



DS8973, DS8974, DS8975, DS8976, DS8978 9-Digit LED Drivers

General Description

The DS8973, DS8974 and DS8976 are 9-digit drivers designed to operate from 3-cell (DS8973) or 4-cell (DS8974) or 6-cell (DS8976) battery supplies. Each driver will sink 100 mA to less than 0.7V when driven by only 0.1 mA. Each input is blocked by diodes so that the input can be driven below ground with virtually no current drain. This is especially important in calculator systems employing a dc-to-dc converter on the negative side of the battery. If the converter were on the positive side of the battery, the converter would have to handle all of the display current, as well as the MOS calculator chip current. But if it is on the negative side, it only has to handle the MOS current. The DS8973 and DS8974

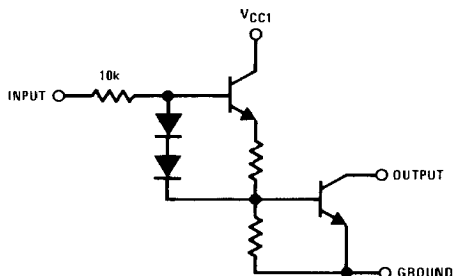
are designed for the more efficient operating mode. The DS8975 is identical to the DS8973, DS8974 and DS8976 but does not specify the low battery indicator. DS8978 is identical to the DS8975 but is in a 20-pin package without low battery pins.

Features

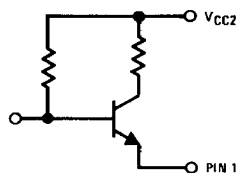
- Nine complete digit drivers
- Built-in low battery indicator
- High current outputs—100 mA
- Choice of 3 or 4-cell operation
- Straight through pin out for easy board layout

Equivalent Circuit Diagrams

Typical Driver Circuit

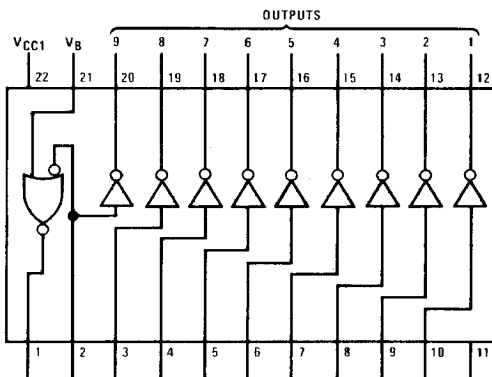


Typical D.P. Out Circuit

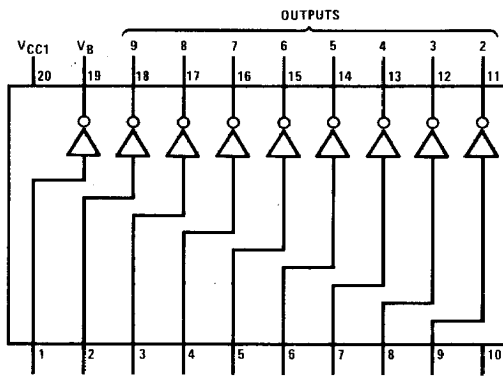


Connection Diagrams

Dual-In-Line Package



Dual-In-Line Package



Absolute Maximum Ratings (Note 1)**Operating Conditions**

Supply Voltage	10V
Input Voltage	10V
Output Voltage	10V
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10 seconds)	300°C

	MIN	MAX	UNITS
Supply Voltage (V _B)			
DS8973	3.0	5.5	V
DS8974	3.0	7.5	V
DS8976	3.0	9.5	V
Supply Voltage (V _{CC1})	3.0	9.5	V
Temperature (T _A)	0	+70	°C

Electrical Characteristics

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
V _{IH}	Logical "1" Input Voltage	V _{CC} = Max	3.9			V
I _{IH}	Logical "1" Input Current	V _{CC} = Max, V _{IH} = 3.9V	0.1		0.3	mA
V _{IL}	Logical "0" Input Voltage	V _{CC} = Max			0.5	V
I _{IL}	Logical "0" Input Current	V _{CC} = Max, V _{IL} = 0.5V			40	μA
V _{BH}	High Battery Threshold	V _{OT} (Pin 1) = 1V, I _{OT} ≤ -50μA, T _A = 25°C, V _{IH} (Pin 2) = 3.9V	DS8973	3.6		V
			DS8974	4.8		V
			DS8976	7.3		V
V _{BL}	Low Battery Threshold	V _{OT} (Pin 1) = 2.1V, I _{OT} ≥ -6 mA, T _A = 25°C, V _{IH} (Pin 2) = 3.9V	DS8973		3.2	V
			DS8974		4.2	V
			DS8976		6.5	V
I _{CEX}	Logical "1" Output Current	V _{CC} = Min, V _{OH} = 9.5V, V _{IL} = 0.5V			50	μA
V _{OL}	Logical "0" Output Voltage	V _{CC} = Min, I _{OL} = 100 mA, V _{IH} = 3.9V			0.7	V
I _{CC1}	Supply Current	V _{CC} = Max, One Input "ON"			6	mA
I _B	Pin 21 (High Battery Supply)	V _{CC} = Max, V _B = Max			1.2	mA

Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operations.

Note 2: Unless otherwise specified, min/max limits apply across the 0°C to +70°C range. All typicals are given for T_A = 25°C.

Note 3: All currents into device pins shown as positive, out of device pins as negative, all voltages referenced to ground unless otherwise noted. All values shown as max or min on absolute value basis.

Typical Applications

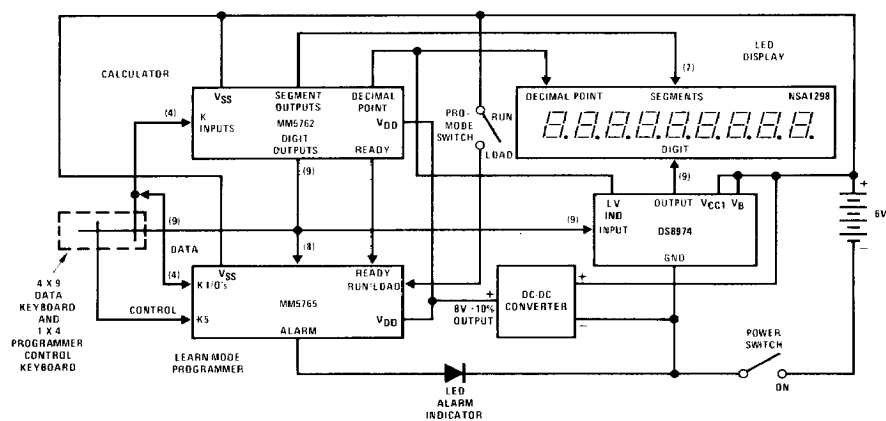


FIGURE 1. 6V Programmable Statistical Calculator

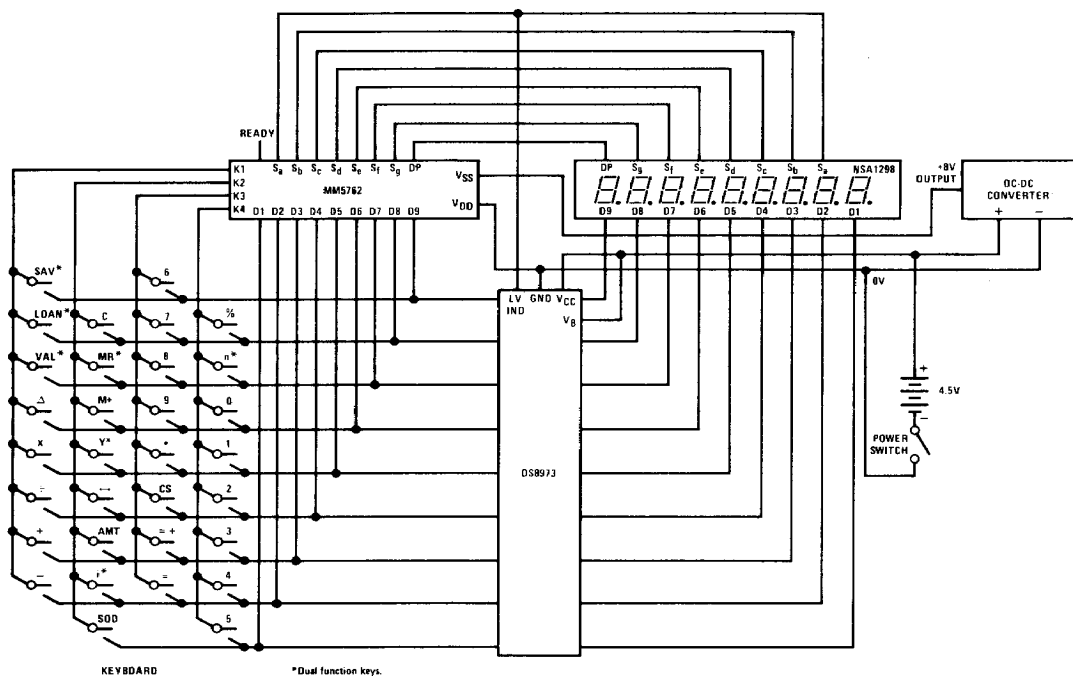


FIGURE 2. Complete Calculator Schematic For 3-Cell System