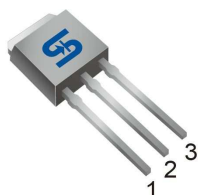


**TO-251
(IPAK)**

**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

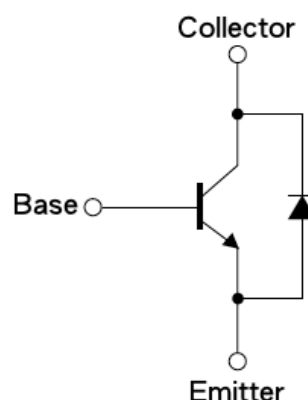
Structure

- 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	$^{\circ}\text{C/W}$
Thermal Resistance - Junction to Ambient	$R\theta_{JA}$	68	$^{\circ}\text{C/W}$

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

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

Notes: Pulsed duration = 380 μS , duty cycle $\leq 2\%$

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

Figure 1. Static Characteristics

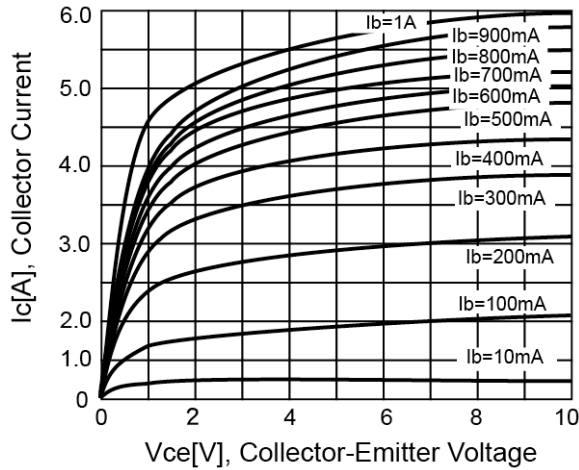


Figure 2. DC Current Gain

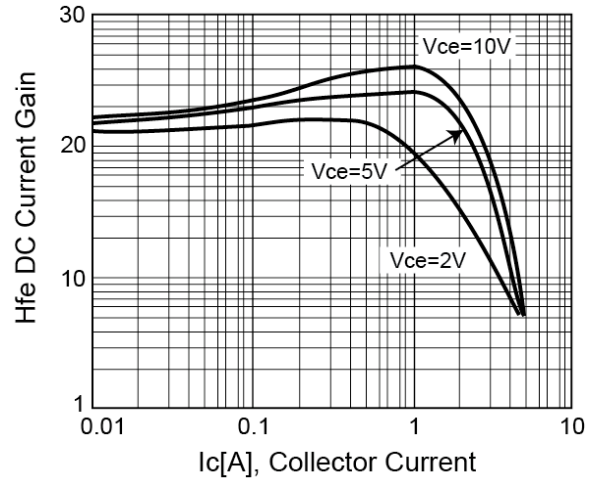


Figure 3. $V_{ce(sat)}$ v.s. $V_{be(sat)}$

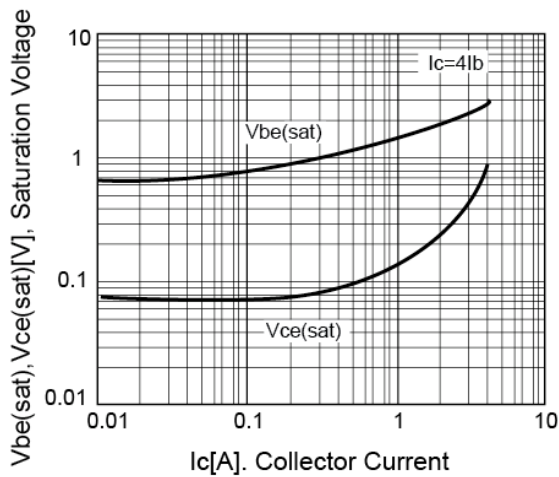


Figure 4. Power Derating

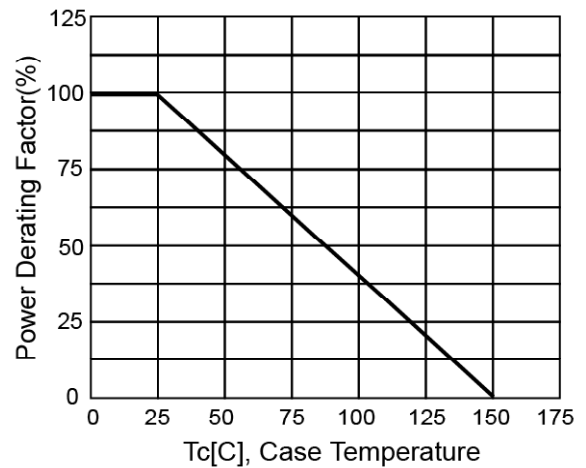


Figure 5. Reverse Bias SOA

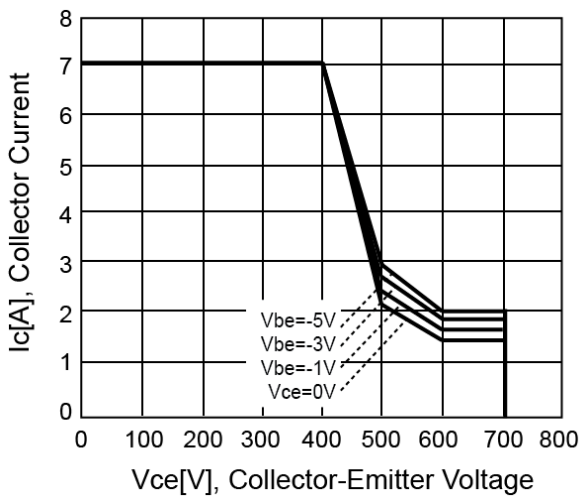
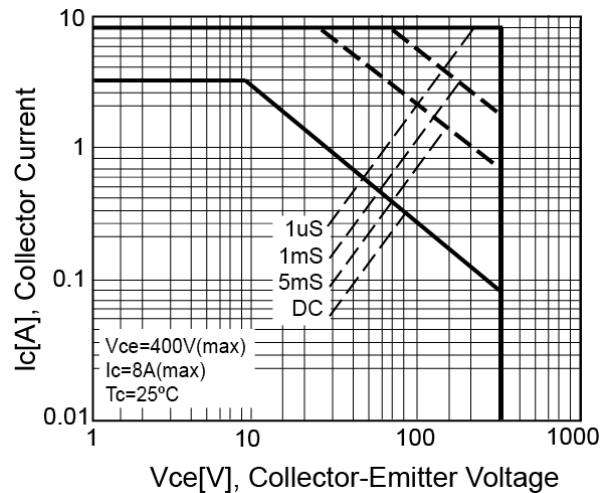
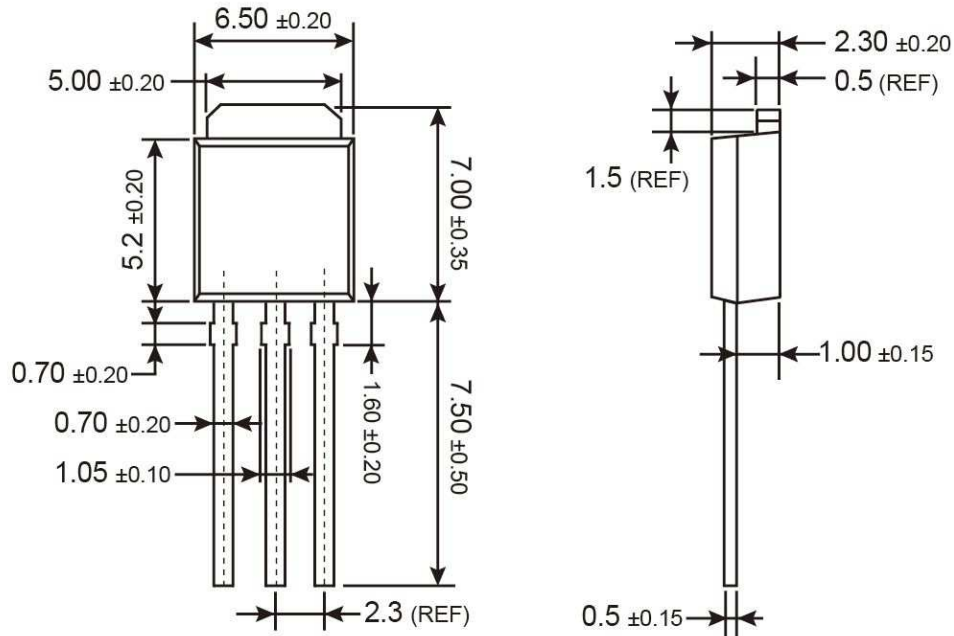


Figure 6. Safety Operating Area

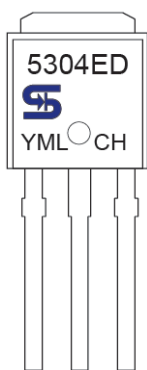


TO-251 Mechanical Drawing



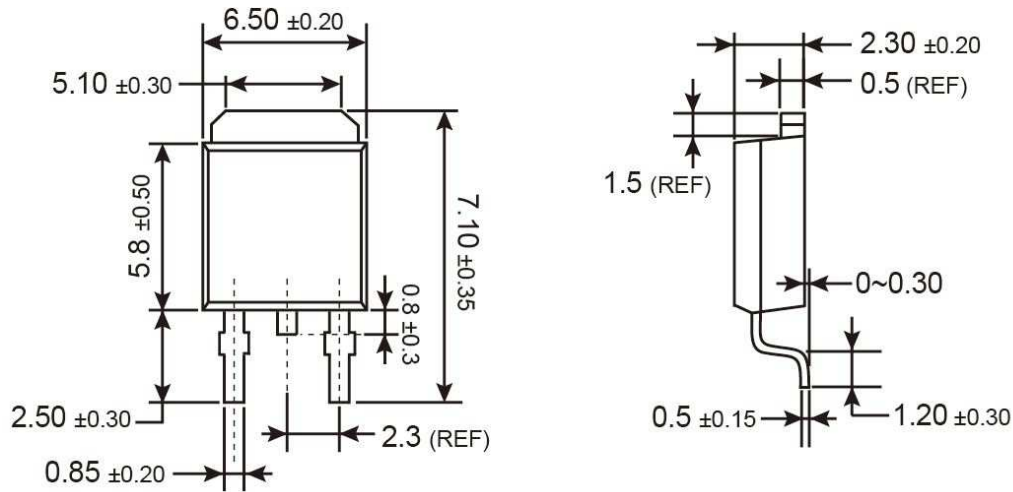
Unit: Millimeters

Marking Diagram



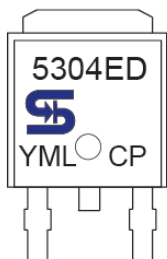
- Y** = Year Code
- M** = Month Code for Halogen Free Product
 (O=Jan, P=Feb, Q=Mar, R=Apl, S=May, T=Jun, U=Jul, V=Aug, W=Sep, X=Oct, Y=Nov, Z=Dec)
- L** = Lot Code

TO-252 Mechanical Drawing



Unit: Millimeters

Marking Diagram



- Y** = Year Code
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TSC5304ED

High Voltage NPN Transistor with Diode

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