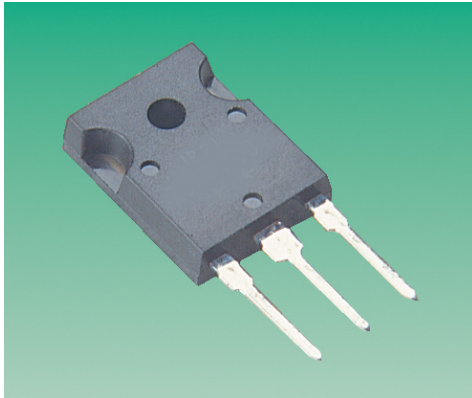


# TIP140 to TIP142 & TIP145 to TIP147

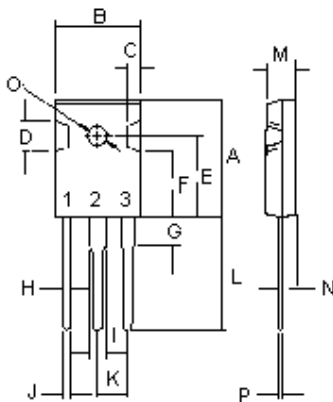
## Darlington Transistors



### Features:

Designed for general-purpose amplifier and low speed switching applications.

- Collector-Emitter sustaining voltage
  - $V_{CEO(sus)} = 60V$  (Minimum) - TIP140, TIP145
  - $= 80V$  (Minimum) - TIP141, TIP146
  - $= 100V$  (Minimum) - TIP142, TIP147
- Collector-Emitter saturation voltage
  - $V_{CE(sat)} = 2.0V$  (Maximum) at  $I_C = 5.0A$
- Monolithic construction with Built-in Base-Emitter shunt resistor.



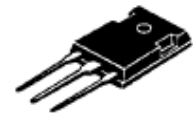
Pin 1. Base  
2. Collector  
3. Emitter

Dimensions	Minimum	Maximum
A	20.63	22.38
B	15.38	16.20
C	1.90	2.70
D	5.10	6.10
E	14.81	15.22
F	11.72	12.84
G	4.20	4.50
H	1.82	2.46
I	2.92	3.23
J	0.89	1.53
K	5.26	5.66
L	18.50	21.50
M	4.68	5.36
N	2.40	2.80
O	3.25	3.65
P	0.55	0.70

Dimensions : Millimetres

NPN	PNP
TIP140	TIP145
TIP141	TIP146
TIP142	TIP147

10 Ampere  
Darlington  
Complementary Silicon  
Power Transistors  
60 - 100 Volts  
125 Watts



TO-247 (3P)



# TIP140 to TIP142 & TIP145 to TIP147

## Darlington Transistors

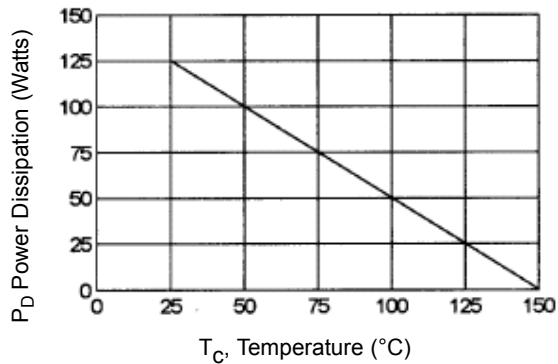


### Maximum Ratings

Characteristic	Symbol	TIP140 TIP145	TIP141 TIP146	TIP142 TIP147	Unit
Collector-Emitter Voltage	$V_{CEO}$	60	80	100	V
Collector-Base Voltage	$V_{CBO}$				
Emitter-Base Voltage	$V_{EBO}$				
Collector Current-Continuous -Peak	$I_C$ $I_{CM}$	5.0			A
Base Current	$I_B$	10 15			
Total Power Dissipation at $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	0.5			W W/°C
Operating and Storage Junction Temperature Range	$T_J, T_{STG}$	125 1.0			-65 to +150 °C

### Thermal Characteristics

Characteristic	Symbol	Maximum	Unit
Thermal Resistance Junction to case	$R_{\theta jc}$	1.0	°C/W



# TIP140 to TIP142 & TIP145 to TIP147

## Darlington Transistors



### Electrical Characteristics ( $T_c = 25^\circ\text{C}$ unless otherwise specified)

Characteristic	Symbol	Minimum	Maximum	Unit
<b>OFF Characteristics</b>				
Collector-Emitter Sustaining Voltage (1) ( $I_C = 30\text{mA}$ , $I_B = 0$ ) TIP140, TIP145 TIP141, TIP146 TIP142, TIP147	$V_{CEO(sus)}$	60 80 100	-	V
Collector Cut off Current ( $V_{CE} = 30\text{V}$ , $I_B = 0$ ) TIP140, TIP145 ( $V_{CE} = 40\text{V}$ , $I_B = 0$ ) TIP141, TIP146 ( $V_{CE} = 50\text{V}$ , $I_B = 0$ ) TIP142, TIP147	$I_{CEO}$	-	2.0 2.0 2.0	mA
Collector Cut off Current ( $V_{CB} = 60\text{V}$ , $I_E = 0$ ) TIP140, TIP145 ( $V_{CB} = 80\text{V}$ , $I_E = 0$ ) TIP141, TIP146 ( $V_{CB} = 100\text{V}$ , $I_E = 0$ ) TIP142, TIP147	$I_{CBO}$	-	1.0 1.0 1.0	
Emitter Cut off Current ( $V_{EB} = 5.0\text{V}$ , $I_C = 0$ )	$I_{EBO}$	-	2.0	

<b>ON Characteristics (1)</b>				
DC Current Gain ( $I_C = 5.0\text{A}$ , $V_{CE} = 4.0\text{V}$ ) ( $I_C = 10\text{A}$ , $V_{CE} = 4.0\text{V}$ )	$h_{FE}$	1000 500	-	-
Collector-Emitter Saturation Voltage ( $I_C = 5.0\text{A}$ , $I_B = 10\text{mA}$ ) ( $I_C = 10\text{A}$ , $I_B = 40\text{mA}$ )	$V_{CE(sat)}$	-	2.0 3.0	V
Base-Emitter Saturation Voltage ( $I_C = 10\text{A}$ , $I_B = 40\text{mA}$ )	$V_{BE(sat)}$	-	3.5	
Base-Emitter On Voltage ( $I_C = 10\text{A}$ , $V_{CE} = 4.0\text{V}$ )	$V_{BE(on)}$	-	3.0	

<b>Switching Characteristics</b>					
Delay Time	$V_{CC} = 30\text{V}$ , $I_C = 5.0\text{A}$ $I_{B1} = -I_{B2} = 20\text{mA}$ $t_p = 20\mu\text{s}$ , Duty cycle $\leq 2.0\%$	$t_d$	0.15 (Typical)	-	$\mu\text{s}$
Rise Time		$t_r$	0.55 (Typical)	-	
Storage Time		$t_s$	2.5 (Typical)	-	
Fall Time		$t_f$		-	

1. Pulse Test: Pulse width =  $30\mu\text{s}$ , Duty cycle  $\leq 2.0\%$



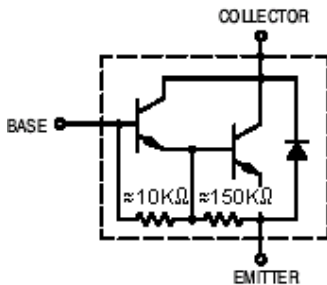
# TIP140 to TIP142 & TIP145 to TIP147

## Darlington Transistors

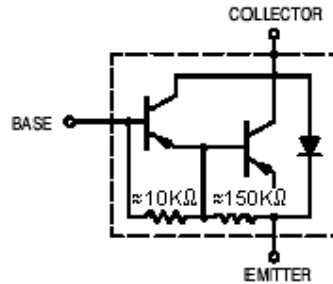


### Internal Schematic Diagram

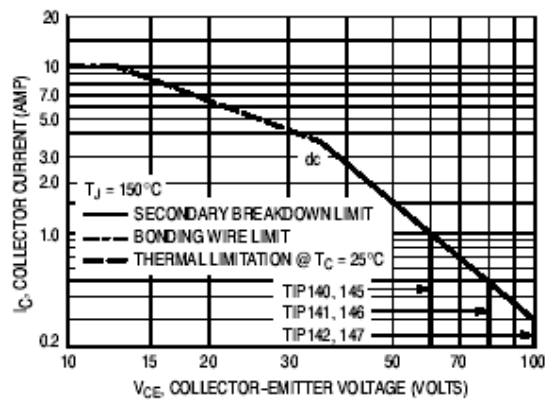
NPN : TIP140, TIP141, TIP142



PNP : TIP145, TIP146, TIP147



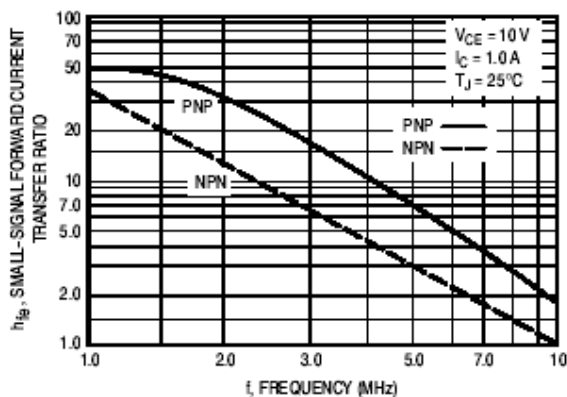
### Active Region Safe Operating Area (SOA)



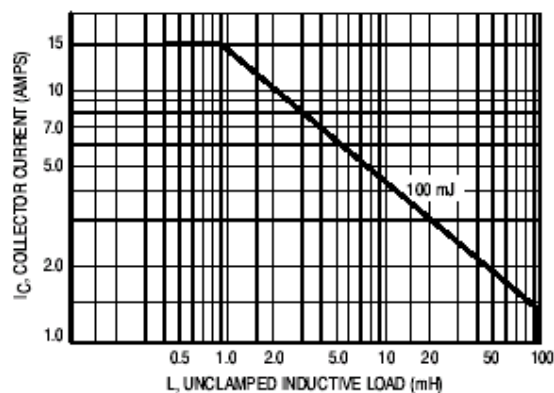
There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown safe operating area curves indicate  $I_C$ - $V_{CE}$  limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation than curves indicate.

The data of SOA curve is based on  $T_J (PK) = 150^\circ C$ ;  $T_C$  is variable depending on conditions. At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

### Small-Signal Common-Emitter Forward Current Transfer Ratio



### Unclamped Inductive Load



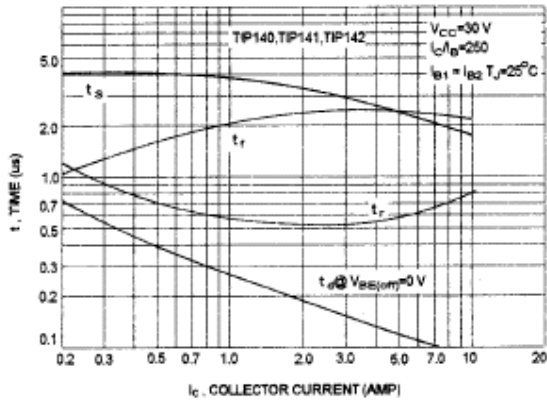
# TIP140 to TIP142 & TIP145 to TIP147

## Darlington Transistors



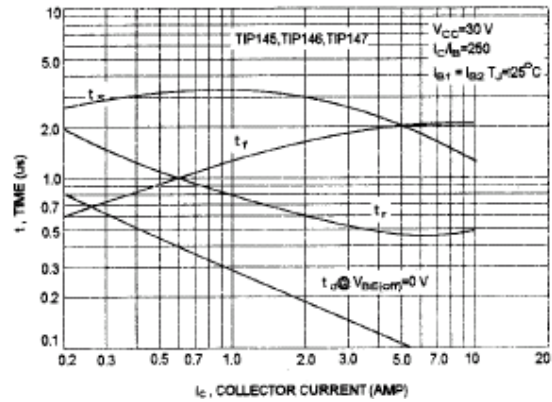
NPN : TIP140, TIP141, TIP142

SWITCHING TIME

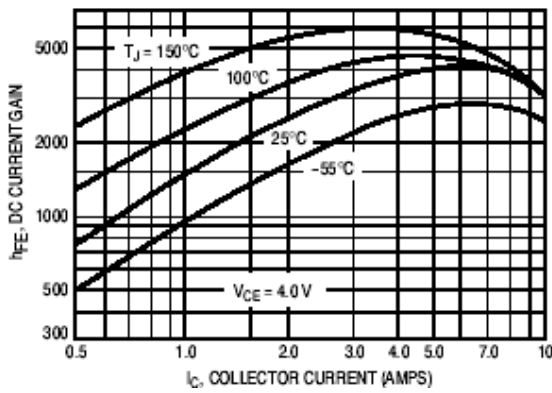


PNP : TIP145, TIP146, TIP147

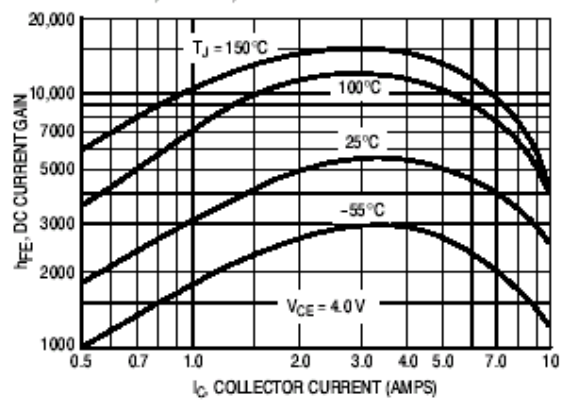
SWITCHING TIME



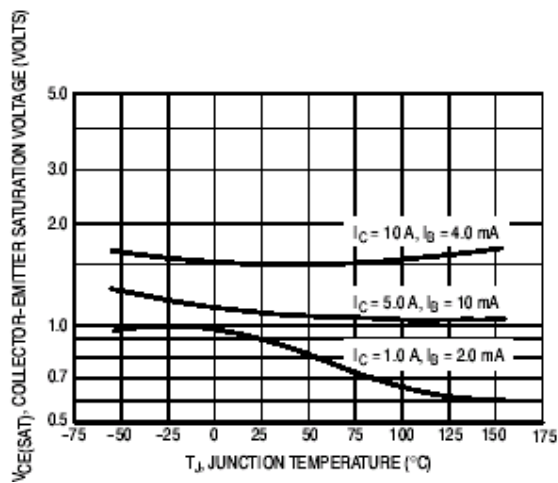
DC Current Gain



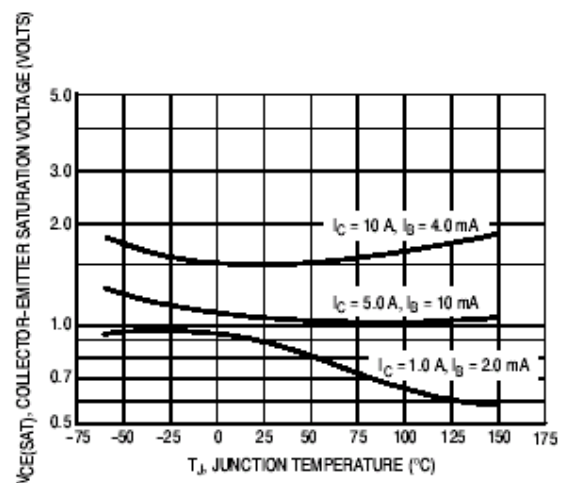
DC Current Gain



Collector-Emitter Saturation Voltage



Collector-Emitter Saturation Voltage



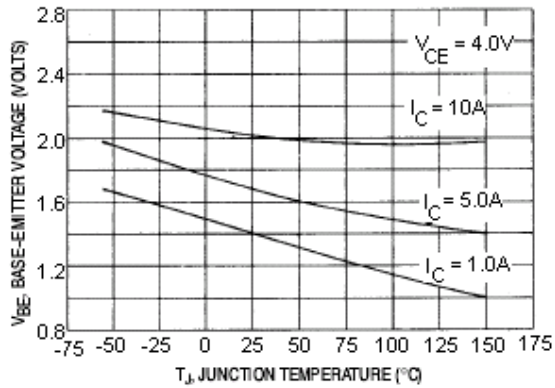
# TIP140 to TIP142 & TIP145 to TIP147

## Darlington Transistors



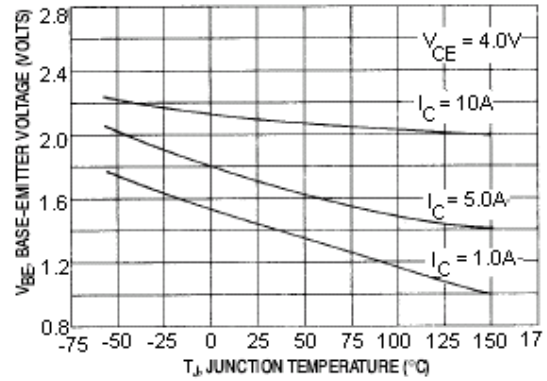
NPN : TIP140, TIP141, TIP142

Base-Emitter Voltage



PNP : TIP145, TIP146, TIP147

Base-Emitter Voltage



### Specifications

I <sub>C</sub> (A)	V <sub>CE0</sub> maximum (V)	h <sub>FE</sub> minimum at I <sub>C</sub> = 5A	P <sub>tot</sub> at 25°C (W)	Package	TYPE	Part Number
10	60	1000	125	TO-247 (3P)	NPN	TIP140
	80					TIP141
	100					TIP142
	60				PNP	TIP145
	80					TIP146
	100					TIP147



# TIP140 to TIP142 & TIP145 to TIP147

## Darlington Transistors



### Notes:

### International Sales Offices:

**AUSTRALIA – Farnell InOne**

Tel No: ++ 61 2 9645 8888  
Fax No: ++ 61 2 9644 7898

**FINLAND – Farnell InOne**

Tel No: ++ 358 9 560 7780  
Fax No: ++ 358 9 345 5411

**NETHERLANDS – Farnell InOne**

Tel No: ++ 31 30 241 7373  
Fax No: ++ 31 30 241 7333

**SWITZERLAND – Farnell InOne**

Tel No: ++ 41 1 204 64 64  
Fax No: ++ 41 1 204 64 54

**AUSTRIA – Farnell InOne**

Tel No: ++ 43 662 2180 680  
Fax No: ++ 43 662 2180 670

**FRANCE – Farnell InOne**

Tel No: ++ 49 89 61 39 39 39  
Fax No: ++ 33 474 68 99 90

**NEW ZEALAND – Farnell InOne**

Tel No: ++ 64 9 357 0646  
Fax No: ++ 64 9 357 0656

**UK – Farnell InOne**

Tel No: ++ 44 8701 200 200  
Fax No: ++ 44 8701 200 201

**BELGIUM – Farnell InOne**

Tel No: ++ 32 3 475 2810  
Fax No: ++ 32 3 227 3648

**GERMANY – Farnell InOne**

Tel No: ++ 49 89 61 39 39 39  
Fax No: ++ 49 89 613 59 01

**NORWAY – Farnell InOne**

Tel No: ++ 45 44 53 66 66  
Fax No: ++ 45 44 53 66 02

**UK – BuckHickman InOne**

++ 44 8450 510 150  
++ 44 8450 510 130

**BRAZIL – Farnell-Newark InOne**

Tel No: ++ 55 11 4066 9400  
Fax No: ++ 55 11 4066 9410

**HONG KONG – Farnell-Newark InOne**

Tel No: ++ 852 2268 9888  
Fax No: ++ 852 2268 9899

**PORTUGAL – Farnell InOne**

Tel No: ++ 34 93 475 8804  
Fax No: ++ 34 93 474 5288

**UK – CPC**

++ 44 8701 202 530  
++ 44 8701 202 531

**CHINA – Farnell-Newark InOne**

Tel No: ++86 10 6238 5152  
Fax No: ++86 10 6238 5022

**IRELAND – Farnell InOne**

Tel No: ++ 353 1 830 9277  
Fax No: ++ 353 1 830 9016

**SINGAPORE – Farnell-Newark InOne**

Tel No: ++ 65 6788 0200  
Fax No: ++ 65 6788 0300

**EXPORT – Farnell InOne**

Tel No: ++ 44 8701 200 208  
Fax No: ++ 44 8701 200 209

For enquiries from all other markets

**DENMARK – Farnell InOne**

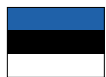
Tel No: ++ 45 44 53 66 44  
Fax No: ++ 45 44 53 66 06

**ITALY – Farnell InOne**

Tel No: ++ 39 02 93 995 200  
Fax No: ++ 39 02 93 995 300

**SPAIN – Farnell InOne**

Tel No: ++ 34 93 475 8805  
Fax No: ++ 34 93 474 5107

**ESTONIA – Farnell InOne**

Tel No: ++ 358 9 560 7780  
Fax No: ++ 358 9 345 5411

**MALAYSIA – Farnell-Newark InOne**

Tel No: ++ 60 3 7873 8000  
Fax No: ++ 60 3 7873 7000

**SWEDEN – Farnell InOne**

Tel No: ++ 46 8 730 50 00  
Fax No: ++ 46 8 83 52 62

<http://www.farnellinone.com>

<http://www.buckhickmaninone.com>

<http://www.cpc.co.uk>

**Disclaimer** This data sheet and its contents (the "Information") belong to the Premier Farnell Group (the "Group") or are licensed to it. No licence is granted for the use of it other than for information purposes in connection with the products to which it relates. No licence of any intellectual property rights is granted. The information is subject to change without notice and replaces all data sheets previously supplied. The information supplied is believed to be accurate but the Group assumes no responsibility for its accuracy or completeness, any error in or omission from it or for any use made of it. Users of this data sheet should check for themselves the information and the suitability of the products for their purpose and not make any assumptions based on information included or omitted. Liability for loss or damage resulting from any reliance on the information or use of it (including liability resulting from negligence or where the Group was aware of the possibility of such loss or damage arising) is excluded. This will not operate to limit or restrict the Group's liability for death or personal injury resulting from its negligence. Multicomp is the registered trademark of the Group. © Premier Farnell plc 2004.

