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 RG = 4.7 Ω

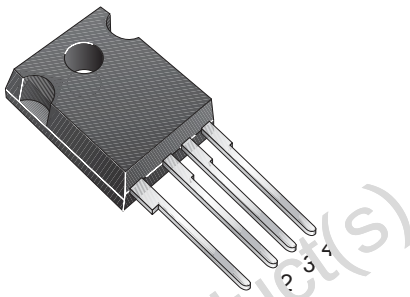
APPLICATION

- AUX SMPS FOR THREE PHASE MAINS

DESCRIPTION

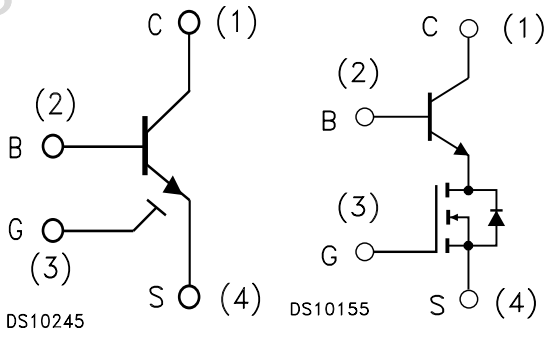
The STC03DE170 is manufactured in a hybrid structure, using dedicated high voltage Bipolar and low voltage MOSFET technologies, aimed to providing the best performance in ESBT topology. The STC03DE170 is designed for use in aux flyback smps for any three phase application.

Figure 1: Package



TO247-4L

Figure 2: Internal Schematic Diagram



Electrical Symbol **Device Structure**

Table 2: Order Code

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

Table 3: Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
$V_{CS(SS)}$	Collector-Source Voltage (V_{BS} = V_{GS} = 0 V)	1700	V
$V_{BS(OS)}$	Base-Source Voltage (I_C= 0, V_{GS} = 0 V)	30	V
$V_{SB(OS)}$	Source-Base Voltage (I_C= 0, V_{GS} = 0 V)	9	V
V_{GS}	Gate-Source Voltage	± 20	V
I_C	Collector Current	3	A
I_{CM}	Collector Peak Current (t_p < 5ms)	6	A
I_B	Base Current	2	A
I_{BM}	Base Peak Current (t_p < 1ms)	4	A
P_{tot}	Total Dissipation at T_C = 25 °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
$R_{thj\text{-}case}$	Thermal Resistance Junction-Case Max	1	°C/W

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

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

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

Figure 3: Safe Operating Area

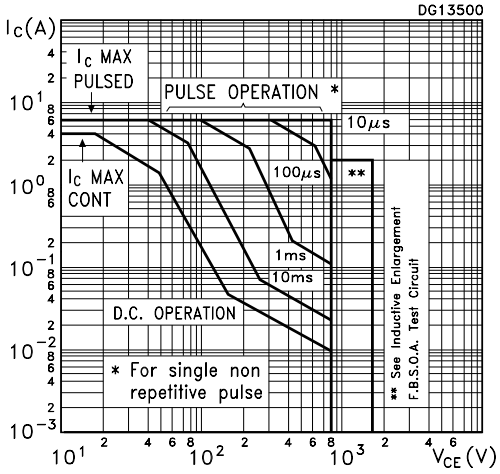


Figure 4: Reverse Biased Safe Operating Area

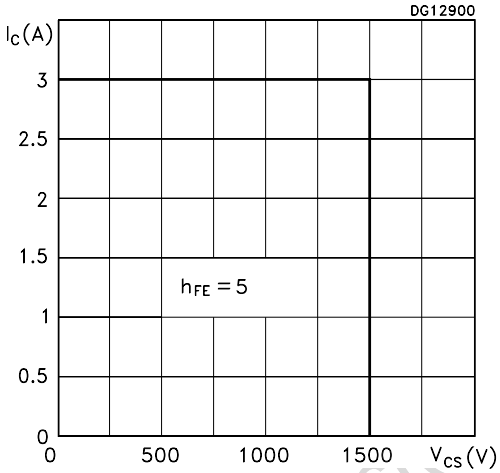


Figure 5: DC Current Gain

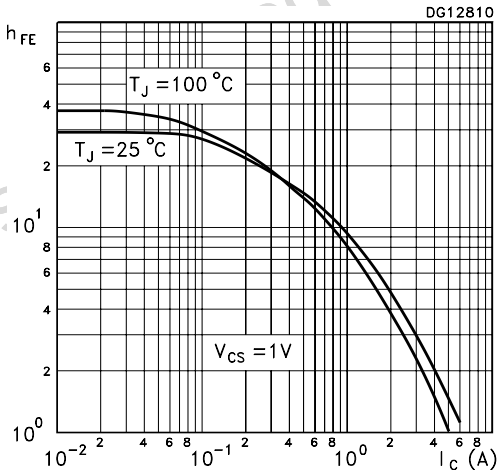


Figure 6: Output Characteristics

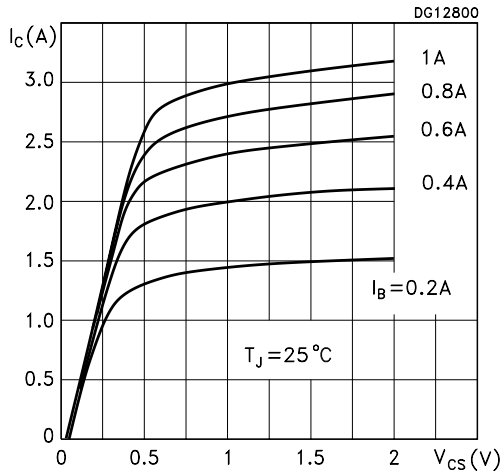


Figure 7: Gate Threshold Voltage vs Temperature

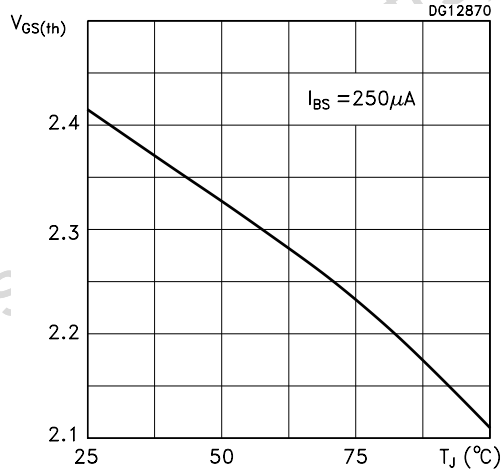


Figure 8: DC Current Gain

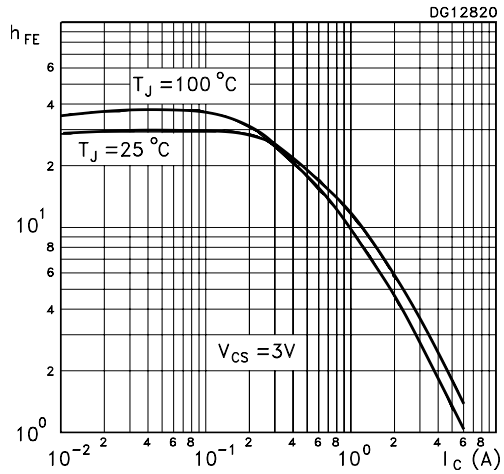


Figure 9: Collector-Source On Voltage

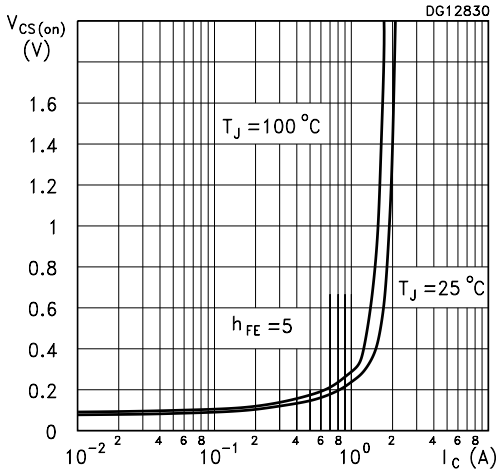


Figure 10: Base-Source On Voltage

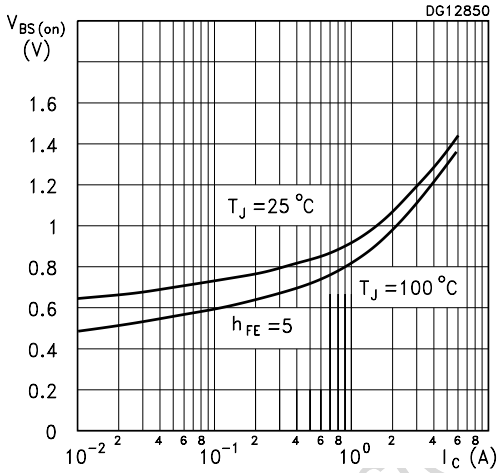


Figure 11: Inductive Load Switching Time

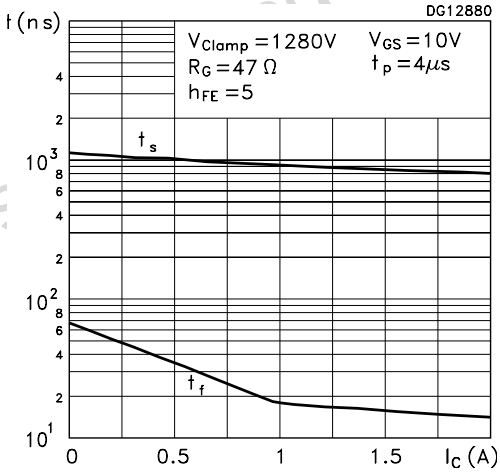


Figure 12: Collector-Source On Voltage

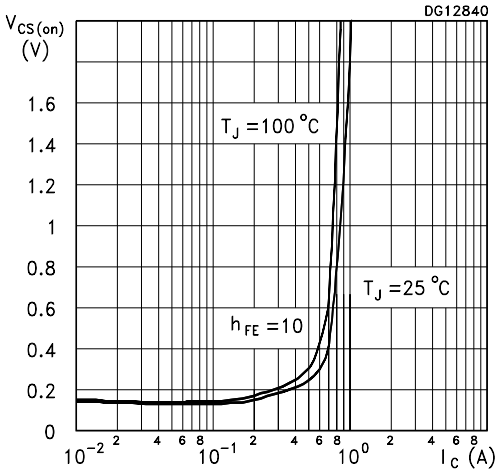


Figure 13: Base-Source On Voltage

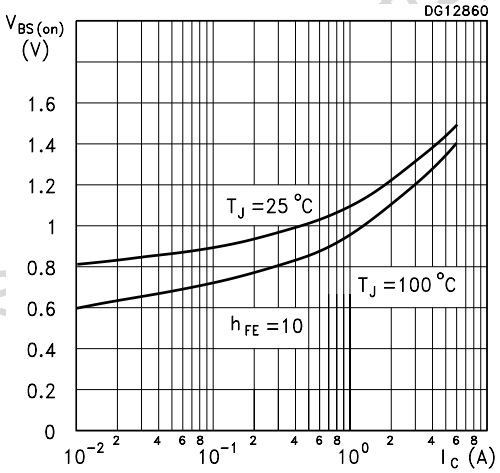


Figure 14: Inductive Load Switching Time

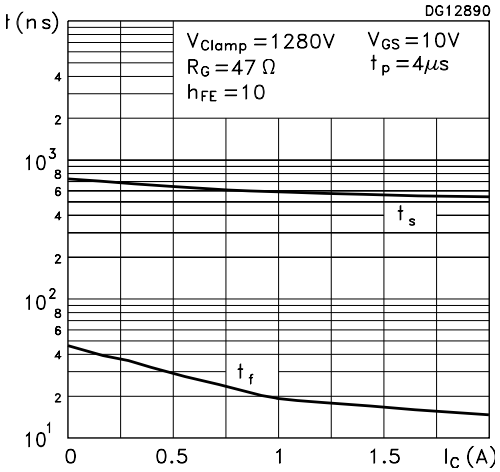


Figure 15: Dynamic Collector-Emitter Saturation Voltage

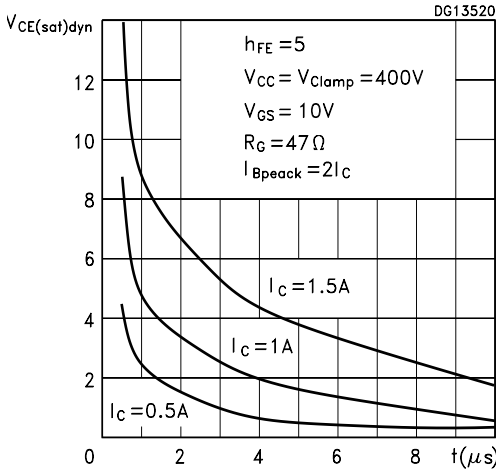


Figure 16: Inductive Load Enlargement FBSOA Circuit

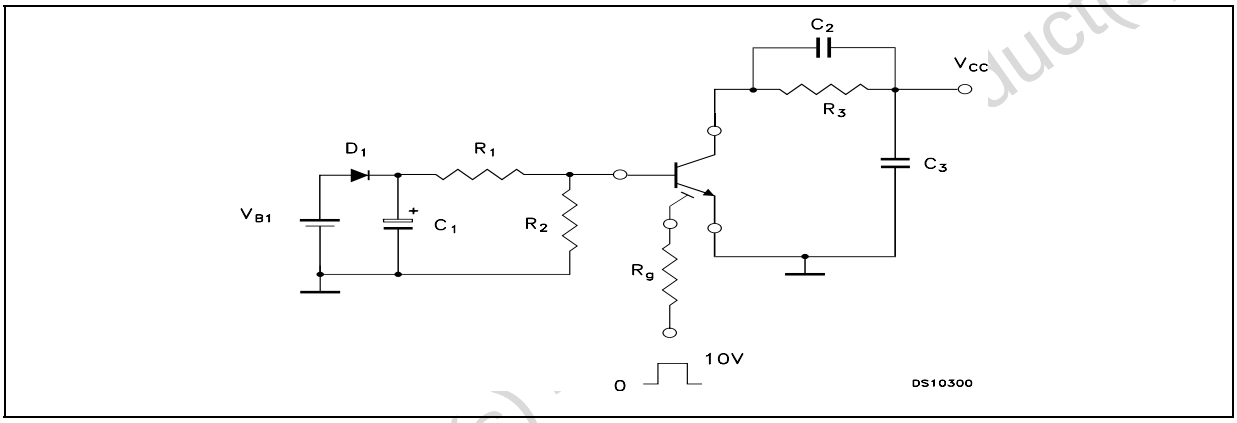


Table 6: Components, Values

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

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	

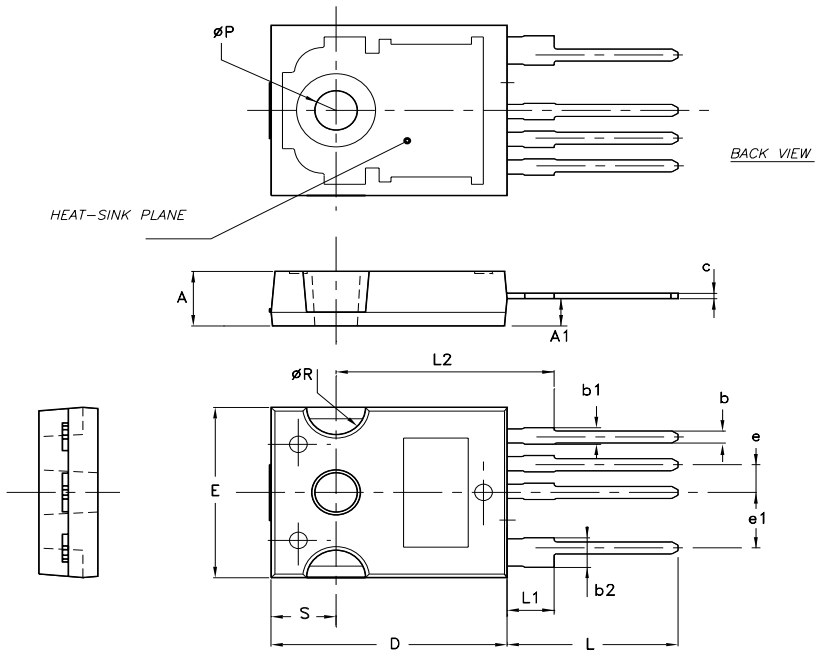


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Table 7: Revision History

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