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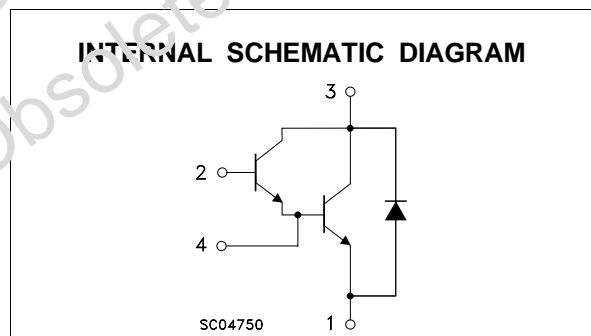
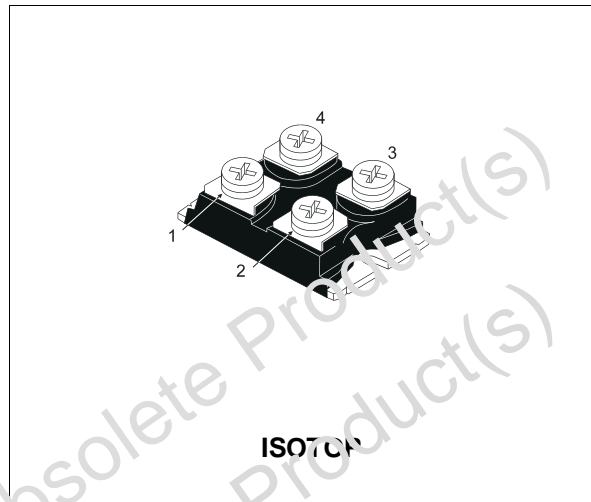
ESM4045DV

NPN DARLINGTON POWER MODULE

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

APPLICATIONS:

- MOTOR CONTROL
- SMPS & UPS
- DC/DC & DC/AC CONVERTERS
- WELDING EQUIPMENT



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CE}	Collector-Emitter Voltage ($V_{BE} = -5$ V)	600	V
$V_{CE(sus)}$	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

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THERMAL DATA

R _{thj-case}	Thermal Resistance Junction-case (transistor)	Max	0.83	°C/W
R _{thj-case}	Thermal Resistance Junction-case (diode)	Max	1.5	°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 = 35 A V _{CE} = 5 V		220		
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		1.15 1.3 1.4 1.5	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	250		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		4.5	8	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		2.5	4.5	V
t _s	Storage Time	I _C = 25 A V _{CC} = 50 V		3.2	5	μs
t _f	Fall Time	V _{BB} = -5 V R _{BB} = 0.6 Ω		0.25	0.5	μs
t _c	Cross-over Time	V _{clamp} = 450 V I _{B1} = 0.5 A L = 0.1 mH T _j = 100 °C		0.75	1.5	μs
V _{CEV}	Maximum Collector Emitter Voltage Without Snubber	I _C Woff = 42 A I _{B1} = 2 A V _{BB} = -5 V V _{CC} = 50 V L = 0.06 mH R _{BB} = 0.6 Ω T _j = 125 °C	450			V
V _F *	Diode Forward Voltage	I _F = 35 A T _j = 100 °C		1.5	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		20	24	A

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

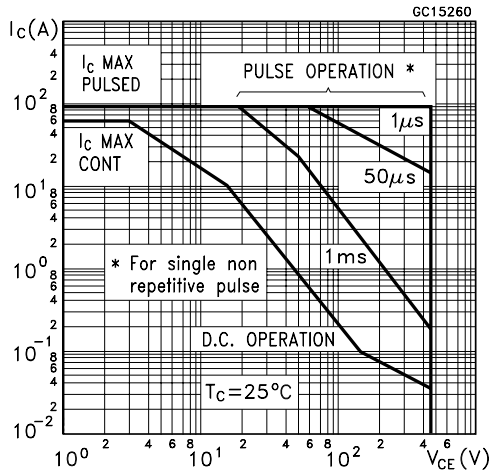
To evaluate the conduction losses of the diode use the following equations:

$$V_F = 1.5 + 0.001 I_F \quad P = 1.5 I_{F(AV)} + 0.001 I_{F(RMS)}^2$$

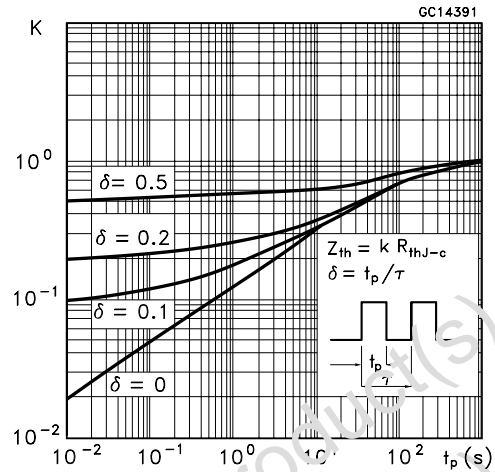
See test circuits in databook introduction

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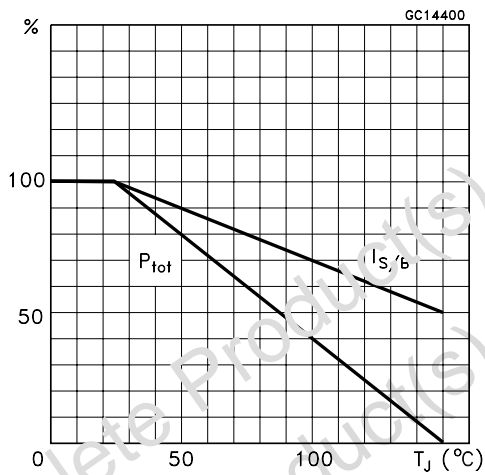
Safe Operating Areas



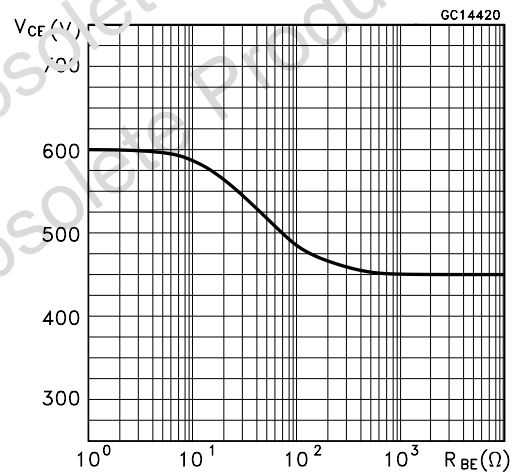
Thermal Impedance



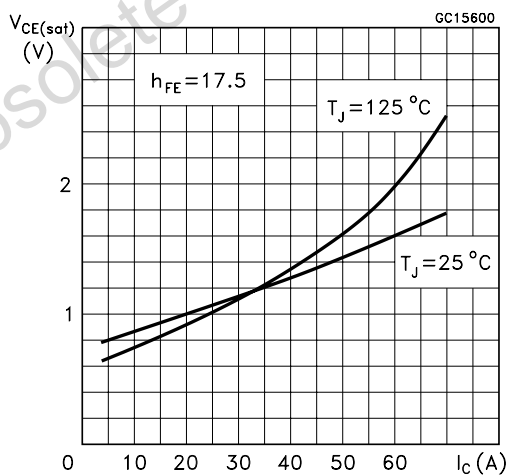
Derating Curve



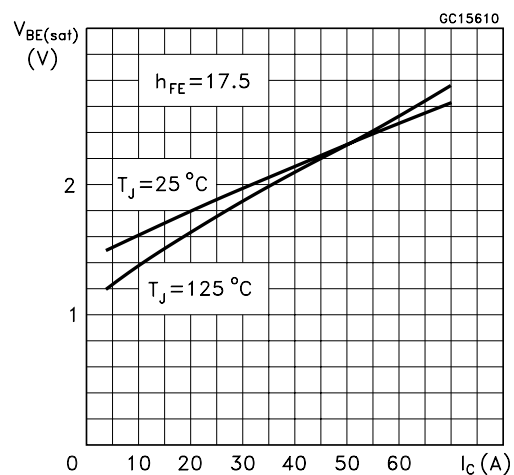
Collector-emitter Voltage Versus base-emitter Resistance



Collector Emitter Saturation Voltage

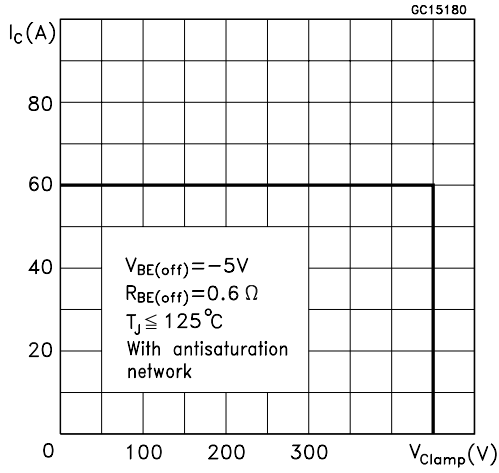


Base-Emitter Saturation Voltage

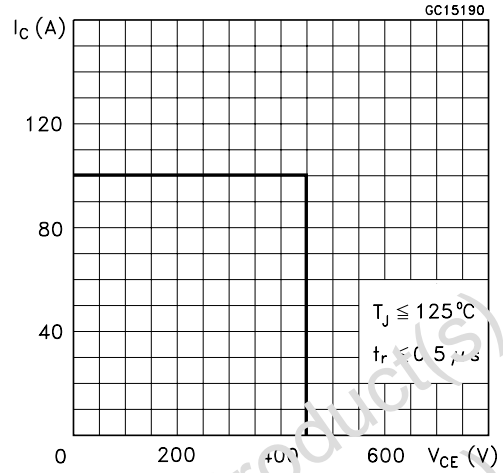


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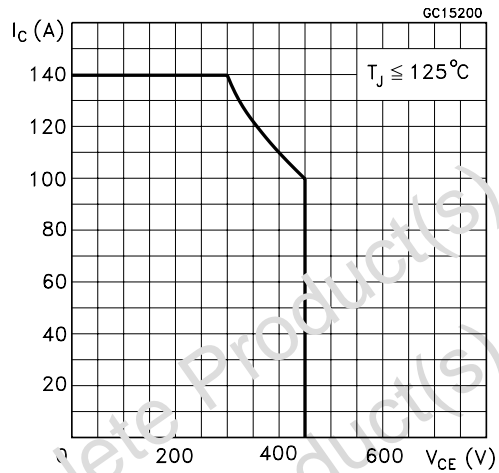
Reverse Biased SOA



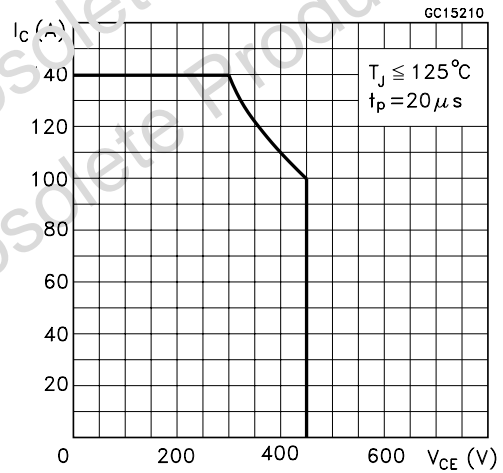
Foward Biased SOA



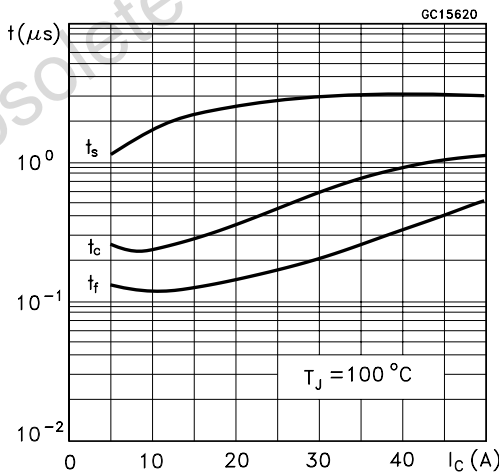
Reverse Biased AOA



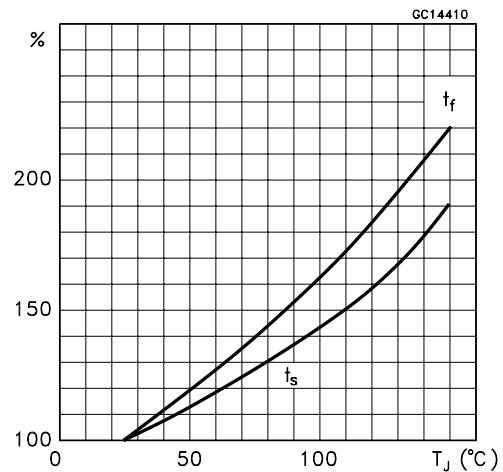
Forward Biased AOA



Switching Times Inductive Load

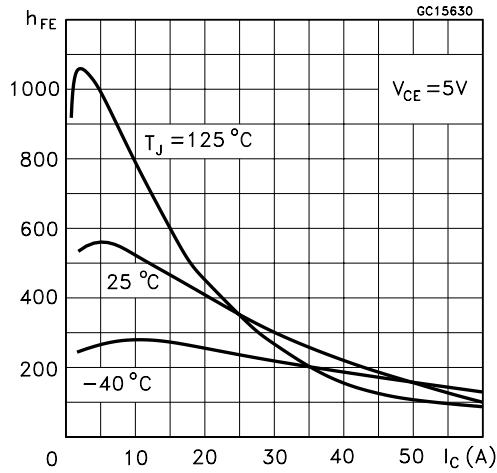


Switching Times Inductive Load Versus Temperature

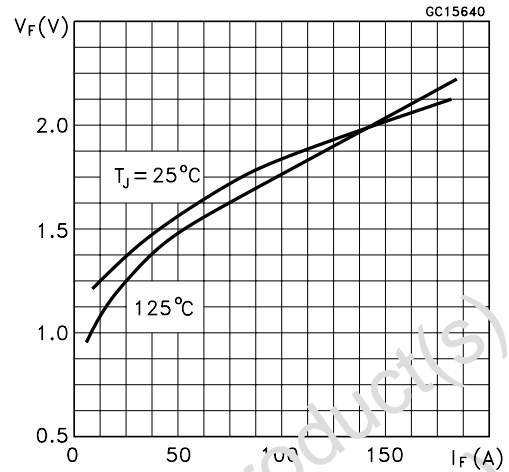


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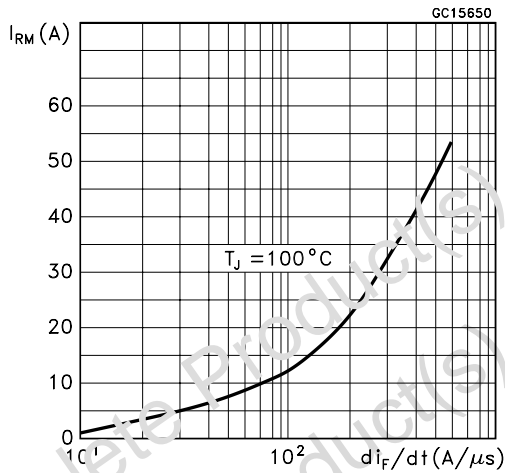
Dc Current Gain



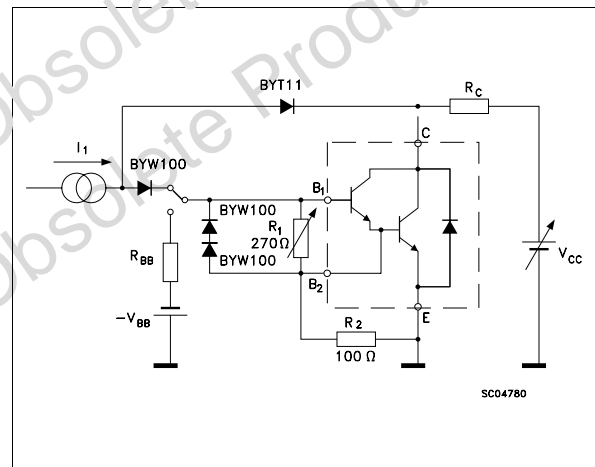
Typical V_F Versus I_F



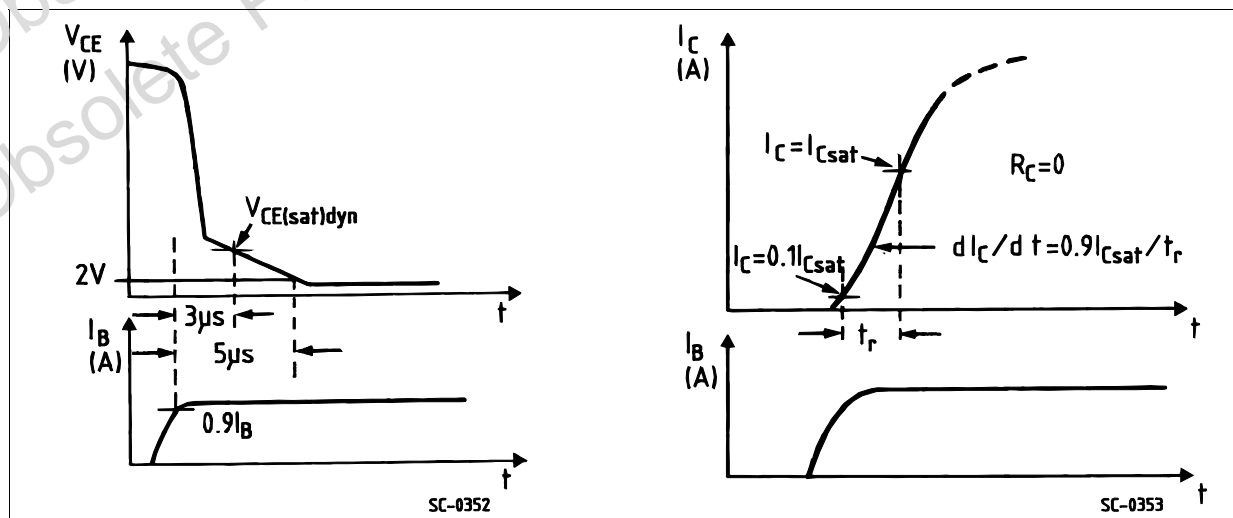
Peak Reverse Current Versus di_F/dt



Turn-on Switching Test Circuit

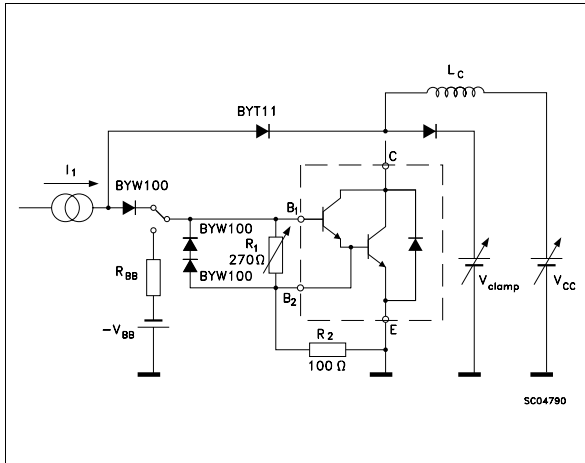


Turn-on Switching Waveforms

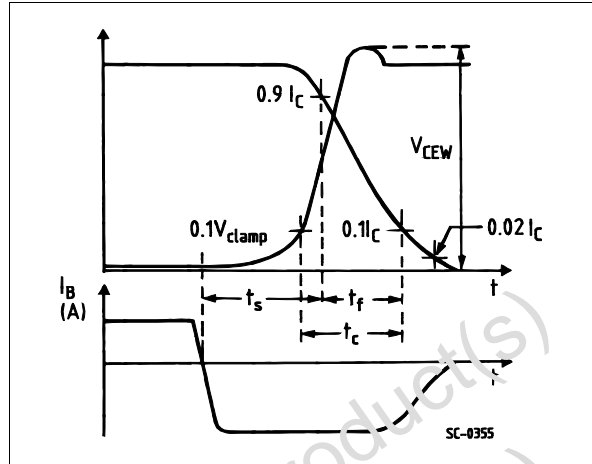


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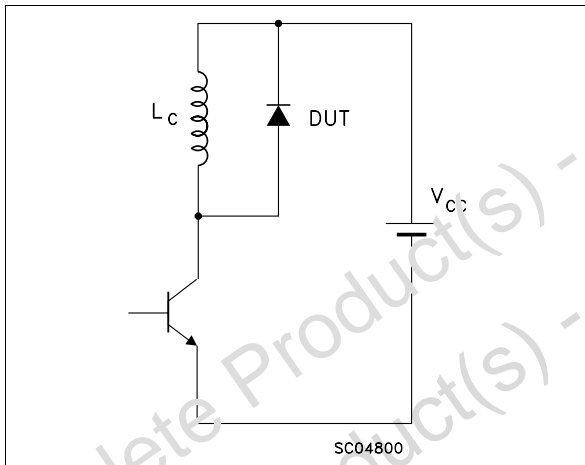
Turn-on Switching Test Circuit



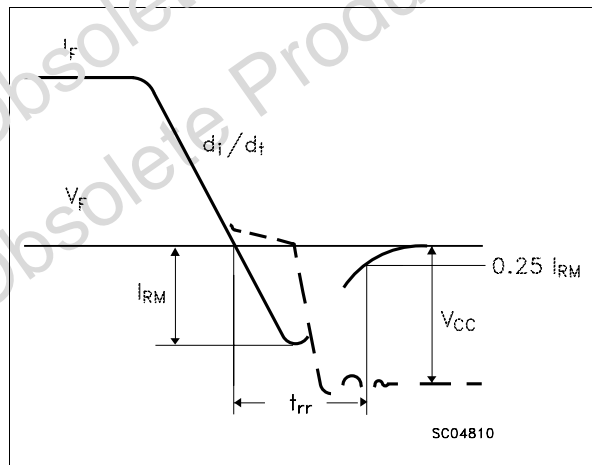
Turn-off Switching Waveforms



Turn-off Switching Test Circuit of Diode



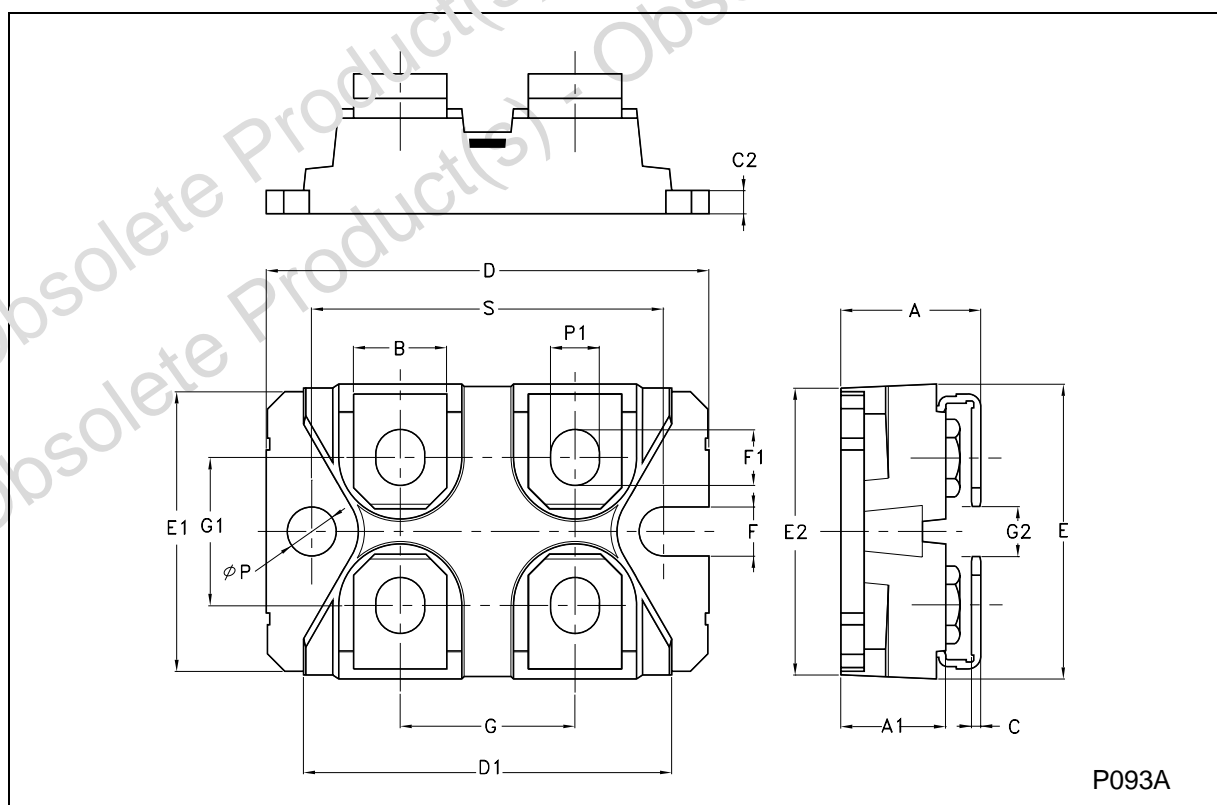
Turn-off Switching Waveform of Diode



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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		1.243
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



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