



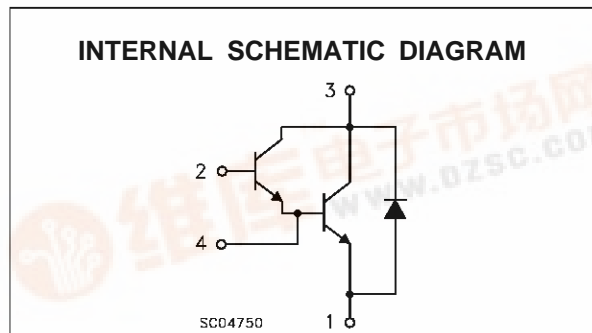
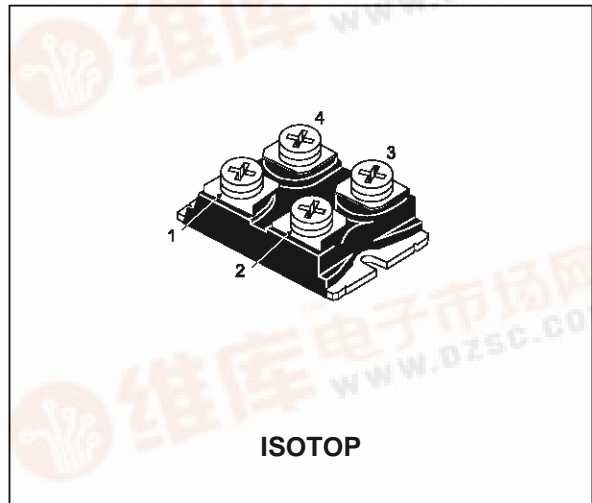
ESM2030DV

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
- UPS
- DC/DC & DC/AC CONVERTERS



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CEV}	Collector-Emitter Voltage ($V_{BE} = -5\text{ V}$)	400	V
$V_{CEO(sus)}$	Collector-Emitter Voltage ($I_B = 0$)	300	V
V_{EBO}	Emitter-Base Voltage ($I_C = 0$)	7	V
I_C	Collector Current	67	A
I_{CM}	Collector Peak Current ($t_p = 10\text{ ms}$)	100	A
I_B	Base Current	3	A
I_{BM}	Base Peak Current ($t_p = 10\text{ ms}$)	6	A
P_{tot}	Total Dissipation at $T_c = 25\text{ }^\circ\text{C}$	150	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	$^\circ\text{C}$

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THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case (transistor)	Max	0.83	$^{\circ}C/W$
$R_{thj-case}$	Thermal Resistance Junction-case (diode)	Max	1.2	$^{\circ}C/W$
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 16	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 11	mA mA
I_{EBO} #	Emitter Cut-off Current ($I_C = 0$)	$V_{EB} = 5 V$			1	mA
$V_{CEO(SUS)}$ *	Collector-Emitter Sustaining Voltage	$I_C = 0.2 A \quad L = 25 mH$ $V_{clamp} = 300 V$	300			V
h_{FE} *	DC Current Gain	$I_C = 56 A \quad V_{CE} = 5 V$		300		
$V_{CE(sat)}$ *	Collector-Emitter Saturation Voltage	$I_C = 40 A \quad I_B = 0.4 A$ $I_C = 40 A \quad I_B = 0.4 A \quad T_j = 100^{\circ}C$ $I_C = 56 A \quad I_B = 1.6 A$ $I_C = 56 A \quad I_B = 1.6 A \quad T_j = 100^{\circ}C$		1.25 1.4 1.5 1.8	1.8 2.2	V V V V
$V_{BE(sat)}$ *	Base-Emitter Saturation Voltage	$I_C = 56 A \quad I_B = 1.6 A$ $I_C = 56 A \quad I_B = 1.6 A \quad T_j = 100^{\circ}C$		2.4 2.5	3	V V
di_c/dt	Rate of Rise of On-state Collector	$V_{CC} = 300 V \quad R_C = 0 \quad t_p = 3 \mu s$ $I_{B1} = 0.6 A \quad T_j = 100^{\circ}C$	220	260		$A/\mu s$
$V_{CE(3 \mu s)}$ •	Collector-Emitter Dynamic Voltage	$V_{CC} = 300 V \quad R_C = 7.5 \Omega$ $I_{B1} = 0.6 A \quad T_j = 100^{\circ}C$		3	6	V
$V_{CE(5 \mu s)}$ •	Collector-Emitter Dynamic Voltage	$V_{CC} = 300 V \quad R_C = 7.5 \Omega$ $I_{B1} = 0.6 A \quad T_j = 100^{\circ}C$		2.2	4	V
t_s	Storage Time	$I_C = 40 A \quad V_{CC} = 50 V$		2	3	μs
t_f	Fall Time	$V_{BB} = -5 V \quad R_{BB} = 0.6 \Omega$		0.35	0.6	μs
t_c	Cross-over Time	$V_{clamp} = 300 V \quad I_{B1} = 0.4 A$ $L = 0.06 mH \quad T_j = 100^{\circ}C$		0.8	1.2	μs
V_{CEW}	Maximum Collector Emitter Voltage Without Snubber	$I_{C\text{Woff}} = 67 A \quad I_{B1} = 1.6 A$ $V_{BB} = -5 V \quad V_{CC} = 50 V$ $L = 0.037 mH \quad R_{BB} = 0.6 \Omega$ $T_j = 125^{\circ}C$	300			V
V_F *	Diode Forward Voltage	$I_F = 56 A \quad T_j = 100^{\circ}C$		1.15	1.6	V
I_{RM}	Reverse Recovery Current	$V_{CC} = 200 V \quad I_F = 56 A$ $di_F/dt = -220 A/\mu s \quad L < 0.05 \mu H$ $T_j = 100^{\circ}C$		12	17	A

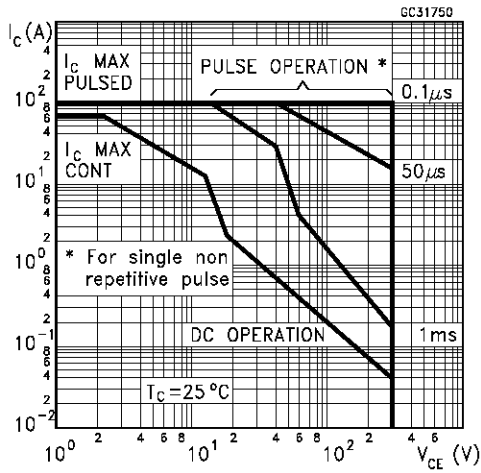
* Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

See test circuit in databook introduction

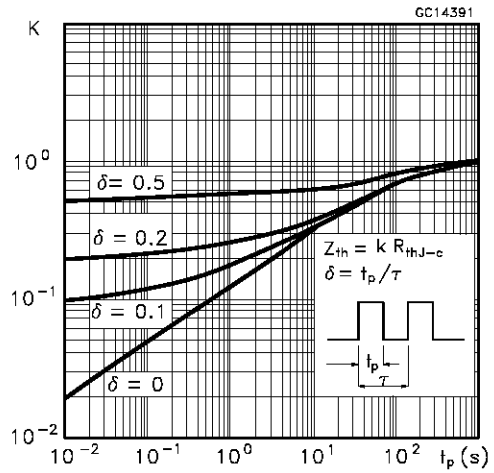
To evaluate the conduction losses of the diode use the following equations:

$$V_F = 1.1 + 0.0045 I_F \quad P = 1.1 I_{F(AV)} + 0.0045 I_{F(RMS)}^2$$

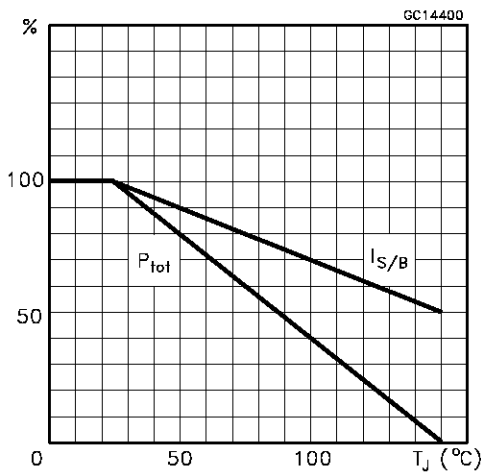
Safe Operating Areas



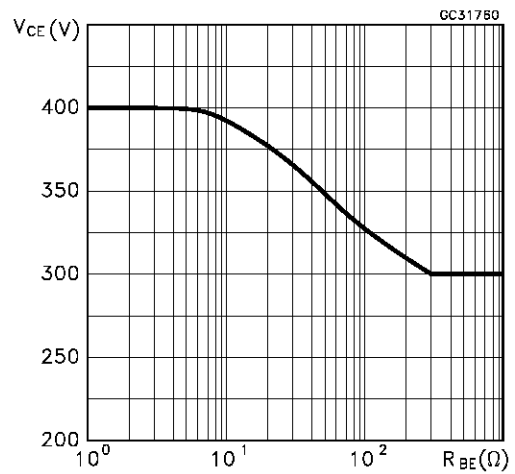
Thermal Impedance



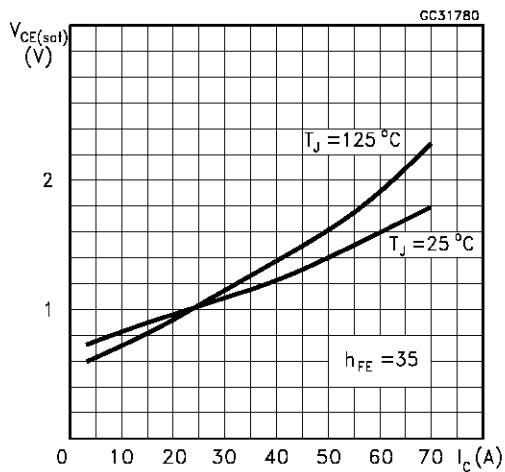
Derating Curve



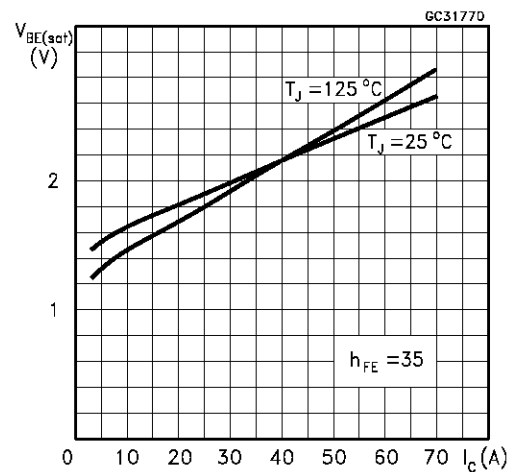
Collector-emitter Voltage Versus base-emitter Resistance



Collector Emitter Saturation Voltage

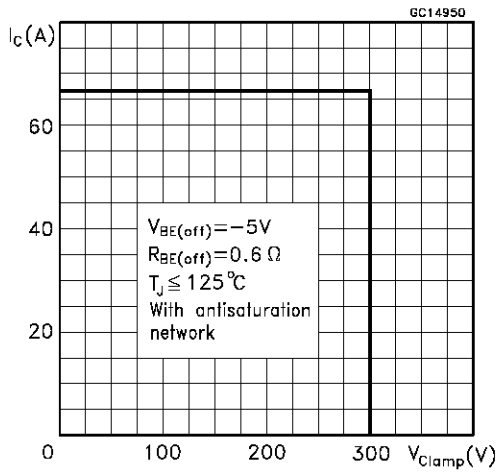


Base-Emitter Saturation Voltage

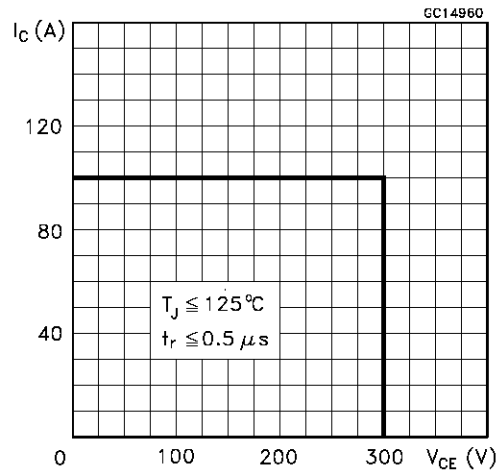


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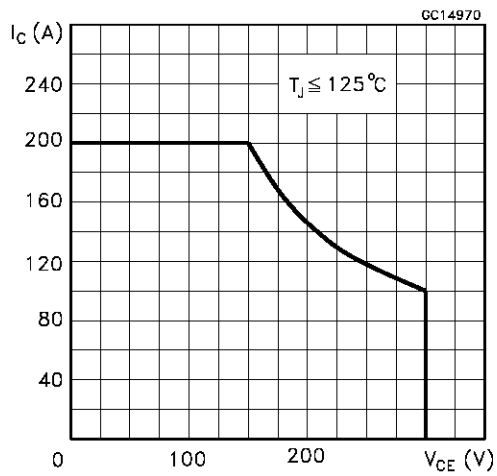
Reverse Biased SOA



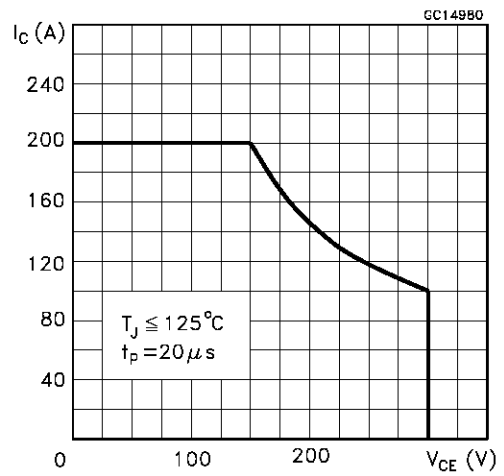
Forward Biased SOA



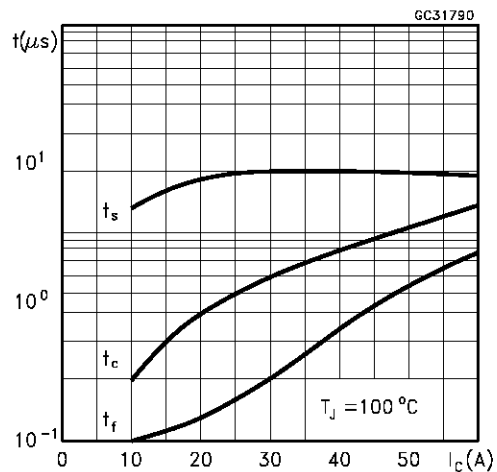
Reverse Biased AOA



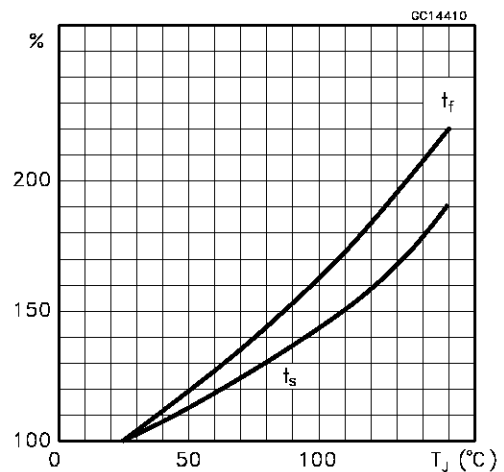
Forward Biased AOA



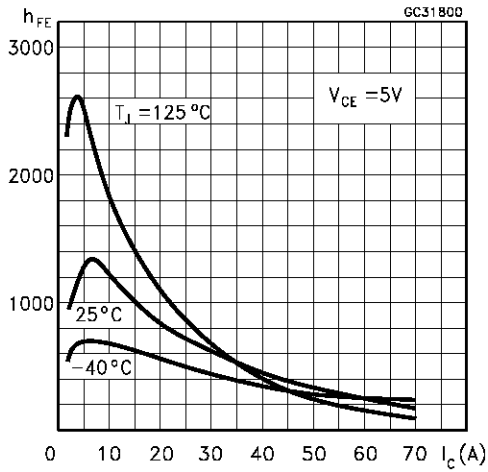
Switching Times Inductive Load



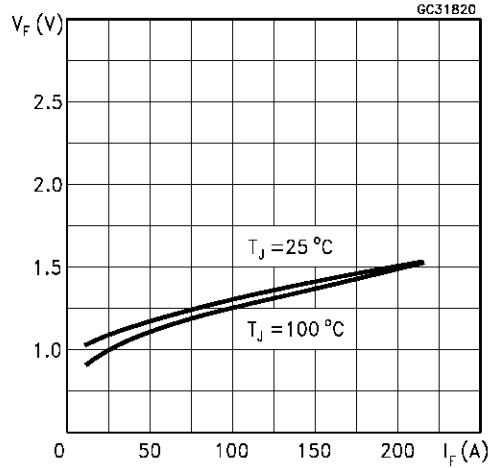
Switching Times Inductive Load Versus Temperature



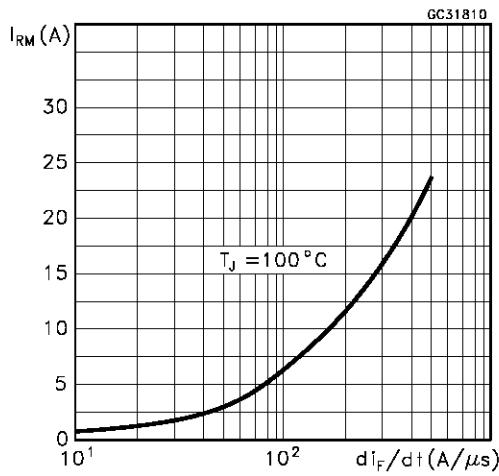
Dc Current Gain



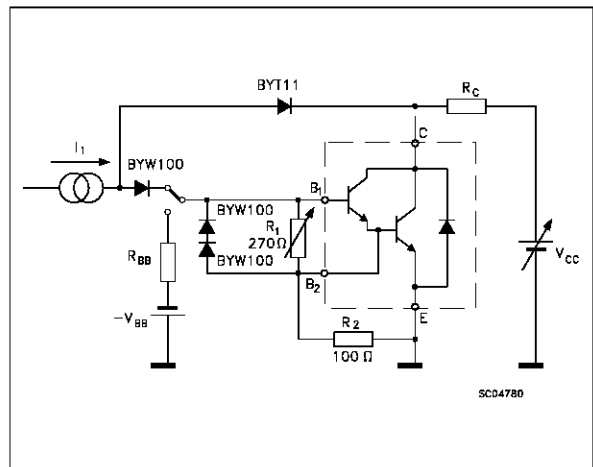
Typical VF Versus IF



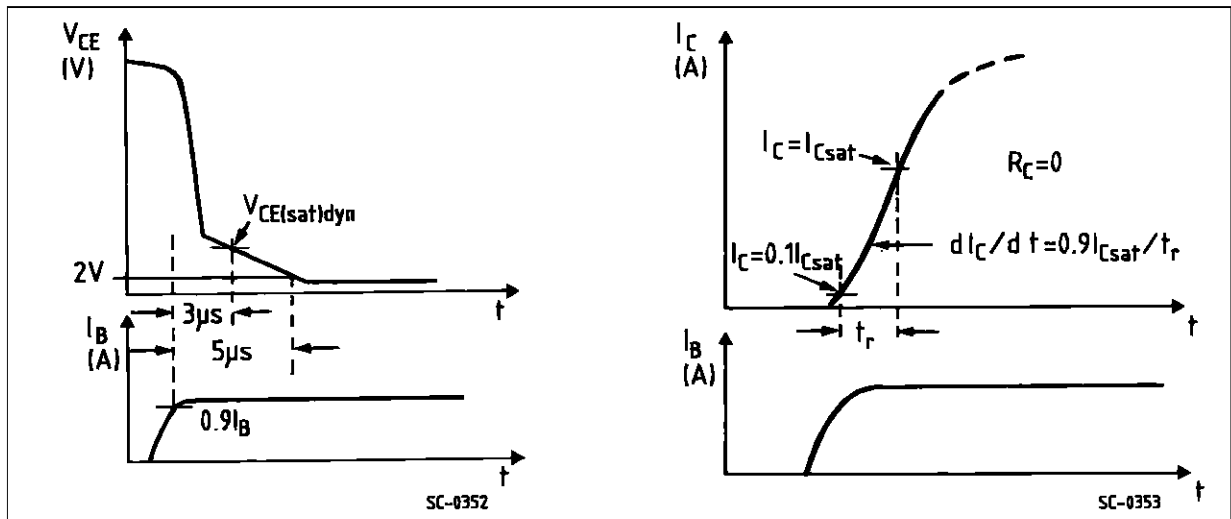
Peak Reverse Current Versus diF/dt



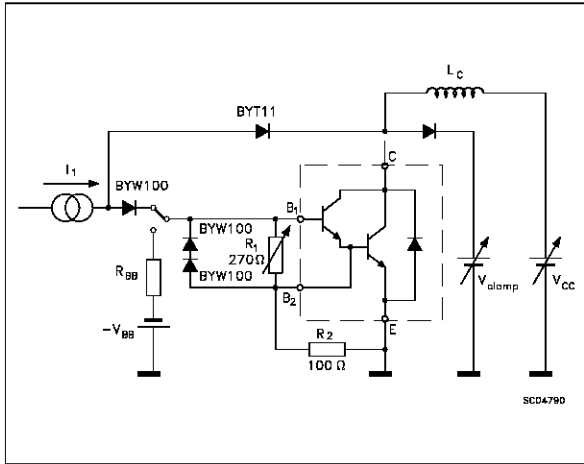
Turn-on Switching Test Circuit



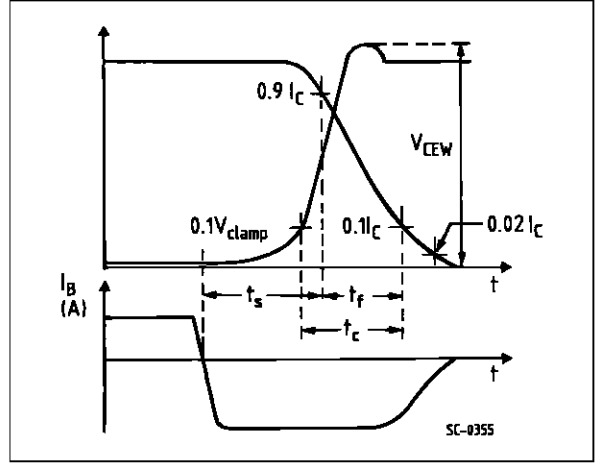
Turn-on Switching Waveforms



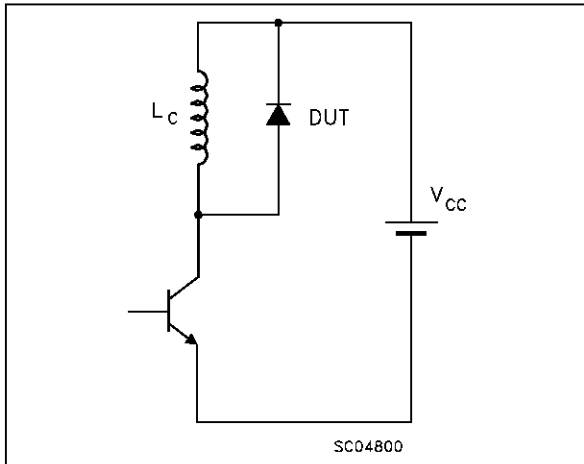
Turn-on Switching Test Circuit



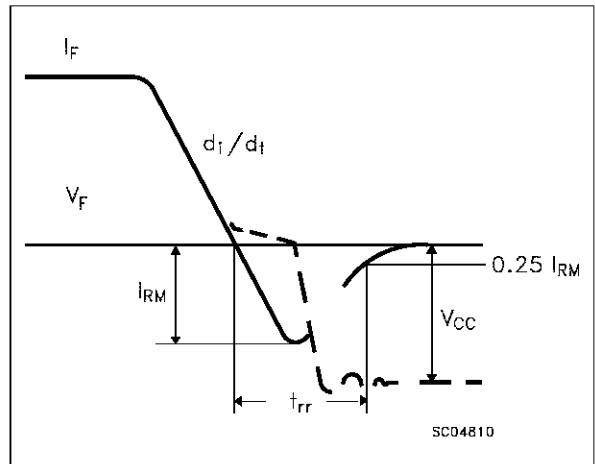
Turn-off Switching Waveforms



Turn-off Switching Test Circuit of Diode

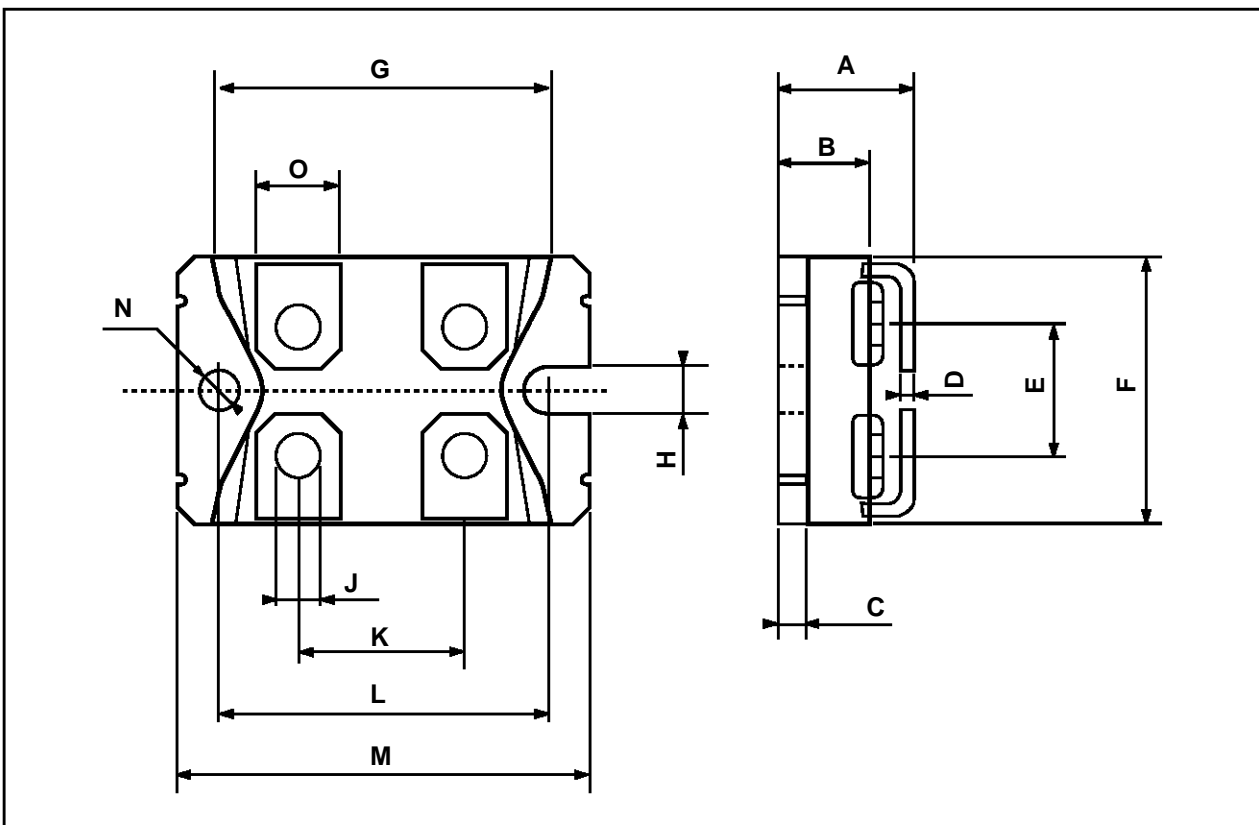


Turn-off Switching Waveform of Diode



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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