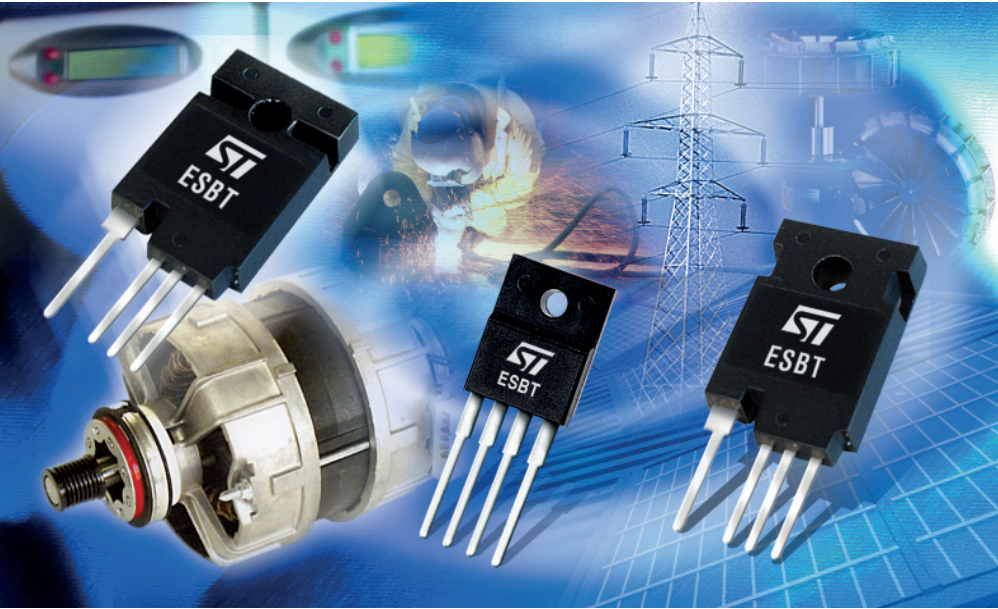


# ESBT<sup>®</sup> Emitter Switched Bipolar Transistors



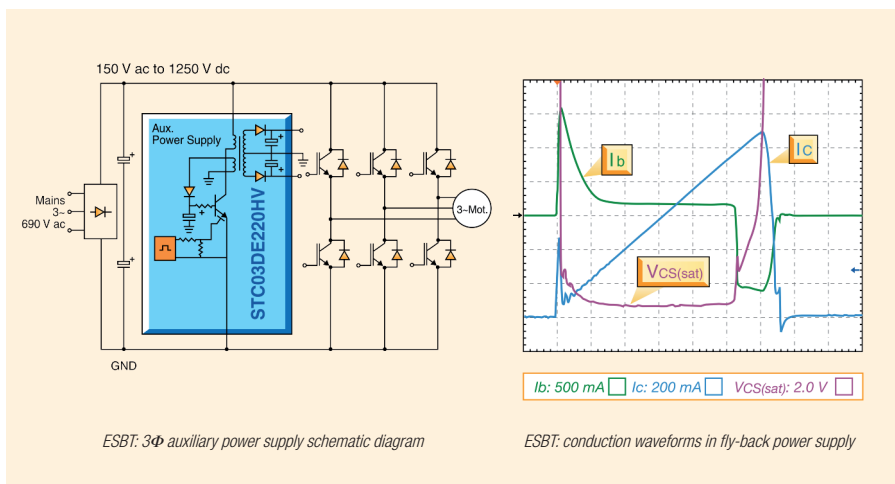
July 2007

## The ESBT product family

Based on an emitter switching concept, the new ESBT family of high-performance power actuators provides a simple, cost-effective solution for applications requiring both high voltage and high switching frequency. The ESBT family of products also offers design flexibility with a complete series of power switches with breakdown voltages ranging from 900 V to 2200 V, capable of handling power requirements up to several kW. This higher breakdown voltage allows power supply designers to accept a higher input voltage range.

## ESBT in 3 $\Phi$ auxiliary power supplies

Industrial high-power applications typically require a high voltage rectified bus built on a 3-phase mains voltage. Auxiliary power supplies are necessary to feed the supporting circuitry needed for the correct functioning of the main inverter. Since nearly all auxiliary power supplies are based on fly-back converters, power switches are required to sustain voltages of 1200 V and above. The simplified schematic diagram of an auxiliary power supply shown below is widely used in high power 3-phase motor drives.



## ESBT in single phase power supplies

Consumer and computer power supply designs aimed at improving the trade-off between cost and efficiency are based on flyback and forward single switch topologies. The 900 V minimum voltage capabilities of ESBT technology provide at least a 100 V higher margin for all devices in the ESBT product range, making them the cheapest and most highly efficient solution for consumer and computer applications. To address the double sourcing requirement for applications in this segment, a special TO220-4L package has been developed which offers PIN to PIN compatibility with standard Power MOSFETs for the first three pins.

## ESBT product range

$V_{CS(SS)}$ [V]	Part number	$I_C @ \eta_{FE} = 10$ / $V_{CS(on)} = 1$ V [A]	$I_C @ \eta_{FE} = 5$ / $V_{CS(on)} = 1$ V [A]	$R_{CS(on)}^{\Delta}$ ( $\Omega$ )	Solution	Package	$P_{tot}$ [W]	Main application
900	STC12IE90HV	6	12	0.083	Monolithic	T0247-4L HV	208	SMPS, PFC
	STP12IE90F4	6	12	0.083	Monolithic	T0220FP-4L	21	SMPS, PFC
	STC20DE90HP	10	20	0.060	Hybrid	T0247-4L HP	46	SMPS, PFC
	STC20DE90HV*	10	20	0.060	Hybrid	T0247-4L HV	139	SMPS, PFC
950	STP12IE95F4	6	12	0.083	Monolithic	T0220FP-4L	21	SMPS, PFC
1000	STE50DE100	30	50	0.026	Hybrid	ISOTOP®	160	Industrial converters
1200	STC05DE120HV*	2.5	5	0.180	Hybrid	T0247-4L HV	100	SMPS, PFC
	STC08IE120HP	4	8	0.100	Monolithic	T0247-4L HP	48	SMPS, PFC
	STC08IE120HV	4	8	0.100	Monolithic	T0247-4L HV	208	SMPS, PFC
	STP08IE120F4*	4	8	0.100	Monolithic	T0220FP-4L	21	SMPS, PFC
	STE70IE120*	45	70	0.014	Monolithic	ISOTOP	TBD	Solar panels, Industrial converters
1500	STC05IE150HP	2	5	0.120	Monolithic	T0247-4L HP	49	SMPS, PFC for 3-phase mains
	STC05IE150HV	2	5	0.120	Monolithic	T0247-4L HV	208	SMPS, PFC for 3-phase mains
	STC08IE150HV*	3	8	0.100	Monolithic	T0247-4L HV	208	SMPS, PFC for 3-phase mains
	STC08DE150HP	5	8	0.075	Hybrid	T0247-4L HP	42	SMPS, PFC for 3-phase mains
	STC08DE150HV	5	8	0.075	Hybrid	T0247-4L HV	156	SMPS, PFC for 3-phase mains
1700	STC03DE170HP	0.7	1.8	0.550	Hybrid	T0247-4L HP	35.5	SMPS, PFC for 3-phase mains
	STC03DE170HV	0.7	1.8	0.550	Hybrid	T0247-4L HV	100	SMPS, PFC for 3-phase mains
	STC04IE170HP	1.5	4	0.150	Monolithic	T0247-4L HP	50	SMPS, PFC for 3-phase mains
	STC04IE170HV	1.5	4	0.150	Monolithic	T0247-4L HV	178	SMPS, PFC for 3-phase mains
	STC06IE170HV	3	6	0.170	Monolithic	T0247-4L HV	208	SMPS, PFC or 3-phase mains
2200	STC03DE220HV	3	6	0.550	Hybrid	T0247-4L HV	195	SMPS, PFC for 3-phase mains

\* Under development  $\Delta V_{CS(on)} / I_C @ \eta_{FE} = 5$

## Features and benefits

- High voltage capability: 900 V to 2,200 V
- Low on-voltage drop: less than 1 V at nominal current
- High switching frequency: up to 150 kHz
- Cooler and more reliable operation

# Marketing tools

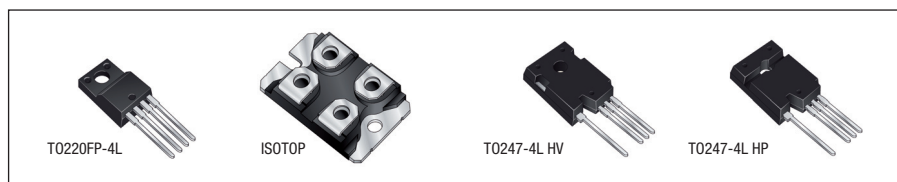
## Evaluation boards

Order code	Output power [W]	Description	Input voltage [V dc]	Output voltage [V dc]	Efficiency [%]	Related part number	Related application note
STEVAL-IPB001V1	2	2 W 3-phase SMPS for breaker based on ESBT	150 to 1250	24	> 80	STC04IE170HP	AN2454
STEVAL-ISA030V1	6	6 W 3-phase SMPS for metering based on ESBT	150 to 850	14	> 80	STC04IE170HP	AN2528
STEVAL-ISA019V1	80	80 W ESBT quasi-resonant wide range SMPS with L6565 for 3-phase applications	250 to 850	24	> 80	STC04IE170HV	AN2495
STEVAL-ISA015V2	100	3-phase power supply with ESBT (100 W)	450 to 700	24	> 85	STC04IE170HV	AN2252
STEVAL-ISA007V1	150	3-phase auxiliary power supply design (150 W) based on emitter switched bipolar transistors (ESBTs)	450 to 850	24	> 80	STC08DE150HV	AN2131

Application notes	Description
AN1699	Efficient driving network for ESBT to reduce the dynamic $V_{CE(sat)}$ and enhance switching performances
AN1889	ESBT STC03DE170HV in 3-phase auxiliary power supplies
AN2050	3-phase auxiliary power supply design based on ESBTs
AN2252	Zero-voltage switching and emitter-switched bipolar transistor in a 3-phase auxiliary power supply
AN2131	High power 3-phase auxiliary power supply design based on L5991 and ESBT STC08DE150HV
AN2454	Universal input voltage power supply for ESBT based breaker and metering applications
AN2495	80 W very wide input voltage range 3-phase SMPS design based on L6565 and ESBT STC04IE170
AN2528	Very wide input voltage range 6 W SMPS for metering

Please contact your local ST sales office for reference design boards ranging from 2 W to 300 W  
For a complete list of resources visit [www.st.com/esbt](http://www.st.com/esbt)

## ESBT package options



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