



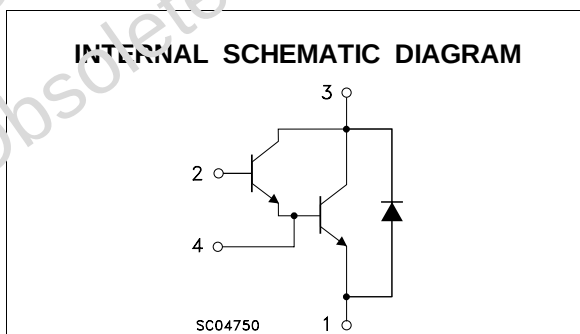
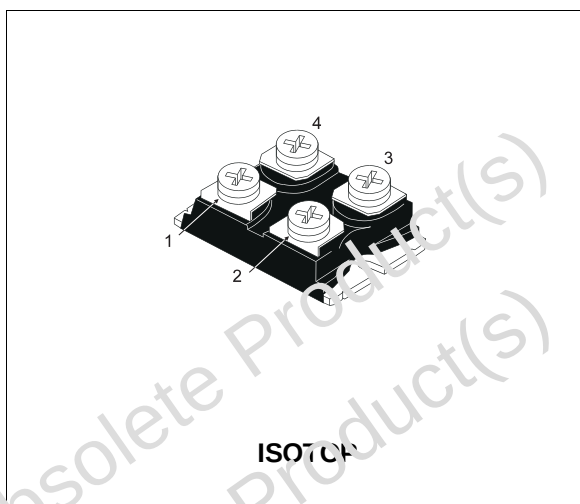
ESM5045DV

NPN DARLINGTON POWER MODULE

- HIGH CURRENT POWER BIPOLAR MODULE
- VERY LOW R_{th} JUNCTION CASE
- SPECIFIED ACCIDENTAL OVERLOAD AREAS
- ULTRAFAST FREEWHEELING DIODE
- FULLY INSULATED PACKAGE (UL COMPLIANT)
- EASY TO MOUNT
- LOW INTERNAL PARASITIC INDUCTANCE

INDUSTRIAL APPLICATIONS:

- MOTOR CONTROL
- SMPS & UPS
- WELDING EQUIPMENT



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_{EBV}	Emitter-Base Voltage ($I_C = 0$)	7	V
I_C	Collector Current	60	A
I_{CM}	Collector Peak Current ($t_p = 10$ ms)	90	A
I_B	Base Current	6	A
I_{BM}	Base Peak Current ($t_p = 10$ ms)	12	A
P_{tot}	Total Dissipation at $T_c = 25$ °C	175	W
V_{isol}	Insulation Withstand Voltage (RMS) from All Four Terminals to External Heatsink	2500	V
T_{stg}	Storage Temperature	-55 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

THERMAL DATA

R _{thj-case}	Thermal Resistance Junction-case (transistor)	Max	0.71	°C/W
R _{thj-case}	Thermal Resistance Junction-case (diode)	Max	1.2	°C/W
R _{thc-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			1.5 20	mA mA
I _{CEV} #	Collector Cut-off Current (V _{BE} = -5)	V _{CE} = V _{CEV} V _{CE} = V _{CEV} T _j = 100 °C			1 13	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 _B = 0)	I _C = 0.2 A L = 25 mH V _{clamp} = 450 V	450			V
h _{FE} *	DC Current Gain	I _C = 50 A V _{CE} = 5 V		150		
V _{CE(sat)} *	Collector-Emitter Saturation Voltage	I _C = 35 A I _B = 0.7 A I _C = 35 A I _B = 0.7 A T _j = 100 °C I _C = 50 A I _B = 2.8 A I _C = 50 A I _B = 2.8 A T _j = 100 °C		1.2 1.4 1.4 1.6	2 2	V V V V
V _{BE(sat)} *	Base-Emitter Saturation Voltage	I _C = 50 A I _B = 2.8 A I _C = 50 A I _B = 2.8 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} = 1.05 A T _j = 100 °C	300	400		A/μs
V _{CE(3 μs)} **	Collector-Emitter Dynamic Voltage	V _{CC} = 300 V R _C = 8.5 Ω I _{B1} = 1.05 A T _j = 100 °C		4.5	8	V
V _{CE(5 μs)} **	Collector-Emitter Dynamic Voltage	V _{CC} = 300 V R _C = 8.5 Ω I _{B1} = 1.05 A T _j = 100 °C		2.5	4.5	V
t _s t _f t _c	Storage Time Fall Time Cross-over Time	I _C = 35 A V _{CC} = 50 V V _{BB} = -5 V R _{BB} = 0.6 Ω V _{clamp} = 450 V I _{B1} = 0.7 A L = 0.07 mH T _j = 100 °C		3.2 0.25 0.75	5 0.5 1.5	μs μs μs
V _{CEW}	Maximum Collector Emitter Voltage Without Snubber	I _{CWoff} = 60 A I _{B1} = 2.8 A V _{BB} = -5 V V _{CC} = 50 V L = 42 μH R _{BB} = 0.6 Ω T _j = 125 °C	450			V
V _F *	Diode Forward Voltage	I _F = 50 A T _j = 100 °C		1.5	1.8	V
I _{RM}	Reverse Recovery Current	V _{CC} = 200 V I _F = 50 A di _F /dt = -300 A/μs L < 0.05 μH T _j = 100 °C		32	38	A

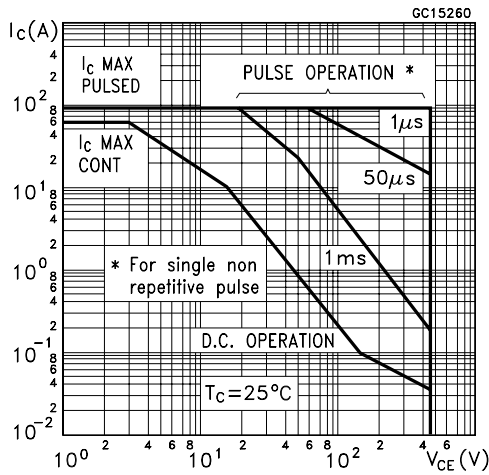
* Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %

To evaluate the conduction losses of the diode use the following equations:

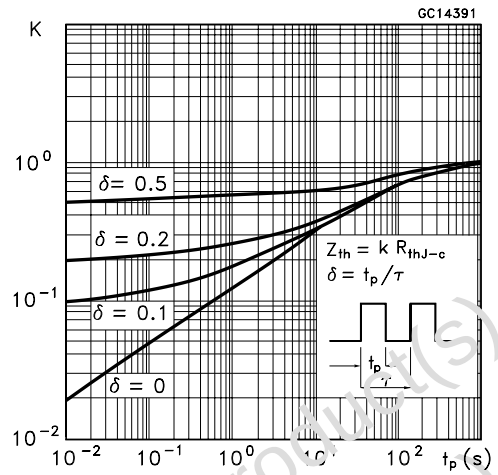
$$V_F = 1.5 + 0.0055 I_F \quad P = 1.5 I_{F(AV)} + 0.0055 I_{F(RMS)}^2$$

See test circuits in databook introduction

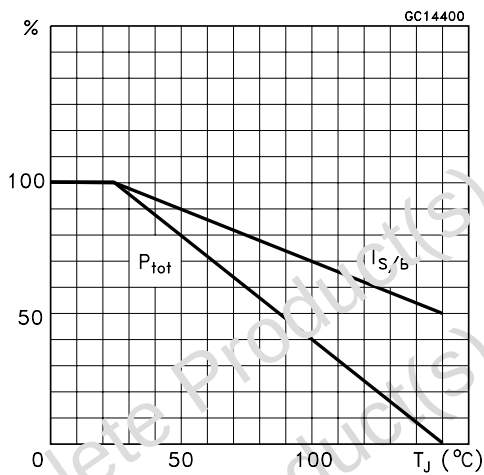
Safe Operating Areas



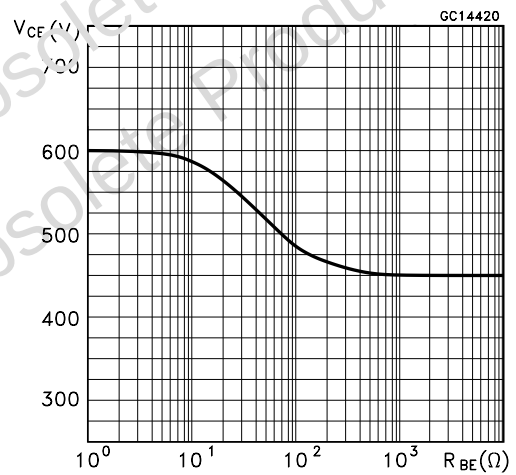
Thermal Impedance



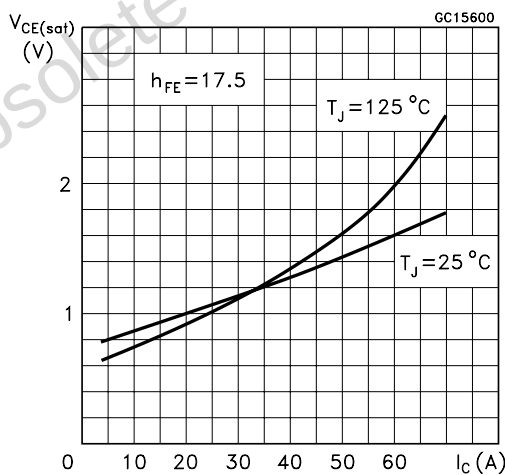
Derating Curve



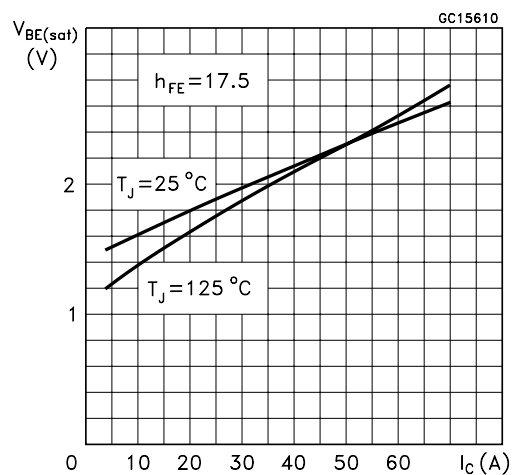
Collector-emitter Voltage Versus base-emitter Resistance



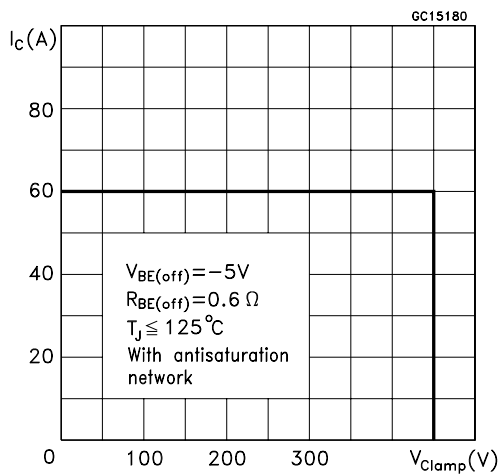
Collector Emitter Saturation Voltage



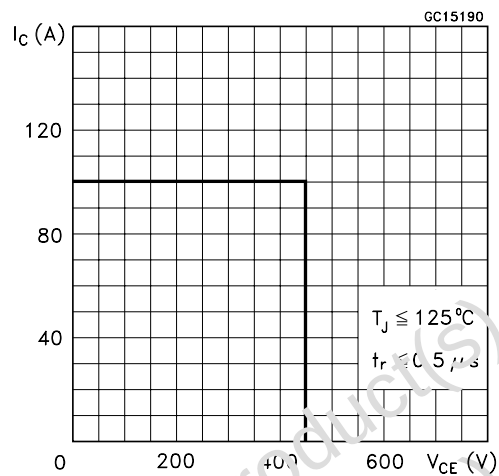
Base-Emitter Saturation Voltage



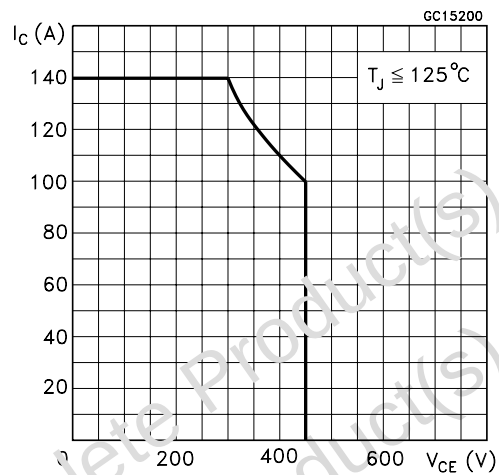
Reverse Biased SOA



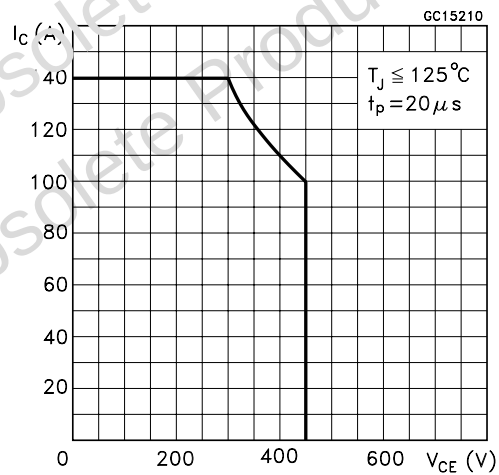
Foward Biased SOA



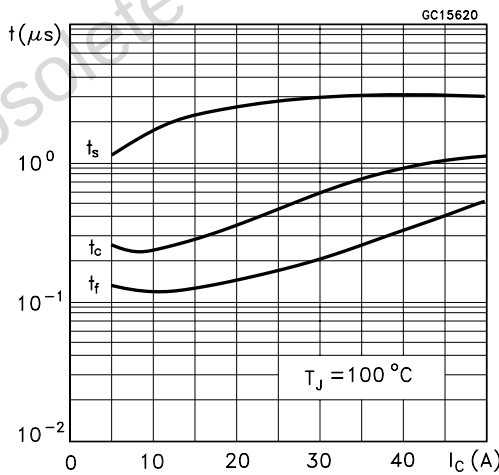
Reverse Biased AOA



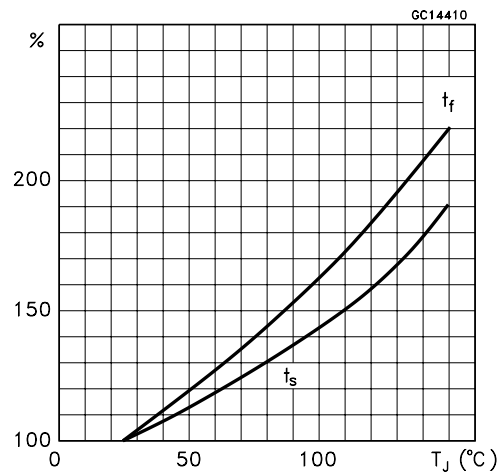
Forward Biased AOA

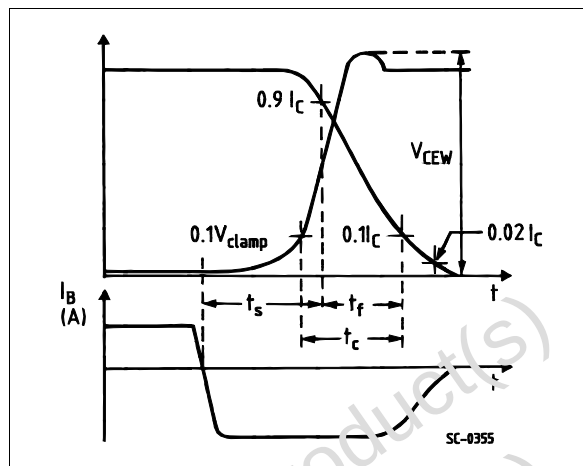
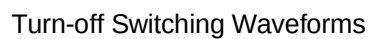


Switching Times Inductive Load

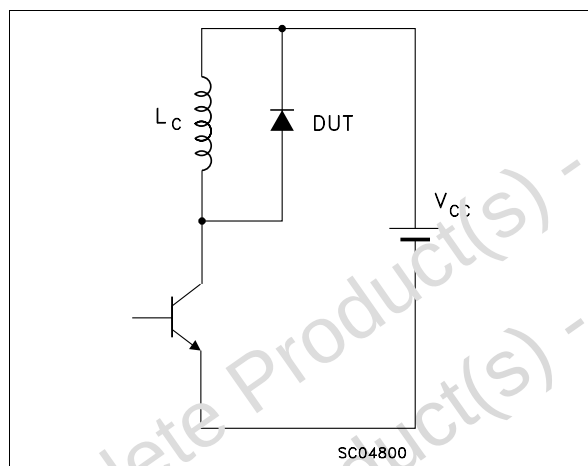


Switching Times Inductive Load Versus Temperature

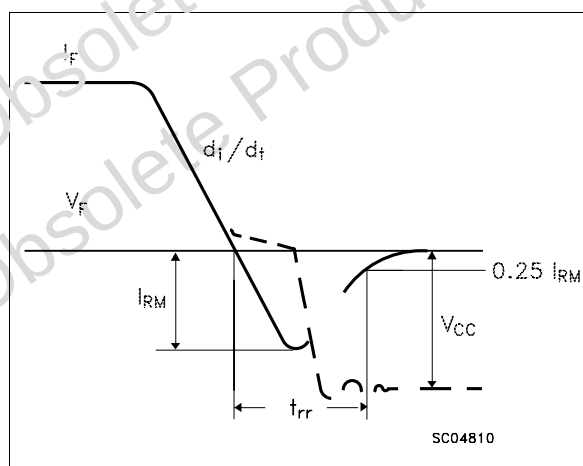




Turn-off Switching Test Circuit of Diode

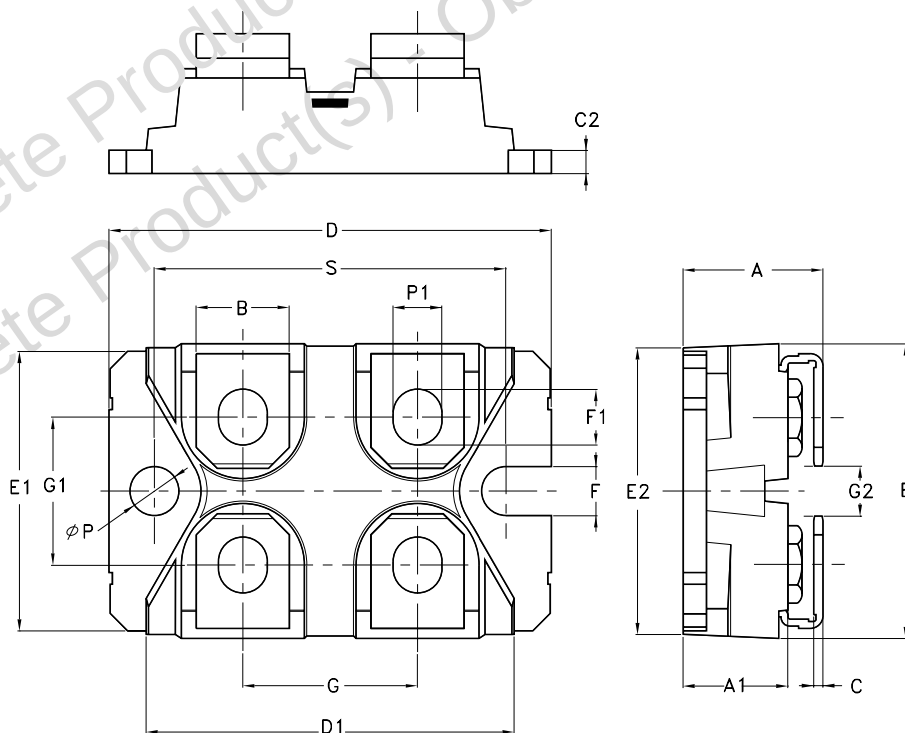


Turn-off Switching Waveform of Diode



ISOTOP MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	11.8		12.2	0.465		0.480
A1	8.9		9.1	0.350		0.358
B	7.8		8.2	0.307		0.322
C	0.75		0.85	0.029		0.033
C2	1.95		2.05	0.076		0.080
D	37.8		38.2	1.488		1.503
D1	31.5		31.7	1.240		1.248
E	25.15		25.5	0.990		1.003
E1	23.85		24.15	0.938		0.950
E2		24.8			0.976	
G	14.9		15.1	0.586		0.594
G1	12.6		12.8	0.496		0.503
G2	3.5		4.3	0.137		1.169
F	4.1		4.3	0.161		0.169
F1	4.6		5	0.181		0.196
P	4		4.3	0.157		0.169
P1	4		4.4	0.157		0.173
S	30.1		30.3	1.185		1.193



P093A

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