



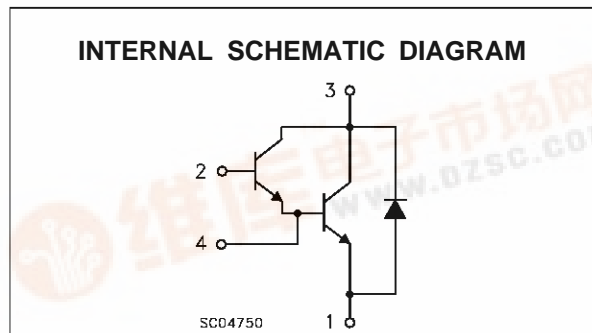
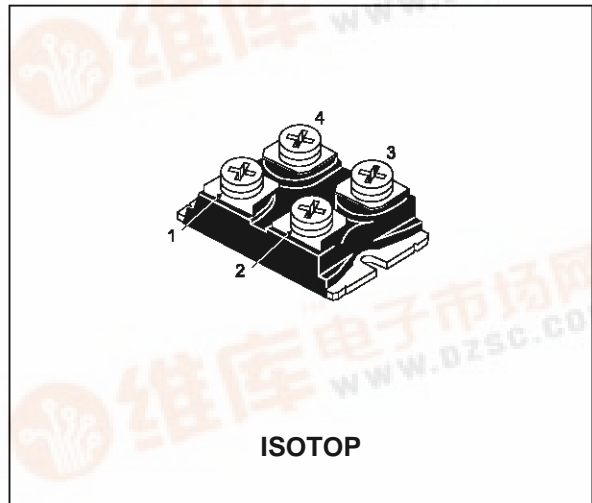
ESM2012DV

NPN DARLINGTON POWER MODULE

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

INDUSTRIAL APPLICATIONS:

- MOTOR CONTROL
- UPS
- DC/DC & DC/AC CONVERTERS



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CEV}	Collector-Emitter Voltage ($V_{BE} = -5\text{ V}$)	150	V
$V_{CEO(sus)}$	Collector-Emitter Voltage ($I_B = 0$)	120	V
V_{EBO}	Emitter-Base Voltage ($I_C = 0$)	7	V
I_C	Collector Current	120	A
I_{CM}	Collector Peak Current ($t_p = 10\text{ ms}$)	180	A
I_B	Base Current	2	A
I_{BM}	Base Peak Current ($t_p = 10\text{ ms}$)	4	A
P_{tot}	Total Dissipation at $T_c = 25\text{ }^\circ\text{C}$	175	W
T_{stg}	Storage Temperature	-55 to 150	$^\circ\text{C}$
T_j	Max. Operating Junction Temperature	150	$^\circ\text{C}$
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	$^\circ\text{C}$

ESM2012DV

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case (transistor)	Max	0.7	$^{\circ}C/W$
$R_{thj-case}$	Thermal Resistance Junction-case (diode)	Max	0.9	$^{\circ}C/W$
R_{thc-h}	Thermal Resistance Case-heatsink With Conductive Grease Applied	Max	0.05	$^{\circ}C/W$

ELECTRICAL CHARACTERISTICS ($T_{case} = 25^{\circ}C$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CER \#}$	Collector Cut-off Current ($R_{BE} = 5 \Omega$)	$V_{CE} = V_{CEV}$ $V_{CE} = V_{CEV} \quad T_j = 100^{\circ}C$			1.5 10	mA mA
$I_{CEV \#}$	Collector Cut-off Current ($V_{BE} = -5V$)	$V_{CE} = V_{CEV}$ $V_{CE} = V_{CEV} \quad T_j = 100^{\circ}C$			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	$I_C = 5 A \quad L = 15 mH$ $V_{clamp} = 125 V$	125			V
$h_{FE} *$	DC Current Gain	$I_C = 100 A \quad V_{CE} = 5 V$		1200		
$V_{CE(sat) *}$	Collector-Emitter Saturation Voltage	$I_C = 70 A \quad I_B = 0.25 A$ $I_C = 70 A \quad I_B = 0.25 A \quad T_j = 100^{\circ}C$ $I_C = 100 A \quad I_B = 1 A$ $I_C = 100 A \quad I_B = 1 A \quad T_j = 100^{\circ}C$		1.25 1.35 1.5 1.65	1.5 2	V V V V
$V_{BE(sat) *}$	Base-Emitter Saturation Voltage	$I_C = 100 A \quad I_B = 1 A$ $I_C = 100 A \quad I_B = 1 A \quad T_j = 100^{\circ}C$		2.3 2.35	3	V V
di_c/dt	Rate of Rise of On-state Collector	$V_{CC} = 90 V \quad R_C = 0 \quad t_p = 3 \mu s$ $I_{B1} = 0.5 A \quad T_j = 100^{\circ}C$	200	230		$A/\mu s$
$V_{CE(3 \mu s) \bullet}$	Collector-Emitter Dynamic Voltage	$V_{CC} = 90 V \quad R_C = 1.3 \Omega$ $I_{B1} = 0.5 A \quad T_j = 100^{\circ}C$		2	3	V
$V_{CE(5 \mu s) \bullet}$	Collector-Emitter Dynamic Voltage	$V_{CC} = 90 V \quad R_C = 1.3 \Omega$ $I_{B1} = 0.5 A \quad T_j = 100^{\circ}C$		1.8	2.5	V
t_s	Storage Time	$I_C = 70 A \quad V_{CC} = 90 V$		0.9	2	μs
t_f	Fall Time	$V_{BB} = -5 V \quad R_{BB} = \Omega$		0.15	0.3	μs
t_c	Cross-over Time	$V_{clamp} = 125 V \quad I_{B1} = 0.25 A$ $L = 60 \mu H \quad T_j = 100^{\circ}C$		0.3	0.6	μs
V_{CEW}	Maximum Collector Emitter Voltage Without Snubber	$I_{C\text{Woff}} = 120 A \quad I_{B1} = 1A$ $V_{BB} = -5 V \quad V_{CC} = 90 V$ $L = 60 \mu H \quad R_{BB} = 1.25 \Omega$ $T_j = 125^{\circ}C$	125			V
$V_F *$	Diode Forward Voltage	$I_F = 100 A \quad T_j = 100^{\circ}C$		0.92	1	V
I_{RM}	Reverse Recovery Current	$V_{CC} = 125 V \quad I_F = 100 A$ $di_F/dt = -200 A/\mu s \quad L < 0.05 \mu H$ $T_j = 100^{\circ}C$		10	14	A

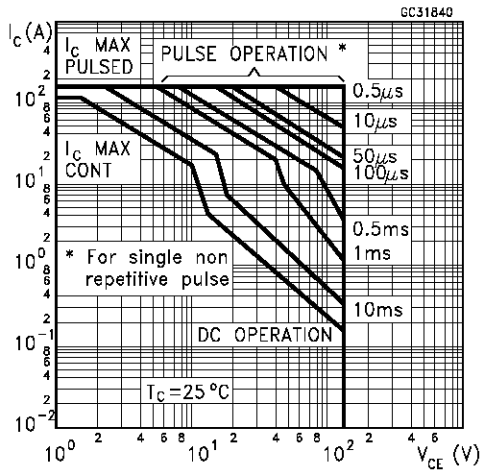
* Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

See test circuits in databook introduction

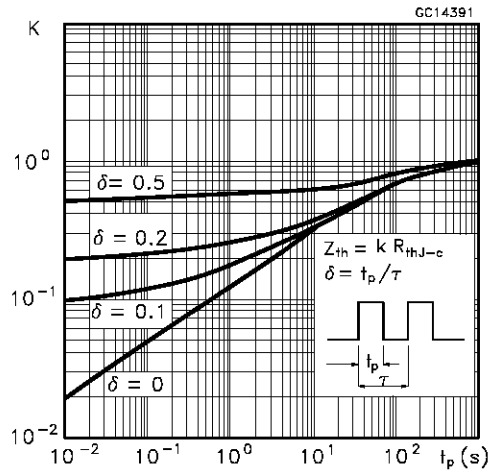
To evaluate the conduction losses of the diode use the following equations:

$$V_F = 0.66 + 0.0034 I_F \quad P = 0.66 I_{F(AV)} + 0.0034 I_{F(RMS)}^2$$

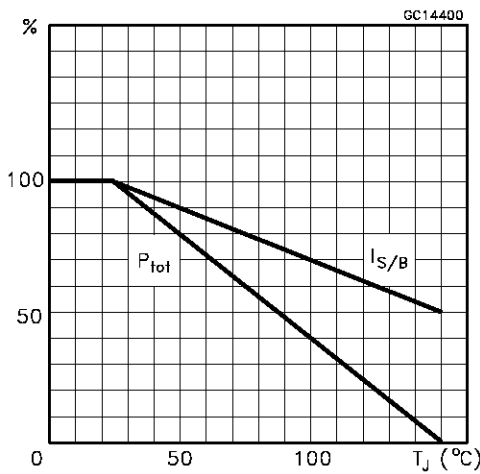
Safe Operating Areas



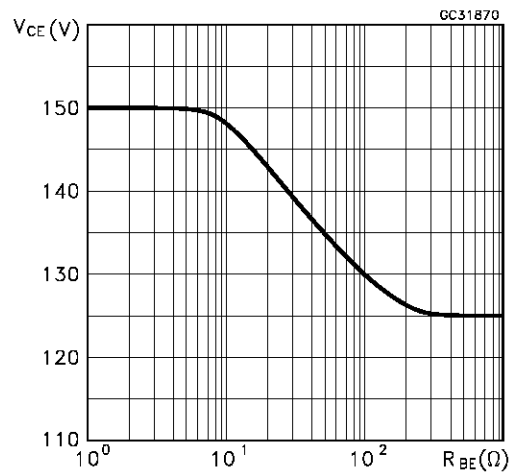
Thermal Impedance



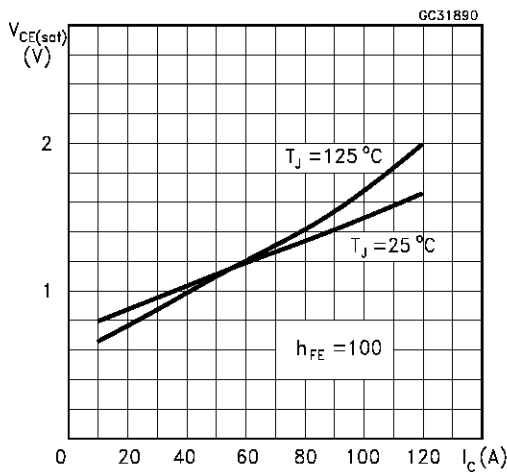
Derating Curve



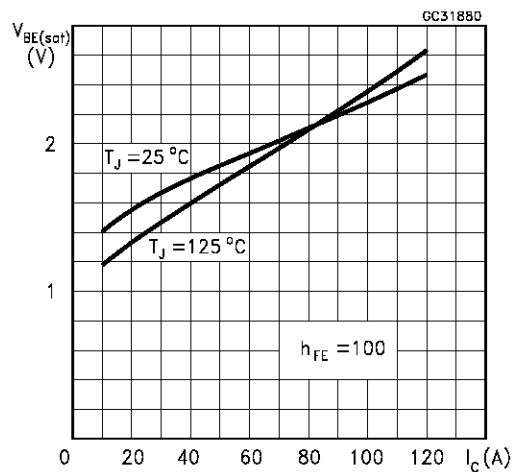
Collector-emitter Voltage Versus base-emitter Resistance



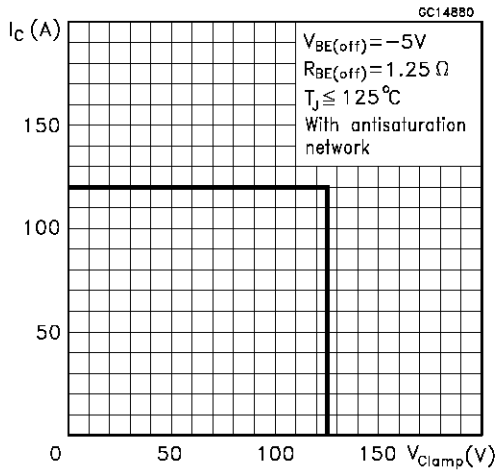
Collector Emitter Saturation Voltage



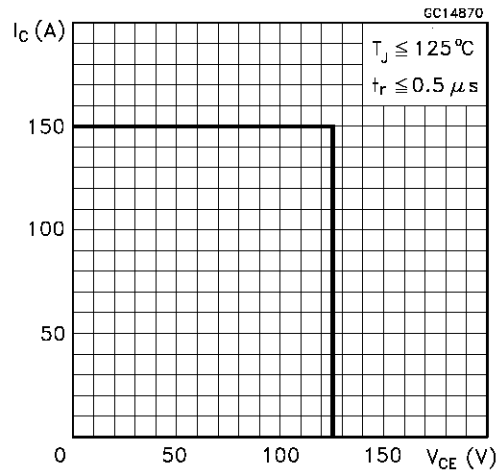
Base-Emitter Saturation Voltage



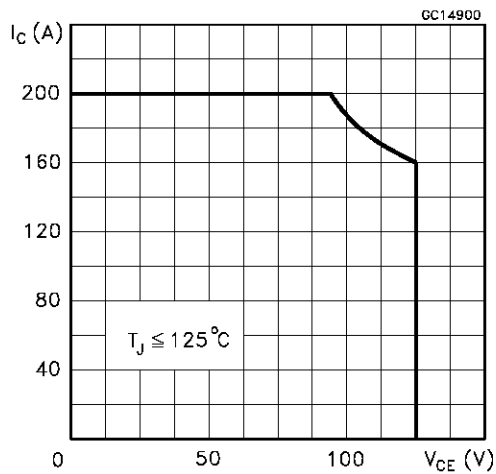
Reverse Biased SOA



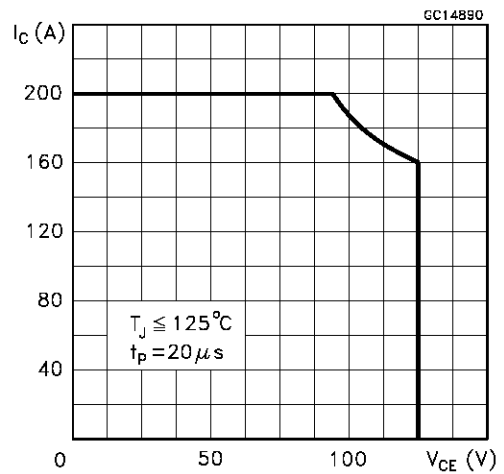
Foward Biased SOA



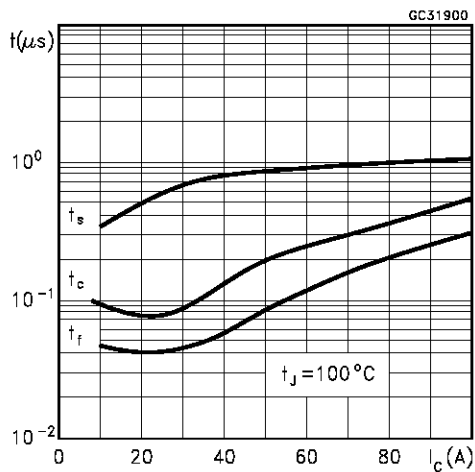
Reverse Biased AOA



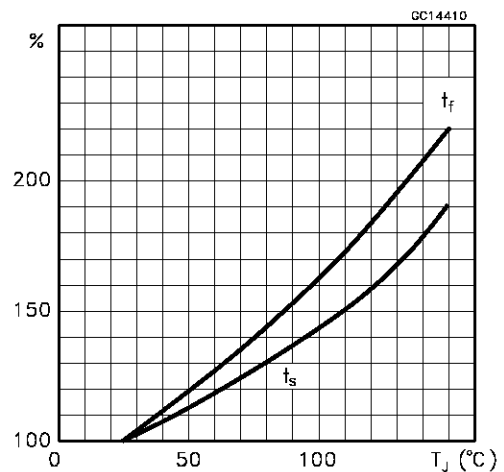
Forward Biased AOA



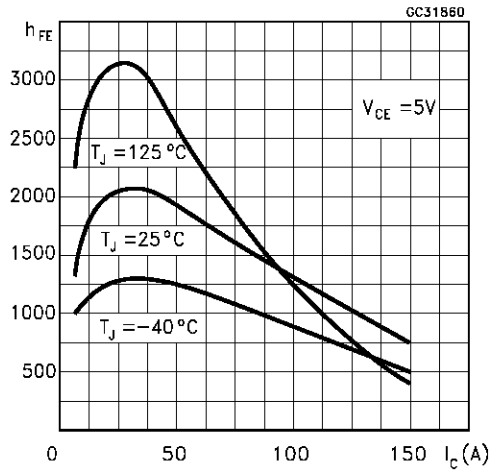
Switching Times Inductive Load



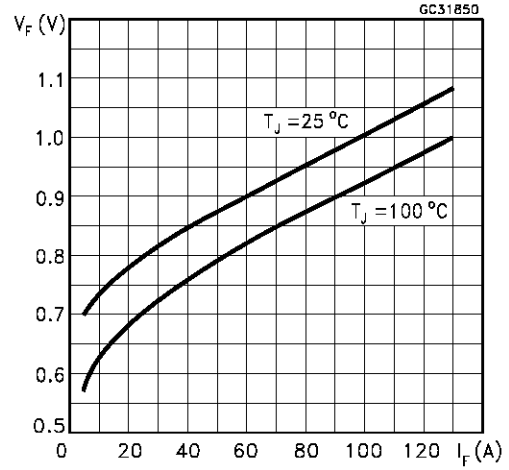
Switching Times Inductive Load Versus Temperature



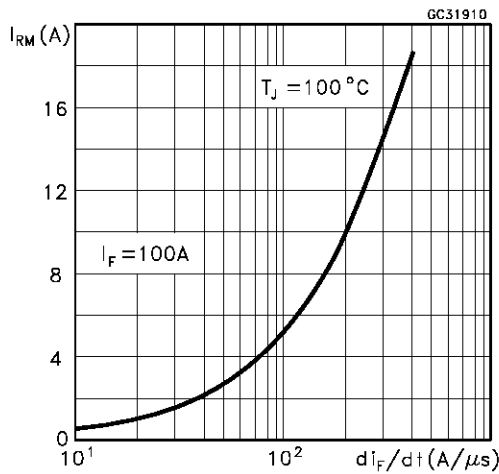
Dc Current Gain



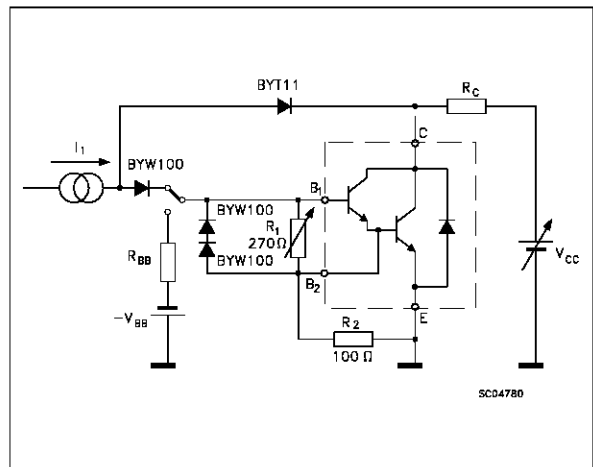
Typical V_F Versus I_F



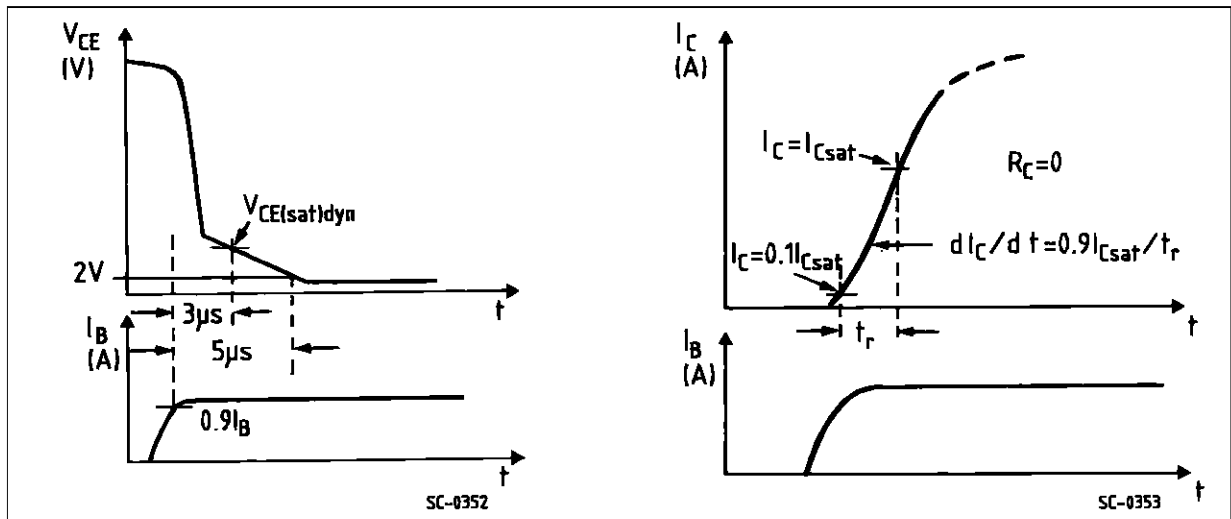
Peak Reverse Current Versus di_F/dt



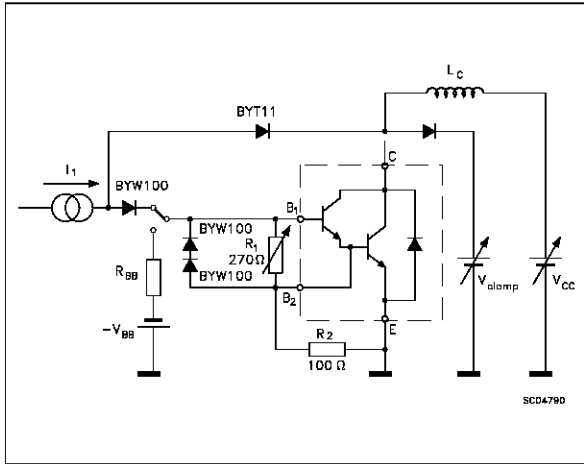
Turn-on Switching Test Circuit



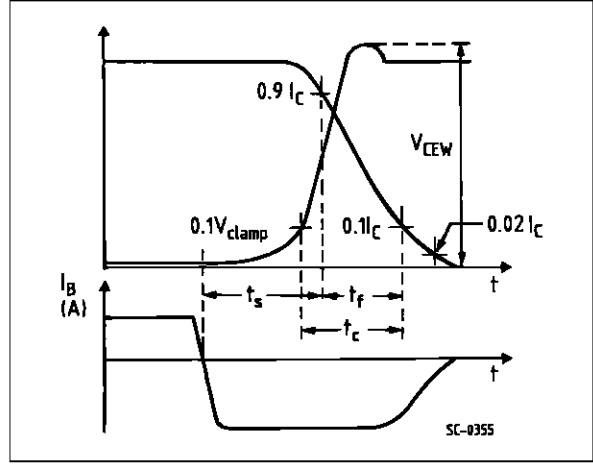
Turn-on Switching Waveforms



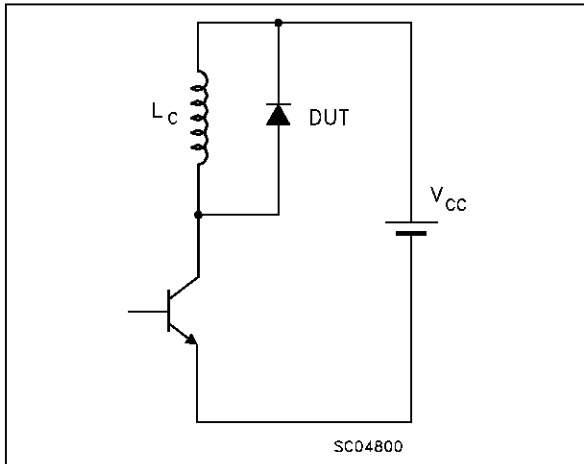
Turn-on Switching Test Circuit



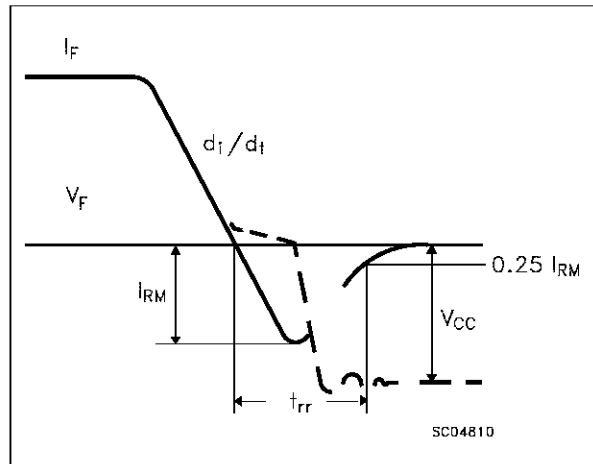
Turn-off Switching Waveforms



Turn-off Switching Test Circuit of Diode

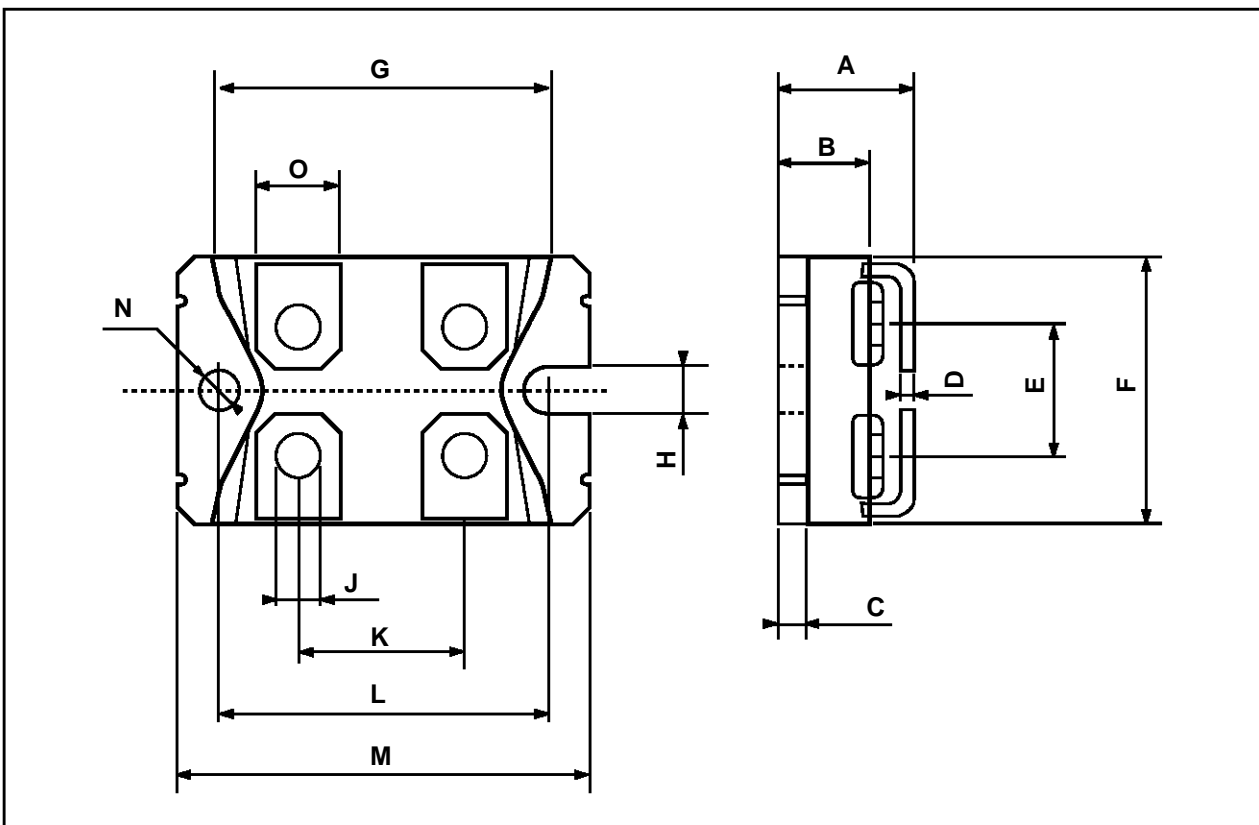


Turn-off Switching Waveform of Diode



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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