

# LT6703-2/LT6703-3

# LT6703HV-2/LT6703HV-3

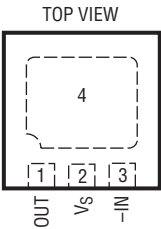
## ABSOLUTE MAXIMUM RATINGS

(Note 1)

|                                              |                       |                                            |                |
|----------------------------------------------|-----------------------|--------------------------------------------|----------------|
| Total Supply Voltage ( $V_S$ to GND) .....   | 18.5V                 | Operating Temperature Range (Note 4)       |                |
| Input Voltage (+IN, -IN)                     |                       | LT6703C-2/-3/LT6703HVC-2/-3 .....          | -40°C to 85°C  |
| (Note 3).....                                | 18.5V to (GND - 0.3V) | LT6703I-2/-3/LT6703HVI-2/-3 .....          | -40°C to 85°C  |
| LT6703HV .....                               | 40V to (GND - 0.3V)   | LT6703H-2/-3/LT6703HVVH-2/-3 .....         | -40°C to 125°C |
| Output Voltage (OUT).....                    | 18.5V to (GND - 0.3V) | Specified Temperature Range (Note 5)       |                |
| LT6703HV .....                               | 40V to (GND - 0.3V)   | LT6703C-2/-3/LT6703HVC-2/-3 .....          | 0°C to 70°C    |
| Output Short-Circuit Duration (Note 2) ..... | Indefinite            | LT6703I-2/-3/LT6703HVI-2/-3 .....          | -40°C to 85°C  |
| Input Current (Note 3).....                  | -10mA                 | LT6703H-2/-3/LT6703HVVH-2/-3 .....         | -40°C to 125°C |
|                                              |                       | Maximum Junction Temperature.....          | 125°C          |
|                                              |                       | Storage Temperature Range.....             | -65°C to 125°C |
|                                              |                       | Lead Temperature (Soldering, 10 sec) ..... | 300°C          |

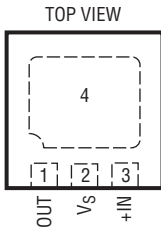
## PIN CONFIGURATION

LT6703-2



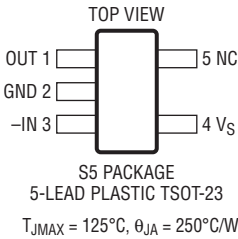
DC PACKAGE  
3-LEAD (2mm × 2mm) PLASTIC DFN  
 $T_{JMAX} = 125^{\circ}\text{C}$ ,  $\theta_{JA} = 102^{\circ}\text{C/W}$   
EXPOSED PAD (PIN 4) IS GND, MUST BE SOLDERED TO PCB

LT6703-3



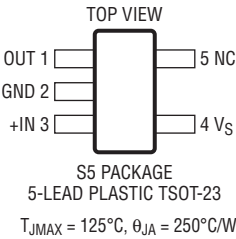
DC PACKAGE  
3-LEAD (2mm × 2mm) PLASTIC DFN  
 $T_{JMAX} = 125^{\circ}\text{C}$ ,  $\theta_{JA} = 102^{\circ}\text{C/W}$   
EXPOSED PAD (PIN 4) IS GND, MUST BE SOLDERED TO PCB

LT6703HV-2



S5 PACKAGE  
5-LEAD PLASTIC TSOT-23  
 $T_{JMAX} = 125^{\circ}\text{C}$ ,  $\theta_{JA} = 250^{\circ}\text{C/W}$

LT6703HV-3



S5 PACKAGE  
5-LEAD PLASTIC TSOT-23  
 $T_{JMAX} = 125^{\circ}\text{C}$ ,  $\theta_{JA} = 250^{\circ}\text{C/W}$

## ORDER INFORMATION

### Lead Free Finish

| TAPE AND REEL (MINI) | TAPE AND REEL       | PART MARKING* | PACKAGE DESCRIPTION            | SPECIFIED TEMPERATURE RANGE |
|----------------------|---------------------|---------------|--------------------------------|-----------------------------|
| LT6703CDC-2#TRMPBF   | LT6703CDC-2#TRPBF   | LCWP          | 3-Lead (2mm × 2mm) Plastic DFN | 0°C to 70°C                 |
| LT6703IDC-2#TRMPBF   | LT6703IDC-2#TRPBF   | LCWP          | 3-Lead (2mm × 2mm) Plastic DFN | –40°C to 85°C               |
| LT6703HDC-2#TRMPBF   | LT6703HDC-2#TRPBF   | LCWP          | 3-Lead (2mm × 2mm) Plastic DFN | –40°C to 125°C              |
| LT6703CDC-3#TRMPBF   | LT6703CDC-3#TRPBF   | LCTW          | 3-Lead (2mm × 2mm) Plastic DFN | 0°C to 70°C                 |
| LT6703IDC-3#TRMPBF   | LT6703IDC-3#TRPBF   | LCTW          | 3-Lead (2mm × 2mm) Plastic DFN | –40°C to 85°C               |
| LT6703HDC-3#TRMPBF   | LT6703HDC-3#TRPBF   | LCTW          | 3-Lead (2mm × 2mm) Plastic DFN | –40°C to 125°C              |
| LT6703HVCS5-2#TRMPBF | LT6703HVCS5-2#TRPBF | LDMN          | 5-Lead Plastic TSOT-23         | 0°C to 70°C                 |
| LT6703HVIS5-2#TRMPBF | LT6703HVIS5-2#TRPBF | LDMN          | 5-Lead Plastic TSOT-23         | –40°C to 85°C               |
| LT6703HVHS5-2#TRMPBF | LT6703HVHS5-2#TRPBF | LDMN          | 5-Lead Plastic TSOT-23         | –40°C to 125°C              |
| LT6703HVCS5-3#TRMPBF | LT6703HVCS5-3#TRPBF | LTDMP         | 5-Lead Plastic TSOT-23         | 0°C to 70°C                 |
| LT6703HVIS5-3#TRMPBF | LT6703HVIS5-3#TRPBF | LTDMP         | 5-Lead Plastic TSOT-23         | –40°C to 85°C               |
| LT6703HVHS5-3#TRMPBF | LT6703HVHS5-3#TRPBF | LTDMP         | 5-Lead Plastic TSOT-23         | –40°C to 125°C              |

TRM = 500 pieces. \*Temperature grades are identified by a label on the shipping container.

Consult LTC Marketing for parts specified with wider operating temperature ranges.

Consult LTC Marketing for information on lead based finish parts.

For more information on lead free part marking, go to: <http://www.linear.com/leadfree/>

For more information on tape and reel specifications, go to: <http://www.linear.com/tapeandreel/>

## ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$ (LT6703-2/LT6703-3) unless otherwise specified.

| SYMBOL       | PARAMETER                                | CONDITIONS                                                                                                                       | MIN | TYP                                 | MAX                              | UNITS              |
|--------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----|-------------------------------------|----------------------------------|--------------------|
| $V_{TH(R)}$  | Rising Input Threshold Voltage (Note 6)  | $R_L = 100k$ , $V_O = 2V$ Swing, $V_S = 5V$                                                                                      | 395 | 400                                 | 405                              | mV                 |
| $V_{TH(F)}$  | Falling Input Threshold Voltage (Note 6) | $R_L = 100k$ , $V_O = 2V$ Swing, $V_S = 5V$                                                                                      | 387 | 393.5                               | 400                              | mV                 |
| HYS          | $HYS = V_{TH(R)} - V_{TH(F)}$            | $V_S = 5V$ , $R_L = 100k$ , $V_O = 2V$ Swing                                                                                     | 3.5 | 6.5                                 | 9.5                              | mV                 |
| $I_B$        | Input Bias Current                       | $V_S = 1.4V$ , $18V$ , $V_{IN} = V_S$<br>$V_S = 1.4V$ , $V_{IN} = 18V$<br>$V_S = 1.4V$ , $18V$ , $V_{IN} = 0.1V$                 |     | $\pm 0.01$<br>$\pm 0.01$<br>$\pm 4$ | $\pm 10$<br>$\pm 10$<br>$\pm 10$ | nA<br>nA<br>nA     |
| $V_{OL}$     | Output Low Voltage                       | 10mV Input Overdrive, $V_S = 5V$ , $I_{OUT} = 5mA$                                                                               |     | 70                                  | 200                              | mV                 |
| $I_{OFF}$    | Output Leakage Current                   | $V_S = 1.4V$ , $18V$ , $V_{OUT} = V_S$ , $V_{IN} = 40mV$ Overdrive<br>$V_S = 1.4V$ , $V_{OUT} = 18V$ , $V_{IN} = 40mV$ Overdrive |     | 0.01<br>0.01                        | 0.8<br>0.8                       | $\mu A$<br>$\mu A$ |
| $t_{PD(HL)}$ | High-to-Low Propagation Delay            | $V_S = 5V$ , 10mV Input Overdrive, $R_L = 10k$ , $V_{OL} = 400mV$                                                                |     | 18                                  |                                  | $\mu s$            |
| $t_{PD(LH)}$ | Low-to-High Propagation Delay            | $V_S = 5V$ , 10mV Input Overdrive, $R_L = 10k$ , $V_{OH} = 0.9 \cdot V_S$                                                        |     | 29                                  |                                  | $\mu s$            |
| $t_r$        | Output Rise Time                         | $V_S = 5V$ , 10mV Input Overdrive, $R_L = 10k$<br>$V_O = (0.1 \text{ to } 0.9) \cdot V_S$                                        |     | 2.2                                 |                                  | $\mu s$            |
| $t_f$        | Output Fall Time                         | $V_S = 5V$ , 10mV Input Overdrive, $R_L = 10k$<br>$V_O = (0.1 \text{ to } 0.9) \cdot V_S$                                        |     | 0.22                                |                                  | $\mu s$            |
| $I_S$        | Supply Current                           | No Load Current, $V_S = 5V$                                                                                                      |     | 6.5                                 | 11                               | $\mu A$            |

# LT6703-2/LT6703-3

## LT6703HV-2/LT6703HV-3

**ELECTRICAL CHARACTERISTICS** The ● denotes the specifications which apply over the temperature range of  $0^{\circ}\text{C} \leq T_A \leq 70^{\circ}\text{C}$ , (LT6703C-2/LT6703C-3) unless otherwise specified (Notes 4, 5).

| SYMBOL      | PARAMETER                                | CONDITIONS                                                                                                                       | MIN         | TYP   | MAX                              | UNITS              |
|-------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-------------|-------|----------------------------------|--------------------|
| $V_{TH(R)}$ | Rising Input Threshold Voltage (Note 6)  | $R_L = 100k$ , $V_O = 2V$ Swing, $V_S = 5V$                                                                                      | ●           | 392.5 | 407.5                            | mV                 |
| $V_{TH(F)}$ | Falling Input Threshold Voltage (Note 6) | $R_L = 100k$ , $V_O = 2V$ Swing, $V_S = 5V$                                                                                      | ●           | 384.5 | 402.5                            | mV                 |
| HYS         | $HYS = V_{TH(R)} - V_{TH(F)}$            | $V_S = 5V$ , $R_L = 100k$ , $V_O = 2V$ Swing                                                                                     | ●           | 3     | 11                               | mV                 |
| $I_B$       | Input Bias Current                       | $V_S = 1.4V$ , $18V$ , $V_{IN} = V_S$<br>$V_S = 1.4V$ , $V_{IN} = 18V$<br>$V_S = 1.4V$ , $18V$ , $V_{IN} = 0.1V$                 | ●<br>●<br>● |       | $\pm 15$<br>$\pm 15$<br>$\pm 15$ | nA<br>nA<br>nA     |
| $V_{OL}$    | Output Low Voltage                       | 10mV Input Overdrive, $V_S = 5V$ , $I_{OUT} = 5mA$                                                                               | ●           |       | 250                              | mV                 |
| $I_{OFF}$   | Output Leakage Current                   | $V_S = 1.4V$ , $18V$ , $V_{OUT} = V_S$ , $V_{IN} = 40mV$ Overdrive<br>$V_S = 1.4V$ , $V_{OUT} = 18V$ , $V_{IN} = 40mV$ Overdrive | ●<br>●      |       | 1<br>1                           | $\mu A$<br>$\mu A$ |
| $I_S$       | Supply Current                           | No Load Current, $V_S = 5V$                                                                                                      | ●           |       | 14                               | $\mu A$            |

The ● denotes the specifications which apply over the temperature range of  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , (LT6703I-2/LT6703I-3) unless otherwise specified (Notes 4, 5).

| SYMBOL      | PARAMETER                                | CONDITIONS                                                                                                                       | MIN         | TYP   | MAX                              | UNITS              |
|-------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-------------|-------|----------------------------------|--------------------|
| $V_{TH(R)}$ | Rising Input Threshold Voltage (Note 6)  | $R_L = 100k$ , $V_O = 2V$ Swing, $V_S = 5V$                                                                                      | ●           | 392   | 408                              | mV                 |
| $V_{TH(F)}$ | Falling Input Threshold Voltage (Note 6) | $R_L = 100k$ , $V_O = 2V$ Swing, $V_S = 5V$                                                                                      | ●           | 383.5 | 403.5                            | mV                 |
| HYS         | $HYS = V_{TH(R)} - V_{TH(F)}$            | $V_S = 5V$ , $R_L = 100k$ , $V_O = 2V$ Swing                                                                                     | ●           | 2     | 11.5                             | mV                 |
| $I_B$       | Input Bias Current                       | $V_S = 1.4V$ , $18V$ , $V_{IN} = V_S$<br>$V_S = 1.4V$ , $V_{IN} = 18V$<br>$V_S = 1.4V$ , $18V$ , $V_{IN} = 0.1V$                 | ●<br>●<br>● |       | $\pm 15$<br>$\pm 15$<br>$\pm 15$ | nA<br>nA<br>nA     |
| $V_{OL}$    | Output Low Voltage                       | 10mV Input Overdrive, $V_S = 5V$ , $I_{OUT} = 5mA$                                                                               | ●           |       | 250                              | mV                 |
| $I_{OFF}$   | Output Leakage Current                   | $V_S = 1.4V$ , $18V$ , $V_{OUT} = V_S$ , $V_{IN} = 40mV$ Overdrive<br>$V_S = 1.4V$ , $V_{OUT} = 18V$ , $V_{IN} = 40mV$ Overdrive | ●<br>●      |       | 1<br>1                           | $\mu A$<br>$\mu A$ |
| $I_S$       | Supply Current                           | No Load Current, $V_S = 5V$                                                                                                      | ●           |       | 15                               | $\mu A$            |

The ● denotes the specifications which apply over the temperature range of  $-40^{\circ}\text{C} \leq T_A \leq 125^{\circ}\text{C}$ , (LT6703H-2/LT6703H-3) unless otherwise specified (Notes 4, 5).

| SYMBOL      | PARAMETER                                | CONDITIONS                                                                                                                       | MIN         | TYP   | MAX                              | UNITS              |
|-------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-------------|-------|----------------------------------|--------------------|
| $V_{TH(R)}$ | Rising Input Threshold Voltage (Note 6)  | $R_L = 100k$ , $V_O = 2V$ Swing, $V_S = 5V$                                                                                      | ●           | 392   | 410                              | mV                 |
| $V_{TH(F)}$ | Falling Input Threshold Voltage (Note 6) | $R_L = 100k$ , $V_O = 2V$ Swing, $V_S = 5V$                                                                                      | ●           | 382.5 | 404.5                            | mV                 |
| HYS         | $HYS = V_{TH(R)} - V_{TH(F)}$            | $V_S = 5V$ , $R_L = 100k$ , $V_O = 2V$ Swing                                                                                     | ●           | 2     | 13.5                             | mV                 |
| $I_B$       | Input Bias Current                       | $V_S = 1.4V$ , $18V$ , $V_{IN} = V_S$<br>$V_S = 1.4V$ , $V_{IN} = 18V$<br>$V_S = 1.4V$ , $18V$ , $V_{IN} = 0.1V$                 | ●<br>●<br>● |       | $\pm 45$<br>$\pm 45$<br>$\pm 50$ | nA<br>nA<br>nA     |
| $V_{OL}$    | Output Low Voltage                       | 10mV Input Overdrive, $V_S = 5V$ , $I_{OUT} = 5mA$                                                                               | ●           |       | 250                              | mV                 |
| $I_{OFF}$   | Output Leakage Current                   | $V_S = 1.4V$ , $18V$ , $V_{OUT} = V_S$ , $V_{IN} = 40mV$ Overdrive<br>$V_S = 1.4V$ , $V_{OUT} = 18V$ , $V_{IN} = 40mV$ Overdrive | ●<br>●      |       | 1<br>1                           | $\mu A$<br>$\mu A$ |
| $I_S$       | Supply Current                           | No Load Current, $V_S = 5V$                                                                                                      | ●           |       | 17                               | $\mu A$            |

## ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$ , (LT6703HV-2/LT6703HV-3) unless otherwise specified.

| SYMBOL       | PARAMETER                                | CONDITIONS                                                                                                                                         | MIN | TYP                                 | MAX                              | UNITS              |
|--------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------------------------------|----------------------------------|--------------------|
| $V_{TH(R)}$  | Rising Input Threshold Voltage (Note 6)  | $R_L = 100k$ , $V_O = 2V$ Swing, $V_S = 5V$                                                                                                        | 395 | 400                                 | 405                              | mV                 |
| $V_{TH(F)}$  | Falling Input Threshold Voltage (Note 6) | $R_L = 100k$ , $V_O = 2V$ Swing, $V_S = 5V$                                                                                                        | 387 | 393.5                               | 400                              | mV                 |
| HYS          | $HYS = V_{TH(R)} - V_{TH(F)}$            | $V_S = 5V$ , $R_L = 100k$ , $V_O = 2V$ Swing                                                                                                       | 3.5 | 6.5                                 | 9.5                              | mV                 |
| $I_B$        | Input Bias Current                       | $V_S = 1.4V, 18V$ , $V_{IN} = V_S$<br>$V_S = 1.4V$ , $V_{IN} = 18V, 36V$<br>$V_S = 1.4V, 18V$ , $V_{IN} = 0.1V$                                    |     | $\pm 0.01$<br>$\pm 0.01$<br>$\pm 4$ | $\pm 10$<br>$\pm 10$<br>$\pm 10$ | nA<br>nA<br>nA     |
| $V_{OL}$     | Output Low Voltage                       | 10mV Input Overdrive, $V_S = 5V$ , $I_{OUT} = 5mA$                                                                                                 |     | 70                                  | 200                              | mV                 |
| $I_{OFF}$    | Output Leakage Current                   | $V_S = 1.4V, 18V$ , $V_{OUT} = V_S$ , $V_{IN} = 40mV$ Overdrive<br>$V_S = 18V$ , $V_{OUT} = 18V$ , (36V, $R_L = 100k$ ), $V_{IN} = 40mV$ Overdrive |     | 0.01<br>0.01                        | 0.8<br>0.8                       | $\mu A$<br>$\mu A$ |
| $t_{PD(HL)}$ | High-to-Low Propagation Delay            | $V_S = 5V$ , 10mV Input Overdrive, $R_L = 10k$ ,<br>$V_{OL} = 400mV$                                                                               |     | 18                                  |                                  | $\mu s$            |
| $t_{PD(LH)}$ | Low-to-High Propagation Delay            | $V_S = 5V$ , 10mV Input Overdrive, $R_L = 10k$ ,<br>$V_{OH} = 0.9 \cdot V_S$                                                                       |     | 29                                  |                                  | $\mu s$            |
| $t_r$        | Output Rise Time                         | $V_S = 5V$ , 10mV Input Overdrive, $R_L = 10k$<br>$V_O = (0.1 \text{ to } 0.9) \cdot V_S$                                                          |     | 2.2                                 |                                  | $\mu s$            |
| $t_f$        | Output Fall Time                         | $V_S = 5V$ , 10mV Input Overdrive, $R_L = 10k$<br>$V_O = (0.1 \text{ to } 0.9) \cdot V_S$                                                          |     | 0.22                                |                                  | $\mu s$            |
| $I_S$        | Supply Current                           | No Load Current, $V_S = 5V$                                                                                                                        |     | 6.5                                 | 11                               | $\mu A$            |

The ● denotes the specifications which apply over the temperature range of  $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$ , (LT6703HVC-2/LT6703HVC-3) unless otherwise specified (Notes 4, 5).

| SYMBOL      | PARAMETER                                | CONDITIONS                                                                                                                                         | MIN         | TYP   | MAX                              | UNITS              |
|-------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------|----------------------------------|--------------------|
| $V_{TH(R)}$ | Rising Input Threshold Voltage (Note 6)  | $R_L = 100k$ , $V_O = 2V$ Swing, $V_S = 5V$                                                                                                        | ●           | 392.5 | 407.5                            | mV                 |
| $V_{TH(F)}$ | Falling Input Threshold Voltage (Note 6) | $R_L = 100k$ , $V_O = 2V$ Swing, $V_S = 5V$                                                                                                        | ●           | 384.5 | 402.5                            | mV                 |
| HYS         | $HYS = V_{TH(R)} - V_{TH(F)}$            | $V_S = 5V$ , $R_L = 100k$ , $V_O = 2V$ Swing                                                                                                       | ●           | 3     | 11                               | mV                 |
| $I_B$       | Input Bias Current                       | $V_S = 1.4V, 18V$ , $V_{IN} = V_S$<br>$V_S = 1.4V$ , $V_{IN} = 18V, 36V$<br>$V_S = 1.4V, 18V$ , $V_{IN} = 0.1V$                                    | ●<br>●<br>● |       | $\pm 15$<br>$\pm 15$<br>$\pm 15$ | nA<br>nA<br>nA     |
| $V_{OL}$    | Output Low Voltage                       | 10mV Input Overdrive, $V_S = 5V$ , $I_{OUT} = 5mA$                                                                                                 | ●           |       | 250                              | mV                 |
| $I_{OFF}$   | Output Leakage Current                   | $V_S = 1.4V, 18V$ , $V_{OUT} = V_S$ , $V_{IN} = 40mV$ Overdrive<br>$V_S = 18V$ , $V_{OUT} = 18V$ , (36V, $R_L = 100k$ ), $V_{IN} = 40mV$ Overdrive | ●<br>●      |       | 1<br>1                           | $\mu A$<br>$\mu A$ |
| $I_S$       | Supply Current                           | No Load Current, $V_S = 5V$                                                                                                                        | ●           |       | 14                               | $\mu A$            |

The ● denotes the specifications which apply over the temperature range of  $-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$ , (LT6703HVI-2/LT6703HVI-3) unless otherwise specified (Notes 4, 5).

| SYMBOL      | PARAMETER                                | CONDITIONS                                                                                                      | MIN         | TYP   | MAX                              | UNITS          |
|-------------|------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------|-------|----------------------------------|----------------|
| $V_{TH(R)}$ | Rising Input Threshold Voltage (Note 6)  | $R_L = 100k$ , $V_O = 2V$ Swing, $V_S = 5V$                                                                     | ●           | 392   | 408                              | mV             |
| $V_{TH(F)}$ | Falling Input Threshold Voltage (Note 6) | $R_L = 100k$ , $V_O = 2V$ Swing, $V_S = 5V$                                                                     | ●           | 383.5 | 403.5                            | mV             |
| HYS         | $HYS = V_{TH(R)} - V_{TH(F)}$            | $V_S = 5V$ , $R_L = 100k$ , $V_O = 2V$ Swing                                                                    | ●           | 2     | 11.5                             | mV             |
| $I_B$       | Input Bias Current                       | $V_S = 1.4V, 18V$ , $V_{IN} = V_S$<br>$V_S = 1.4V$ , $V_{IN} = 18V, 36V$<br>$V_S = 1.4V, 18V$ , $V_{IN} = 0.1V$ | ●<br>●<br>● |       | $\pm 15$<br>$\pm 15$<br>$\pm 15$ | nA<br>nA<br>nA |

# LT6703-2/LT6703-3

## LT6703HV-2/LT6703HV-3

**ELECTRICAL CHARACTERISTICS** The ● denotes the specifications which apply over the temperature range of  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , (LT6703HVI-2/LT6703HVI-3) unless otherwise specified (Notes 4, 5).

| SYMBOL    | PARAMETER              | CONDITIONS                                                                                                                                                                                   | MIN | TYP | MAX | UNITS         |
|-----------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|---------------|
| $V_{OL}$  | Output Low Voltage     | 10mV Input Overdrive, $V_S = 5\text{V}$ , $I_{OUT} = 5\text{mA}$                                                                                                                             | ●   |     | 250 | mV            |
| $I_{OFF}$ | Output Leakage Current | $V_S = 1.4\text{V}$ , 18V, $V_{OUT} = V_S$ , $V_{IN} = 40\text{mV}$ Overdrive<br>$V_S = 18\text{V}$ , $V_{OUT} = 18\text{V}$ , (36V, $R_L = 100\text{k}$ ), $V_{IN} = 40\text{mV}$ Overdrive | ●   |     | 1   | $\mu\text{A}$ |
| $I_S$     | Supply Current         | No Load Current, $V_S = 5\text{V}$                                                                                                                                                           | ●   |     | 15  | $\mu\text{A}$ |

The ● denotes the specifications which apply over the temperature range of  $-40^{\circ}\text{C} \leq T_A \leq 125^{\circ}\text{C}$ , (LT6703HVH-2/LT6703HVH-3) unless otherwise specified (Notes 4, 5).

| SYMBOL      | PARAMETER                                | CONDITIONS                                                                                                                                                                                   | MIN | TYP   | MAX      | UNITS         |
|-------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------|----------|---------------|
| $V_{TH(R)}$ | Rising Input Threshold Voltage (Note 6)  | $R_L = 100\text{k}$ , $V_O = 2\text{V}$ Swing, $V_S = 5\text{V}$                                                                                                                             | ●   | 392   | 410      | mV            |
| $V_{TH(F)}$ | Falling Input Threshold Voltage (Note 6) | $R_L = 100\text{k}$ , $V_O = 2\text{V}$ Swing, $V_S = 5\text{V}$                                                                                                                             | ●   | 382.5 | 404.5    | mV            |
| HYS         | $HYS = V_{TH(R)} - V_{TH(F)}$            | $V_S = 5\text{V}$ , $R_L = 100\text{k}$ , $V_O = 2\text{V}$ Swing                                                                                                                            | ●   | 2     | 13.5     | mV            |
| $I_B$       | Input Bias Current                       | $V_S = 1.4\text{V}$ , 18V, $V_{IN} = V_S$<br>$V_S = 1.4\text{V}$ , $V_{IN} = 18\text{V}$ , 36V<br>$V_S = 1.4\text{V}$ , 18V, $V_{IN} = 0.1\text{V}$                                          | ●   |       | $\pm 45$ | nA            |
| $V_{OL}$    | Output Low Voltage                       | 10mV Input Overdrive, $V_S = 5\text{V}$ , $I_{OUT} = 5\text{mA}$                                                                                                                             | ●   |       | 250      | mV            |
| $I_{OFF}$   | Output Leakage Current                   | $V_S = 1.4\text{V}$ , 18V, $V_{OUT} = V_S$ , $V_{IN} = 40\text{mV}$ Overdrive<br>$V_S = 18\text{V}$ , $V_{OUT} = 18\text{V}$ , (36V, $R_L = 100\text{k}$ ), $V_{IN} = 40\text{mV}$ Overdrive | ●   |       | 1        | $\mu\text{A}$ |
| $I_S$       | Supply Current                           | No Load Current, $V_S = 5\text{V}$                                                                                                                                                           | ●   |       | 17.0     | $\mu\text{A}$ |

**Note 1:** Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

**Note 2:** A heat sink may be required to keep the junction temperature below the absolute maximum rating when the output is shorted indefinitely.

**Note 3:** The inputs are protected by ESD diodes to the ground pin. If the input voltage exceeds  $-0.3\text{V}$  below ground, the input current should be limited to less than 10mA.

**Note 4:** The LT6703C-2/-3/LT6703HVC-2/-3, and LT6703I-2/-3/LT6703HVI-2/-3 are guaranteed functional over the operating temperature range of  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

The LT6703H-2/-3/LT6703HVH-2/-3, is guaranteed functional over the operating temperature range of  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ .

**Note 5:** The LT6703C-2/-3/LT6703HVC-2/-3, are guaranteed to meet the specified performance from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ . The LT6703C-2/-3/LT6703HVC-2/-3 are designed, characterized and expected to meet specified performance from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$  but are not tested or QA sampled at these temperatures. The LT6703I-2/-3/LT6703HVI-2/-3, are guaranteed to meet specified performance from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ . The LT6703H-2/-3/LT6703HVH-2/-3, is guaranteed to meet specified performance from  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ .

**Note 6:**  $V_{TH}$  defines the threshold voltage of the comparator and combines the effect of offset and reference accuracy.

## PIN FUNCTIONS

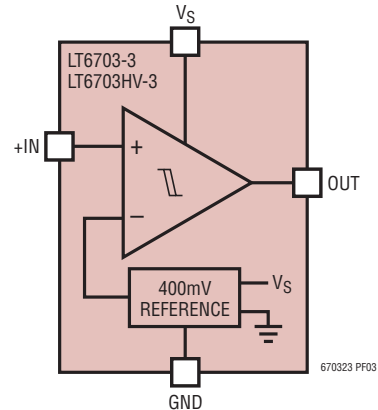
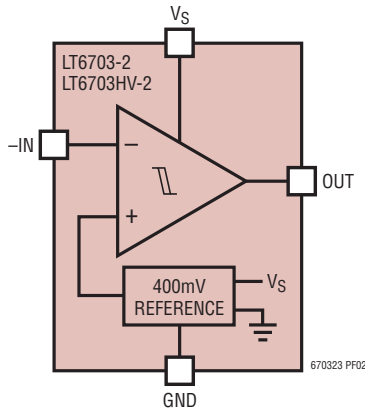
**OUT:** Open-Collector Output of Comparator. This pin provides drive for up to 40mA of load current. Off-state voltage may be as high as 18V (36V for LT6703HV) above GND, regardless of  $V_S$  used.

**GND:** Ground. This pin is also the low side return of the internal 400mV reference.

**IN:** External Input for Comparator. The voltage on this pin can range from  $-0.3\text{V}$  to 18V (36V for LT6703HV) with respect to GND regardless of  $V_S$  used. The input is noninverting for the LT6703-3/LT6703HV-3, and inverting for the LT6703-2/LT6703HV-2. The other comparator input is internally connected to the 400mV reference.

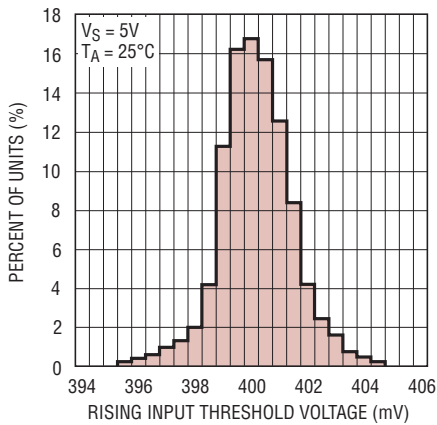
**$V_S$ :** Supply Voltage. The parts are characterized for operation with  $1.4\text{V} \leq V_S \leq 18\text{V}$  with respect to GND.

## PIN FUNCTIONS

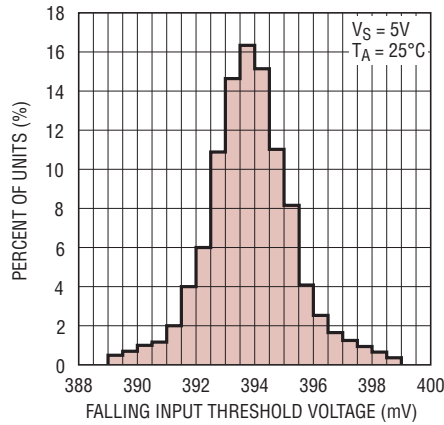


## TYPICAL PERFORMANCE CHARACTERISTICS

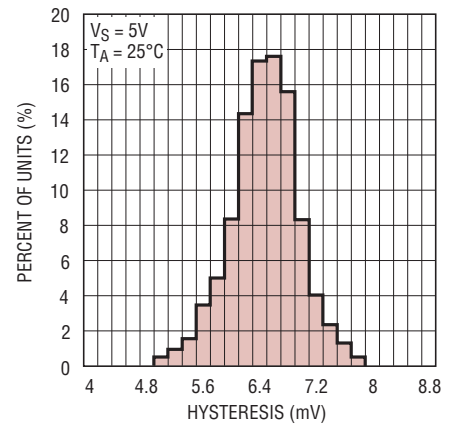
Distribution of Rising Input Threshold Voltage



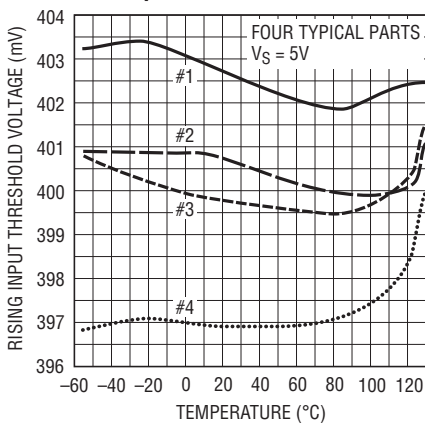
Distribution of Falling Input Threshold Voltage



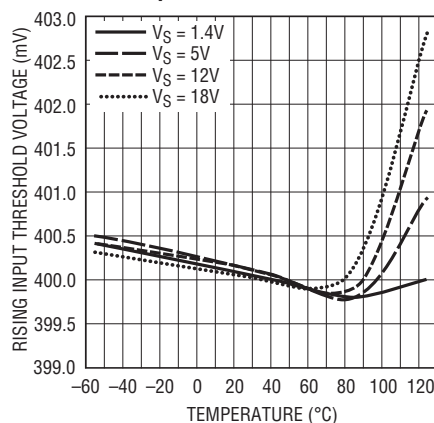
Distribution of Hysteresis



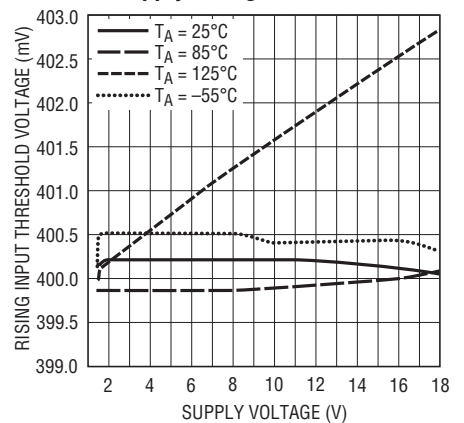
Rising Input Threshold Voltage vs Temperature



Rising Input Threshold Voltage vs Temperature

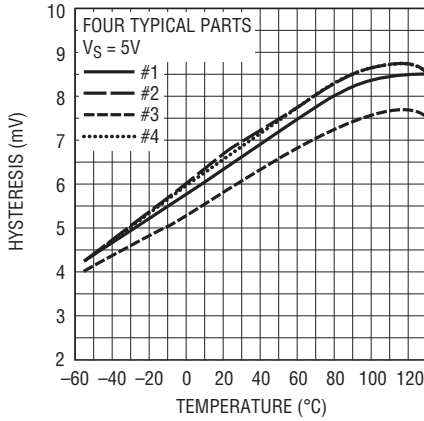


Rising Input Threshold Voltage vs Supply Voltage

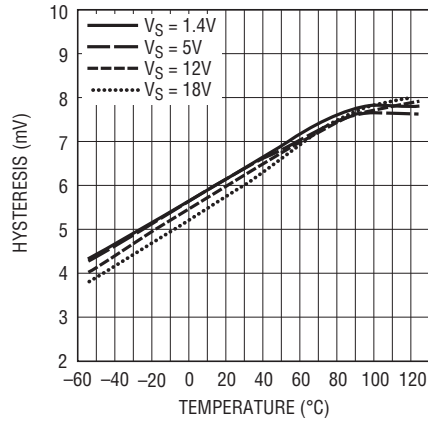


## TYPICAL PERFORMANCE CHARACTERISTICS

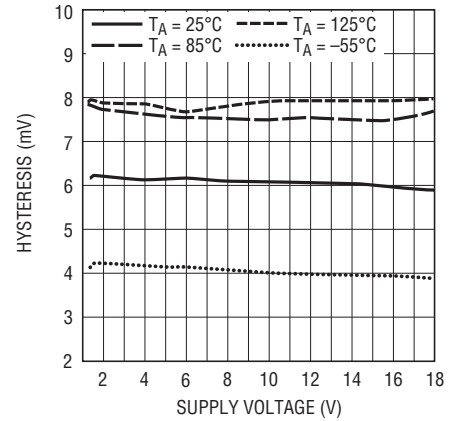
Hysteresis vs Temperature



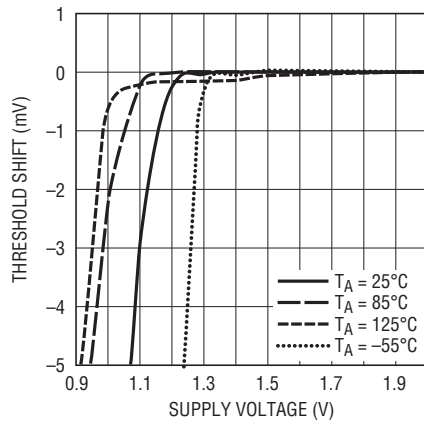
Hysteresis vs Temperature



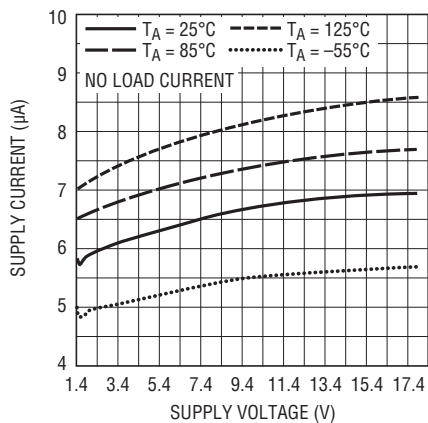
Hysteresis vs Supply Voltage



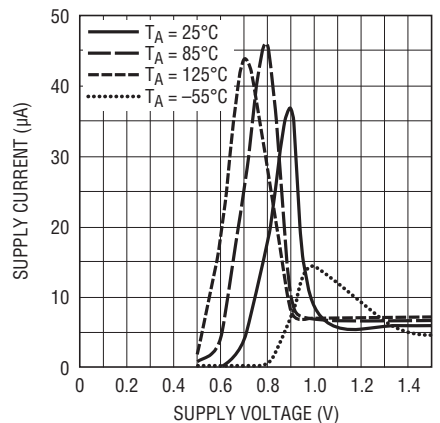
Minimum Supply Voltage



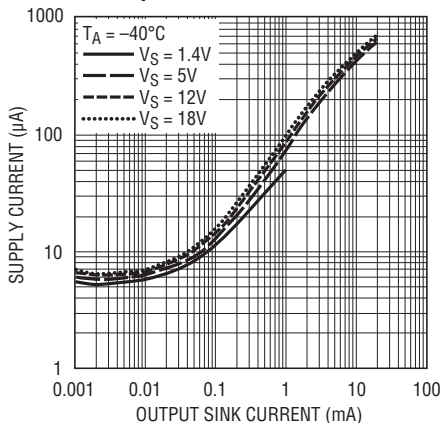
Quiescent Supply Current vs Supply Voltage



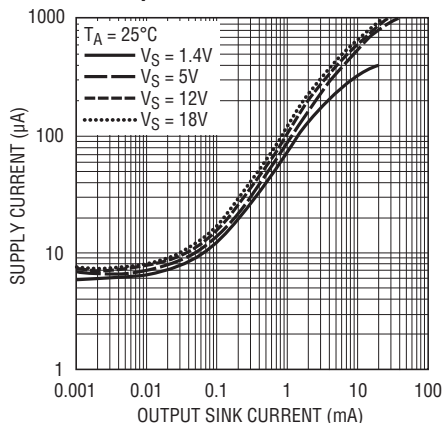
Start-Up Supply Current



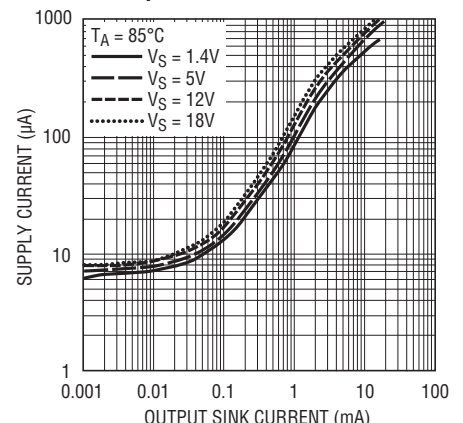
Supply Current vs Output Sink Current



Supply Current vs Output Sink Current

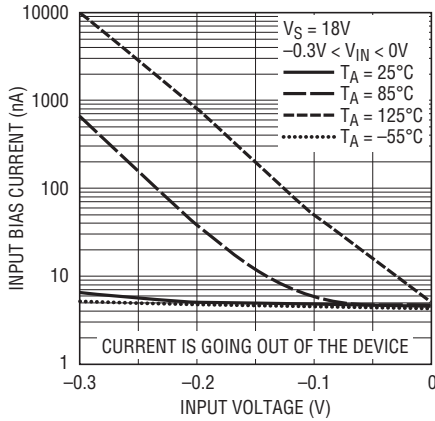


Supply Current vs Output Sink Current



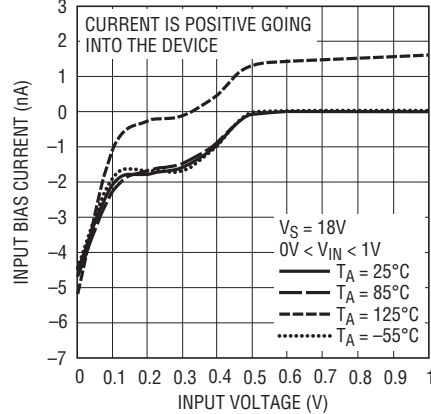
## TYPICAL PERFORMANCE CHARACTERISTICS

Below Ground Input Bias Current



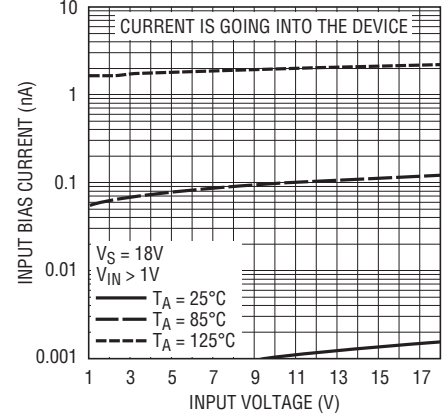
670323 G16

Low Level Input Bias Current



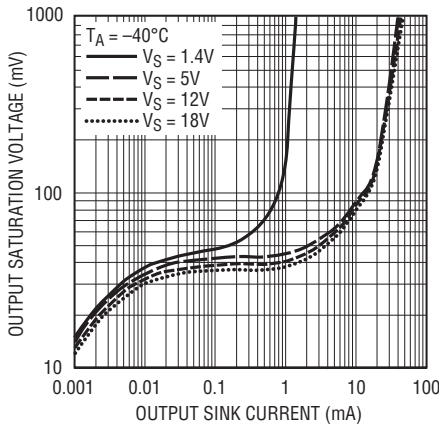
670323 G17

High Level Input Bias Current



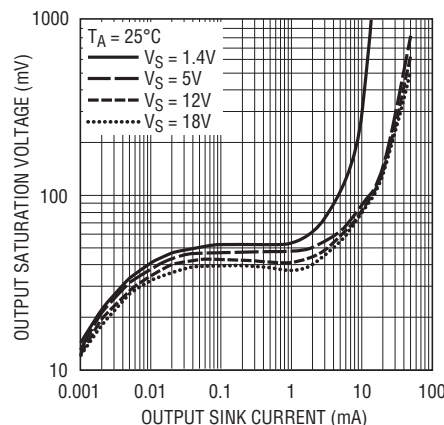
670323 G18

Output Saturation Voltage vs Output Sink Current



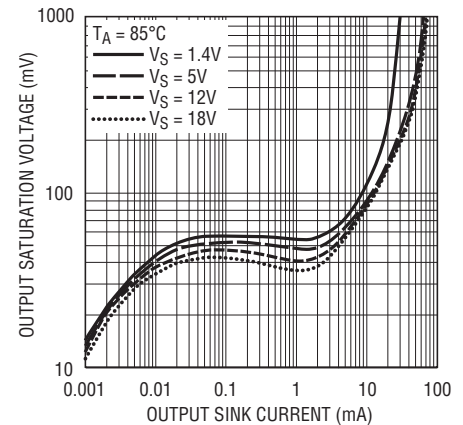
670323 G19

Output Saturation Voltage vs Output Sink Current



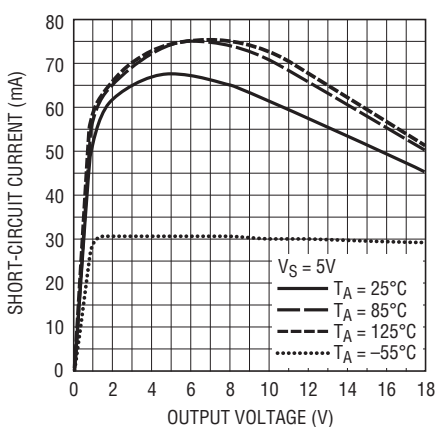
670323 G20

Output Saturation Voltage vs Output Sink Current



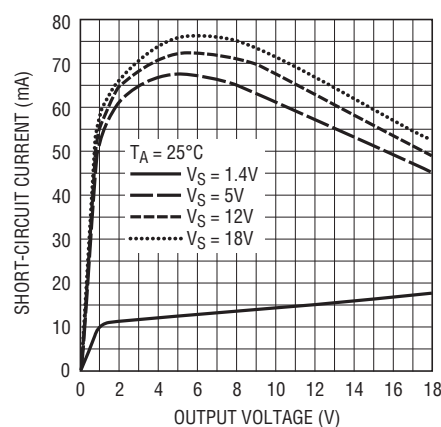
670323 G21

Output Short-Circuit Current



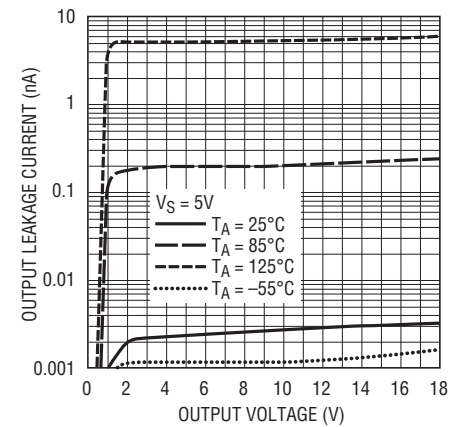
670323 G22

Output Short-Circuit Current



670323 G23

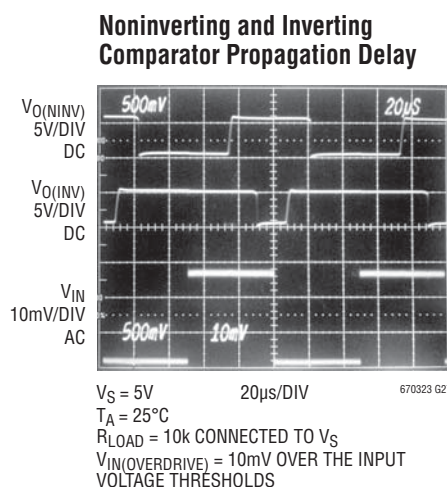
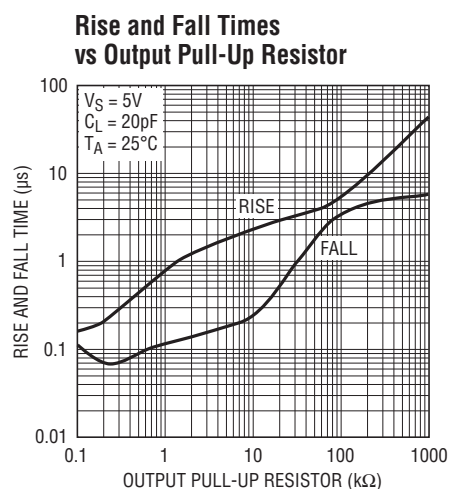
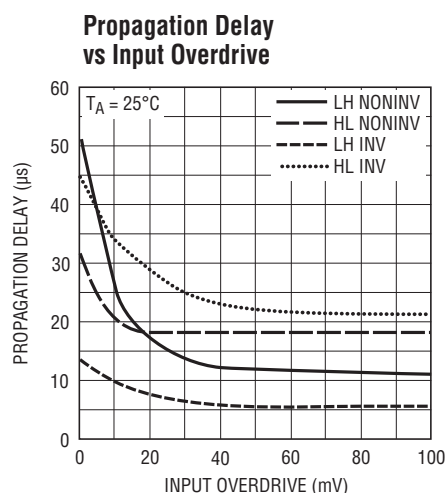
Output Leakage Current



670323 G24

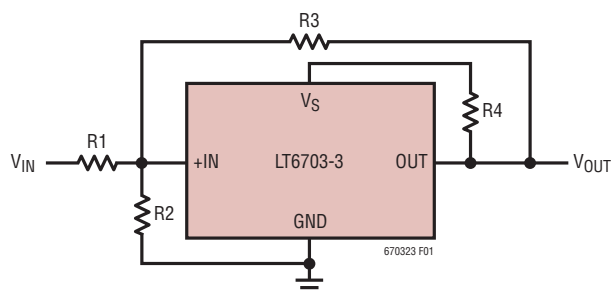
670323fd

## TYPICAL PERFORMANCE CHARACTERISTICS



## APPLICATIONS INFORMATION

The LT6703-2/LT6703-3/LT6703HV-2/LT6703HV-3 devices are micropower comparators with a built-in 400mV reference. Features include wide supply voltage range (1.4V to 18V), Over-The-Top input and output range, 2% accurate rising input threshold voltage and 6.5mV typical built-in hysteresis.



THRESHOLD EQUATIONS:

$$V_{IN} \text{ (L TO H)} = (400\text{mV}) \cdot (R_1) \cdot \left( \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \right)$$

$$V_{IN} \text{ (H TO L)} = (393\text{mV}) \cdot (R_1) \cdot \left( \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3 + R_4} \right) - \left( \frac{V_S \cdot R_1}{R_3 + R_4} \right)$$

Figure 1. Additional Hysteresis Circuit

### Internal Reference

Each comparator has one input available externally. The two versions of the part differ by the polarity of the available input (i.e., inverting or noninverting). The other comparator input is connected internally to the 400mV reference. The rising input threshold voltage of the comparator is designed to be equal to that of the reference (i.e.,  $\approx 400\text{mV}$ ). The reference voltage is established with respect to the device GND connection.

### Hysteresis

Each comparator has built-in 6.5mV (typical) of hysteresis to simplify designs, to insure stable operation in the presence of noise at the inputs, and to reject supply rail noise that might be induced by state change load transients. The hysteresis is designed such that the falling input threshold voltage is nominally 393.5mV. External positive feedback circuitry can be employed to increase effective hysteresis if desired, but such circuitry will provide an apparent effect on both the rising and falling input thresholds (the actual internal thresholds remain unaffected).

## APPLICATIONS INFORMATION

### Comparator Input

The comparator input can range from ground to 18V (36V for LT6703HV), regardless of the supply voltage used. The typical input current for inputs well above the threshold (i.e., >800mV) is a few pA leaking into the input. With decreasing input voltage, a small bias current begins to be drawn out of the input, reaching a few nA when at ground potential. The input may be forced 100mV below ground without causing an improper output, though some additional bias current will begin to flow from the ESD input protection diode. Inputs driven further negative than 100mV below ground will not cause damage provided the current is limited to 10mA.

### Comparator Output

The comparator output is open collector and capable of sinking 40mA typical. Load currents are directed out of the GND pin of the part. The output off-state voltage may range between -0.3V and 18V (36V for LT6703HV) with respect to ground, regardless of the supply voltage used. When the output high state bias voltage is above 18V, a 100k minimum pull-up resistor is required and no total load capacitor greater than 100nF should be used. If the output high state is above 18V, caution has to be taken to prevent a short from the output directly to the bias voltage, even if the output is in the off state. As with any open-collector device, the outputs of multiple comparators may be tied together to implement wire-AND logic functions.

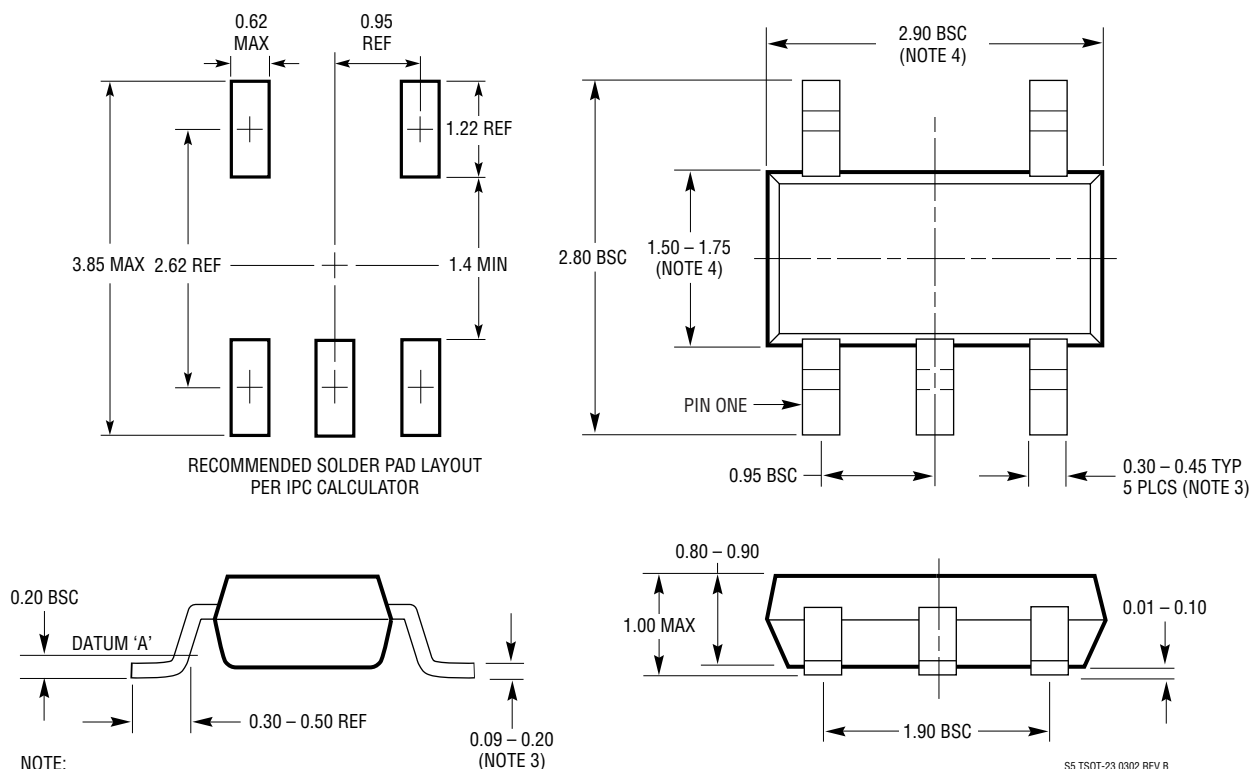
### Power Supplies

The comparator circuitry operates from a single 1.4V to 18V supply. A minimum 0.1 $\mu$ F bypass capacitor is required between the  $V_S$  pin and GND. When an output load is connected to the supply rail near the part and the output is sinking more than 5mA, a 1 $\mu$ F bypass capacitor is recommended. In instances where the supply is relatively “soft” (such as with small batteries) and susceptible to load steps, an additional 47 $\Omega$  series decoupling resistor can further improve isolation of supply transients from the  $V_S$  pin.



## PACKAGE DESCRIPTION

**S5 Package**  
**5-Lead Plastic TSOT-23**  
(Reference LTC DWG # 05-08-1635 Rev B)

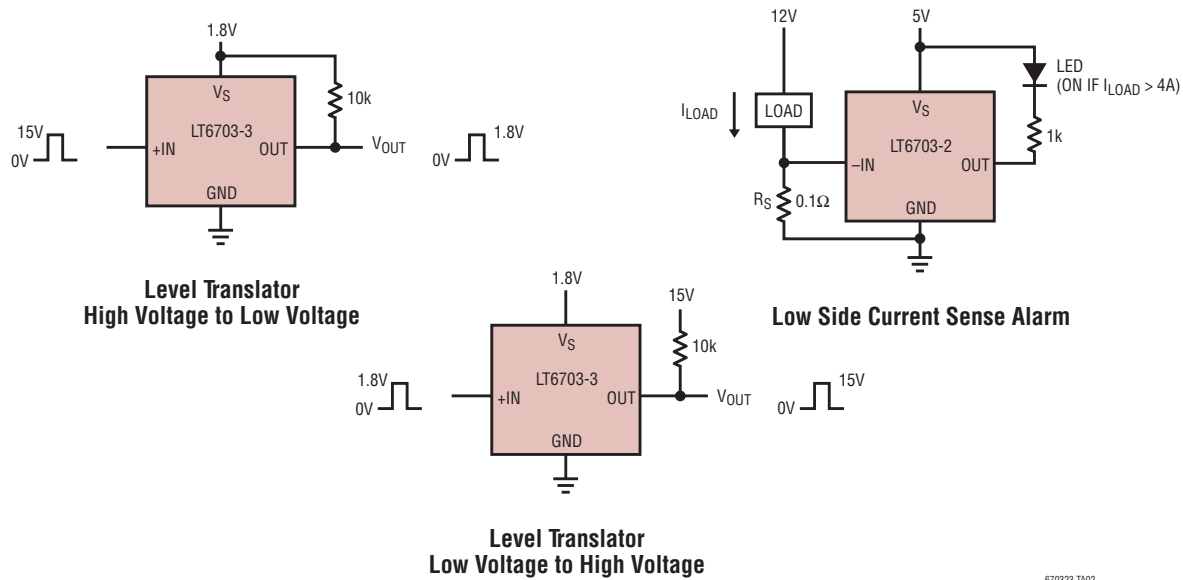


S5 TSOT-23 0302 REV B

# LT6703-2/LT6703-3

# LT6703HV-2/LT6703HV-3

## TYPICAL APPLICATIONS



## RELATED PARTS

| PART NUMBER     | DESCRIPTION                                     | COMMENTS                                                      |
|-----------------|-------------------------------------------------|---------------------------------------------------------------|
| LT1017/LT1018   | Micropower Dual Comparator                      | 1.1V (Min) Supply Voltage, ±1.4mV (Max) Input Offset          |
| LTC1441/LTC1442 | Micropower Dual Comparator with 1% Reference    | 1.182 ±1% Reference, ±10mV (Max) Input Offset                 |
| LTC1998         | Micropower Comparator for Battery Monitoring    | 2.5µA Typ Supply Current, Adjustable Threshold and Hysteresis |
| LT6700          | Dual Micropower Comparator with 400mV Reference | 1.4V to 18V Supply Voltage, 6.5µA Typical Supply Current      |