



STC03DE170

HYBRID EMITTER SWITCHED BIPOLAR TRANSISTOR ESBT™ 1700 V - 3 A - 0.55 Ω

Table 1: General Features

$V_{CS(ON)}$	I_C	$R_{CS(ON)}$
1 V	1.8 A	0.55 Ω

- LOW EQUIVALENT ON RESISTANCE
- VERY FAST-SWITCH, UP TO 150 kHz
- SQUARED RBSOA, UP TO 1700 V
- VERY LOW C_{ISS} DRIVEN BY $R_G = 4.7 \Omega$

APPLICATION

- AUX SMPS FOR THREE PHASE MAINS

DESCRIPTION

The STC03DE170 is manufactured in a hybrid structure, using dedicated high voltage Bipolar and low voltage MOSFET technologies, aimed to providing the best performance in ESBT topology. The STC03DE170 is designed for use in aux flyback smps for any three phase application.

Figure 1: Package

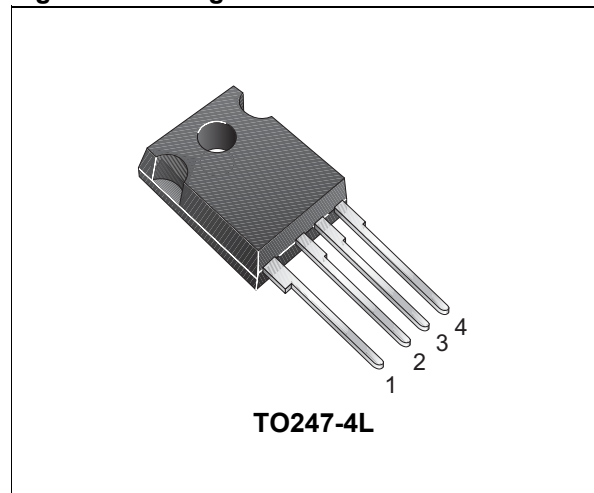


Figure 2: Internal Schematic Diagram

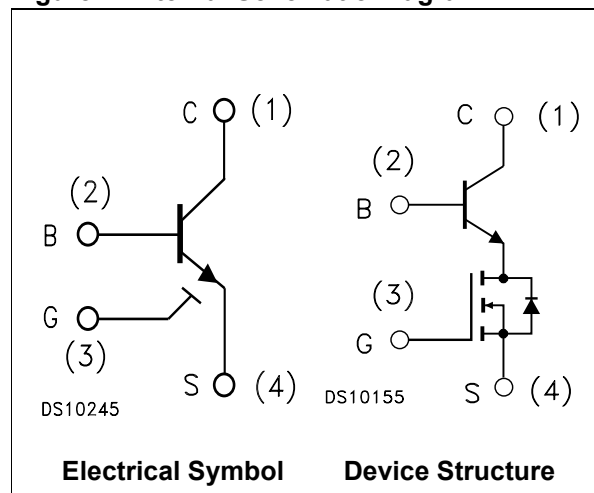


Table 2: Order Code

Part Number	Marking	Package	Packaging
STC03DE170	STC03DE170	TO247-4L	TUBE

STC03DE170**Table 3: Absolute Maximum Ratings**

Symbol	Parameter	Value	Unit
$V_{CS(SS)}$	Collector-Source Voltage ($V_{BS} = V_{GS} = 0\text{ V}$)	1700	V
$V_{BS(OS)}$	Base-Source Voltage ($I_C = 0, V_{GS} = 0\text{ V}$)	30	V
$V_{SB(OS)}$	Source-Base Voltage ($I_C = 0, V_{GS} = 0\text{ V}$)	9	V
V_{GS}	Gate-Source Voltage	± 20	V
I_C	Collector Current	3	A
I_{CM}	Collector Peak Current ($t_p < 5\text{ ms}$)	6	A
I_B	Base Current	2	A
I_{BM}	Base Peak Current ($t_p < 1\text{ ms}$)	4	A
P_{tot}	Total Dissipation at $T_C = 25\text{ °C}$	100	W
T_{stg}	Storage Temperature	-65 to 125	°C
T_J	Max. Operating Junction Temperature	125	°C

Table 4: Thermal Data

Symbol	Parameter	Unit
$R_{thj-case}$	Thermal Resistance Junction-Case Max	1 °C/W

Table 5: Electrical Characteristics ($T_{case} = 25\text{ °C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CS(SS)}$	Collector-Source Current ($V_{BS} = V_{GS} = 0\text{ V}$)	$V_{CS(SS)} = 1700\text{ V}$			100	μA
$I_{BS(OS)}$	Base-Source Current ($I_C = 0, V_{GS} = 0\text{ V}$)	$V_{BS(OS)} = 30\text{ V}$			10	μA
$I_{SB(OS)}$	Source-Base Current ($I_C = 0, V_{GS} = 0\text{ V}$)	$V_{SB(OS)} = 9\text{ V}$			100	μA
$I_{GS(OS)}$	Gate-Source Leakage	$V_{GS} = \pm 20\text{ V}$			500	nA
$V_{CS(ON)}$	Collector-Source ON Voltage	$V_{GS} = 10\text{ V } I_C = 1.8\text{ A } I_B = 0.36\text{ A}$ $V_{GS} = 10\text{ V } I_C = 0.7\text{ A } I_B = 70\text{ mA}$		1 1	1.5 1.3	V V
h_{FE}	DC Current Gain	$I_C = 1.8\text{ A } V_{CS} = 1\text{ V } V_{GS} = 10\text{ V}$ $I_C = 0.7\text{ A } V_{CS} = 1\text{ V } V_{GS} = 10\text{ V}$	3.5 6	5 10		
$V_{BS(ON)}$	Base-Source ON Voltage	$V_{GS} = 10\text{ V } I_C = 1.8\text{ A } I_B = 0.36\text{ A}$ $V_{GS} = 10\text{ V } I_C = 0.7\text{ A } I_B = 70\text{ mA}$		1 0.8	1.2 1	V V
$V_{GS(th)}$	Gate Threshold Voltage	$V_{BS} = V_{GS} \quad I_B = 250\text{ }\mu\text{A}$	1.5	2.2	3	V
C_{iss}	Input Capacitance	$V_{CS} = 25\text{ V} \quad f = 1\text{ MHz}$ $V_{GS} = V_{CB} = 0$		750		pF
$Q_{GS(tot)}$	Gate-Source Charge	$V_{CS} = 15\text{ V} \quad V_{GS} = 10\text{ V}$ $V_{CB} = 0 \quad I_C = 1.8\text{ A}$		12.5		nC
t_s	INDUCTIVE LOAD Storage Time	$V_{GS} = 10\text{ V}$ $R_G = 47\text{ }\Omega \quad V_{Clamp} = 1200\text{ V}$		760		ns
t_f	Fall Time	$t_p = 4\text{ }\mu\text{s} \quad I_C = 1.8\text{ A } I_B = 0.36\text{ A}$		14		ns

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_s t_f	INDUCTIVE LOAD	$V_{GS} = 10\text{ V}$				
	Storage Time	$R_G = 47\ \Omega$ $V_{Clamp} = 1200\text{ V}$		690		ns
	Fall Time	$t_p = 4\ \mu\text{s}$ $I_C = 0.7\text{ A}$ $I_B = 70\text{ mA}$		32		ns
V_{CSW}	Maximum Collector-Source Voltage without Snubber	$R_G = 47\ \Omega$ $h_{FE} = 5\text{ A}$ $I_C = 3\text{ A}$	1500			V
$V_{CS(dyn)}$	Collector-Source Dynamic Voltage (500 ns)	$V_{CC} = V_{Clamp} = 400\text{ V}$ $V_{GS} = 10\text{ V}$ $R_G = 47\ \Omega$ $I_C = 0.5\text{ A}$ $I_B = 0.1\text{ A}$ $I_{Bpeak} = 1\text{ A}$ $t_{peak} = 500\text{ ns}$		3.9		V
$V_{CS(dyn)}$	Collector-Source Dynamic Voltage (1 μs)	$V_{CC} = V_{Clamp} = 400\text{ V}$ $V_{GS} = 10\text{ V}$ $R_G = 47\ \Omega$ $I_C = 0.5\text{ A}$ $I_B = 0.1\text{ A}$ $I_{Bpeak} = 1\text{ A}$ $t_{peak} = 500\text{ ns}$		2.2		V

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Figure 3: Safe Operating Area

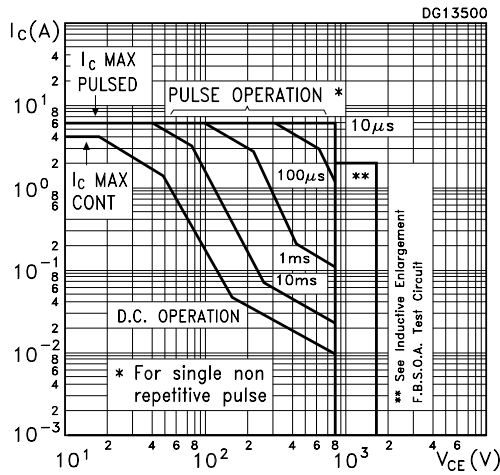


Figure 4: Reverse Biased Safe Operating Area

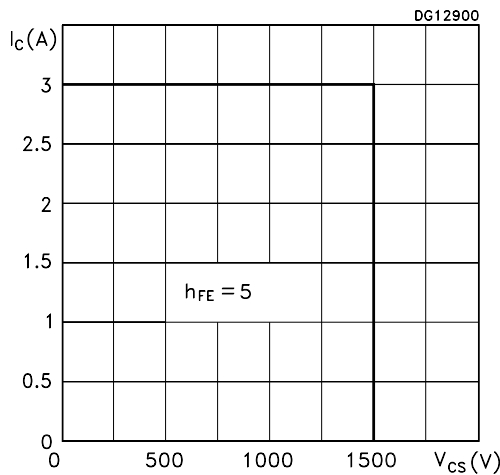


Figure 5: DC Current Gain

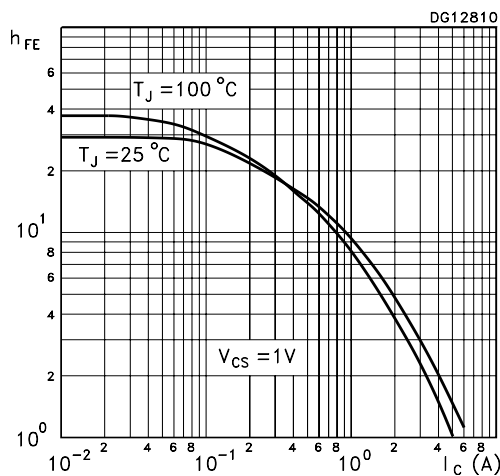


Figure 6: Output Characteristics

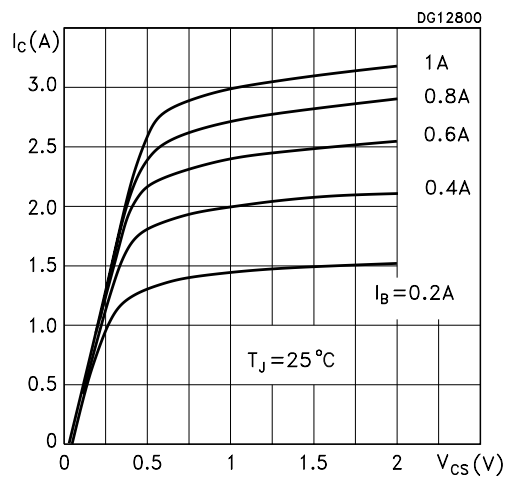


Figure 7: Gate Threshold Voltage vs Temperature

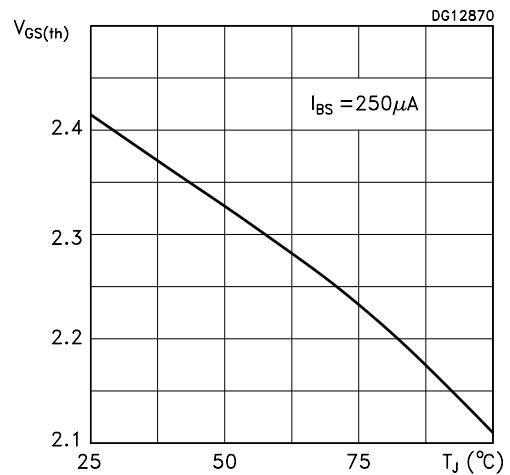


Figure 8: DC Current Gain

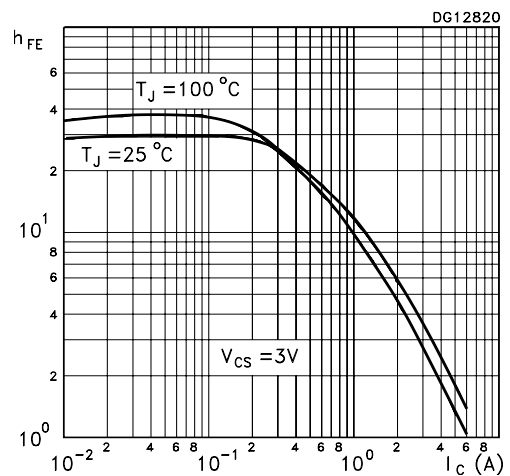


Figure 9: Collector-Source On Voltage

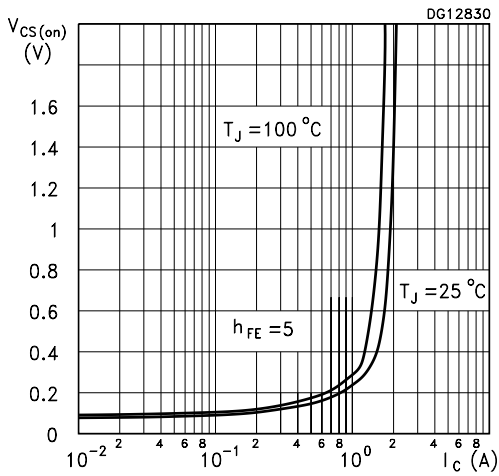


Figure 10: Base-Source On Voltage

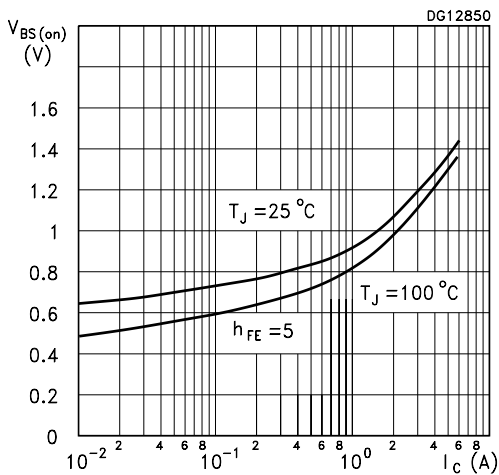


Figure 11: Inductive Load Switching Time

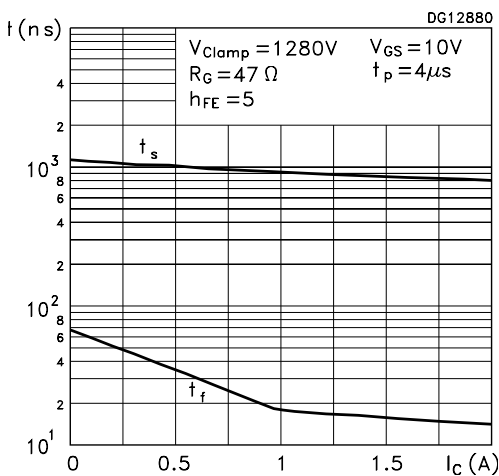


Figure 12: Collector-Source On Voltage

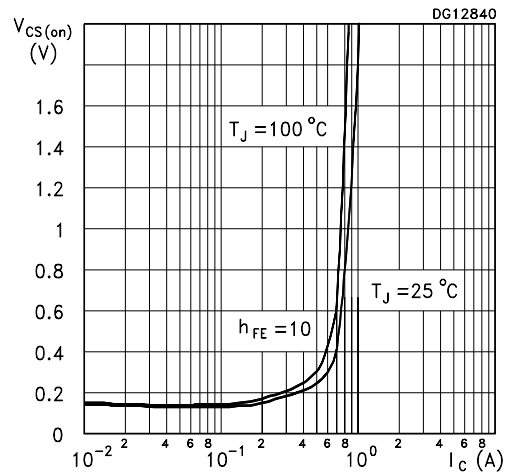


Figure 13: Base-Source On Voltage

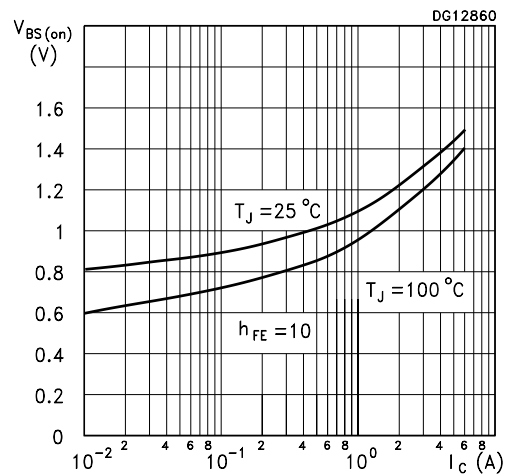
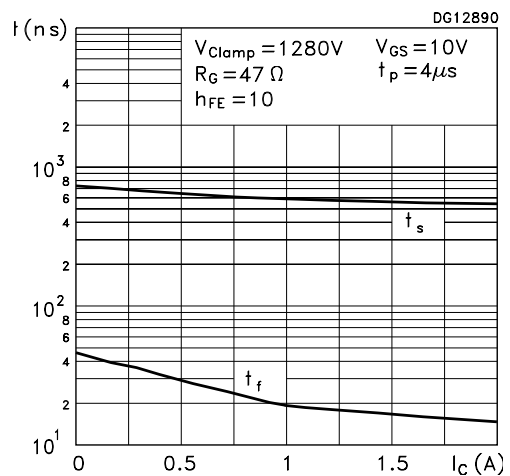


Figure 14: Inductive Load Switching Time



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Figure 15: Dynamic Collector-Emitter Saturation Voltage

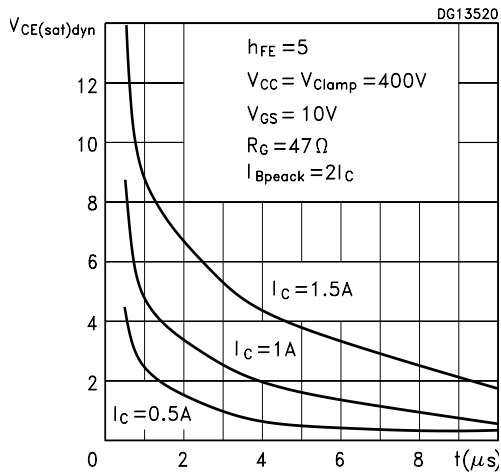


Figure 16: Inductive Load Enlargement FBSOA Circuit

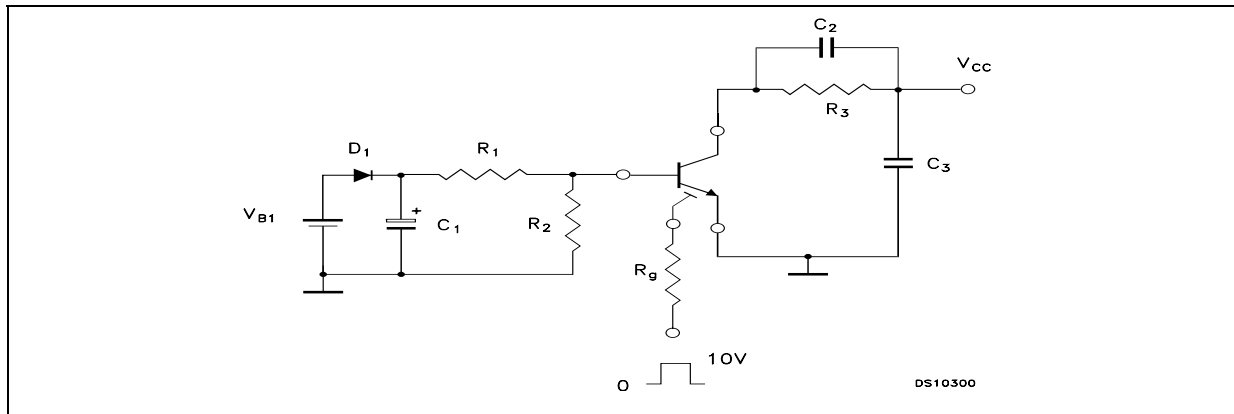
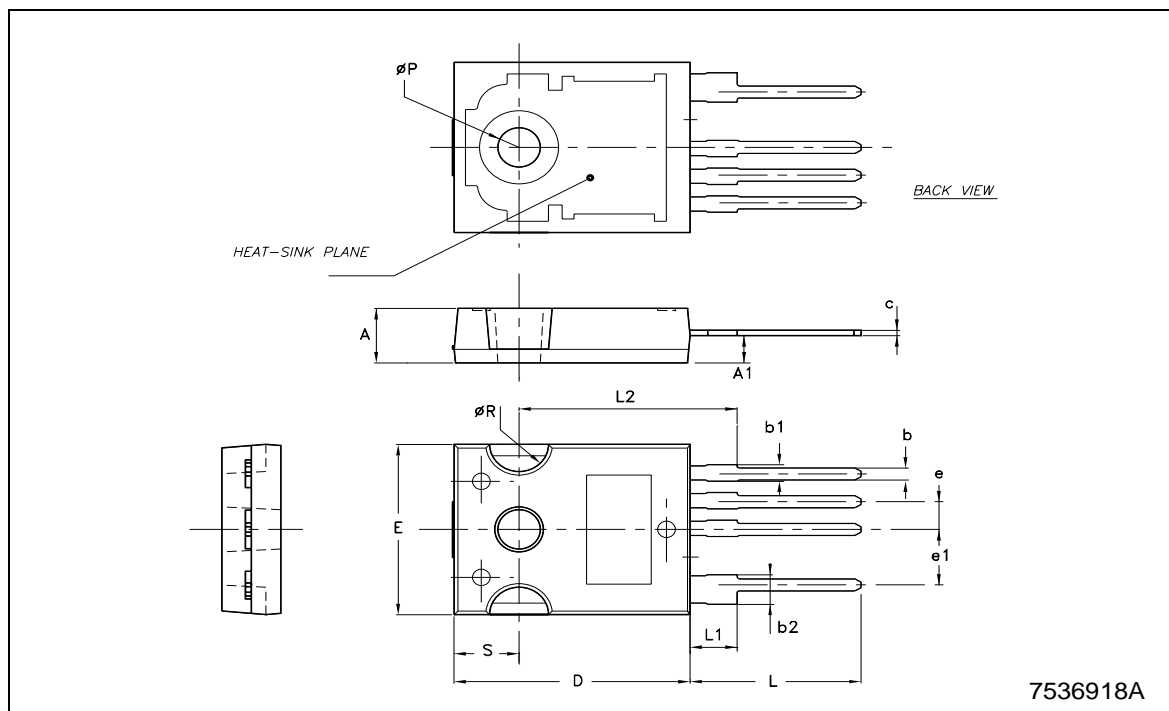


Table 6: Components, Values

$V_{B1} = 4.16 V$	$C_1 = 220 nF$
$D_1 = BA157$	$C_2 \leq 70 pF$
$R_1 = 1 \Omega$	$C_3 = 50 nF$
$R_2 = 100 \Omega$	$V_g = 10 V$
$R_3 = V_{CC} / I_{Cn}$	Pulse Time = $5 \mu s$
$R_g = 47 \Omega$	

TO247-4L MECHANICAL DATA

DIM.	mm		
	MIN.	TYP.	MAX.
A	4.85		5.15
A1	2.20		2.60
b	0.95	1.10	1.30
b1	1.30		1.70
b2	2.50		2.90
c	0.40		0.80
D	19.85		20.15
E	15.45		15.75
e		2.54	
e1		5.08	
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
ØP	3.55		3.65
ØR	4.50		5.50
S		5.50	



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Table 7: Revision History

Date	Release	Change Designator
13-Sep-2004	1	First Release.
04-Oct-2004	2	Figure 15 has been updated on page 6.

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