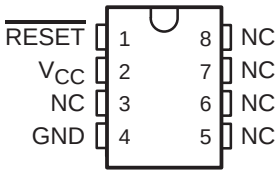
TL7757
SUPPLY-VOLTAGE SUPERVISOR AND PRECISION VOLTAGE DETECTOR

SLVS041E – SEPTEMBER 1991 – REVISED JULY 1999

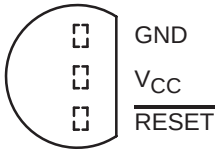
- **Power-On Reset Generator**
- **Automatic Reset Generation After Voltage Drop**
- **Low Standby Current . . . 20 μA**
- **Reset Output Defined When V_{CC} Exceeds 1 V**
- **Complementary Reset Output**
- **True and Complementary Reset Outputs**
- **Precision Threshold Voltage 4.55 V ±120 mV**
- **High Output Sink Capability . . . 20 mA**
- **Comparator Hysteresis Prevents Erratic Resets**

D PACKAGE
(TOP VIEW)

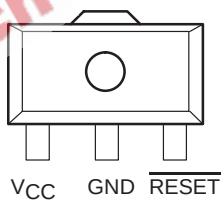


NC–No internal connection

LP PACKAGE
(TOP VIEW)



PK PACKAGE
(TOP VIEW)



GND is in electrical contact with the tab.

description

The TL7757 is a supply-voltage supervisor designed for use in microcomputer and microprocessor systems. The supervisor monitors the supply voltage for undervoltage conditions. During power up, when the supply voltage, V_{CC}, attains a value approaching 1 V, the $\overline{\text{RESET}}$ output becomes active (low) to prevent undefined operation. If the supply voltage drops below threshold voltage level (V_{IT-}), the $\overline{\text{RESET}}$ output goes to the active (low) level until the supply undervoltage fault condition is eliminated.

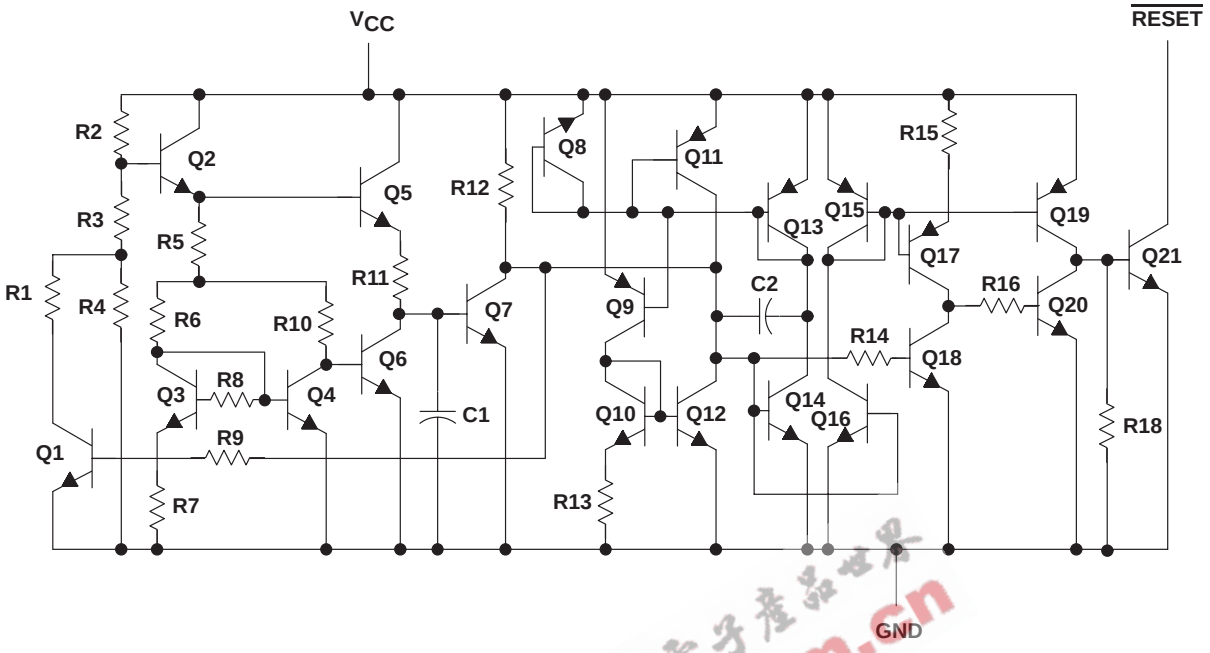
The TL7757C is characterized for operation from 0°C to 70°C. The TL7757I is characterized for operation from –40°C to 85°C.

AVAILABLE OPTIONS

T_A	PACKAGED DEVICES			CHIP FORM (Y)
	SMALL OUTLINE (D)	TO-226AA (LP)	SOT-89 (PK)	
0°C to 70°C	TL7757CD	TL7757CLP	TL7757CPK	TL7757Y
–40°C to 85°C	TL7757ID	TL7757ILP	TL7757IPK	

D and LP packages are available taped and reeled. Add the suffix R to device type (e.g., TL7757CDR). Chip forms are tested at 25°C.

equivalent schematic



ACTUAL DEVICE COMPONENT COUNT	
Transistors	27
Resistors	20
Capacitors	2

absolute maximum ratings over operating free-air temperature (unless otherwise noted)†

Supply voltage range, V_{CC} (see Note 1) . . . . . –0.3 V to 20 V
Offstate output voltage range (see Note 1) . . . . . –0.3 V to 20 V
Output current, I_O . . . . . 30 mA
Package thermal impedance, θ_{JA} (see Notes 2 and 3): D package . . . . . 97°C/W
LP package . . . . . 156°C/W
PK package . . . . . 52°C/W
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds . . . . . 260°C
Storage temperature range, T_{stg} . . . . . –65°C to 150°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 under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. All voltage values are with respect to network terminal ground.
2. Maximum power dissipation is a function of $T_J(max)$, θ_{JA}, and T_A. The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(max) – T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can impact reliability.
3. The package thermal impedance is calculated in accordance with JESD 51, except for through-hole packages, which use a trace length of zero.

recommended operating conditions

		MIN	MAX	UNIT
Supply voltage, V_{CC}		1	7	V
High-level output voltage, V_{OH}			15	V
Low-level output current, I_{OL}			20	mA
Operating free-air temperature, T_A	TL7757C	0	70	°C
	TL7757I	–40	85	

electrical characteristics at specified free-air temperature

PARAMETER		TEST CONDITIONS	T_A	TL7757C			UNIT
				MIN	TYP	MAX	
V_{IT-}	Negative-going input threshold voltage at V_{CC}		25°C	4.43	4.55	4.67	V
			0°C to 70°C	4.4		4.7	
V_{hys}†	Hysteresis at V_{CC}		25°C	40	50	60	mV
			0°C to 70°C	30		70	
V_{OL}	Low-level output voltage	I_{OL} = 20 mA, V_{CC} = 4.3 V	25°C		0.4	0.8	V
			0°C to 70°C			0.8	
I_{OH}	High-level output current	V_{CC} = 7 V, V_{OH} = 15 V, See Figure 1	25°C			1	µA
			0°C to 70°C			1	
V_{res}‡	Power-up reset voltage	R_L = 2.2 kΩ, V_{CC} slew rate ≤ 5 V/µs	25°C		0.8	1	V
			0°C to 70°C			1.2	
I_{CC}	Supply current	V_{CC} = 4.3 V	25°C		1400	2000	µA
			0°C to 70°C			2000	
		V_{CC} = 5.5 V	0°C to 70°C			40	

† This is the difference between positive-going input threshold voltage, V_{IT+}, and negative-going input threshold voltage, V_{IT-}.
‡ This is the lowest voltage at which RESET becomes active.

switching characteristics at specified free-air temperature

PARAMETER		TEST CONDITIONS	T_A	TL7757C			UNIT
				MIN	TYP	MAX	
t_{PLH}	Propagation delay time, low-to-high-level output	V_{CC} slew rate ≤ 5 V/µs, See Figures 2 and 3	25°C		3.4	5	µs
			0°C to 70°C			5	
t_{PHL}	Propagation delay time, high-to-low-level output	See Figures 2 and 3	25°C		2	5	µs
			0°C to 70°C			5	
t_r	Rise time	V_{CC} slew rate ≤ 5 V/µs, See Figures 2 and 3	25°C		0.4	1	µs
			0°C to 70°C			1	
t_f	Fall time	See Figures 2 and 3	25°C		0.05	1	µs
			0°C to 70°C			1	
$t_{w(min)}$	Minimum pulse duration at V_{CC} for output response		25°C			5	µs
			0°C to 70°C			5	

electrical characteristics at specified free-air temperature

PARAMETER		TEST CONDITIONS	T_A	TL7757I			UNIT
				MIN	TYP	MAX	
V_{IT-}	Negative-going input threshold voltage at V_{CC}		25°C	4.43	4.55	4.67	V
			–40°C to 85°C	4.4		4.7	
V_{hys}†	Hysteresis at V_{CC}		25°C	40	50	60	mV
			–40°C to 85°C	30		70	
V_{OL}	Low-level output voltage	I_{OL} = 20 mA, V_{CC} = 4.3 V	25°C		0.4	0.8	V
			–40°C to 85°C			0.8	
I_{OH}	High-level output current	V_{CC} = 7 V, V_{OH} = 15 V, See Figure 1	25°C			1	µA
			–40°C to 85°C			1	
V_{res}‡	Power-up reset voltage	R_L = 2.2 kΩ, V_{CC} slew rate ≤ 5 V/µs	25°C		0.8	1	V
			–40°C to 85°C			1.2	
I_{CC}	Supply current	V_{CC} = 4.3 V	25°C		1400	2000	µA
			–40°C to 85°C			2100	
		V_{CC} = 5.5 V	–40°C to 85°C			40	

† This is the difference between positive-going input threshold voltage, V_{IT+}, and negative-going input threshold voltage, V_{IT-}.
‡ This is the lowest voltage at which $\overline{\text{RESET}}$ becomes active.

switching characteristics at specified free-air temperature

PARAMETER		TEST CONDITIONS	T_A	TL7757I			UNIT
				MIN	TYP	MAX	
t_{PLH}	Propagation delay time, low-to-high-level output	V_{CC} slew rate ≤ 5 V/µs, See Figures 2 and 3	25°C		3.4	5	µs
			–40°C to 85°C			5	
t_{PHL}	Propagation delay time, high-to-low-level output	See Figures 2 and 3	25°C		2	5	µs
			–40°C to 85°C			5	
t_r	Rise time	V_{CC} slew rate ≤ 5 V/µs, See Figures 2 and 3	25°C		0.4	1	µs
			–40°C to 85°C			1	
t_f	Fall time	See Figures 2 and 3	25°C		0.05	1	µs
			–40°C to 85°C			1	
$t_{w(min)}$	Minimum pulse duration at V_{CC} for output response		25°C			5	µs
			–40°C to 85°C			5	

electrical characteristics at T_A = 25°C

PARAMETER		TEST CONDITIONS	TL7757Y			UNIT
			MIN	TYP	MAX	
V_{IT-}	Negative-going input threshold voltage at V_{CC}			4.55		V
V_{hys}†	Hysteresis at V_{CC}			50		mV
V_{OL}	Low-level output voltage	I_{OL} = 20 mA, V_{CC} = 4.3 V		0.4		V
I_{OH}	High-level output current	V_{CC} = 7 V, V_{OH} = 15 V, See Figure 1				µA
V_{res}‡	Power-up reset voltage	R_L = 2.2 kΩ, V_{CC} slew rate ≤ 5 V/µs		0.8		V
I_{CC}	Supply current	V_{CC} = 4.3 V		1400		µA
		V_{CC} = 5.5 V				

† This is the difference between positive-going input threshold voltage, V_{IT+}, and negative-going input threshold voltage, V_{IT-}.
‡ This is the lowest voltage at which RESET becomes active.

switching characteristics at T_A = 25°C

PARAMETER		TEST CONDITIONS	TL7757Y			UNIT
			MIN	TYP	MAX	
t_{PLH}	Propagation delay time, low-to-high-level output	V_{CC} slew rate ≤ 5 V/µs, See Figures 2 and 3		3.4		µs
t_{PHL}	Propagation delay time, high-to-low-level output	See Figures 2 and 3		2		µs
t_r	Rise time	V_{CC} slew rate ≤ 5 V/µs, See Figures 2 and 3		0.4		µs
t_f	Fall time	See Figures 2 and 3		0.05		µs

PARAMETER MEASUREMENT INFORMATION

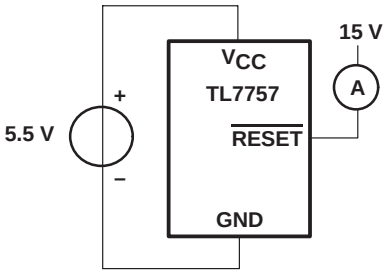
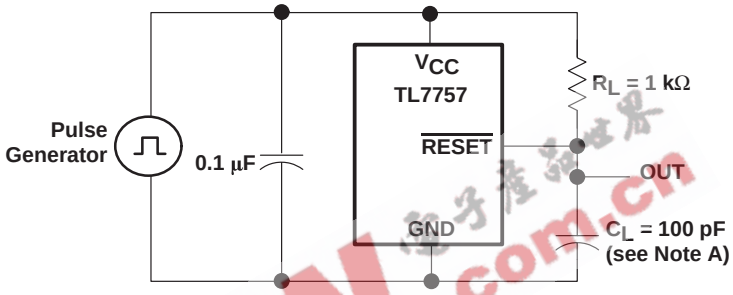
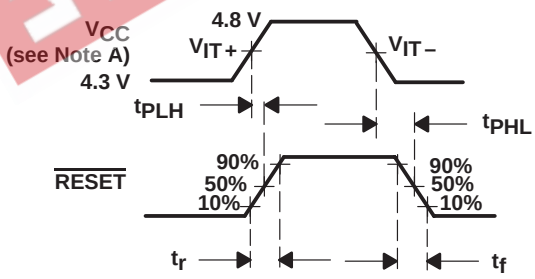


Figure 1. Test Circuit for Output Leakage Current



NOTE A: Includes jig and probe capacitance.

Figure 2. Test Circuit for $\overline{\text{RESET}}$ Output Switching Characteristics



NOTE A: V_{CC} slew rate ≤ 5 µs

Figure 3. Switching Diagram

TYPICAL CHARACTERISTICS†

Table of Graphs

		FIGURE
V_{CC}	Supply voltage vs $\overline{\text{RESET}}$ output voltage	4
I_{CC}	Supply current vs Supply voltage	5
I_{CC}	Supply current vs Free-air temperature	6
V_{OL}	Low-level output voltage vs Low-level output current	7
V_{OL}	Low-level output voltage vs Free-air temperature	8
I_{OL}	Output current vs Supply voltage	9
V_{IT-}	Input threshold voltage (negative-going V_{CC}) vs Free-air temperature	10
V_{res}	Power-up reset voltage vs Free-air temperature	11
V_{res}	Power-up reset voltage and supply voltage vs Time	12
	Propagation delay time	13

SUPPLY VOLTAGE vs $\overline{\text{RESET}}$ OUTPUT VOLTAGE

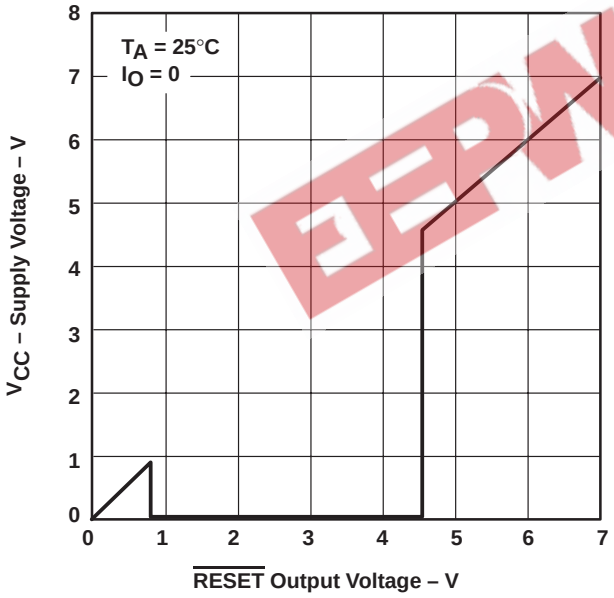


Figure 4

SUPPLY CURRENT vs SUPPLY VOLTAGE

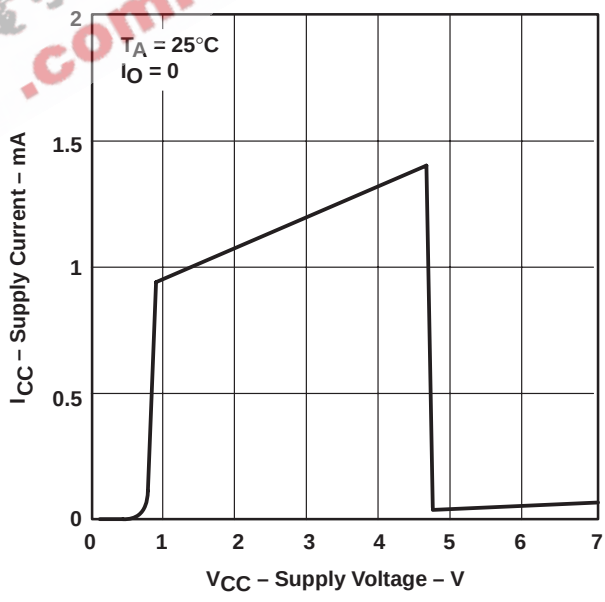


Figure 5

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS†

SUPPLY CURRENT vs FREE-AIR TEMPERATURE

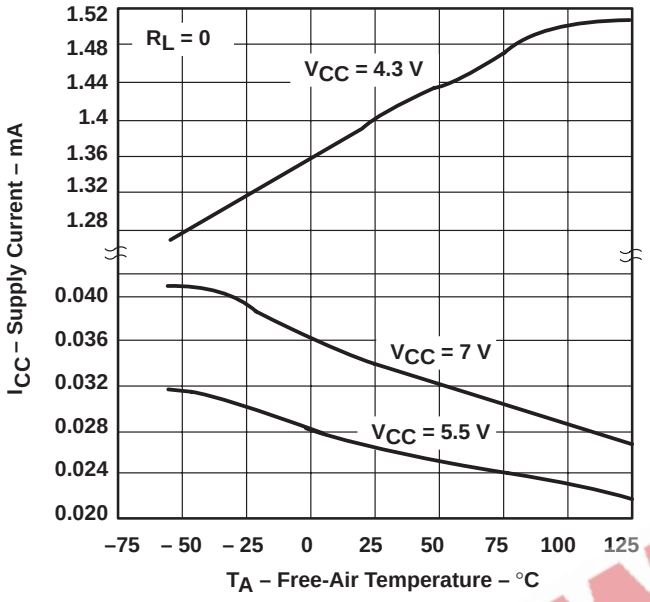


Figure 6

LOW-LEVEL OUTPUT VOLTAGE vs LOW-LEVEL OUTPUT CURRENT

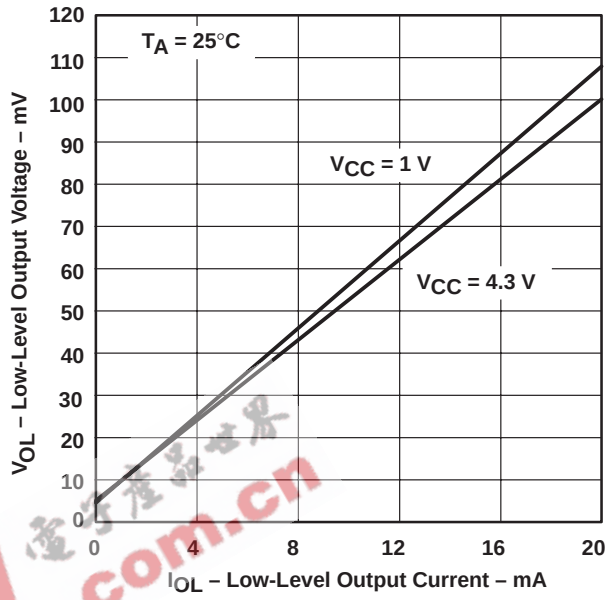


Figure 7

LOW-LEVEL OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE

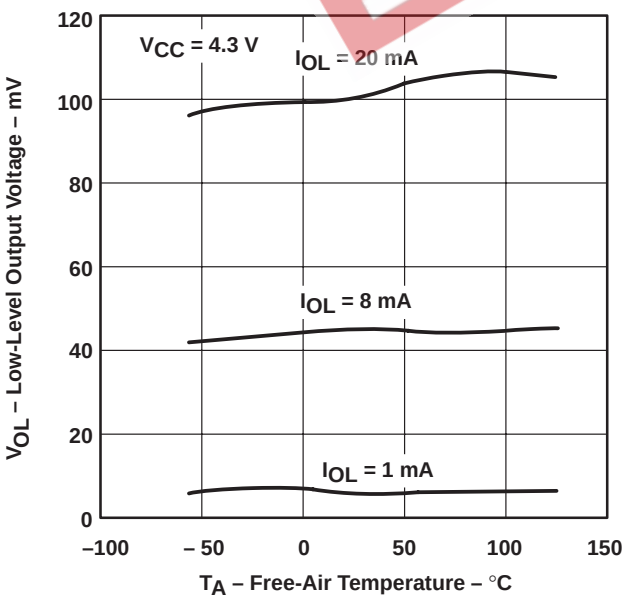


Figure 8

OUTPUT CURRENT vs SUPPLY VOLTAGE

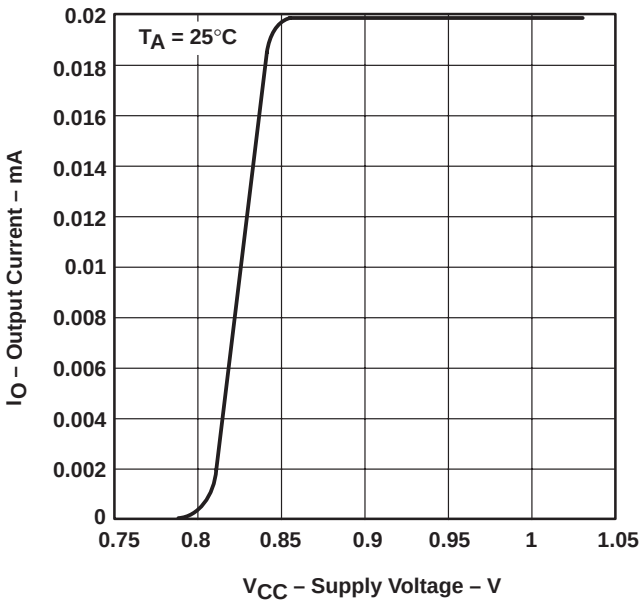


Figure 9

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS†

**INPUT THRESHOLD VOLTAGE
(NEGATIVE-GOING V_{CC})
vs
FREE-AIR TEMPERATURE**

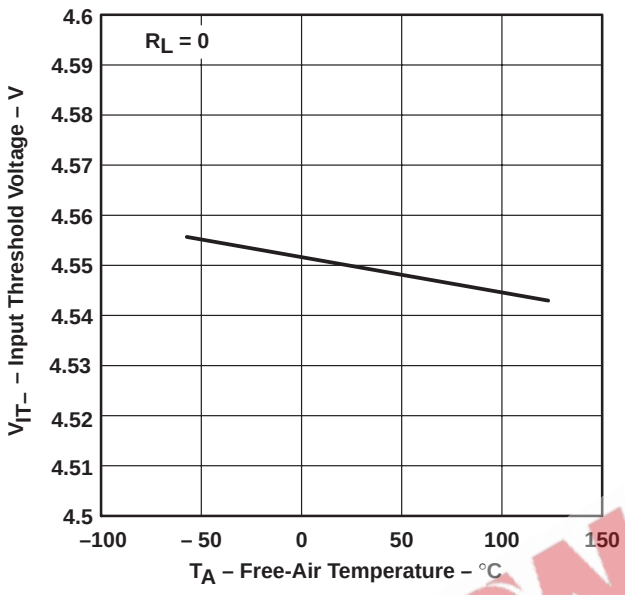


Figure 10

**POWER-UP RESET VOLTAGE
vs
FREE-AIR TEMPERATURE**

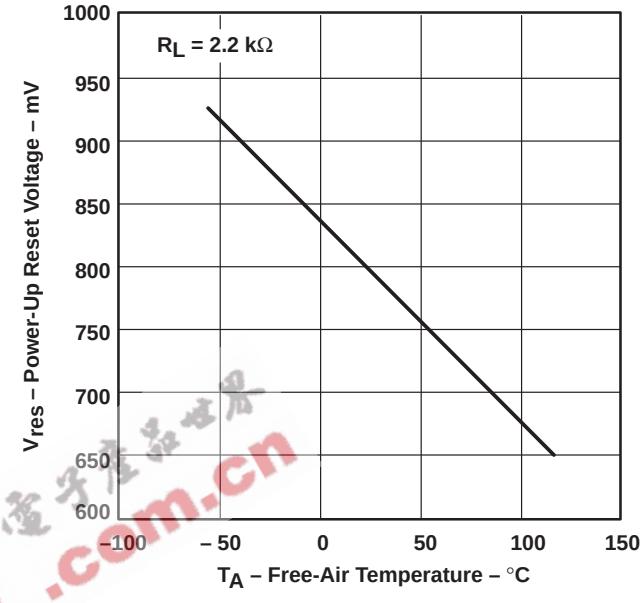


Figure 11

**POWER-UP RESET VOLTAGE
AND SUPPLY VOLTAGE
vs
TIME**

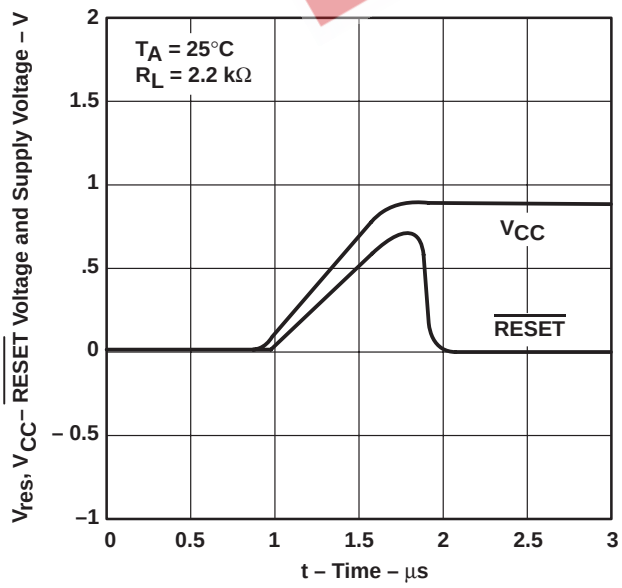


Figure 12

PROPAGATION DELAY TIME

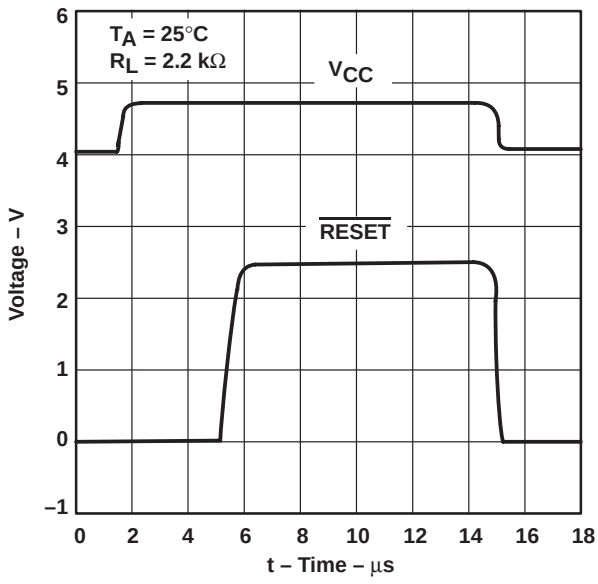
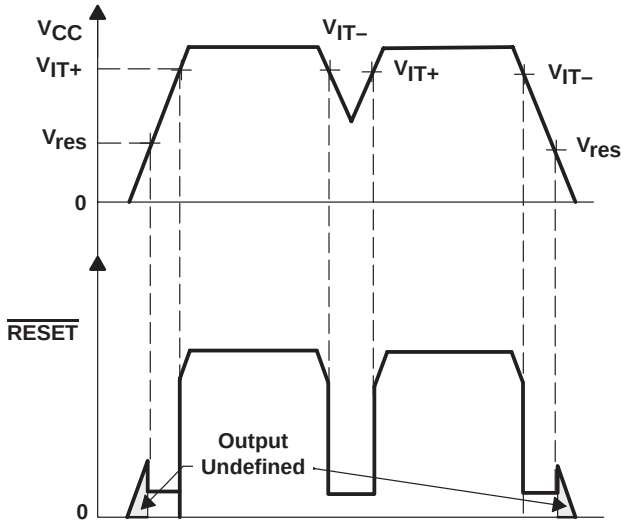


Figure 13

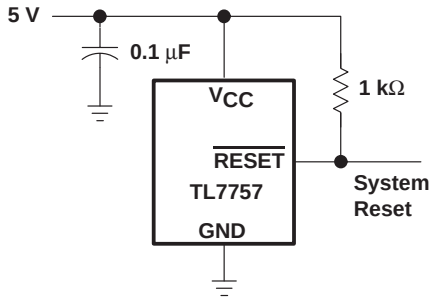
† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

APPLICATION INFORMATION

TYPICAL TIMING DIAGRAM



TYPICAL APPLICATION DIAGRAM



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