

AC Thyristors & AC Thyristor Triacs

Solid state AC control with overvoltage clamping protection and enhanced immunity to false triggering



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A Power Semiconductor with benefits of small size, simple structure and reliable performance, **Thyristors** are widely used in the electronic control of Home Appliances and industrial applications. **Triacs**, as bi-directional thyristors, are the only semiconductor devices that can control current in both directions to directly control AC loads like induction motors, universal brush motors, AC valves and solenoids, electric heaters, etc. as used in White Goods and small home appliances as well as industrial applications.

False triggering when a triac is in the off-state can be a problem in some applications. System noise, unsuppressed load switching and other transients on the AC line can introduce high overvoltages and high dV/dt across the triac. Exceeding a triac's V_{DRM} and dV_p/dt capability is a major cause of false triggering. The triac may then be damaged if the load current rises too fast (excessive $dI_T/dt > 100A/\mu s$).

WeEn Semiconductors, as a leading supplier to the worldwide thyristor market, is constantly developing new designs and enhanced technologies to yield better performance, higher reliability and products that are easy to use. Based on our unique Planar Passivation technology, which is used on all our thyristors, we have introduced and continue to expand our product families with embedded overvoltage protection:

- AC Thyristors (ACT)
- AC Thyristor Triacs (ACTT)

The ACT & ACTT series products can clamp overvoltage transients without false triggering into conduction. This sets them apart from conventional 3Q and "Snubberless" triacs, which are not guaranteed to clamp and can spontaneously turn on if an overvoltage exceeds their voltage-blocking capability. The ability to clamp instead of turning on reduces a major cause of false triggering.

During overvoltage clamping, the transient energy is safely dissipated in a region on the

Latest generation AC Thyristor Triac
 (12A, 800V, 35mA I_{GT})
Clamping at 1.1kV, 15mA!

Conventional 3Q triac
 (12A, 800V, 35mA I_{GT})
No clamping

$I_{T(RMS)}$ (A)	V_{DRM} (V)	I_{GT} (max) (mA)	SO8	SOT54 (TO-92)	SOT78 (TO-220AB)	SOT186A (isolated TO-220AB)	SOT223	SOT226 (I ² PAK)	SOT404 (D ² PAK)	SOT428 (DPAK)
0.2	600	D	ACT102H							
0.8	600	D/E		ACT108			ACT108W			
0.8	800	E		ACT108			ACT108W			
2	800	E				ACTT2X				ACTT2S
2	800	ETN				ACTT2X	ACTT2W			ACTT2S
4	800	C/E				ACTT4X				ACTT4S
6	800	E			ACTT6	ACTT6X		ACTT6G	ACTT6B	
6	800	CN			ACTT6	ACTT6X			ACTT6B	
8	800	C0/C0T			ACTT8	ACTT8X			ACTT8B	
8	800	CTN			ACTT8	ACTT8X			ACTT8B	
10	800	C/CT			ACTT10	ACTT10X				
10	800	CTN			ACTT10	ACTT10X			ACTT10B	
12	800	C/CT			ACTT12	ACTT12X			ACTT12B	
12	800	CTN			ACTT12	ACTT12X			ACTT12B	
16	800	CTN			ACTT16	ACTT16X			ACTT16B	

I_{GT} key: D: 5mA C: 35mA C0: 5 - 30mA E: 10mA N: enhanced dynamic performance T: high T_{jmax} 150°C

silicon chip that's designed for that purpose. It is not a random or risky event as can be the case with older technologies, especially non-planar. As clamping current increases, the device will eventually turn on as a self-protection feature to avoid permanent damage. The difference from conventional triacs is turn-on at milliamperes instead of microamperes of clamping current.

The screen shots compare the overvoltage clamping performance of ACTT and conventional triac. There is effectively no clamping with the conventional triac.

The clamping feature withstands 2000 – 2500V overvoltage transients to IEC 61000-4-5 standard.

In addition to its overvoltage clamping capability, WeEn's technology possesses the industry's highest false trigger immunity guarantees with

top products boasting a min dV_p/dt guarantee of $2000V/\mu s @ T_j = 150^\circ C$ (ACTT12-800CTN). These device capabilities maximise the whole system noise immunity and false trigger immunity.

WeEn Semiconductors has a comprehensive ACT and ACTT offering, with products covering $I_{T(RMS)}$ from 0.2A to 16A and V_{DRM} from 600V to 800V. There are multiple package options and most parts have $T_{j(max)}$ capability of 150°C.

WeEn continues to develop more ACT / ACTT products. A recent addition to the portfolio is the ACTT2W-800ETN. This is the first 2A-rated device in SOT223 with 150°C $T_{j(max)}$ and overvoltage clamping function. Its excellent immunity, dynamic performance and inrush capability bring major benefits to engineers for their small load electronic designs.

