ULN-2350C AND ULN-2351C
TUFF CHIP® SEMI-CUSTOM INTEGRATED CIRCUITS

FEATURES

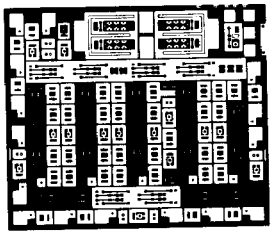
- BV_{CES} = 80 V Min.
- 250 mA Outputs
- 500 Volt Resistors
- High-Gain PNP Transistors
- 80 pF Capacitors
- Time and Cost Savings

TUFF CHIP SEMI-CUSTOM integrated circuits offer substantial time and cost savings for custom circuit applications requiring from 2,000 to 100,000 pieces. This is an area that previously was met by hybrid circuits and, in some cases, by printed wiring boards.

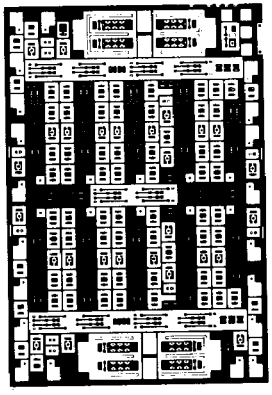
The TUFF CHIP semi-custom approach utilizes a standard array of components fabricated on a single silicon chip: the ULN-2350C contains 460 separate elements; the ULN-2351C provides 261. Besides the traditional complement of NPN and lateral PNP transistors, high-gain vertical PNP transistors are included.

The user lays out the interconnecting circuit, similar to a printed wiring board layout, on sheets provided by Sprague Electric. The artwork is checked by Sprague engineers, and used to generate the customer's proprietary metal mask. Finished circuits are electrically probed and visually inspected. Chips are tray-packed for hybrid circuit manufacturers or are mounted in plastic, ceramic, or hermetic dual in-line packages with from eight to 28 pins.

TUFF CHIP components are optimized for a minimum BV_{CES} of 80 volts. Two or four 250 mA power transistors are provided, and these may be paralleled for high current requirements. On-chip transient protection of sensitive circuit components utilizes deposited film resistors with breakdown voltages higher than 500 volts. On-chip capacitors may be used for noise suppression or filtering.



89 × 104 mils
2.26 × 2.64 mm
ULN-2351C



104 × 150 mils
2.64 × 3.81 mm
ULN-2350C

Circuit users can expect prototypes six to 10 weeks after submitting initial artwork; production quantities can be shipped eight to 10 weeks after prototype approval.

ELECTRICAL CHARACTERISTICS at T_J = +25°C

Characteristic	Limits Min.	Typ.	Max.	Units
Small-Signal NPN Transistors				
h_{FE} at I_C = 1.0 mA	50	150	200	—
Matching of h_{FE}	—	10	20	±%
BV_{CEO} at I_C = 100 µA	30	40	—	V
BV_{CES} at I_C = 100 µA	80	100	—	V
BV_{EBO} at I_E = 100 µA	6.9	—	7.7	V
R_{SAT} at I_B = 100 µA (with plug)	—	300	—	Ω
Cutoff Frequency	—	500	—	MHz
Useful Current Range	0.1	—	10k	µA
NPN Power Transistors				
h_{FE} at I_C = 200 mA	50	150	200	—
BV_{CEO} at I_C = 100 µA	30	40	—	V
BV_{CES} at I_C = 100 µA	80	100	—	V
$V_{CE(SAT)}$ at I_C = 250 mA	—	—	1.4	V
Useful Current Range	2.0	—	250	mA
Lateral PNP Transistors				
h_{FE} at I_C = 100 µA	15	30	—	—
BV_{CEO} at I_C = 10 µA	60	80	—	V
Cutoff Frequency	—	3.0	—	MHz
Vertical PNP Transistors				
h_{FE} at I_C = 100 µA	30	60	—	—
BV_{CEO} at I_C = 10 µA	50	—	—	V
Passive Components				
Resistor Tolerance	—	—	30	±%
Resistor Matching (1:1) Tol.	—	1.0	3.0	±%
BV—Base Resistor to Substrate	—	80	—	V
BV—Deposited Film Resistor to Substrate	500	—	—	V
Capacitance Tolerance	—	40	—	±%
BV—Capacitors	12	—	—	V

COMPONENT LIST

Component	Number of Devices ULN-2350C	ULN-2351C
Small-Signal NPN Transistors	70	38
NPN Power Transistors	4	2
Lateral PNP Transistors	27	14
Vertical PNP Transistors	10	7
5.8 V Zener Diodes	5	2
Base Resistors:		
200Ω	10	5
450Ω	20	12
900Ω	20	12
1.8 kΩ	20	12
3.6 kΩ	20	12
Deposited Film Resistors:		
2.0 kΩ	16	8
4.5 kΩ	58	33
9.0 kΩ	48	28
18 kΩ	50	29
36 kΩ	72	42
80 pF Capacitors	10	5
Bonding Pads	28	19