

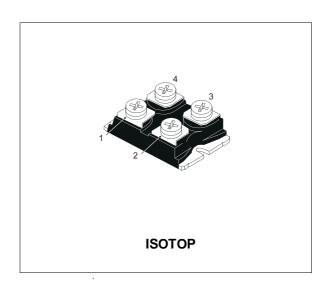
# **ESM3030DV**

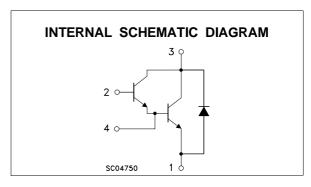
# NPN DARLINGTON POWER MODULE

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

#### **INDUSTRIAL APPLICATIONS:**

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





#### **ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
V <sub>CEV</sub>	Collector-Emitter Voltage (V <sub>BE</sub> = -5 V)	400	V
V <sub>CEO(sus)</sub>	Collector-Emitter Voltage (I <sub>B</sub> = 0)	300	V
V <sub>EBO</sub>	Emitter-Base Voltage (I <sub>C</sub> = 0)	7	V
Ic	Collector Current	100	Α
I <sub>CM</sub>	Collector Peak Current (tp = 10 ms)	150	Α
I <sub>B</sub>	Base Current	5	Α
I <sub>BM</sub>	Base Peak Current (tp = 10 ms)	10	Α
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	225	W
V <sub>isol</sub>	Insulation Withstand Voltage (RMS) from All Four Terminals to Exernal Heatsink	2500	V
T <sub>stg</sub>	Storage Temperature	-55 to 150	°C
Tj	Max. Operating Junction Temperature	150	°C

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#### THERMAL DATA

R <sub>thj-case</sub>	Thermal Resistance Junction-case (transistor)	Max	0.55	°C/W
R <sub>thj-case</sub>	Thermal Resistance Junction-case (diode)	Max	1.2	°C/W
R <sub>thc-h</sub>	Thermal Resistance Case-heatsink With Conductive			
	Grease Applied	Max	0.05	°C/W

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

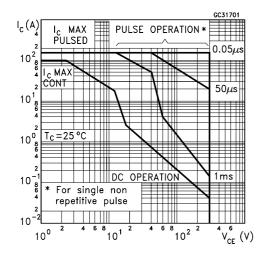
Symbol	ymbol Parameter Test Conditi		ns Min.			Unit	
I <sub>CER</sub> #	Collector Cut-off Current ( $R_{BE} = 5 \Omega$ )	$V_{CE} = V_{CEV}$ $V_{CE} = V_{CEV}$ $T_j = 100$ °C			1.5 16	mA mA	
I <sub>CEV</sub> #	Collector Cut-off Current (V <sub>BE</sub> = -5)	V <sub>CE</sub> = V <sub>CEV</sub> V <sub>CE</sub> = V <sub>CEV</sub> T <sub>j</sub> = 100 °C			1 11	mA mA	
I <sub>EBO</sub> #	Emitter Cut-off Current (I <sub>C</sub> = 0)	V <sub>EB</sub> = 5 V			1	mA	
V <sub>CEO(SUS)</sub> *	Collector-Emitter Sustaining Voltage (I <sub>B</sub> = 0)	$I_C = 0.2 \text{ A}$ L = 25 mH $V_{clamp} = 300 \text{ V}$	300			V	
h <sub>FE</sub> *	DC Current Gain	I <sub>C</sub> = 85 A V <sub>CE</sub> = 5 V		300			
V <sub>CE(sat)</sub> *	Collector-Emitter Saturation Voltage	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		1.25 1.4 1.5 1.8	1.8	V V V	
V <sub>BE(sat)</sub> *	Base-Emitter Saturation Voltage	I <sub>C</sub> = 85 A I <sub>B</sub> = 2.4 A I <sub>C</sub> = 85 A I <sub>B</sub> = 2.4 A T <sub>j</sub> = 100 °C		2.4 2.5	3	V V	
di <sub>C</sub> /dt	Rate of Rise of On-state Collector	$V_{CC} = 300 \text{ V}$ $R_C = 0$ $t_p = 3 \mu s$ $I_{B1} = 0.9 \text{ A}$ $T_j = 100  ^{\circ}\text{C}$	330	430		A/μs	
V <sub>CE</sub> (3 μs)••	Collector-Emitter Dynamic Voltage	$V_{CC} = 300 \text{ V}$ $R_C = 5 \Omega$ $I_{B1} = 0.9 \text{ A}$ $T_j = 100 ^{\circ}\text{C}$		3	6	٧	
V <sub>CE</sub> (5 μs)••	Collector-Emitter Dynamic Voltage	$V_{CC} = 300 \text{ V}$ $R_C = 5 \Omega$ $I_{B1} = 0.9 \text{ A}$ $T_j = 100 ^{\circ}\text{C}$		2.2	4	V	
t <sub>s</sub> t <sub>f</sub> t <sub>c</sub>	Storage Time Fall Time Cross-over Time	$I_{C} = 60 \text{ A}$ $V_{CC} = 50 \text{ V}$ $V_{BB} = -5 \text{ V}$ $R_{BB} = 0.6 \Omega$ $V_{clamp} = 300 \text{ V}$ $I_{B1} = 0.6 \text{ A}$ $L = 0.04 \text{ mH}$ $T_{j} = 100 \text{ °C}$		2.3 0.35 0.8	3.5 0.6 1.2	μs μs μs	
Vcew	Maximum Collector Emitter Voltage Without Snubber	$\begin{array}{lll} I_{CWoff} = 100 \; A & I_{B1} = 2.4 \; A \\ V_{BB} = -5 \; V & V_{CC} = 50 \; V \\ L = 25 \; \mu H & R_{BB} = 0.6 \; \Omega \\ T_j = 125 \; ^{\circ}C & \end{array}$	300			V	
V <sub>F</sub> *	Diode Forward Voltage	I <sub>F</sub> = 85 A T <sub>j</sub> = 100 °C		1.2	1.55	V	
I <sub>RM</sub>	Reverse Recovery Current	$V_{CC} = 200 \text{ V}$ $I_F = 85 \text{ A}$ $di_F/dt = -330 \text{ A/}\mu\text{s}$ $L < 50 \text{ nH}$ $T_j = 100  ^{\circ}\text{C}$		18	25	А	

<sup>\*</sup> Pulsed: Pulse duration = 300 μs, duty cycle 1.5 % # See test circuits in databook introduction

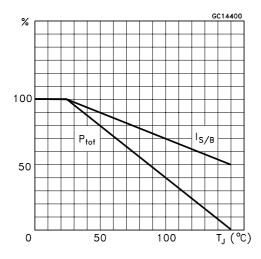
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To evaluate the conduction losses of the diode use the following equations:  $V_F = 1.1 + 0.0045 \; I_F \qquad P = 1.1 \; I_{F(AV)} + 0.0045 \; I_{F(RMS)}^2$ 

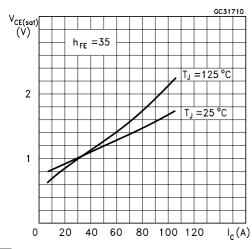
#### Safe Operating Areas



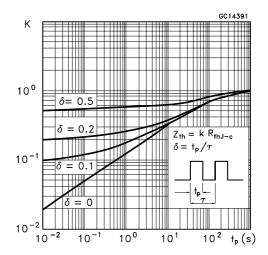
# **Derating Curve**



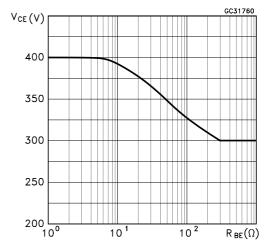
## Collector Emitter Saturation Voltage



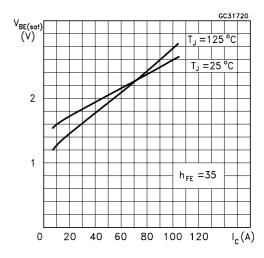
## Thermal Impedance



# Collector-emitter Voltage Versus base-emitter Resistance

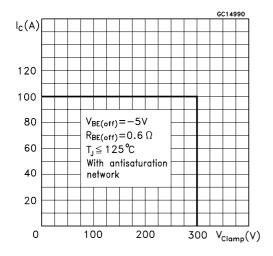


## Base-Emitter Saturation Voltage

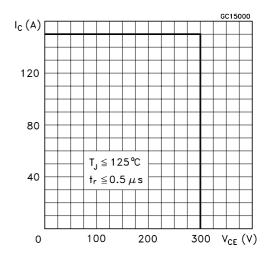


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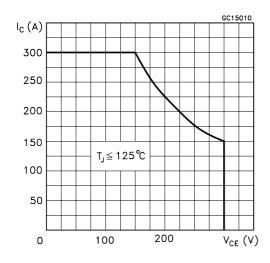
#### Reverse Biased SOA



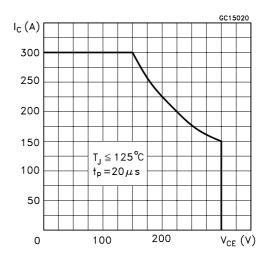
#### Foward Biased SOA



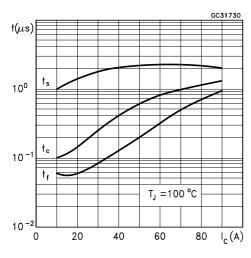
#### Reverse Biased AOA



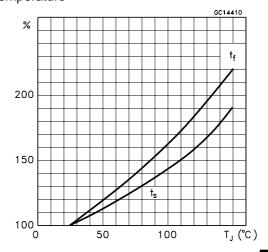
Forward Biased AOA



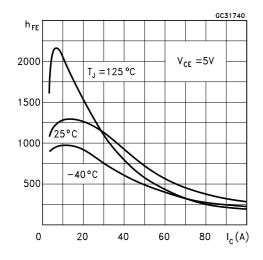
## Switching Times Inductive Load



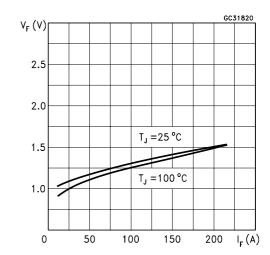
Switching Times Inductive Load Versus Temperature



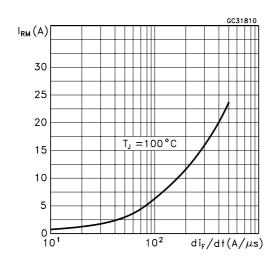
#### Dc Current Gain



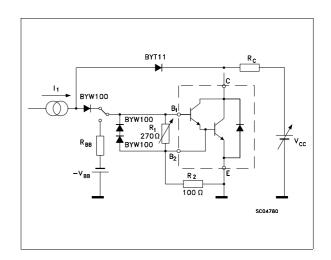
#### Typical V<sub>F</sub> Versus I<sub>F</sub>



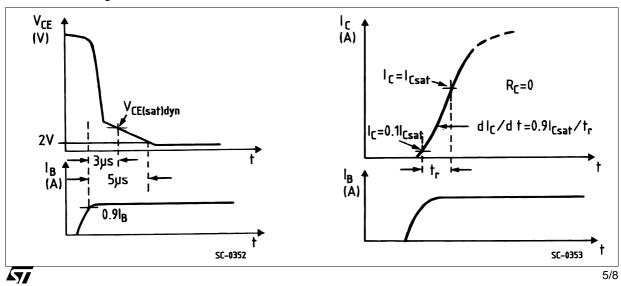
Peak Reverse Current Versus di<sub>F</sub>/dt



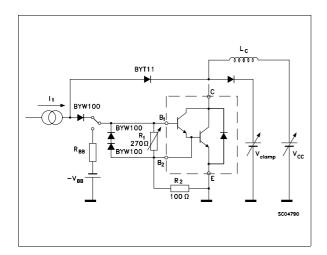
Turn-on Switching Test Circuit



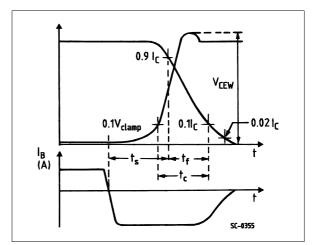
Turn-on Switching Waveforms



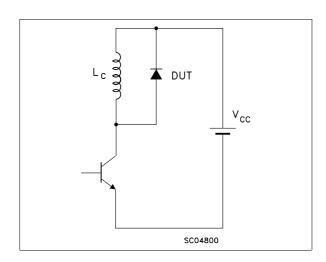
# Turn-on Switching Test Circuit



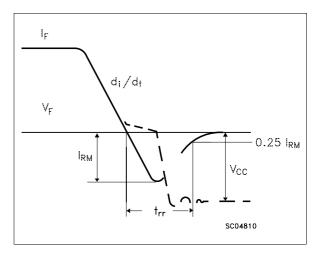
# Turn-off Switching Waveforms



Turn-off Switching Test Circuit of Diode

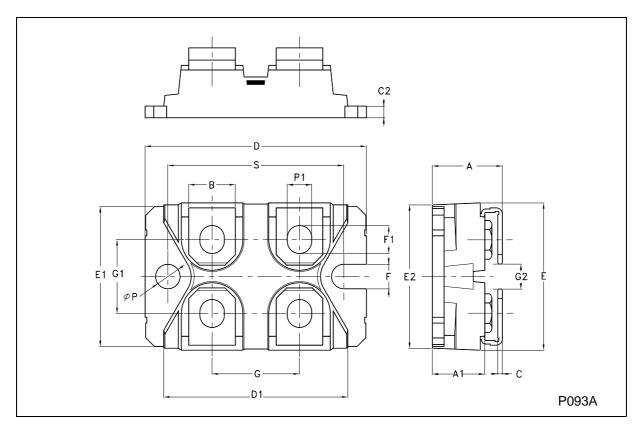


Turn-off Switching Waveform of Diode



# **ISOTOP MECHANICAL DATA**

DIM.		mm			inch	
DIN.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
А	11.8		12.2	0.465		0.480
A1	8.9		9.1	0.350		0.358
В	7.8		8.2	0.307		0.322
С	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		1.248
Е	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
Р	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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