



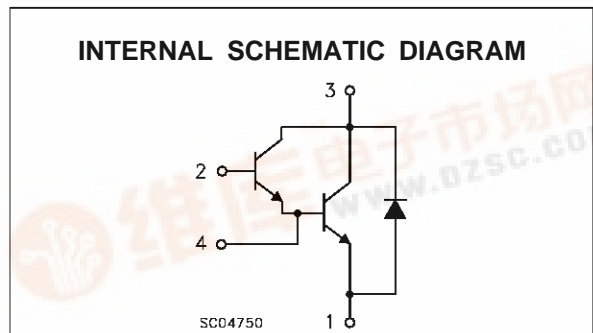
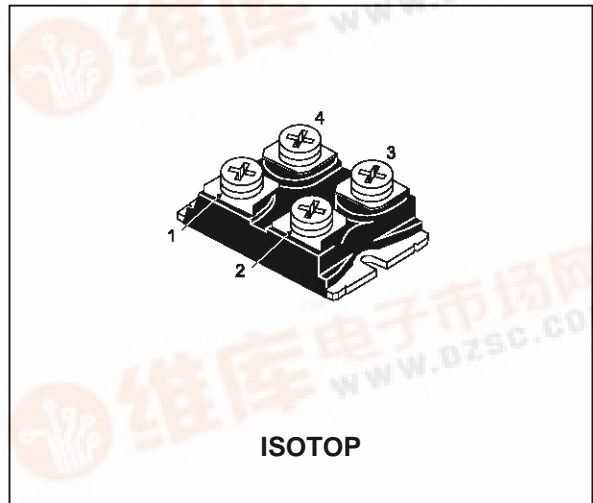
ESM5045DV

NPN DARLINGTON POWER MODULE

- 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



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CEV}	Collector-Emitter Voltage ($V_{BE} = -5\text{ V}$)	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	60	A
I_{CM}	Collector Peak Current ($t_p = 10\text{ ms}$)	90	A
I_B	Base Current	6	A
I_{BM}	Base Peak Current ($t_p = 10\text{ ms}$)	12	A
P_{tot}	Total Dissipation at $T_c = 25\text{ °C}$	175	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	°C



ESM5045DV

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 _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	Storage Time	I _C = 35 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} = 0.7 A L = 0.07 mH T _j = 100 °C		0.75	1.5	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

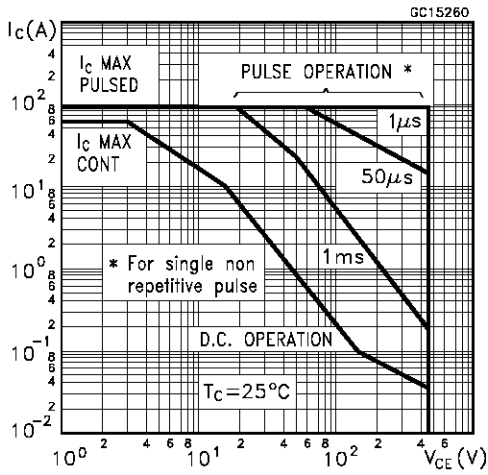
* Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %

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

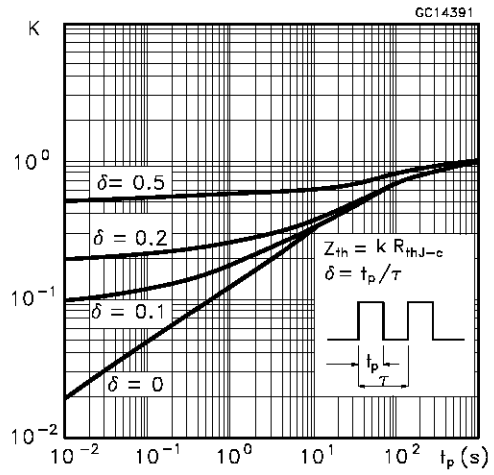
$$V_F = 1.5 + 0.0055 I_F \quad P = 1.5 I_{F(AV)} + 0.0055 I_{F(RMS)}^2$$

See test circuits in databook introduction

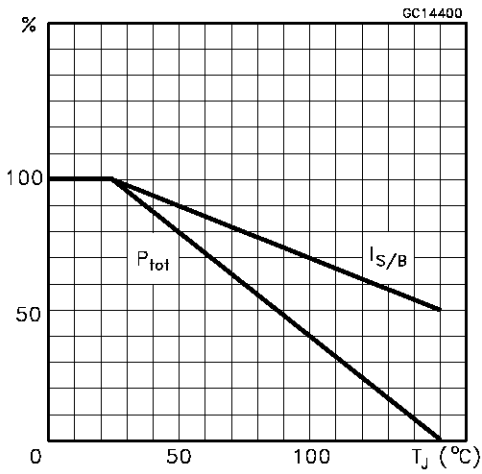
Safe Operating Areas



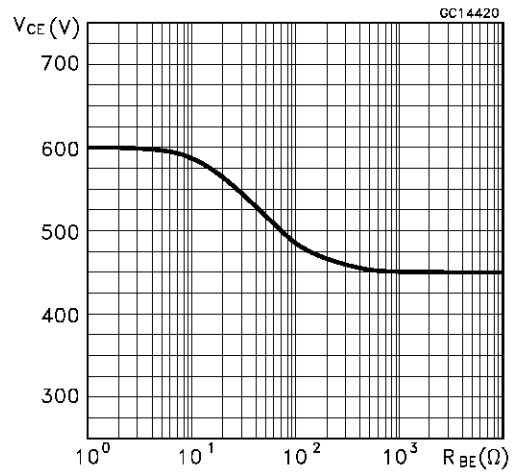
Thermal Impedance



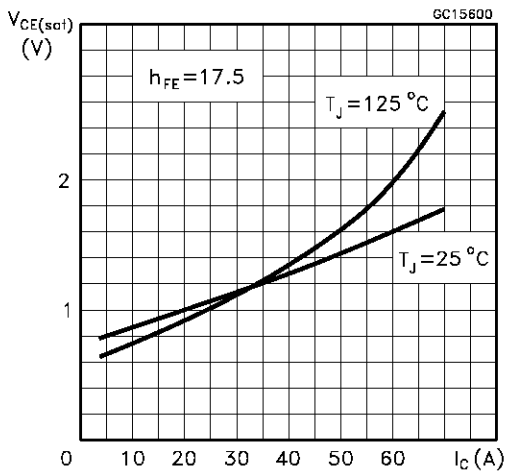
Derating Curve



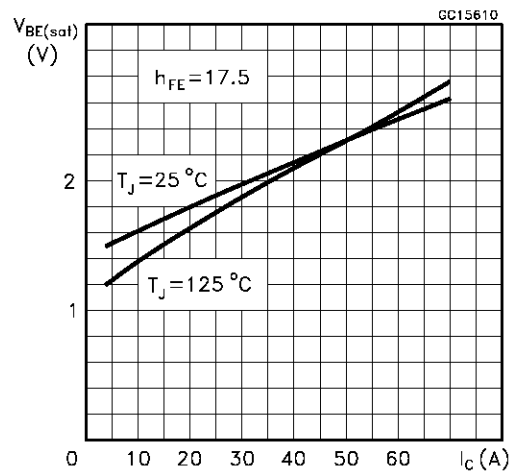
Collector-emitter Voltage Versus base-emitter Resistance



Collector Emitter Saturation Voltage

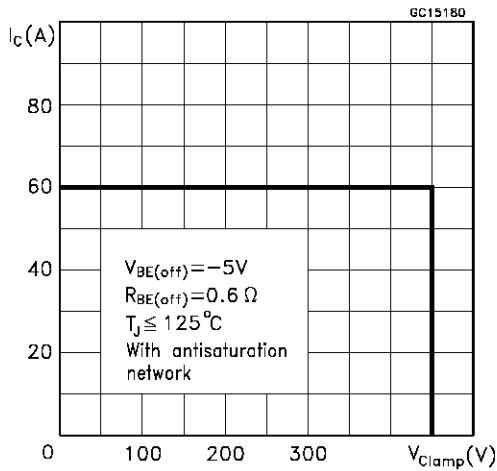


Base-Emitter Saturation Voltage

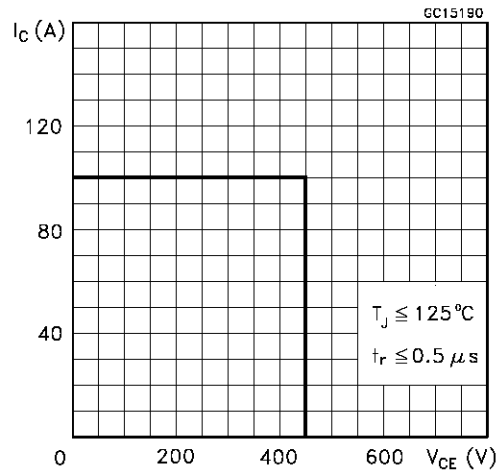


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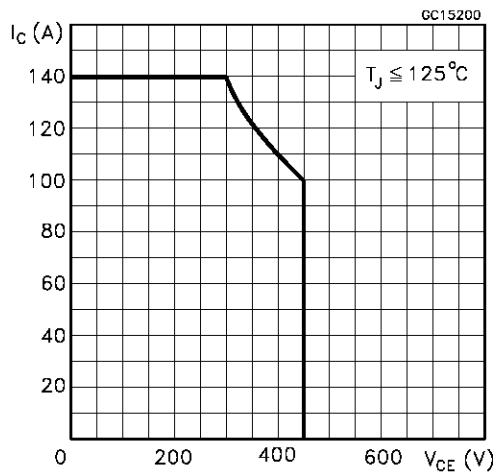
Reverse Biased SOA



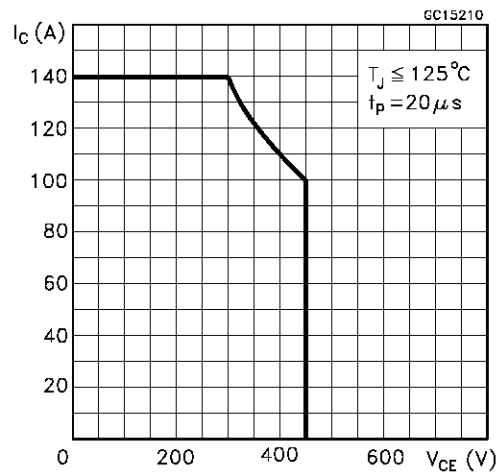
Foward Biased SOA



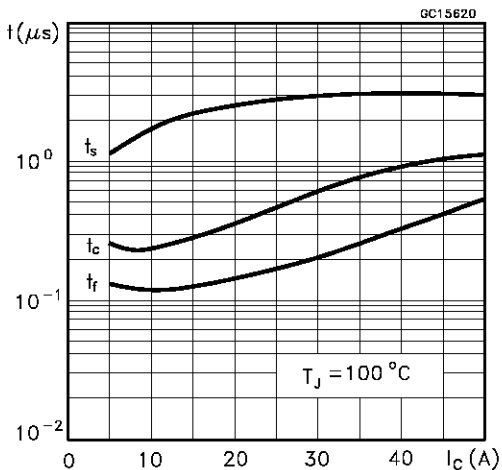
Reverse Biased AOA



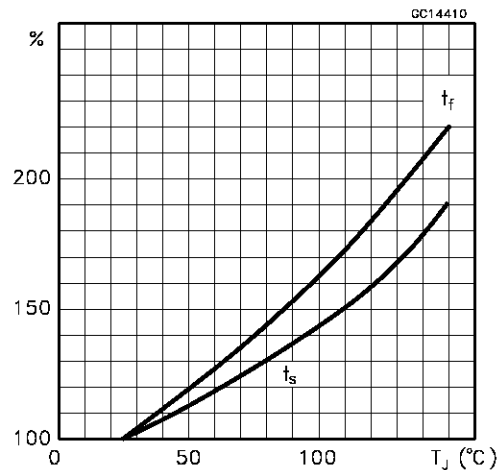
Forward Biased AOA



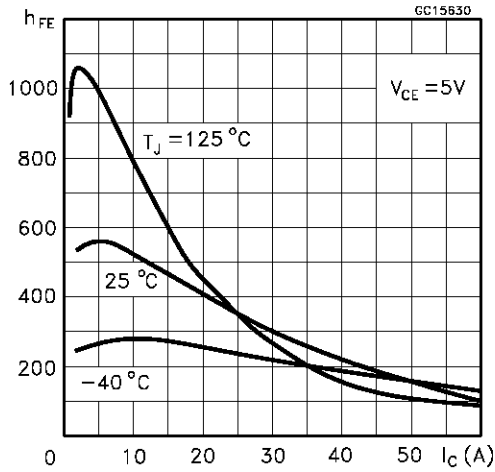
Switching Times Inductive Load



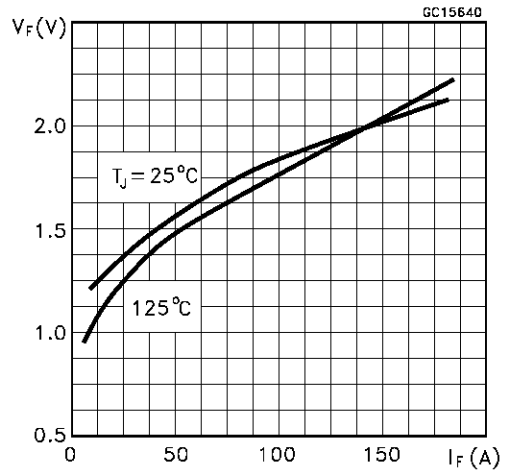
Switching Times Inductive Load Versus Temperature



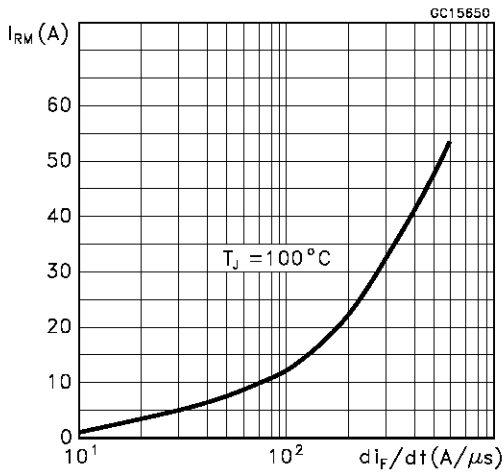
Dc Current Gain



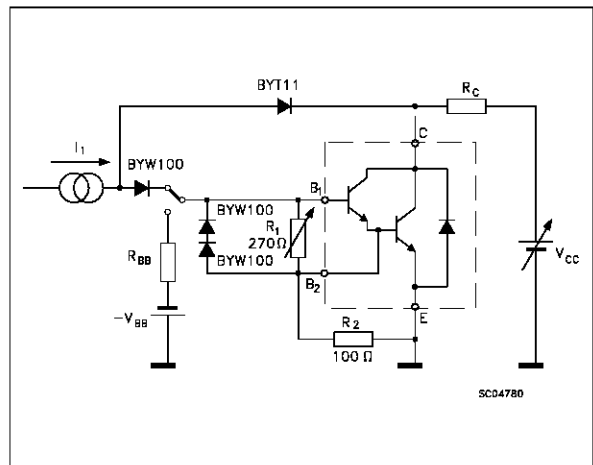
Typical V_F Versus I_F



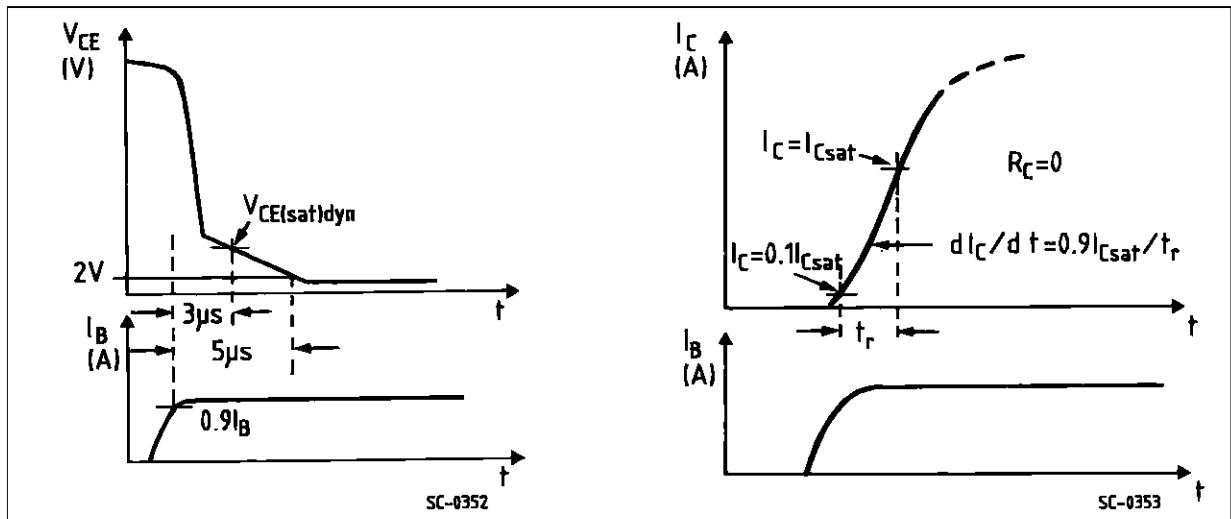
Peak Reverse Current Versus di_F/dt



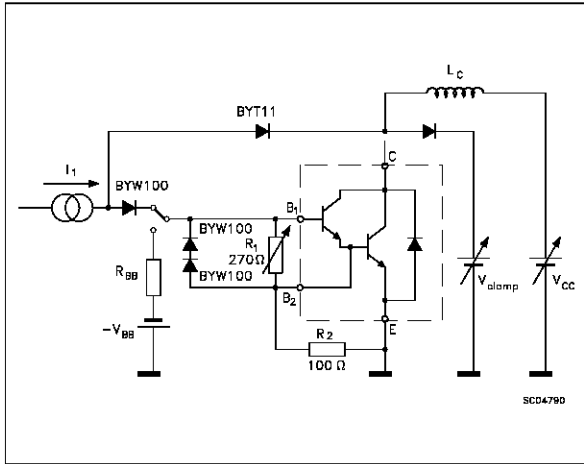
Turn-on Switching Test Circuit



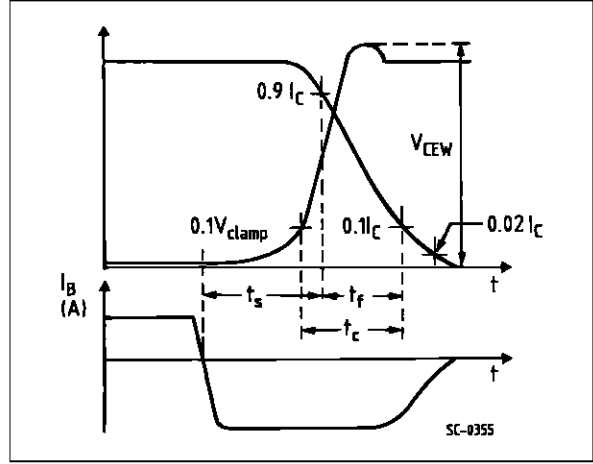
Turn-on Switching Waveforms



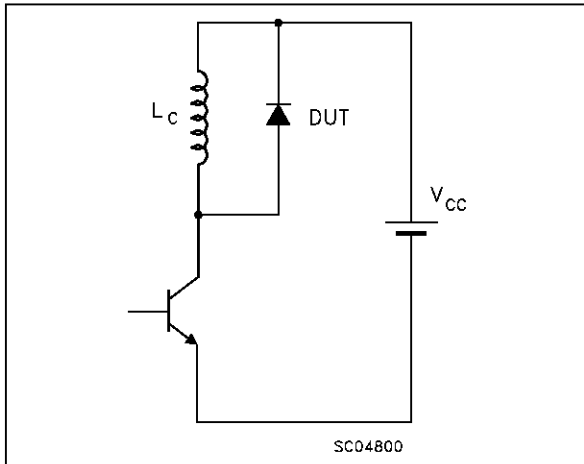
Turn-on Switching Test Circuit



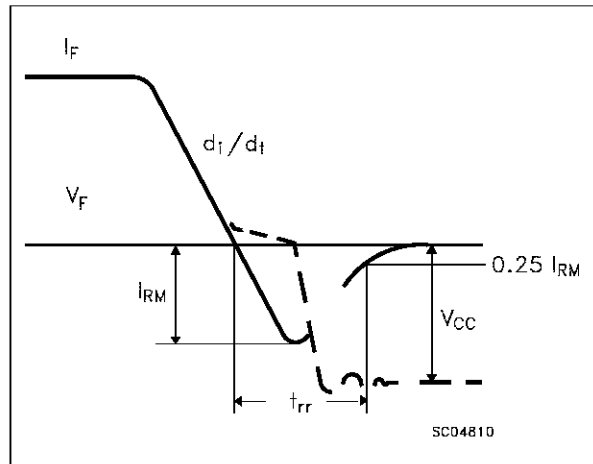
Turn-off Switching Waveforms



Turn-off Switching Test Circuit of Diode

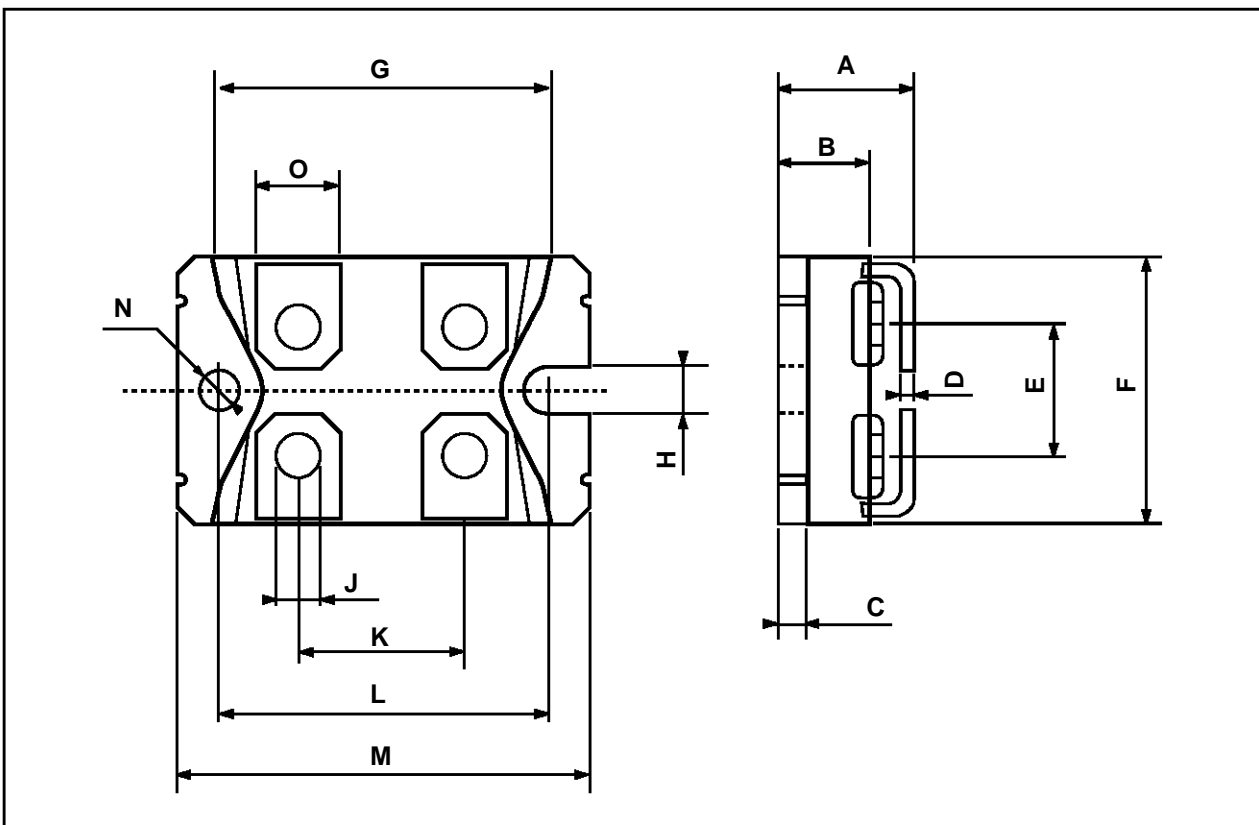


Turn-off Switching Waveform of Diode



ISOTOP MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	11.8		12.2	0.466		0.480
B	8.9		9.1	0.350		0.358
C	1.95		2.05	0.076		0.080
D	0.75		0.85	0.029		0.033
E	12.6		12.8	0.496		0.503
F	25.15		25.5	0.990		1.003
G	31.5		31.7	1.240		1.248
H	4			0.157		
J	4.1		4.3	0.161		0.169
K	14.9		15.1	0.586		0.594
L	30.1		30.3	1.185		1.193
M	37.8		38.2	1.488		1.503
N	4			0.157		
O	7.8		8.2	0.307		0.322



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