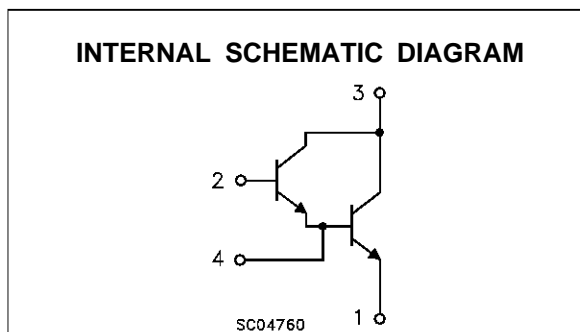
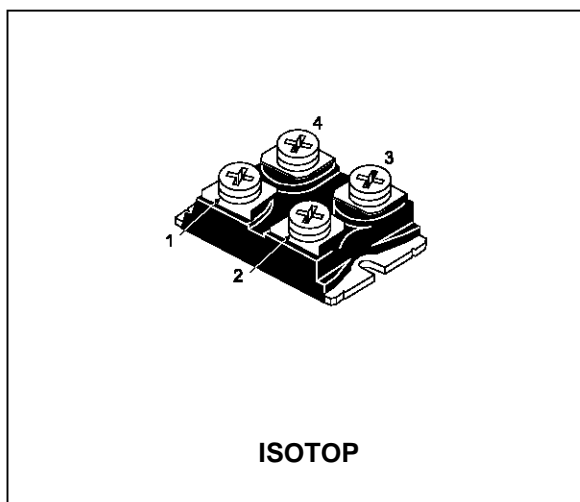


## NPN DARLINGTON POWER MODULE

- HIGH CURRENT POWER BIPOLAR MODULE
- VERY LOW  $R_{th}$  JUNCTION CASE
- SPECIFIED ACCIDENTAL OVERLOAD AREAS
- 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 ( $V_{BE} = -5$ V)	1000	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	72	A
$I_{CM}$	Collector Peak Current ( $t_p = 10$ ms)	108	A
$I_B$	Base Current	8	A
$I_{BM}$	Base Peak Current ( $t_p = 10$ ms)	16	A
$P_{tot}$	Total Dissipation at $T_C = 25$ °C	250	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

# ESM6045AV

## THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.5	°C/W
$R_{thc-h}$	Thermal Resistance Case-heatsink With Conductive Grease Applied	Max	0.05	°C/W

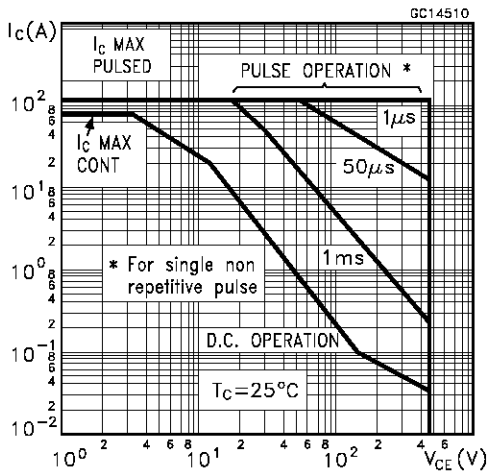
## ELECTRICAL CHARACTERISTICS ( $T_{case} = 25\text{ °C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CER}$ #	Collector Cut-off Current ( $R_{BE} = 5\ \Omega$ )	$V_{CE} = V_{CEV}$ $V_{CE} = V_{CEV}$ $T_j = 100\text{ °C}$			1.5 22	mA mA
$I_{CEV}$ #	Collector Cut-off Current ( $V_{BE} = -5$ )	$V_{CE} = V_{CEV}$ $V_{CE} = V_{CEV}$ $T_j = 100\text{ °C}$			1 15	mA mA
$I_{EBO}$ #	Emitter Cut-off Current ( $I_C = 0$ )	$V_{EB} = 5\text{ V}$			1	mA
$V_{CEO(SUS)}$ *	Collector-Emitter Sustaining Voltage	$I_C = 0.2\text{ A}$ $L = 25\text{ mH}$ $V_{clamp} = 450\text{ V}$	450			V
$h_{FE}$ *	DC Current Gain	$I_C = 60\text{ A}$ $V_{CE} = 5\text{ V}$		150		
$V_{CE(sat)}$ *	Collector-Emitter Saturation Voltage	$I_C = 50\text{ A}$ $I_B = 1\text{ A}$ $I_C = 50\text{ A}$ $I_B = 1\text{ A}$ $T_j = 100\text{ °C}$ $I_C = 60\text{ A}$ $I_B = 2.4\text{ A}$ $I_C = 60\text{ A}$ $I_B = 2.4\text{ A}$ $T_j = 100\text{ °C}$		1.2 1.6 1.3 1.55	2 2	V V V V
$V_{BE(sat)}$ *	Base-Emitter Saturation Voltage	$I_C = 60\text{ A}$ $I_B = 2.4\text{ A}$ $I_C = 60\text{ A}$ $I_B = 2.4\text{ A}$ $T_j = 100\text{ °C}$		2.1 2.15	3	V V
$di_c/dt$	Rate of Rise of On-state Collector	$V_{CC} = 300\text{ V}$ $R_C = 0$ $t_p = 3\ \mu s$ $I_{B1} = 3.6\text{ A}$ $T_j = 100\text{ °C}$	450	500		A/ $\mu s$
$V_{CE(3\ \mu s)}$ #	Collector-Emitter Dynamic Voltage	$V_{CC} = 300\text{ V}$ $R_C = 5\ \Omega$ $I_{B1} = 3.6\text{ A}$ $T_j = 100\text{ °C}$		4	7	V
$V_{CE(5\ \mu s)}$ #	Collector-Emitter Dynamic Voltage	$V_{CC} = 300\text{ V}$ $R_C = 5\ \Omega$ $I_{B1} = 3.6\text{ A}$ $T_j = 100\text{ °C}$		2.5	4	V
$t_s$	Storage Time	$I_C = 60\text{ A}$ $V_{CC} = 50\text{ V}$		4.6	6	$\mu s$
$t_f$	Fall Time	$V_{BB} = -5\text{ V}$ $R_{BB} = 0.3\ \Omega$		0.4	0.6	$\mu s$
$t_c$	Cross-over Time	$V_{clamp} = 450\text{ V}$ $I_{B1} = 2.4\text{ A}$ $L = 0.04\text{ mH}$ $T_j = 100\text{ °C}$		1.2	2	$\mu s$
$V_{CEW}$	Maximum Collector Emitter Voltage Without Snubber	$I_{C\text{Woff}} = 72\text{ A}$ $I_{B1} = 2.4\text{ A}$ $V_{BB} = -5\text{ V}$ $V_{CC} = 50\text{ V}$ $L = 35\ \mu H$ $R_{BB} = 0.3\ \Omega$ $T_j = 125\text{ °C}$	450			V

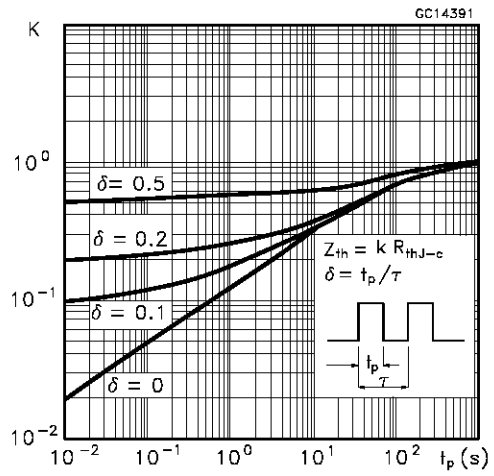
\* Pulsed: Pulse duration = 300  $\mu s$ , duty cycle 1.5 %

# See test circuits in databook introduction

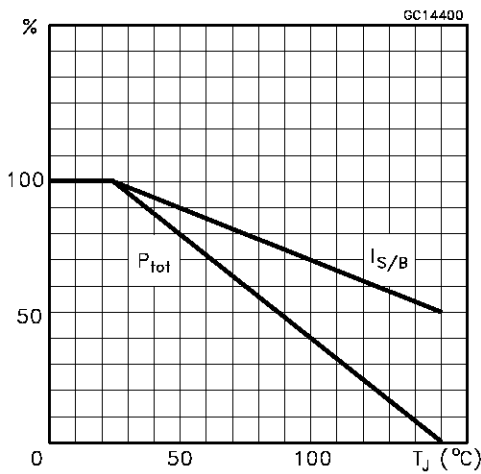
Safe Operating Areas



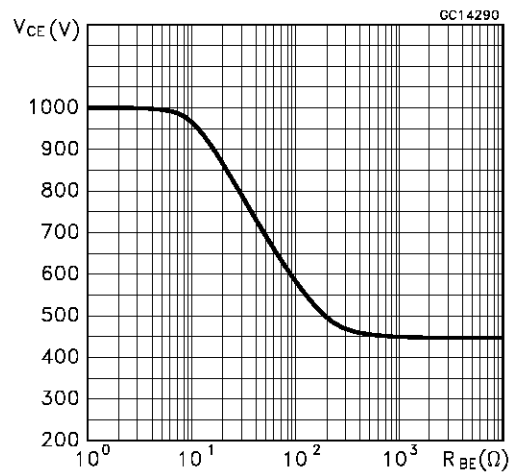
Thermal Impedance



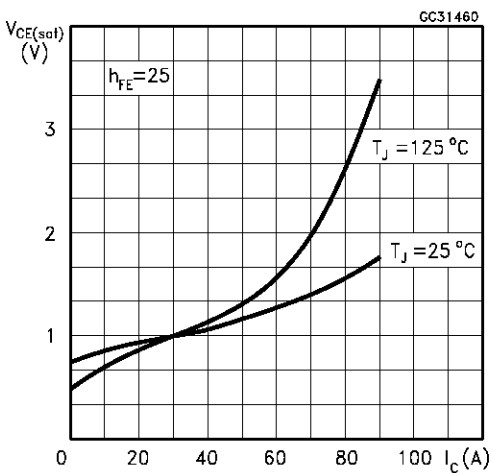
Derating Curve



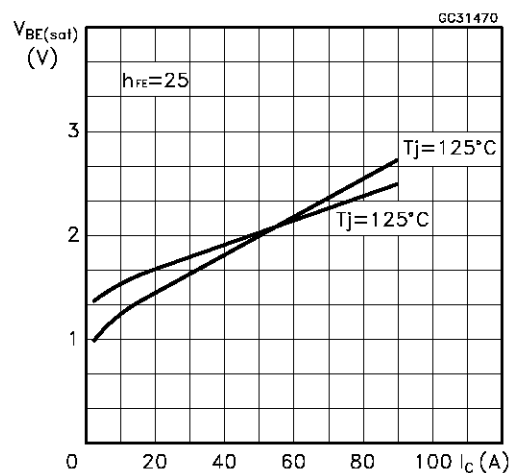
Collector-emitter Voltage Versus base-emitter Resistance



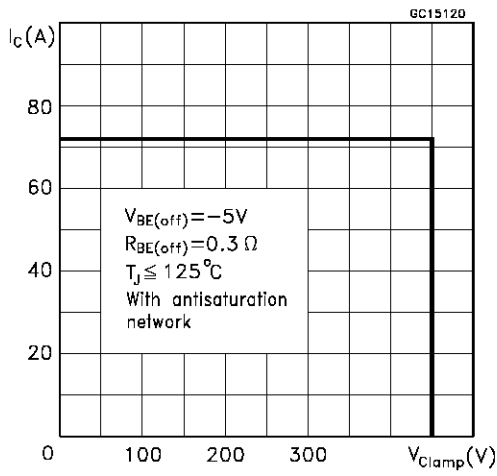
Collector Emitter Saturation Voltage



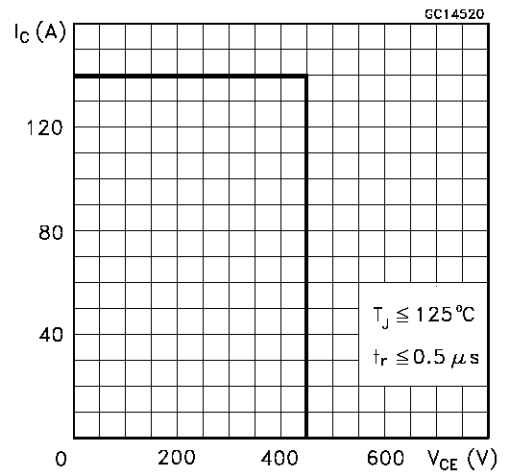
Base-Emitter Saturation Voltage



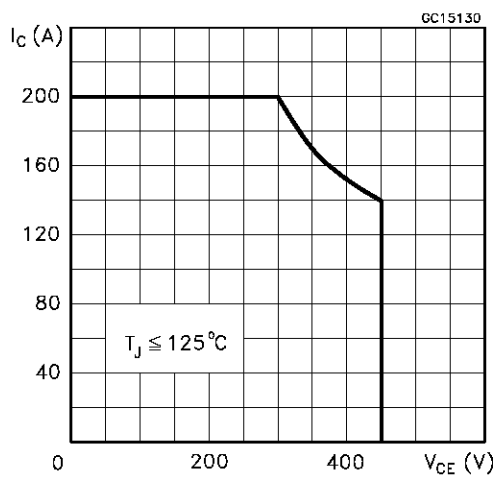
Reverse Biased SOA



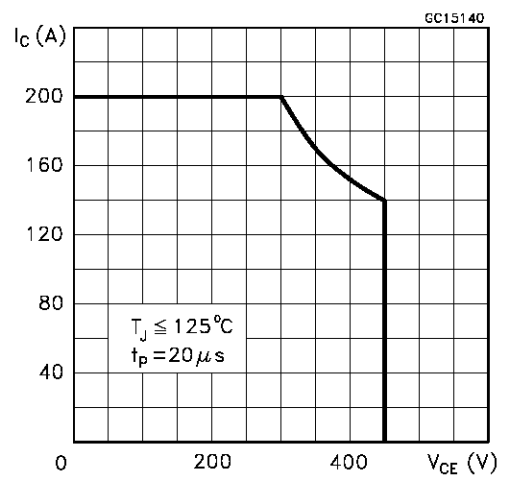
Forward Biased SOA



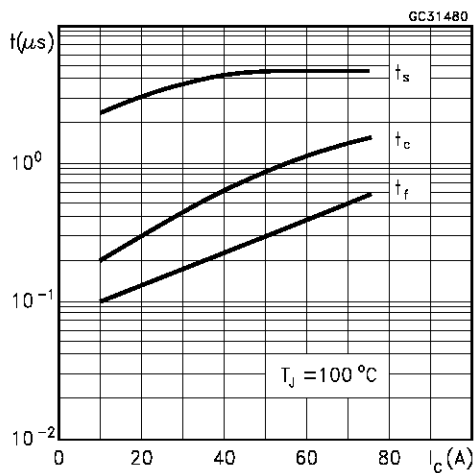
Reverse Biased AOA



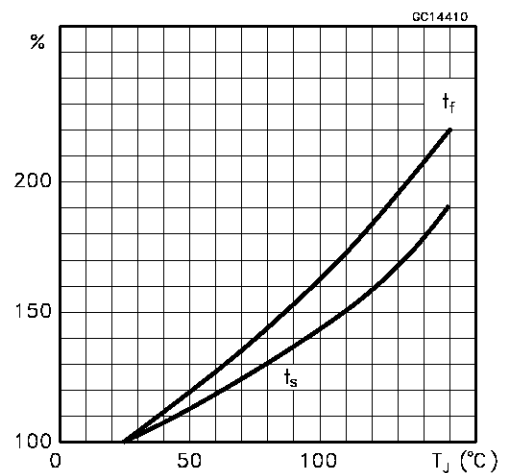
Forward Biased AOA



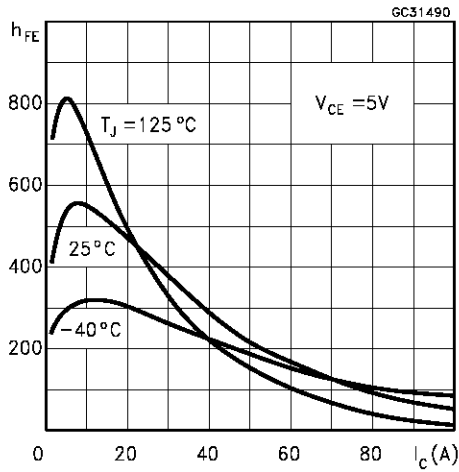
Switching Times Inductive Load



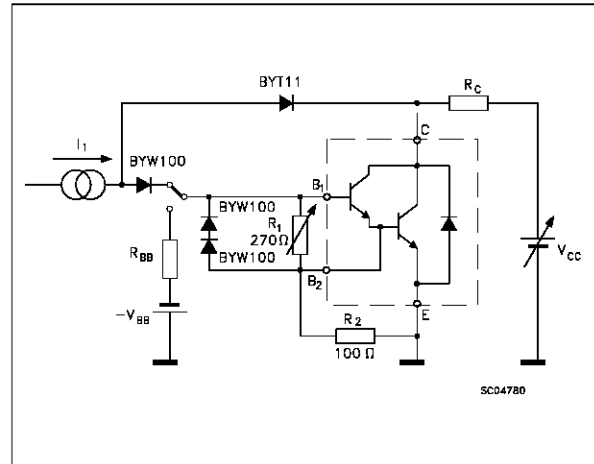
Switching Times Inductive Load Versus Temperature



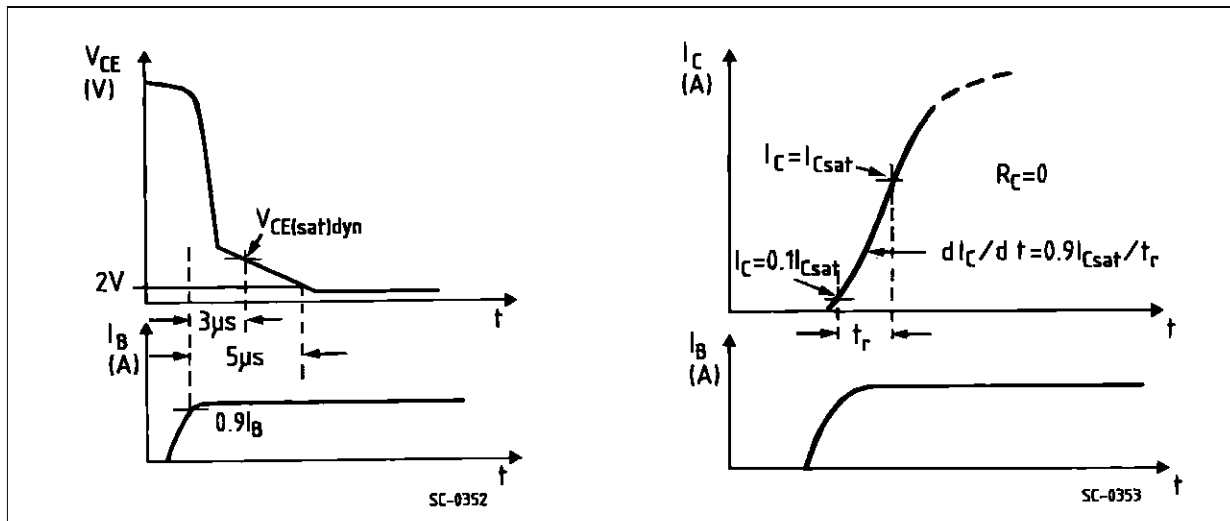
Dc Current Gain



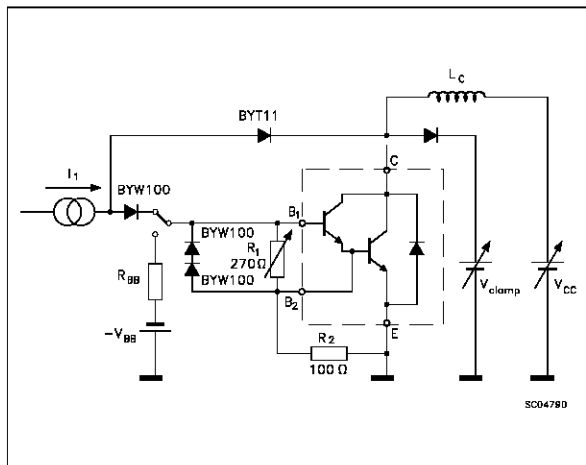
Turn-on Switching Test Circuit



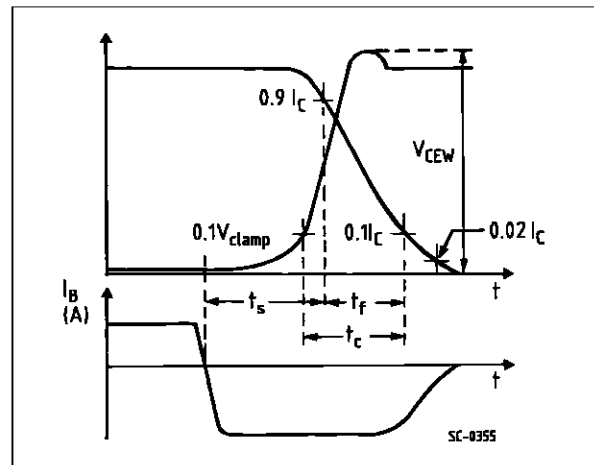
Turn-on Switching Waveforms



Turn-off Switching Test Circuit

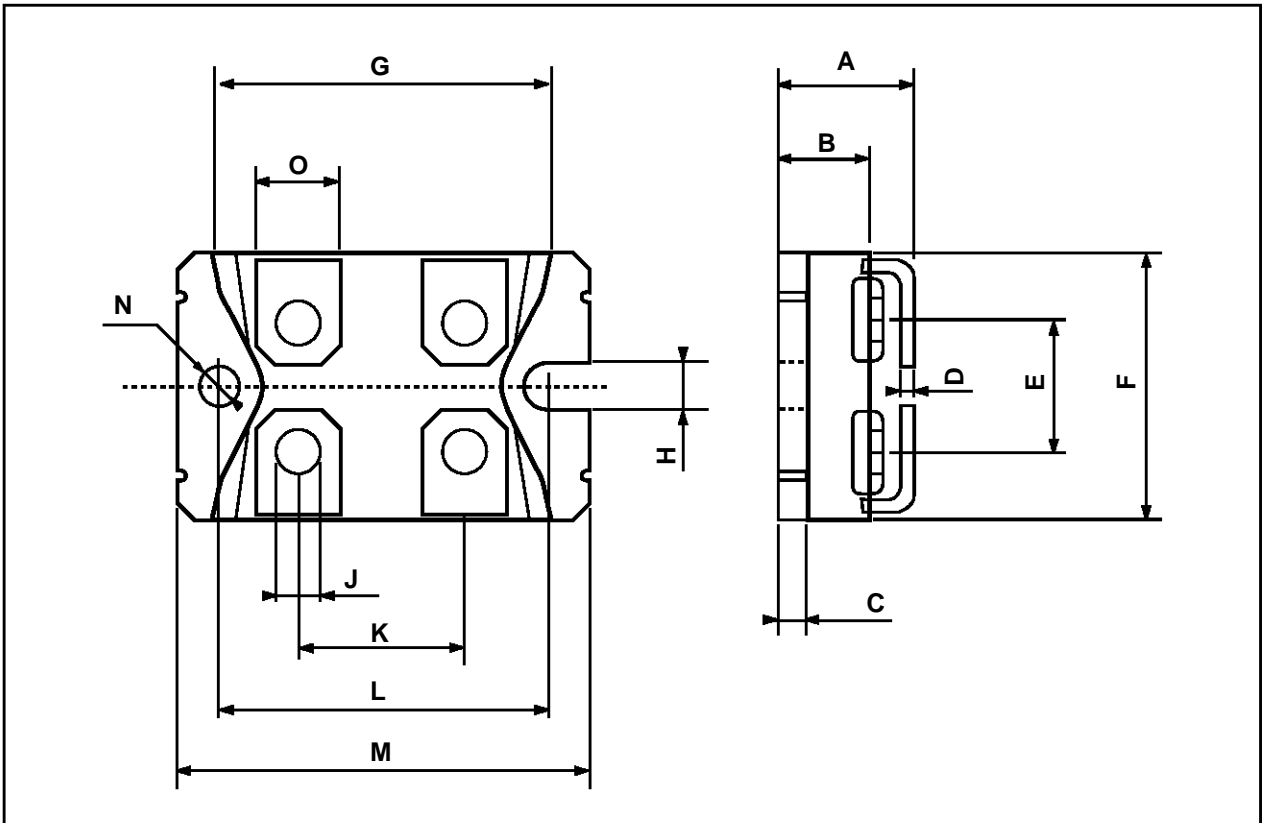


Turn-off Switching Waveforms



**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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