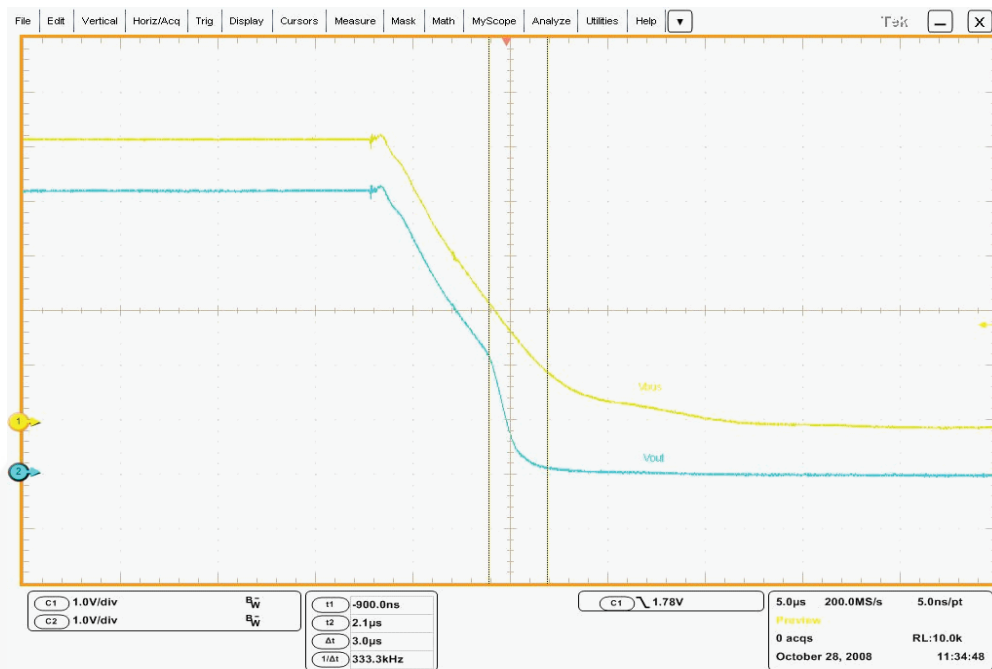


Figure 7. Turn Off Time

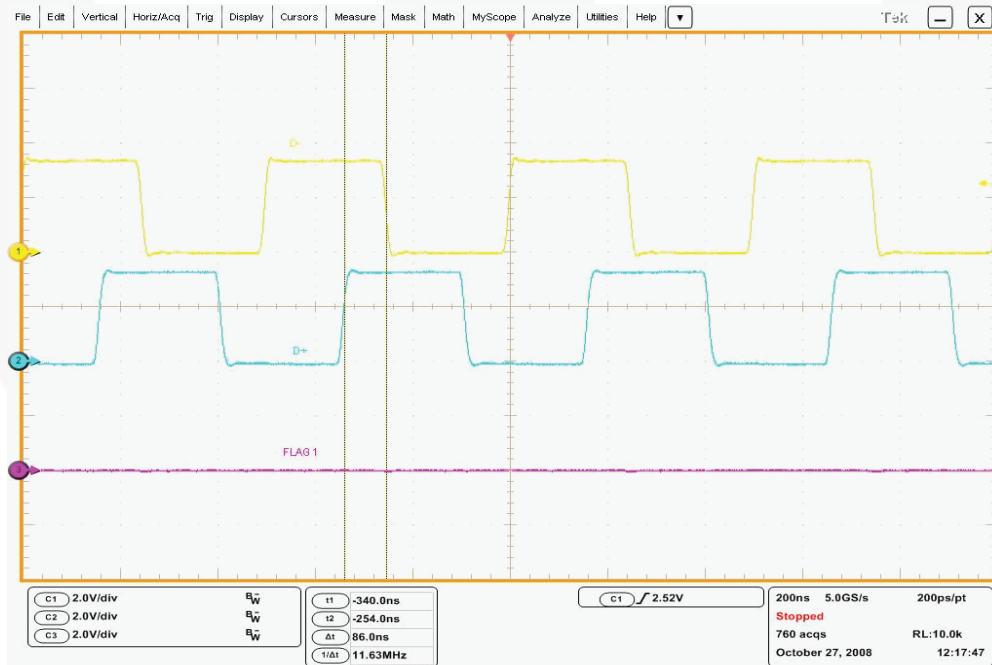


Figure 8. No Fault on Flag 1, Skew=65ns

Typical Performance Characteristics (Continued)

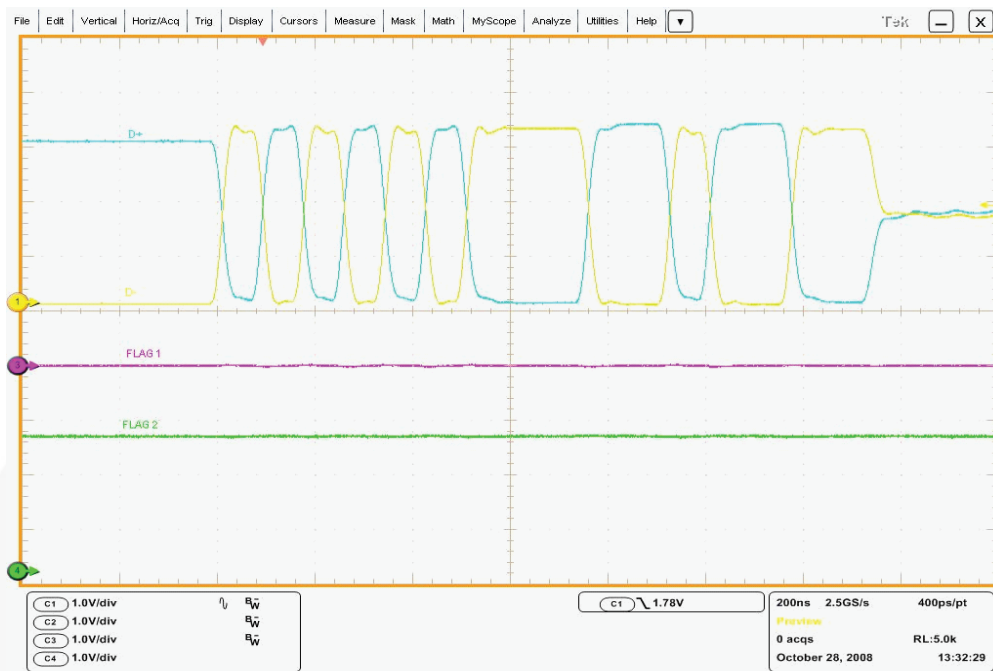


Figure 9. PC Data Running D+/D- (Flag 1 and Flag 2 at Correct Levels)



Figure 10. Standard USB Charger Plug-In

Applications Information

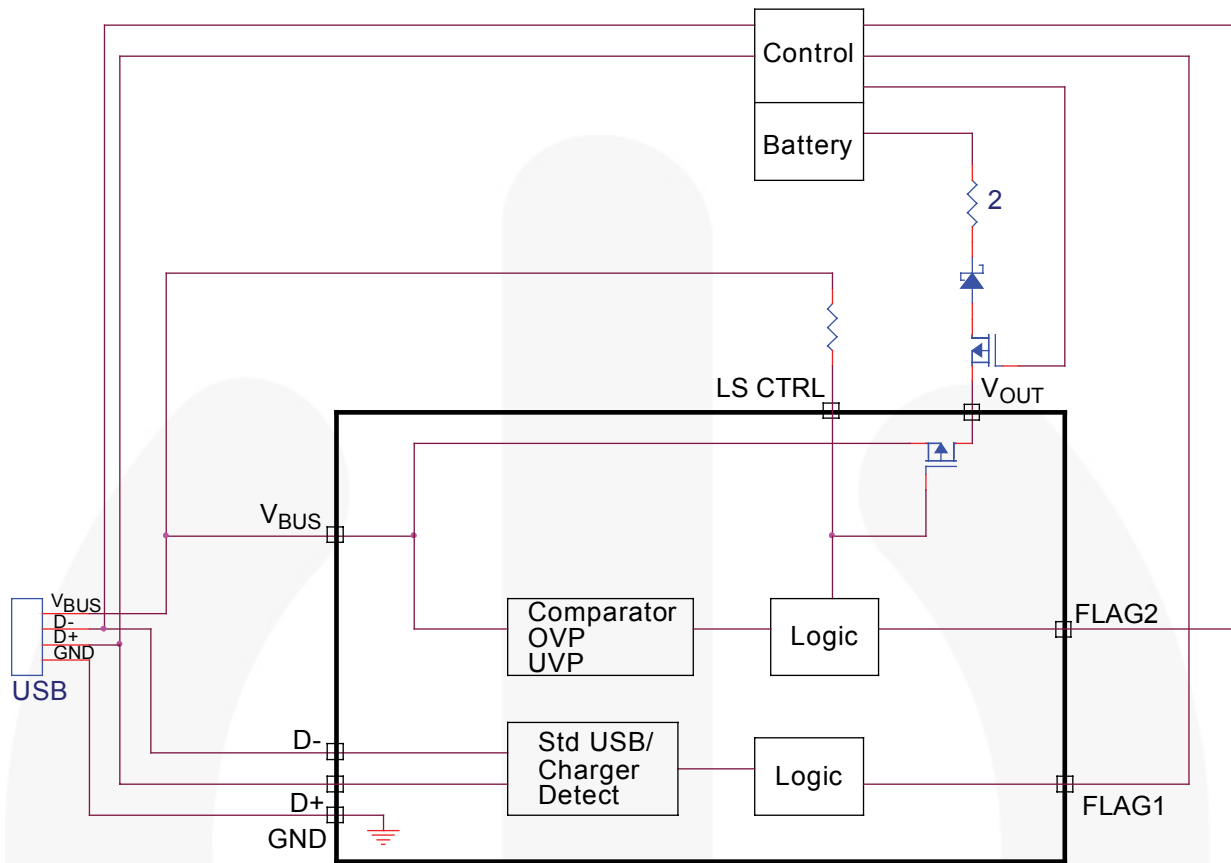
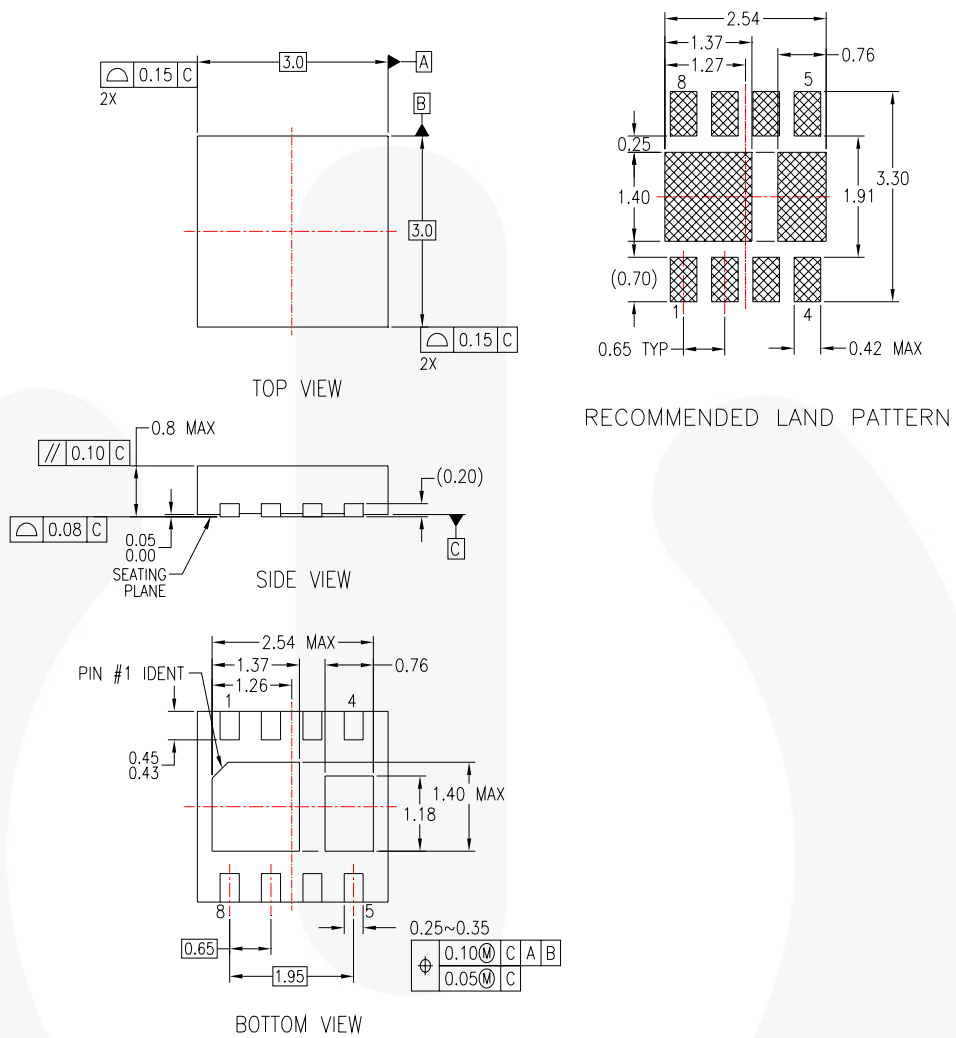


Figure 11. Mobile Phone Battery Charging System

Physical Dimensions



NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-229, VARIATION VEEC, DATED 11/2001
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

MLP08ErevA

Figure 12. 8-Lead Molded Leadless Package (MLP)







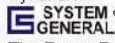
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