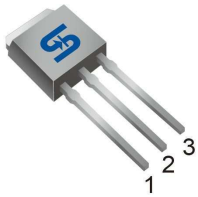




TO-251  
(IPAK)



TO-252  
(DPAK)



**Pin Definition:**

1. Base
2. Collector
3. Emitter

**PRODUCT SUMMARY**

$BV_{CEO}$	400V
$BV_{CBO}$	700V
$I_C$	4A
$V_{CE(SAT)}$	0.25V (Typ.) @ $I_C=0.5A, I_B=0.1A$

**Features**

- Build-in Free-wheeling Diode Makes Efficient Anti-saturation Operation
- Low Base Drive Requirement
- Suitable for Half Bridge Light Ballast Application

**Structure**

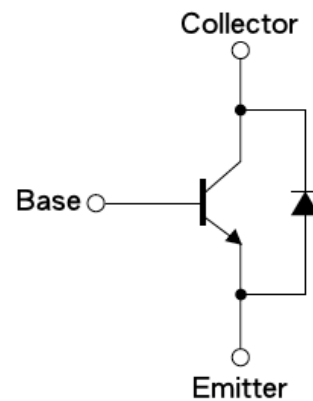
- Silicon Triple Diffused Type
- NPN Silicon Transistor
- Integrated Anti-parallel Collector-Emitter Diode

**Ordering Information**

Part No.	Package	Packing
TSC5304EDCP ROG	TO-252	2.5Kpcs / 13" Reel
TSC5304EDCH C5G	TO-251	75pcs / Tube

Note: "G" denote for Halogen Free Product

**Block Diagram**



**Absolute Maximum Rating** ( $T_a = 25^{\circ}C$  unless otherwise noted)

Parameter	Symbol	Limit	Unit
Collector-Base Voltage	$V_{CBO}$	700	V
Collector-Emitter Voltage @ $V_{BE}=0V$	$V_{CES}$	700	V
Collector-Emitter Voltage	$V_{CEO}$	400	V
Emitter-Base Voltage	$V_{EBO}$	9	V
Collector Current	$I_C$	4	A
Collector Peak Current ( $t_p < 5ms$ )	$I_{CM}$	8	A
Base Current	$I_B$	2	A
Base Peak Current ( $t_p < 5ms$ )	$I_{BM}$	4	A
Power Total Dissipation @ $T_c=25^{\circ}C$	$P_{DTOT}$	35	W
Maximum Operating Junction Temperature	$T_J$	+150	$^{\circ}C$
Storage Temperature Range	$T_{STG}$	-55 to +150	$^{\circ}C$

### Thermal Performance

Parameter	Symbol	Limit	Unit
Thermal Resistance - Junction to Case	$R\theta_{JC}$	3.57	$^{\circ}C/W$
Thermal Resistance - Junction to Ambient	$R\theta_{JA}$	68	$^{\circ}C/W$

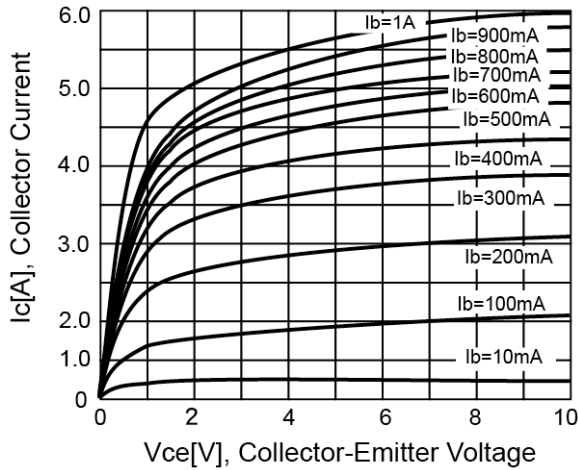
### Electrical Specifications (Ta = 25 $^{\circ}C$ unless otherwise noted)

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Collector-Base Voltage	$I_C = 1mA, I_B = 0$	$BV_{CBO}$	700	--	--	V
Collector-Emitter Breakdown Voltage	$I_C = 10mA, I_E = 0$	$BV_{CEO}$	400	--	--	V
Emitter-Base Breakdown Voltage	$I_E = 1mA, I_C = 0$	$BV_{EBO}$	9	--	--	V
Collector Cutoff Current	$V_{CB} = 700V, I_E = 0$	$I_{CBO}$	--	--	100	$\mu A$
Collector Cutoff Current	$V_{CE} = 400V, I_B = 0$	$I_{CEO}$	--	--	250	$\mu A$
Emitter Cutoff Current	$V_{EB} = 7V, I_C = 0$	$I_{EBO}$	--	--	10	$\mu A$
Collector-Emitter Saturation Voltage	$I_C = 0.5A, I_B = 0.1A$	$V_{CE(SAT)1}$	--	0.25	0.7	V
	$I_C = 1A, I_B = 0.2A$	$V_{CE(SAT)2}$	--	0.5	1	
	$I_C = 2.5A, I_B = 0.5A$	$V_{CE(SAT)3}$	--	1.2	1.5	
	$I_C = 4A, I_B = 1A$	$V_{CE(SAT)4}$	--	0.5	--	
Base-Emitter Saturation Voltage	$I_C = 1A, I_B = 0.2A$	$V_{BE(SAT)1}$	--	--	1.1	V
	$I_C = 2A, I_B = 0.5A$	$V_{BE(SAT)2}$	--	--	1.2	
DC Current Gain	$V_{CE} = 5V, I_C = 10mA$	Hfe	10	--	--	
	$V_{CE} = 5V, I_C = 1A$		17	--	37	
	$V_{CE} = 5V, I_C = 2A$		12	--	32	
Forward Voltage Drop	$I_F = 2A$	Vf	--	--	2	V
Turn On Time	$V_{CC} = 250V, I_C = 1A,$	$t_{ON}$	--	0.2	0.6	$\mu S$
Storage Time	$I_{B1} = I_{B2} = 0.2A, t_p = 25\mu S$	$t_{STG}$	--	3.0	4.5	$\mu S$
Fall Time	Duty Cycle < 1%	$t_f$	--	0.2	0.3	$\mu S$
Turn On Time	$V_{CC} = 5V, I_C = 0.1A,$	$t_{ON}$	--	0.35	0.6	$\mu S$
Storage Time	$I_{B1} = I_{B2} = 0.02A, t_p = 25\mu S$	$t_{STG}$	6.5	--	8.5	$\mu S$
Fall Time	Duty Cycle < 1%	$t_f$	--	0.3	0.6	$\mu S$

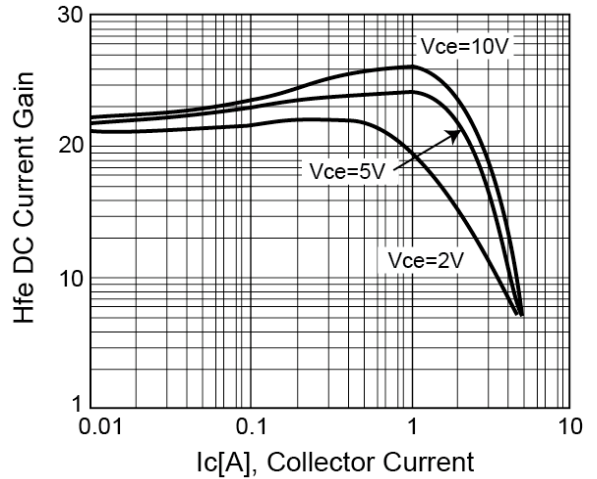
**Notes:** Pulsed duration = 380 $\mu S$ , duty cycle  $\leq 2\%$

**Electrical Characteristics Curve** ( $T_a = 25^\circ\text{C}$ , unless otherwise noted)

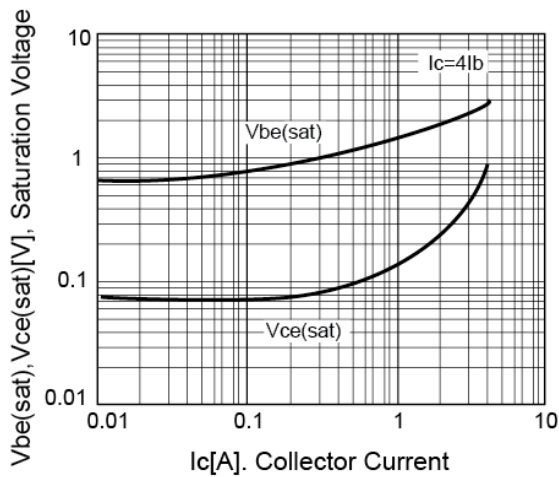
**Figure 1. Static Characteristics**



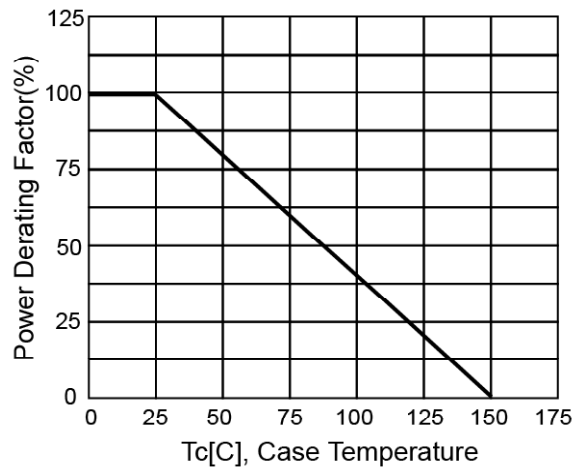
**Figure 2. DC Current Gain**



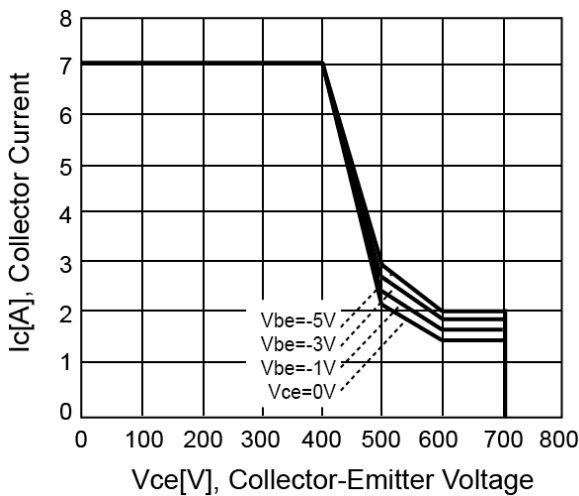
**Figure 3. Vce(sat) v.s. Vbe(sat)**



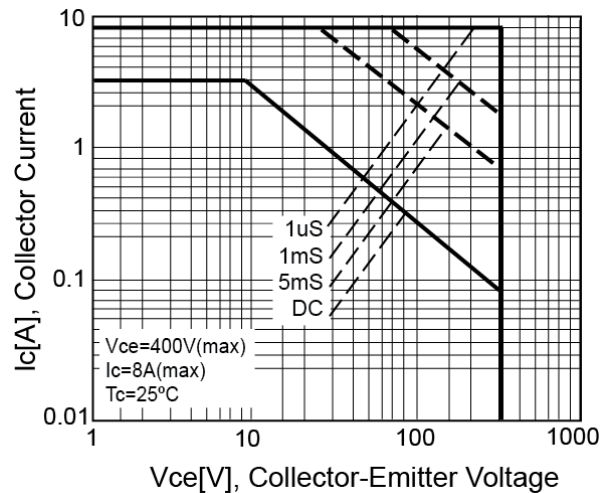
**Figure 4. Power Derating**



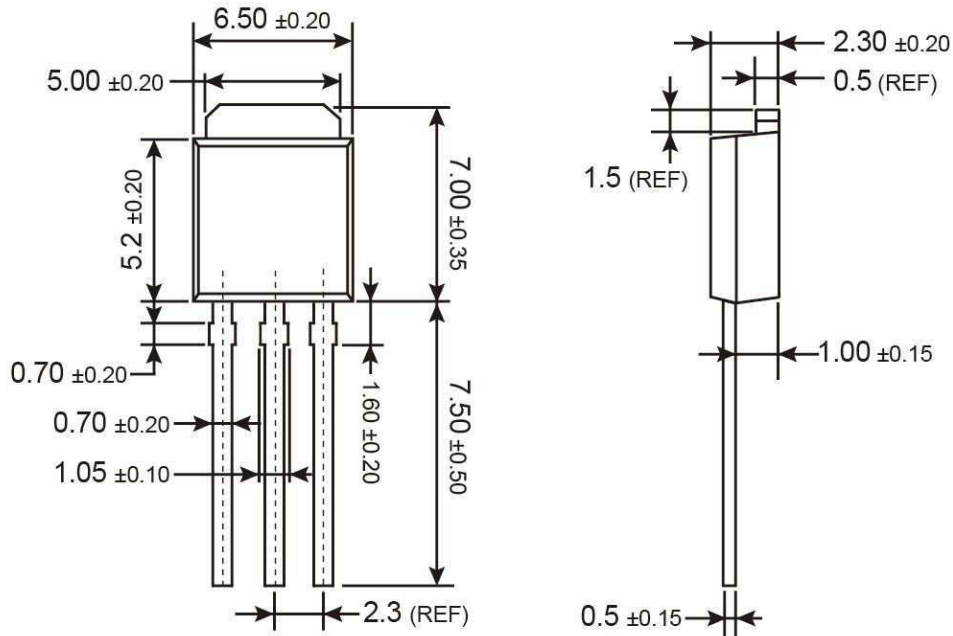
**Figure 5. Reverse Bias SOA**



**Figure 6. Safety Operating Area**

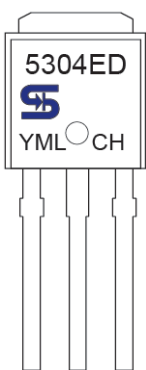


**TO-251 Mechanical Drawing**



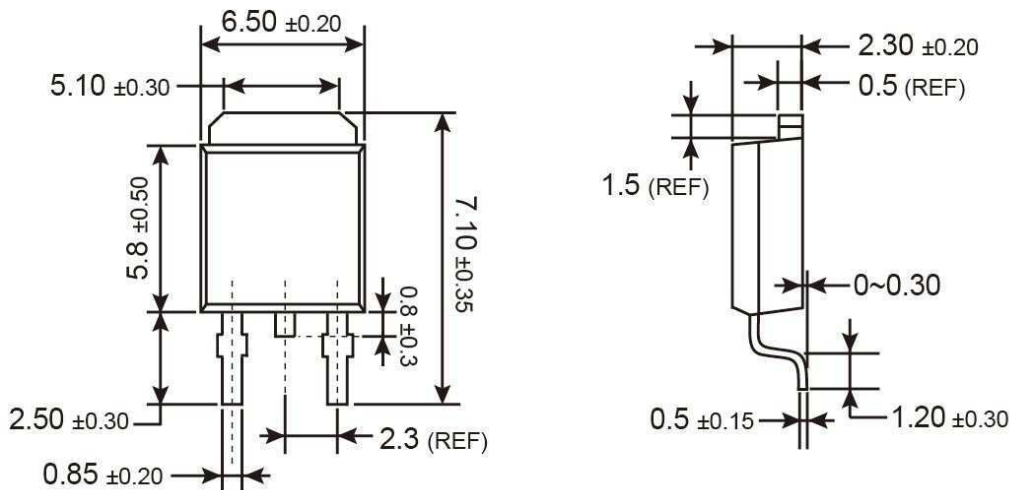
Unit: Millimeters

**Marking Diagram**



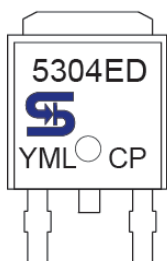
- Y** = Year Code
- M** = Month Code for Halogen Free Product  
(**O**=Jan, **P**=Feb, **Q**=Mar, **R**=Apr, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug, **W**=Sep, **X**=Oct, **Y**=Nov, **Z**=Dec)
- L** = Lot Code

### TO-252 Mechanical Drawing



Unit: Millimeters

### Marking Diagram



- Y** = Year Code
- M** = Month Code for Halogen Free Product  
(**O**=Jan, **P**=Feb, **Q**=Mar, **R**=Apr, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug, **W**=Sep, **X**=Oct, **Y**=Nov, **Z**=Dec)
- L** = Lot Code

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