SGS-THOMSON MICROELECTRONICS

S G S-THOMSON

STF4045DF
STF4045DV

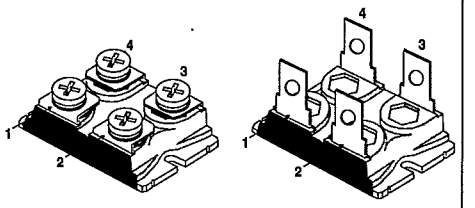
T-33-35

NPN DARLINGTON POWER MODULE

- EASY TO DRIVE TECHNOLOGY (ETD)
- HIGH CURRENT POWER BIPOLAR
- MODULE VERY LOW R_{th} JUNCTION CASE
- SPECIFIED ACCIDENTAL OVERLOAD AREAS
- ULTRAFAST FREEWHEELING DIODE
- ISOLATED CASE (2500V RMS)
- EASY TO MOUNT
- LOW INTERNAL PARASITIC INDUCTANCE

INDUSTRIAL APPLICATIONS:

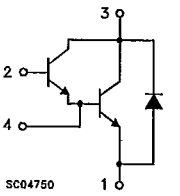
- MOTOR CONTROL
- SMPS & UPS
- WELDING EQUIPMENT



STF4045DV STF4045DF

ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CEV}	Collector-Emitter Voltage (V_{BE} = -5 V)	600	V
$V_{CEO(sus)}$	Collector-Emitter Voltage (I_B = 0)	450	V
V_{EBO}	Emitter-Base Voltage (I_C = 0)	7	V
I_C	Collector Current	42	A
I_{CM}	Collector Peak Current (t_p = 10 ms)	63	A
I_B	Base Current	4	A
I_{BM}	Base Peak Current (t_p = 10 ms)	8	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	W
T_{stg}	Storage Temperature	-55 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	V

THERMAL DATA

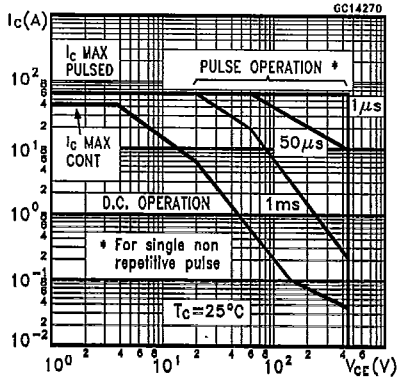
$R_{thj\text{-}case}$	Thermal Resistance Junction-case (transistor)	Max	0.83	°C/W
$R_{thj\text{-}case}$	Thermal Resistance Junction-case (diode)	Max	1.5	°C/W
$R_{thc\text{-}h}$	Thermal Resistance Case-heatsink With Conductive Grease Applied	Max	0.05	°C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

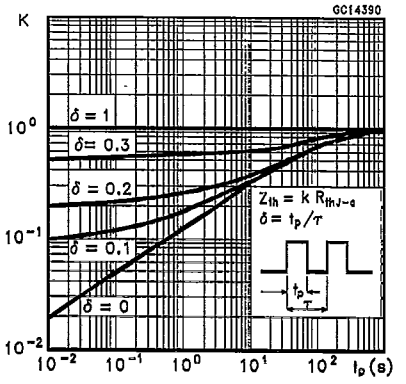
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CER} #	Collector Cut-off Current (R_{BE} = 5 Ω)	V_{CE} = V_{CEV} V_{CE} = V_{CEV} T_j = 100 °C			1 7	mA mA
I_{CEV} #	Collector Cut-off Current (V_{BE} = -5)	V_{CE} = V_{CEV} V_{CE} = V_{CEV} T_j = 100 °C			1 7	mA mA
I_{EBO} #	Emitter Cut-off Current (I_C = 0)	V_{EB} = 5 V			1	mA
$V_{CEO(sus)}$*	Collector-Emitter Sustaining Voltage	I_C = 0.2 A L = 25 mH V_{clamp} = 450 V	450			V
h_{FE}*	DC Current Gain	I_C = 35 A V_{CE} = 5 V		300		
$V_{CE(sat)}$*	Collector-Emitter Saturation Voltage	I_C = 25 A I_B = 0.5 A I_C = 25 A I_B = 0.5 A T_j = 100 °C I_C = 35 A I_B = 2 A I_C = 35 A I_B = 2 A T_j = 100 °C		1.2 1.3 1.4 1.4	 2 2	V V V V
$V_{BE(sat)}$*	Base-Emitter Saturation Voltage	I_C = 35 A I_B = 2 A I_C = 35 A I_B = 2 A T_j = 100 °C		2.3 2.3	 3	V V
dI_C/dt	Rate of Rise of On-state Collector	V_{CC} = 300 V R_C = 0 t_p = 3 µs I_{B1} = 0.75 A T_j = 100 °C	200			A/µs
V_{CE}(3 µs)	Collector-Emitter Dynamic Voltage	V_{CC} = 300 V R_C = 12 Ω I_{B1} = 0.75 A T_j = 100 °C		2	4	V
V_{CE}(5 µs)	Collector-Emitter Dynamic Voltage	V_{CC} = 300 V R_C = 12 Ω I_{B1} = 0.75 A T_j = 100 °C		1.6	3	V
t_s t_f t_c	Storage Time Fall Time Cross-over Time	I_C = 25 A V_{CC} = 50 V V_{BB} = -5 V R_{BB} = 0.6 Ω V_{clamp} = 450 V I_{B1} = 0.5 A L = 0.1 mH T_j = 100 °C		3 0.1 0.3	4.5 0.3 1	µs µs µs
t_s t_f t_c	Storage Time Fall Time Cross-over Time	I_C = 25 A V_{CC} = 50 V V_{BB} = 0 V R_{BB} = 0.6 Ω V_{clamp} = 450 V I_{B1} = 0.5 A L = 0.1 mH T_j = 100 °C		5.4 0.22 0.6		µs µs µs
V_{CEW}	Maximum Collector Emitter Voltage Without Snubber	I_{CWoff} = 42 A I_{B1} = 2 A V_{BB} = -5 V V_{CC} = 50 V L = 60 µH R_{BB} = 0.6 Ω T_j = 125 °C	400			V
V_F*	Diode Forward Voltage	I_F = 35 A T_j = 100 °C			1.85	V
I_{RM}	Reverse Recovery Current	V_{CC} = 200 V I_F = 35 A dI_F/dt = -200 A/µs L < 0.05 µH T_j = 100 °C			24	A

* Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
# See test circuits in databook introduction
To evaluate the conduction losses of the diode use the following equations:
V_F = 1.1 + 0.007 I_F P = 1.1 $I_{F(AV)}$ + 0.007 $I^2_{F(RMS)}$

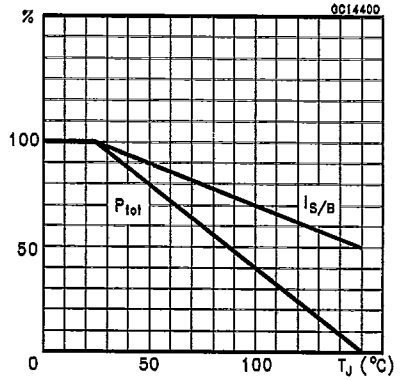
Safe Operating Areas



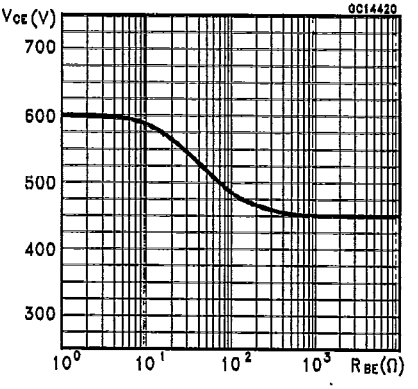
Thermal Impedance



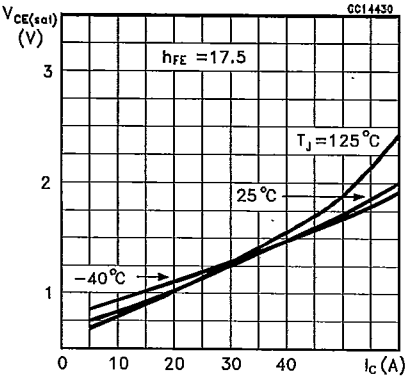
Derating Curve



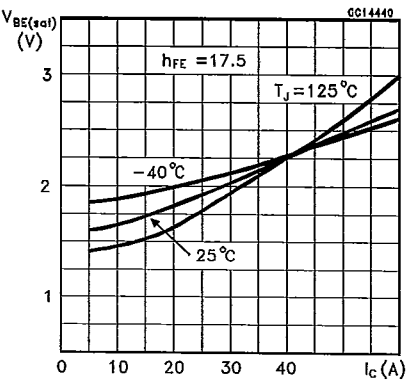
Collector-Emitter Voltage Versus Base-Emitter Resistance



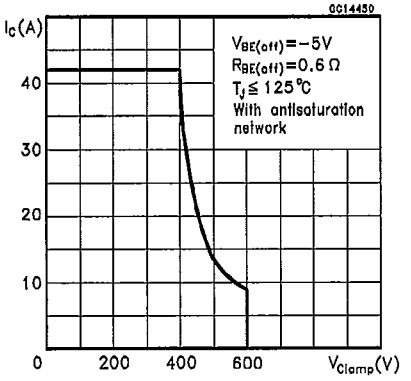
Collector-Emitter Saturation Voltage



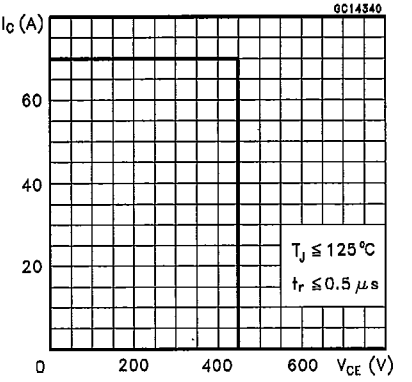
Base-Emitter Saturation Voltage



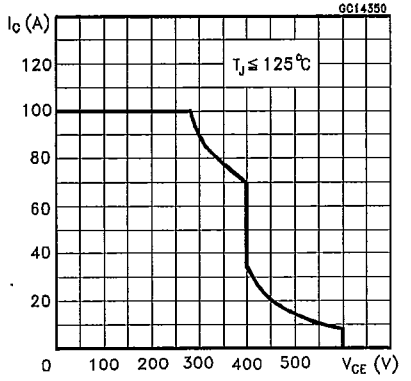
Reverse Biased SOA



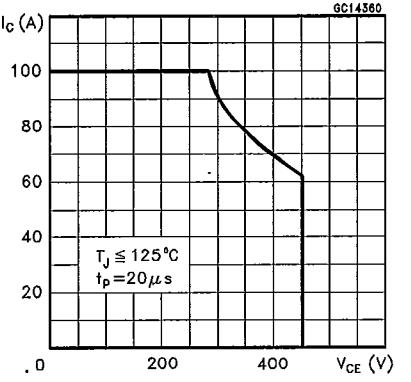
Forward Biased SOA



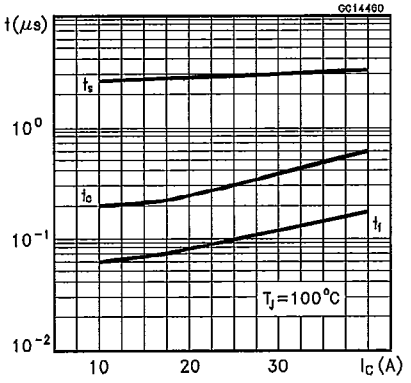
Reverse Biased AOA



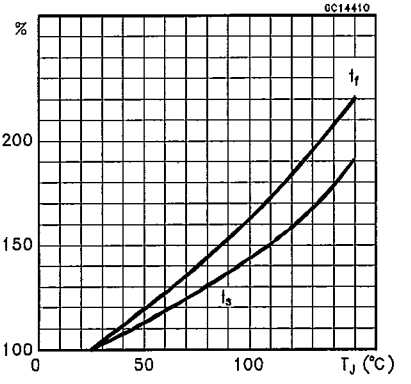
Forward Biased AOA



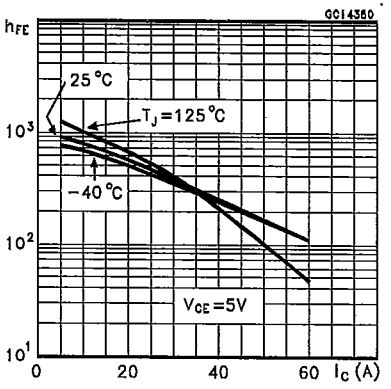
Switching Times Inductive Load



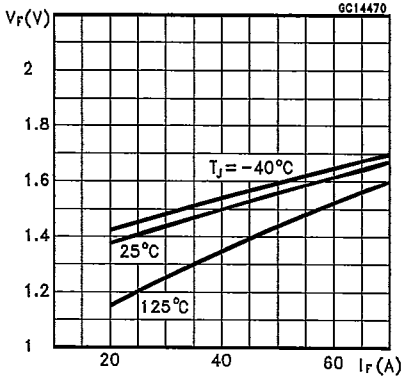
Switching Times Inductive Load Versus Temperature



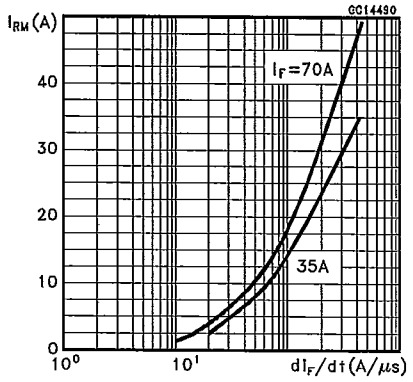
DC Current Gain



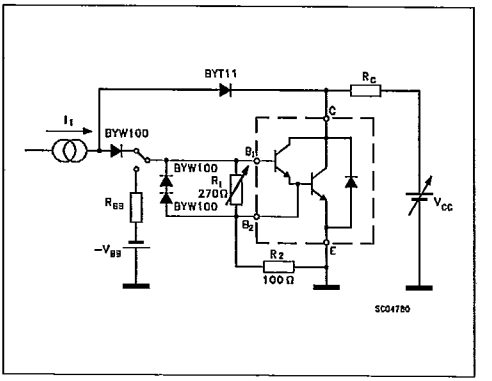
Typical V_F Versus I_F



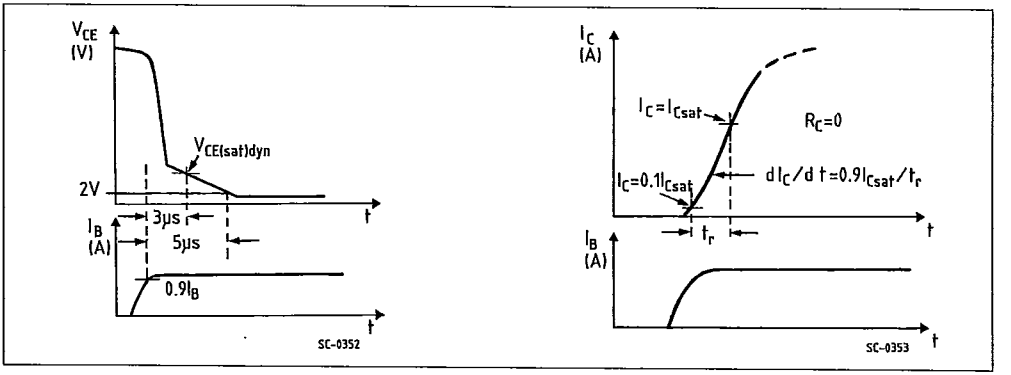
Peak Reverse Current Versus dI_F/dt



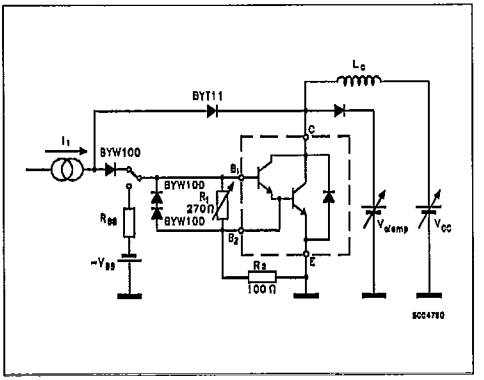
Turn-on Switching Test Circuit



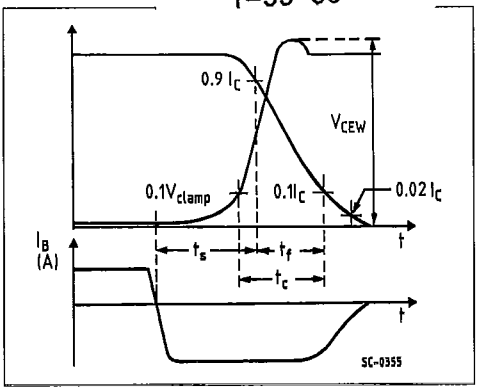
Turn-on Switching Waveforms



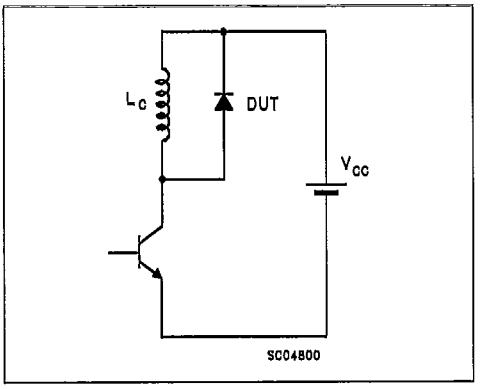
Turn-off Switching Test Circuit



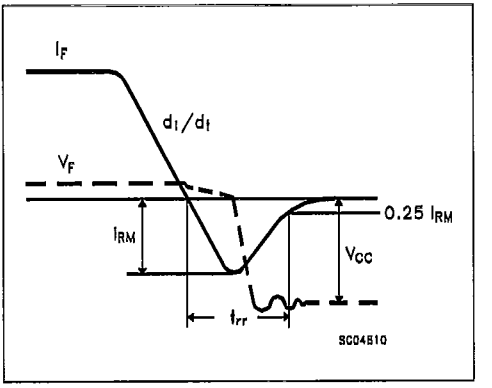
Turn-off Switching Waveforms

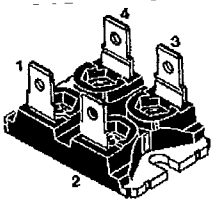


Turn-off Switching Test Circuits of Diode



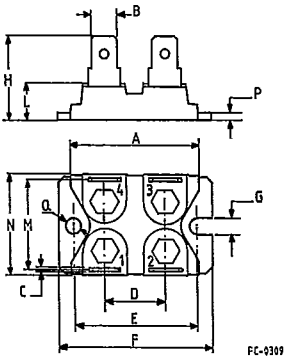
Turn-off Switching Waveform of Diode





ISOTOP
Fast-on version
sales types with the suffix F

MECHANICAL DATA



	DIMENSIONS			
	mm		Inches	
	min.	max	min.	max
A	31.5	31.7	1.240	1.248
B	6.2	6.4	0.244	0.252
C	0.75	0.85	0.029	0.033
D	14.9	15.1	0.586	0.590
E	30.1	30.3	1.185	1.193
F	38	38.2	1.496	1.503
G	4	–	0.157	–
H	20.3	20.7	0.799	0.815
L	8.9	9.1	0.350	0.358
M	22.4	23	0.881	0.905
N	25.2	25.4	0.992	1.000
P	1.95	2.05	0.076	0.080
Q	4	–	0.157	–

PIN CONNECTIONS

MOSFET

pin 1: Source pin 2: Gate
pin 3: Drain pin 4: Source sensings

DARLINGTON

pin 1: Emitter pin 2: Base1
pin 3: Collector pin 4: Base 2

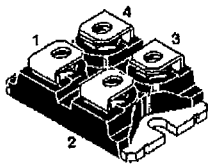
TRANSISTOR

pin 1: Emitter pin 2: Base
pin 3: Collector pin 4: Emitter sensing

Torque: Mounting 1.3 ± 0.2 N • m (max)

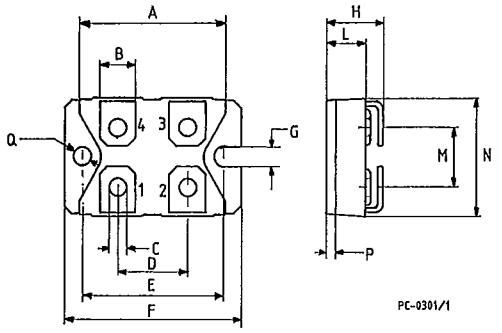
Weight: Package 25.5 g

Note: The mechanical data are the same for the 3 pin version (4th pin missing)



ISOTOP
Screw version
sales types with the suffix V

MECHANICAL DATA



	DIMENSIONS			
	mm		Inches	
	min.	max	min.	max
A	31.5	31.7	1.240	1.248
B	7.8	8.2	0.307	0.322
C	4.1	4.3	0.161	0.169
D	14.9	15.1	0.586	0.590
E	30.1	30.3	1.185	1.193
F	38	38.2	1.496	1.503
G	4	–	0.157	–
H	11.8	12.2	0.464	0.480
L	8.9	9.1	0.350	0.358
M	12.6	12.8	0.496	0.503
N	25.2	25.4	0.992	1.000
P	1.95	2.05	0.076	0.080
Q	4	–	0.157	–

PIN CONNECTIONS

MOSFET

pin 1: Source pin 2: Gate
pin 3: Drain pin 4: Source sensings

DARLINGTON

pin 1: Emitter pin 2: Base1
pin 3: Collector pin 4: Base 2

TRANSISTOR

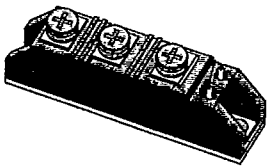
pin 1: Emitter pin 2: Base
pin 3: Collector pin 4: Emitter sensing

Torque: Terminal 1.3 ± 0.2 N • m (max)
Mounting 1.3 ± 0.2 N • m (max)

Weight: Package 29 g
4 Screws: 7.5 g

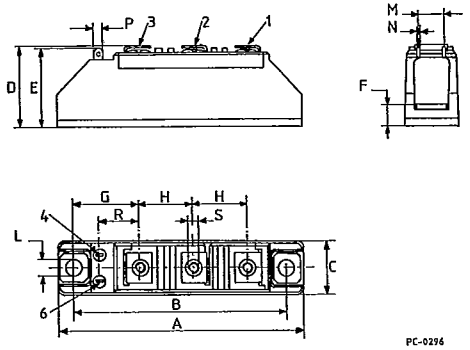
Note: The mechanical data are the same for the 3 pin version (4th pin missing)

T-91-20



TRANSPACK (TO-240)

MECHANICAL DATA



	DIMENSIONS			
	mm		Inches	
	min.	max	min.	max
A	91.5	92.5	3.602	3.641
B	79.75	80.25	3.140	3.160
C	19.5	20.55	0.767	0.809
D	29.00	31.00	1.141	1.220
E	28.8	30	1.134	1.181
F	8.5 typ.		0.334 typ.	
G	24.4 typ.		0.960 typ.	
H	19.5	20.5	0.767	0.807
L	6.2 typ.		0.244 typ.	
M	8.95	11.05	0.352	0.435
N	0.78	0.84	0.030	0.033
P	2.72	2.87	0.107	0.113
R	14	–	0.551	–
S	M5			

Torque: Terminal 2.2 ± 0.5 N • m (max)
Mounting 3.5 ± 0.5 N • m (max)

Weight: Package 110 g
Accessory 21 g

Note: The mechanical data are the same for the 2 power pin version (either pin 1 or pin 2 missing)