The ZTX413 Avalanche Transistor

Low Voltage Operation up to 50A

The ZTX413 is the latest addition to the Zetex range of avalanche mode transistors. The ZTX413, in common with the ZTX415 through-hole device, and FMMT415 and FMMT417 surface mount components, are processed and characterised specifically for avalanche mode operation. They can thereby offer advantages such as reliability and reproducible avalanche parameters and circuit performance; factors very difficult to control when attempting to use standard transistors.The ZTX413 provides avalanche operation over a voltage range of 60 to 150V, and can handle pulse avalanche currents of up to 50A (See Figure 1). These features enable the device to be ideally suited as a laser diode driver for range and motion measurements. Simple charge storage methods can be utilised; the circuit shown (see Figure 2) produces a 20A sinusoidal-like pulse of 20ns base width using a 100V supply.

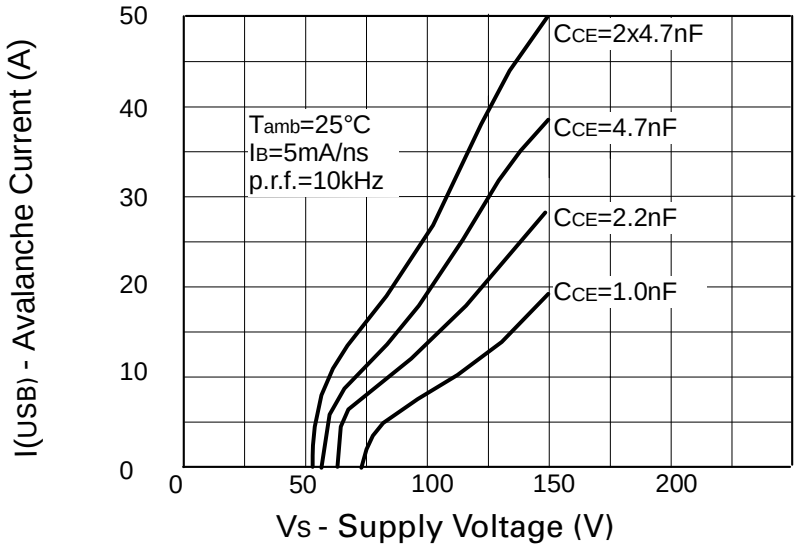

Figure 1.
Avalanche Current against Supply Voltage.

The avalanche current is dependent on the supply voltage, the collector-emitter capacitance, and load and PCB layout inductance. The chart shown indicates the typical pulse current produced for C-E capacitance values of 1nF to 9.4nF (actually 2 off 4n7), over the supply voltage range. The capacitor used for this application must be a low loss, low inductance type. Ceramic chip capacitors (as used for RF circuits) and small, thick leaded disc parts were used for the characterisation of avalanche parameters. The circuit boards are best constructed using a ground-plane technique, and all component leads in the discharge loop must be as short as possible, and be of very low resistance.

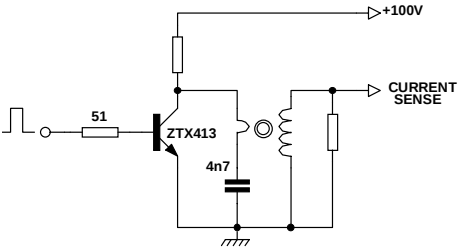

Figure 2
Avalanche Transistor Test Circuit.

Appendix

Papers Detailing Applications Of Avalanche Transistors

Application Of Avalanche Transistors To Circuits With A Long Mean Time To Failure
Werner B.Herden.
IEEE Transactions On Instrumentation And Measurement, Vol.25, No.2 June 1976.

Properties Of Avalanche Injection And Its Application To Fast Pulse Generation And Switching
Yoshihiko Mizushima and Yoshiharu Okamoto.
IEEE Transactions On Electron Devices, Vol. ED-14, No. 3, March 1967

Static And Dynamic Behaviour Of Transistors In The Avalanche Region
Paolo Spirito
Istituto Elettrotecnico, Universita di Napoli, Piazzale Tecchio, 80125 Napoli, Italy
IEEE Journal Of Solid-State Circuits, April 1971.

An Analysis Of The Dynamic Behaviour Of Switching Circuits Using Avalanche Transistors
P. Spirito and G.F. Vitale
IEEE Journal Of Solid-State Circuits, August 1972.