

Microprocessor Reset IC

Features

- Precision Monitoring of +3V, +3.3V, and +5V Power-Supply Voltages
- Fully Specified Over Temperature
- Available in Two Output Configurations
Push-Pull $\overline{\text{RESET}}$ Output (G676L)
Open-Drain $\overline{\text{RESET}}$ Output (G677L)
- Adjustable Reset Delay Time
- Manual Reset Input with Adjustable Manual Reset Deglitch Time
- 14 μA Supply Current
- Guaranteed Reset Valid to $V_{\text{CC}} = 1\text{V}$
- Power Supply Transient Immunity
- 6 pin SOT-23-6 and ADFN1.5X1.5-6 Packages
- 2% Threshold Accuracy

Applications

- Computers
- Controllers
- Intelligent Instruments
- Critical μP and μC Power Monitoring
- Portable / Battery-Powered Equipment
- Automotive

General Description

The G676/G677 are microprocessor (μP) supervisory circuits used to monitor the power supplies in μP and digital systems. They provide excellent circuit reliability and low cost and adjustments when used with +5V, +3.3V, +3.0V- powered circuits.

These circuits perform a single function: they assert a reset signal whenever the V_{CC} supply voltage declines below a preset threshold or manual reset is triggered, and keeping it asserted for time delay determined by adjustable time delay generator (CD pin) after V_{CC} has risen above the reset threshold or manual reset is released. Reset thresholds suitable for operation with a variety of supply voltages are available. Manual reset is generated after pull low $\overline{\text{MR}}$ pin lastingly over deglitch time delay set by capacitor connected in MRDLY pin.

The G677L has an open-drain output stage, while the G676 have push-pull outputs. The G677L's open-drain $\overline{\text{RESET}}$ output requires a pull-up resistor that can be connected to a voltage higher than V_{CC} . The reset comparator is designed to ignore fast transients on V_{CC} , and the outputs are guaranteed to be in the correct logic state for V_{CC} down to 1V.

Low supply current makes the G676/G677 ideal for use in portable equipment. The G676/G677 are available in 6-pin SOT-23-6 and ADFN1.5X1.5-6 packages.

Ordering Information

ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE (Green)
G676LxxxTBU	676xx	-40°C ~ +105°C	SOT-23-6
G677LxxxTBU	677xx	-40°C ~ +105°C	SOT-23-6
G676LxxxA31U	66 xx	-40°C ~ +105°C	ADFN1.5X1.5-6
G677LxxxA31U	67 xx	-40°C ~ +105°C	ADFN1.5X1.5-6

* xxx specifies the threshold voltage.

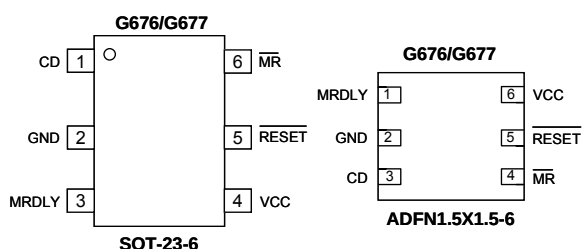
e.g. 263 denotes the 2.64V threshold voltage.

TB: SOT-23-6 A3:ADFN1.5X1.5-6

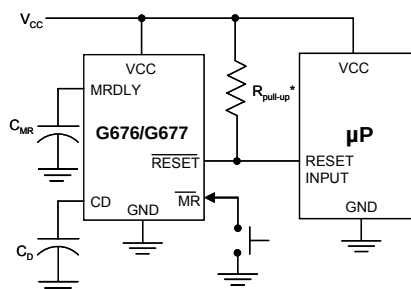
1 : Bonding Code

U: Tape & Reel

Pin Configuration



Typical Application Circuit



*G677 ONLY

ICC may increased at high T_A , Therefore, can not connect Resistors to VCC to prevent ICC abnormal behavior at high T_A .

Selector Guide

SOT-23-6

ORDER NUMBER	MARKING	RESET THRESHOLD (V)	OUTPUT TYPE
G677L463TBU	677Gx	4.60	Open-Drain $\overline{\text{RESET}}$
G677L438TBU	677Fx	4.32	Open-Drain $\overline{\text{RESET}}$
G677L400TBU	677Ex	3.96	Open-Drain $\overline{\text{RESET}}$
G677L330TBU	677Dx	3.30	Open-Drain $\overline{\text{RESET}}$
G677L308TBU	677Cx	3.10	Open-Drain $\overline{\text{RESET}}$
G677L293TBU	677Bx	2.91	Open-Drain $\overline{\text{RESET}}$
G677L263TBU	677Ax	2.64	Open-Drain $\overline{\text{RESET}}$
G676L463TBU	676Gx	4.60	Push-Pull $\overline{\text{RESET}}$
G676L438TBU	676Fx	4.32	Push-Pull $\overline{\text{RESET}}$
G676L400TBU	676Ex	3.96	Push-Pull $\overline{\text{RESET}}$
G676L330TBU	676Dx	3.30	Push-Pull $\overline{\text{RESET}}$
G676L308TBU	676Cx	3.10	Push-Pull $\overline{\text{RESET}}$
G676L293TBU	676Bx	2.91	Push-Pull $\overline{\text{RESET}}$
G676L263TBU	676Ax	2.64	Push-Pull $\overline{\text{RESET}}$

Note: TB: SOT-23-6

U: Tape & Reel

ADFN1.5X1.5-6

ORDER NUMBER	MARKING	RESET THRESHOLD (V)	OUTPUT TYPE
G677L463A31U	67 Gx	4.60	Open-Drain $\overline{\text{RESET}}$
G677L438A31U	67 Fx	4.32	Open-Drain $\overline{\text{RESET}}$
G677L400A31U	67 Ex	3.96	Open-Drain $\overline{\text{RESET}}$
G677L330A31U	67 Dx	3.30	Open-Drain $\overline{\text{RESET}}$
G677L308A31U	67 Cx	3.10	Open-Drain $\overline{\text{RESET}}$
G677L293A31U	67 Bx	2.91	Open-Drain $\overline{\text{RESET}}$
G677L263A31U	67 Ax	2.64	Open-Drain $\overline{\text{RESET}}$
G676L463A31U	66 Gx	4.60	Push-Pull $\overline{\text{RESET}}$
G676L438A31U	66 Fx	4.32	Push-Pull $\overline{\text{RESET}}$
G676L400A31U	66 Ex	3.96	Push-Pull $\overline{\text{RESET}}$
G676L330A31U	66 Dx	3.30	Push-Pull $\overline{\text{RESET}}$
G676L308A31U	66 Cx	3.10	Push-Pull $\overline{\text{RESET}}$
G676L293A31U	66 Bx	2.91	Push-Pull $\overline{\text{RESET}}$
G676L263A31U	66 Ax	2.64	Push-Pull $\overline{\text{RESET}}$

Note: A3:ADFN1.5X1.5-6

1: Bonding Code

U: Tape & Reel

Absolute Maximum Ratings

Terminal Voltage (with respect to GND)

V_{CC} -0.3V to +6.0V

Delay Capacitor Pin Voltage, V_{CD} -0.3 to ($V_{CC} + 0.3V$)

$\overline{RESET}$ (push-pull) -0.3V to ($V_{CC} + 0.3V$)

$\overline{RESET}$ (open drain) -0.3V to +6.0V

Input Current, V_{CC} 20mA

Output Current, $\overline{RESET}$ 20mA

Thermal Resistance Junction to Ambient, (θ_{JA})

SOT-23-6 420°C/W

ADFN1.5X1.5-6 310°C/W

Continuous Power Dissipation ($T_A = +25^\circ\text{C}$)

SOT-23-6 297mW

ADFN1.5X1.5-6 400mW

Thermal Resistance Junction to Case, (θ_{JC})

SOT-23-6 180°C/W

ADFN1.5X1.5-6 100°C/W

Junction Temperature (T_J) 150°C

Operating Temperature Rang. -40°C to +105°C

Storage Temperature Range. -65°C to +150°C

Reflow Temperature (soldering, 10sec) 260°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_{CC} = full range, $T_A = -40^\circ\text{C}$ to $+105^\circ\text{C}$, unless otherwise noted. Typical values are at $T_A = +25^\circ\text{C}$, $V_{CC} = 5V$ for 463/438/400/330 versions, $V_{CC} = 3.3V$ for 308/293 versions, and $V_{CC} = 3V$ for 263 version.) (Note 1)

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
V_{CC} Range			1	---	5.5	V
Supply Current	I_{CC}	$V_{CC} < 5.5V$, G67_463/438/400/330	---	16.5	25	μA
		$V_{CC} < 3.6V$, G67_308/293/263	---	13.9	22	
Reset Threshold	V_{TH}	G67_463	4.46	4.56	4.65	V
		G67_438	4.2	4.284	4.36	
		G67_400	3.85	3.93	4.0	
		G67_330	3.22	3.27	3.34	
		G67_308	3.02	3.07	3.13	
		G67_293	2.84	2.89	2.93	
		G67_263	2.57	2.62	2.67	
Reset Threshold Tempco			---	70	---	ppm/°C
C_D Delay Pin Threshold Voltage	V_{TCD}		0.87	1.25	1.29	V
Delay Capacitor Pin Sink Current	I_{CD}	$V_{CC} = 1.5V$, $V_{CD} = 0.5V$	300	800	---	μA
Delay Capacitor Pin Source Current		$V_{CC} > V_{TH} + V_{HYS}$	0.42	0.67	1.06	μA
MRDLY Pin Source Current	I_{MRDH}		0.5	1.1	1.6	μA
MRDLY Pin Sink Current	I_{MRDL}		0.5	1.1	1.6	
MRDLY Pin High Threshold Voltage	V_{MRDH}		---	689	---	mV
MRDLY Pin Low Threshold Voltage	V_{MRDL}		---	110	---	mV
MR Deglitch Time/Capacitor Ratio	R_{MRDLY}	MR Deglitch Time/MRDLY Capacitor	76.8	96	120.3	M Ω
MR Input High Threshold	V_{IH}		0.76 V_{CC}	---	---	
MR Input Low Threshold	V_{IL}		---	---	0.3 V_{CC}	
MR Pull-up Resistance	R_{MR}		10	15	25	k Ω
$\overline{RESET}$ Output Current Low	I_{OL}	$V_{CC} = 2.5V$, $V_{\overline{RESET}} = 0.5V$	1	---	---	mA
$\overline{RESET}$ Output Current High (G676L)	I_{OH}	$V_{CC} = 5V$, $V_{\overline{RESET}} = 4.5V$, G676L463/438/400/330	4.5	---	---	mA
		$V_{CC} = 3.3V$, $V_{\overline{RESET}} = 2.8V$, G676L308/293	3	---	---	---
		$V_{CC} = 3V$, $V_{\overline{RESET}} = 2.5V$, G676L263	2	---	---	---
$\overline{RESET}$ Open-Drain Output Leakage Current (G677L)		$V_{CC} > V_{TH}$, $\overline{RESET}$ deasserted	---	---	1	μA

Note 1: Production testing done at $T_A = +25^\circ\text{C}$; limits over temperature guaranteed by design.

Timing Diagram

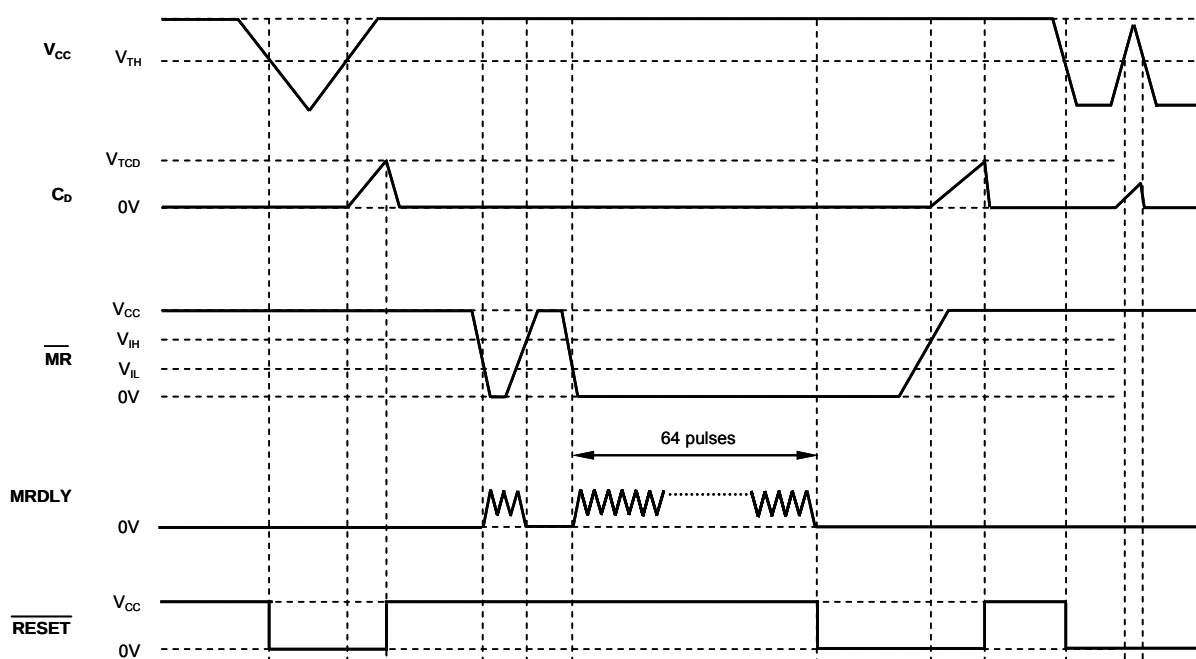
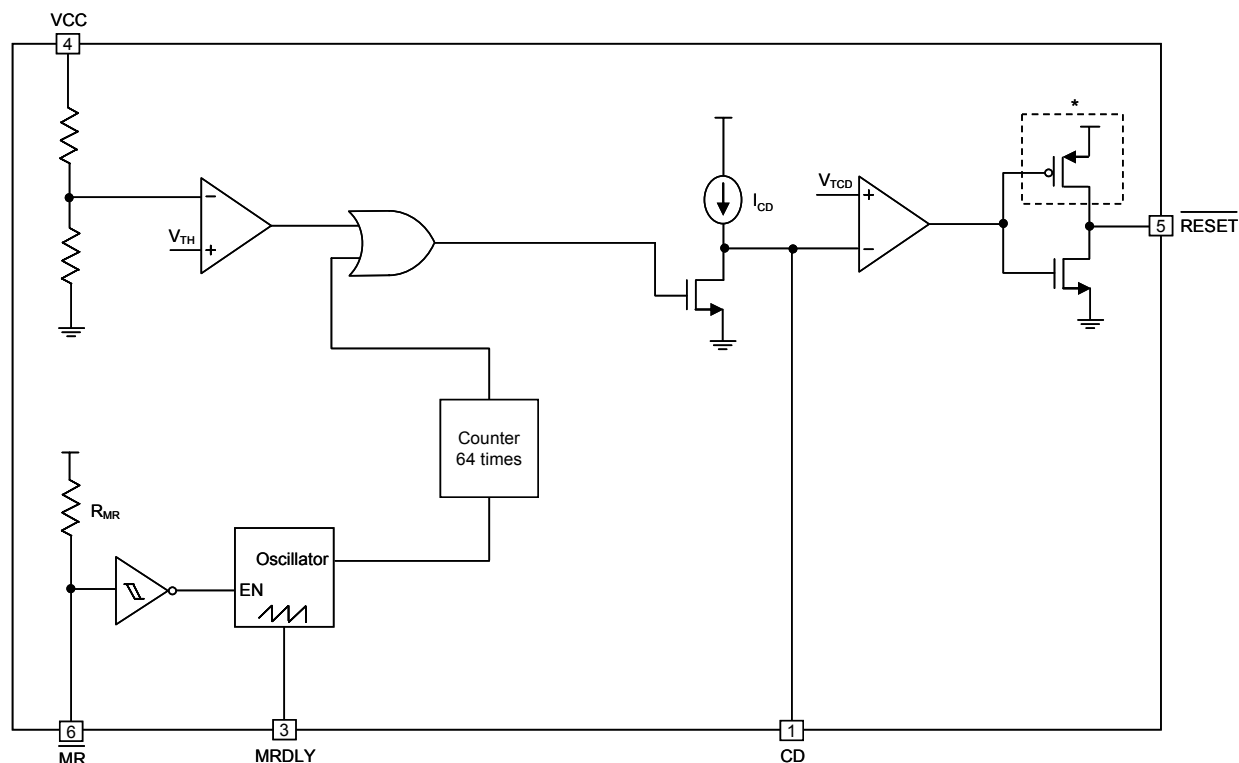


Figure 1

Functional Diagram



* Is for G676 only

Figure 2

Pin Description

PIN		NAME	FUNCTION
SOT-23-6	ADFN1.5X1.5-6		
1	3	CD	External Programmable reset time delay is set by the capacitor connected to CD pin.
2	2	GND	Ground
3	1	MRDLY	External programmable manual reset deglitch time delay is set by the capacitor connected to MRDLY pin.
4	6	VCC	Supply Voltage. (+5V, +3.3V, +3.0V)
5	5	RESET	RESET Output remains low while VCC is below the reset threshold or manual reset is triggered, and for delay time set by C _D after VCC rises above the reset threshold.
6	4	MR	Manual reset input. A logic low on MR and lasting over deglitch time delay set by MRDLY pin triggers manual reset signal.

Detailed Description

A microprocessor's (μP's) reset input starts the μP in a known state. The G677L/G676L assert reset to prevent code-execution errors during power-up, power-down, or brownout conditions. They assert a reset signal whenever the V_{CC} supply voltage declines below a preset threshold (V_{TH}) or manual reset is triggered, keeping it asserted for time delay set by capacitor connected to C_D pin, after V_{CC} has risen above the reset threshold V_{TH} or manual reset is released. The G677L uses an open-drain output, and the G676L have a push-pull output stage. Connect a pull-up resistor on the G677L's RESET output to any supply between 0 and 5.5V.

The time delay is set by external capacitor C_D, and internal pull up current I_{CD}. When the voltage at C_D pin exceeds the buffer threshold, typically 1.25V, the RESET output high (RESET output low). The voltage detector and buffer have built-in hysteresis to prevent erratic reset operation. The formula of time delay is

$$T_{CD}(\text{ms}) \cong 1860 C_D (\mu\text{F})$$

Manual reset is generated after pulling low MR pin over deglitch time delay set by capacitor connected to MRDLY pin. The formula of deglitch time is

$$T_{MR}(\text{ms}) \cong 88000 \times C_{MR} (\mu\text{F})$$

After MR is release, RESET output high after T_{CD}.

Fig1 and Fig2 show a timing diagram and a Functional Block.

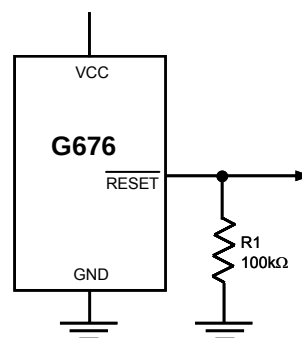


Figure3. RESET Valid to V_{CC} = Ground Circuit

Ensuring a Valid Reset Output Down to V_{CC} = 0

When V_{CC} falls below 1V, the G676 RESET output no longer sinks current—it becomes an open circuit. Therefore, high-impedance CMOS logic inputs connected to RESET can drift to undetermined voltages. This presents no problem in most applications since most μP and other circuitry is inoperative with V_{CC} below 1V. However, in applications where RESET must be valid down to 0V, adding a pull-down resistor to RESET causes any stray leakage currents to flow to ground, holding RESET low (Figure 4). R1's value is not critical; 100kΩ is large enough not to load RESET and small enough to pull RESET to ground.

A 100kΩ pull-up resistor to V_{CC} is also recommended for the G677L if RESET is required to remain valid for V_{CC} < 1V.

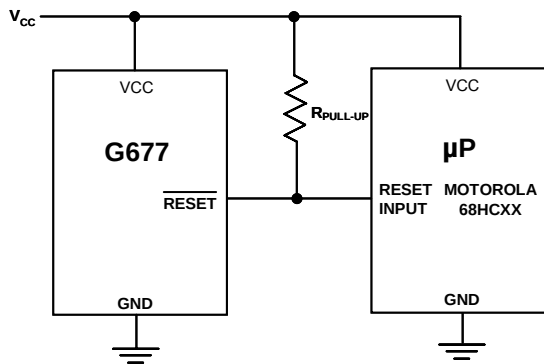


Figure 4. Interfacing to μ Ps with Bidirectional Reset I/O

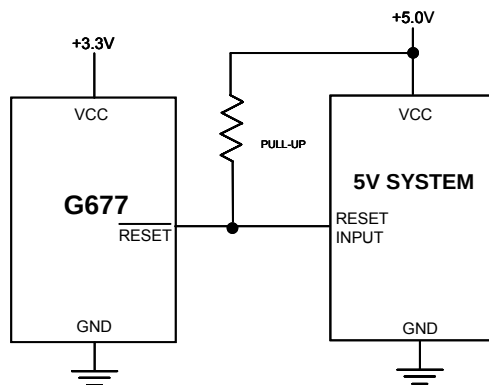
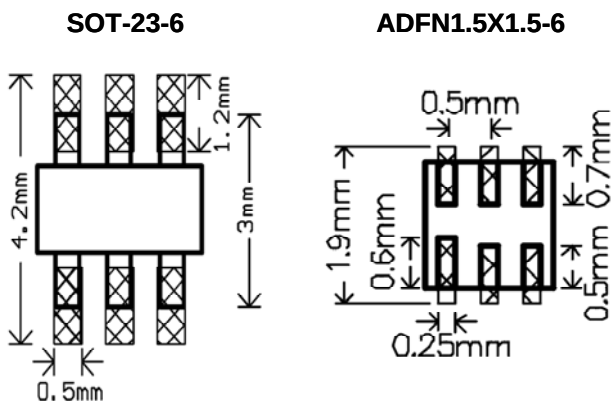


Figure 5. G677L Open-Drain $\overline{\text{RESET}}$ Output Allows Use with Multiple Supplies

Minimum Footprint PCB Layout Section



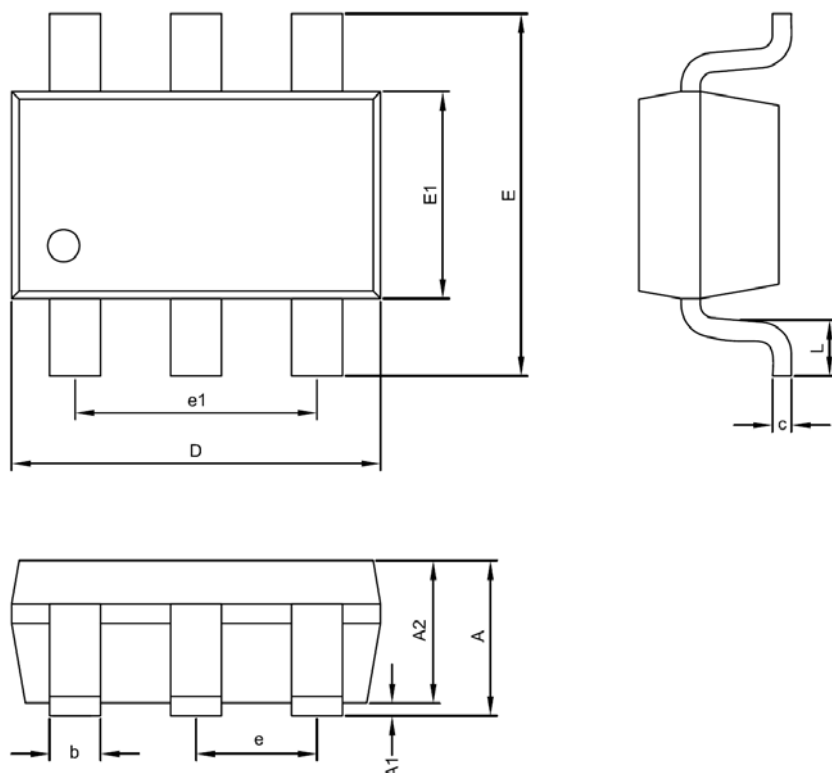
Interfacing to μ Ps with Bidirectional Reset Pins

Since the $\overline{\text{RESET}}$ output on the G677L is open drain, this device interfaces easily with μ Ps that have bidirectional reset pins, such as the Motorola 68HC11. Connecting the μ P supervisor's $\overline{\text{RESET}}$ output directly to the microcontroller's (μ C's) $\overline{\text{RESET}}$ pin with a single pull-up resistor allows either device to assert reset (Figure 5).

G677L Open-Drain $\overline{\text{RESET}}$ Output Allows Use with Multiple Supplies

Generally, the pull-up connected to the G677L will connect to the supply voltage that is being monitored at the IC's V_{CC} pin. However, some systems may use the open-drain output to level-shift from the monitored supply to reset circuitry powered by some other supply (Figure 6). Note that as the G677L's V_{CC} decreases below 1V, so does the IC's ability to sink current at $\overline{\text{RESET}}$. Also, with any pull-up, $\overline{\text{RESET}}$ will be pulled high as V_{CC} decays toward 0. The voltage where this occurs depends on the pull-up resistor value and the voltage to which it is connected.

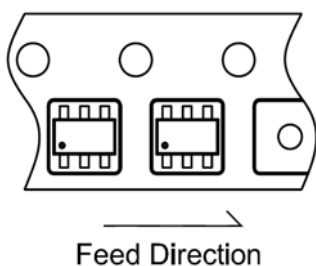
Package Information



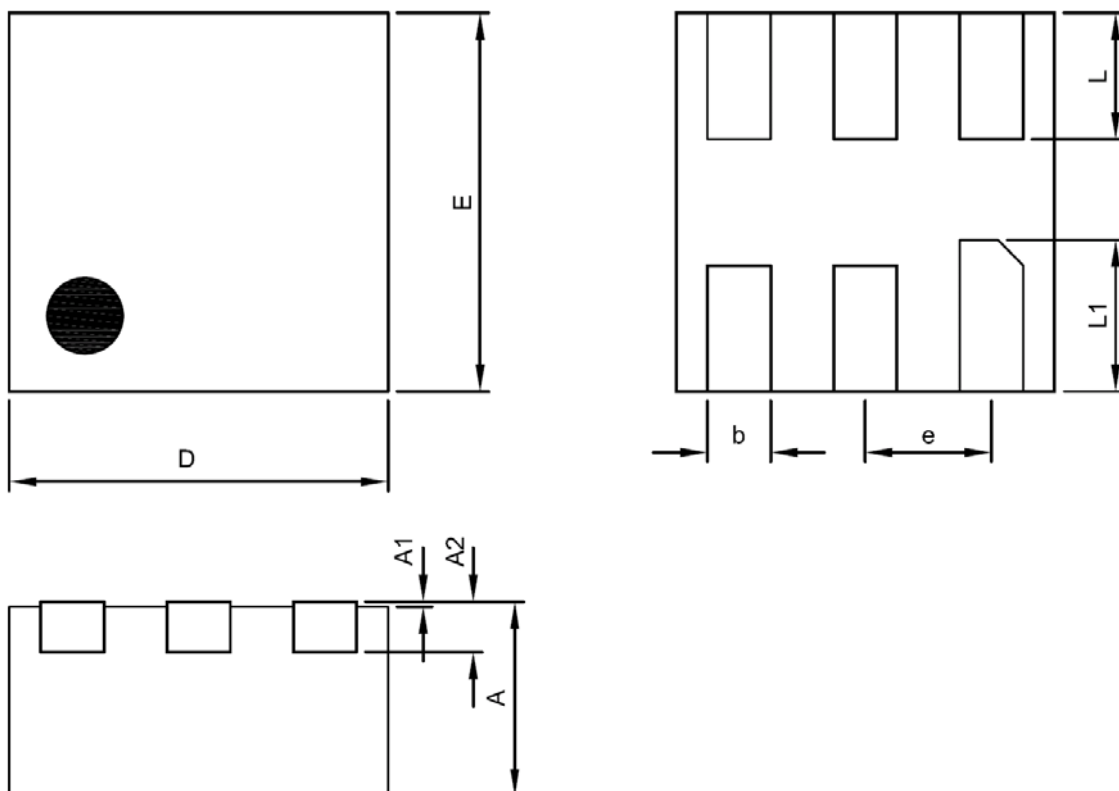
SOT-23-6 (TB) Package

Symble	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.00	1.10	1.45	0.039	0.043	0.057
A1	0.00	---	0.15	0.000	---	0.006
A2	1.00	1.10	1.30	0.039	0.043	0.051
D	2.70	2.90	3.10	0.106	0.114	0.122
E	2.60	2.80	3.00	0.102	0.110	0.118
E1	1.50	1.60	1.70	0.059	0.063	0.067
c	0.08	0.15	0.25	0.003	0.006	0.010
b	0.30	0.40	0.50	0.012	0.016	0.020
e	0.95 BSC			0.037 BSC		
e1	1.90 BSC			0.075 BSC		
L	0.30	0.45	0.60	0.012	0.018	0.024

Taping Specification

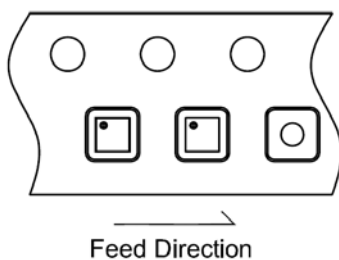


PACKAGE	Q'TY/REEL
SOT-23-6	3,000 ea


ADFN1.5X1.5-6 (A3) Package

Symble	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.0276	0.0295	0.0315
A1	0.00	---	0.05	0.0000	---	0.0020
A2	0.10	0.11	0.12	0.0039	0.0043	0.0047
D	1.45	1.50	1.55	0.0570	0.0590	0.0610
E	1.45	1.50	1.55	0.0570	0.0590	0.0610
b	0.20	0.25	0.30	0.0079	0.0098	0.0118
e	0.50 BSC			0.0197 BSC		
L	0.45	0.50	0.55	0.0177	0.0197	0.0217
L1	0.55	0.60	0.65	0.0217	0.0236	0.0256

Taping Specification



PACKAGE	Q'TY/REEL
ADFN1.5X1.5-6	3,000 ea