Table 13.3: QUIETEST results.

Ckt.	# of tran- sistors	# of leakage faults	% selected vectors	Leakage fault coverage	# of weak faults	% selected vectors	Weak fault coverage
1	7584	39295	0.50 %	94.84 %	1923	0.35 %	85.30 %
2	42373	220571	0.99 %	90.50 %	1497	0.21 %	87.64 %

Meyer floating pin technique [350, 712] or circuits in the tester power supply [176]. Off-chip I_{DDQ} measurements are degraded by the pulse width of the CMOS IC transient current, impedance loading of the tester probe (from 20 to 200 pF), and current leakages into/out of the tester. Also, the high noise of the tester load board [176, 283] is caused by impedances on probes that vary with the probe voltage. This can be eliminated if output pins are disconnected or put in high impedance mode during the I_{DDQ} test. Many testers let one multiplex one probe between two chip pins, but this increases tester noise, and requires a slower I_{DDQ} testing rate.

13.3.4 Current Limit Setting

Production I_{DDQ} current testing needs a pass/fail value for the current limit, and it is difficult to pick a correct value. One should evaluate test data from representative circuits and characterize I_{DDQ} current using every vector from a functional vector set and a slow, *precision measurement unit* on a tester [283].

Figure 13.14 [617] shows the relative I_{DDQ} scatter for various vectors. Most devices have low I_{DDQ} current (they are good), but there is a distribution of high-current devices due to gate oxide shorts. There may be a multi-modal distribution with enough separation between the peaks to indicate an appropriate limit for I_{DDQ} current. One should drive the I_{DDQ} limit to $< 1 \ \mu A$. The I_{DDQ} data expose many undetected defects [282, 450, 451, 519, 520]. It is common in production testing to have $1 \ \mu A \leq I_{DDQ} \ limit \ \leq 20 \ \mu A$. A 0.5 to 1 mA limit for I_{DDQ} current on a few vectors can find defects not caught by scan-based stuck-fault voltage testing with 99.6% stuck-at fault coverage [520].
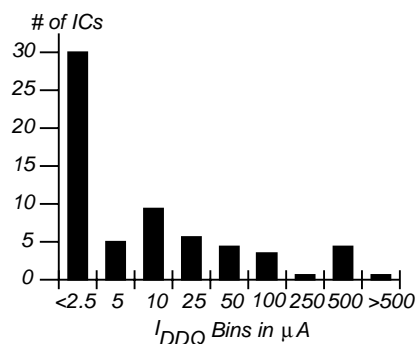
Figure 13.14: I_{DDQ} current histogram for a 32-bit microprocessor.