

**■ PRODUCT CHARACTERISTICS**

BVCBO	700V
BVCEO	400V
HFE@5V2A	8-40
IC	12A

**■ APPLICATIONS**

- Fluorescent lamp
- Electronic ballast
- Electronic transformer
- Switch mode power supply

**■ FEATURES**

- \*  $V_{CEO(SUS)}$  400V
- \* 700V Blocking Capability

Symbol


**■ ORDER INFORMATION**

Order codes		Package	Packing
Halogen-Free	Halogen		
N/A	RST13009DQ	TO-3PB	30 pieces/Tube

**■ ABSOLUTE MAXIMUM RATING**

PARAMETER	SYMBOL	RATINGS	UNIT
Collector-Emitter Voltage	$V_{CEO}$	400	V
Collector-Emitter Voltage ( $V_{BE}=-1.5V$ )	$V_{CEV}$	700	V
Emitter Base Voltage	$V_{EBO}$	9	V
Collector Current	Continuous	$I_C$	12
	Peak	$I_{CM}$	24
Base Current	Continuous	$I_B$	6
	Peak	$I_{BM}$	12
Emitter Current	Continuous	$I_E$	18
	Peak	$I_{EM}$	36
Power Dissipation	$P_D$	80	W
Derate above 25°C		640	mW/°C
Junction Temperature	$T_J$	+150	°C
Storage Temperature	$T_{STG}$	-40 ~ +150	°C

**■ THERMAL DATA**

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	21	°C/W
Junction to Case	$\theta_{JC}$	1.55	°C/W

■ ELECTRICAL CHARACTERISTICS ( $T_C=25^\circ\text{C}$ , unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS (Note)</b>						
Collector- Emitter Sustaining Voltage	$V_{CE0}$	$I_C = 10\text{mA}, I_B = 0$	400	-	-	V
Collector Cutoff Current	$I_{CEV}$	$V_{BE(OFF)} = 1.5V_{DC}$	-	-	1	mA
$V_{CBO}=\text{Rated Value}$		$V_{BE(OFF)} = 1.5V_{DC}, T_C = 100^\circ\text{C}$	-	-	5	
Emitter Cutoff Current	$I_{E0}$	$V_{EB} = 9V_{DC}, I_C = 0$	-	-	1	mA
<b>ON CHARACTERISTICS (Note)</b>						
DC Current Gain	$h_{FE1}$	$I_C = 5A, V_{CE} = 5V$	-	-	40	
	$h_{FE2}$	$I_C = 8A, V_{CE} = 5V$	-	-	30	
Current-Emitter Saturation Voltage	$V_{CE(SAT)}$	$I_C = 5A, I_B = 1A$	-	-	1	V
		$I_C = 8A, I_B = 1.6A$	-	-	1.5	V
		$I_C = 12A, I_B = 3A$	-	-	3	V
		$I_C = 8A, I_B = 1.6A, T_C = 100^\circ\text{C}$	-	-	2	V
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	$I_C = 5A, I_B = 1A$	-	-	1.2	V
		$I_C = 8A, I_B = 1.6A$	-	-	1.6	V
		$I_C = 8A, I_B = 1.6A, T_C = 100^\circ\text{C}$	-	-	1.5	V
<b>DYNAMIC CHARACTERISTICS</b>						
Transition frequency	$f_T$	$I_C = 500\text{mA}, V_{CE} = 10V, f = 1\text{MHz}$	4	-	-	MHz
Output Capacitance	$C_{OB}$	$V_{CB} = 10V, I_E = 0, f = 0.1\text{MHz}$	-	180	-	pF
<b>SWITCHING CHARACTERISTICS (Resistive Load, Table 1)</b>						
Delay Time	$t_{DLY}$	$V_{CC} = 125V_{dc}, I_C = 8A$ $I_{B1} = I_{B2} = 1.6A, t_P = 25\mu\text{s}$ Duty Cycle $\leq 1\%$	-	0.06	0.1	$\mu\text{s}$
Rise Time	$t_R$		-	0.45	1	$\mu\text{s}$
Storage Time	$t_S$		-	1.3	3	$\mu\text{s}$
Fall Time	$t_F$		-	0.2	0.7	$\mu\text{s}$
<b>Inductive Load, Clamped (Table 1, Fig. 13)</b>						
Voltage Storage Time	$t_S$	$I_C=8A, V_{CLAMP}=300V, I_{B1}=1.6A$	-	0.92	2.3	$\mu\text{s}$
Crossover Time	$t_C$	$V_{BE(OFF)} = 5V, T_C = 100^\circ\text{C}$	-	0.12	0.7	$\mu\text{s}$

Note: Pulse Test: Pulse Width = 300 $\mu\text{s}$ , Duty Cycle = 2%

### ■ TYPICAL CHARACTERISTICS

Fig. 1 Forward Bias Safe Operating Area

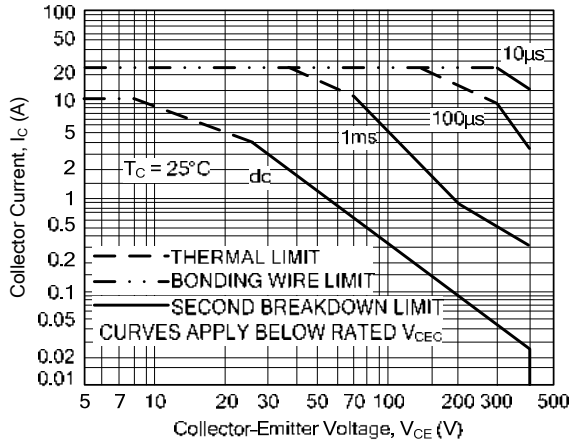


Fig. 2 Reverse Bias Switching Safe Operating Area

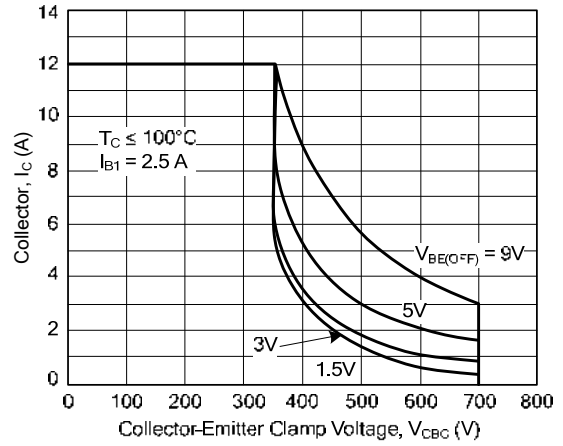


Fig. 3 Forward Bias Power Derating

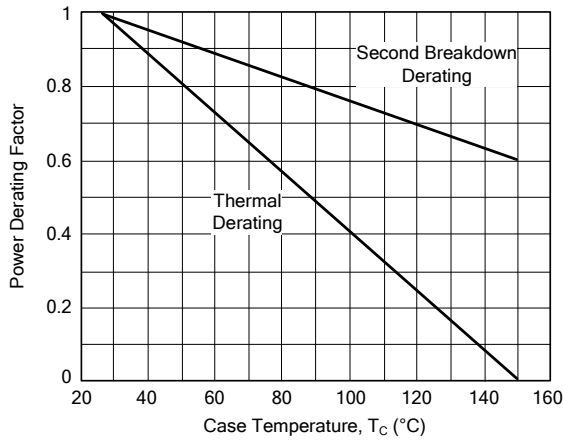
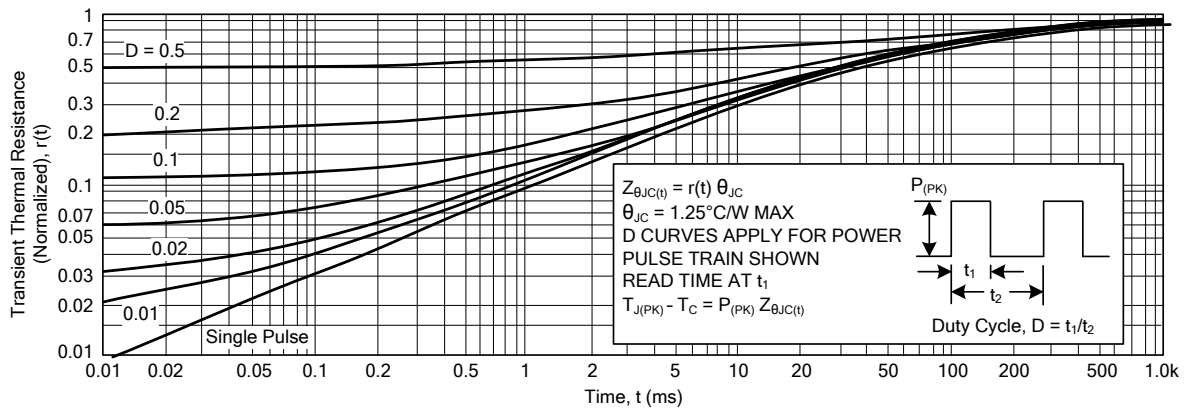


Fig. 4 Typical Thermal Response [ $Z_{\theta JC}(t)$ ]



■ TYPICAL CHARACTERISTICS(Cont.)

Fig. 5 DC Current Gain

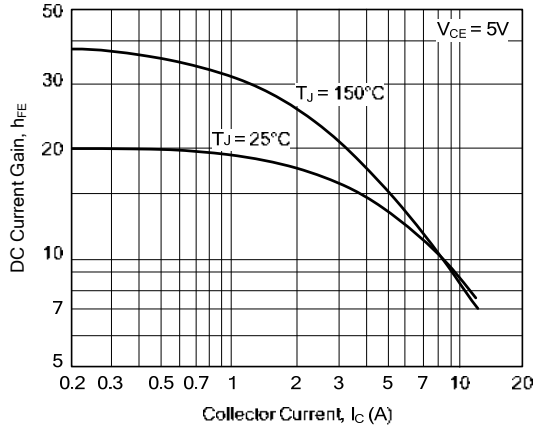


Fig. 6 Collector Saturation Region

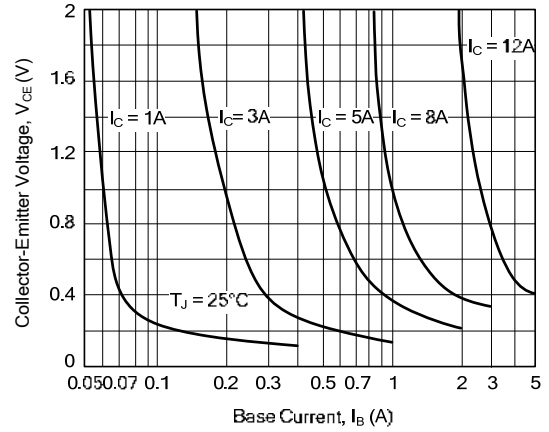


Fig. 7 Base-Emitter Saturation Voltage

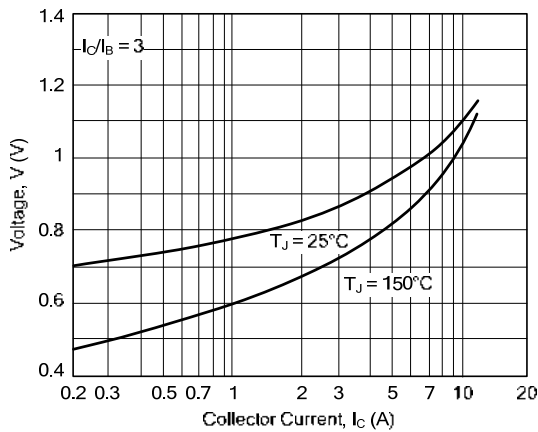


Fig. 8 Collector-Emitter Saturation Voltage

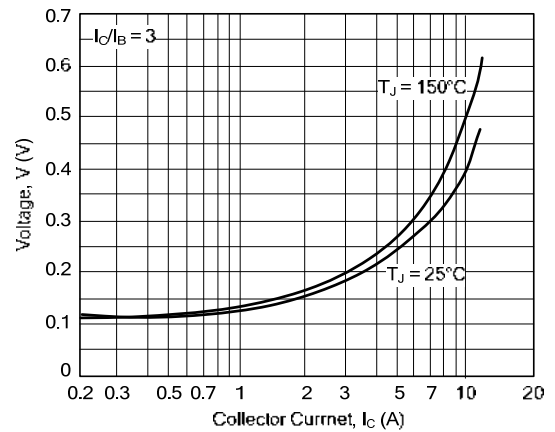


Fig. 9 Collector Cutoff Region

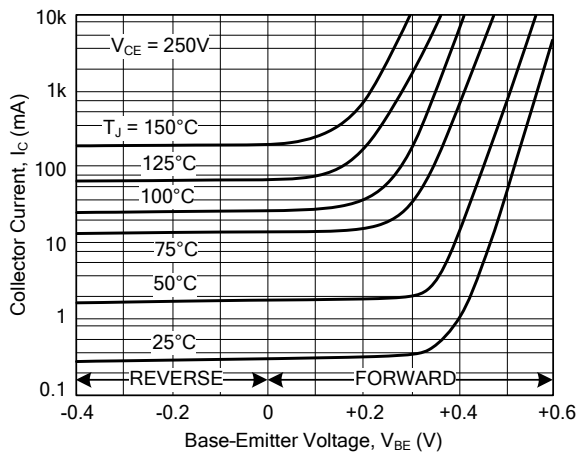
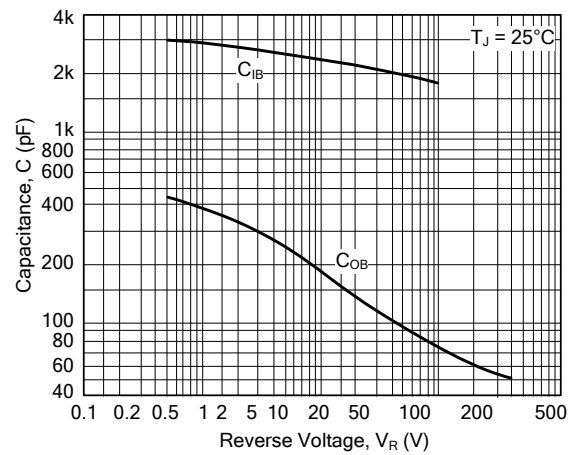


Fig. 10 Capacitance



### RESISTIVE SWITCHING PERFORMANCE

Fig. 11. Turn-On Time

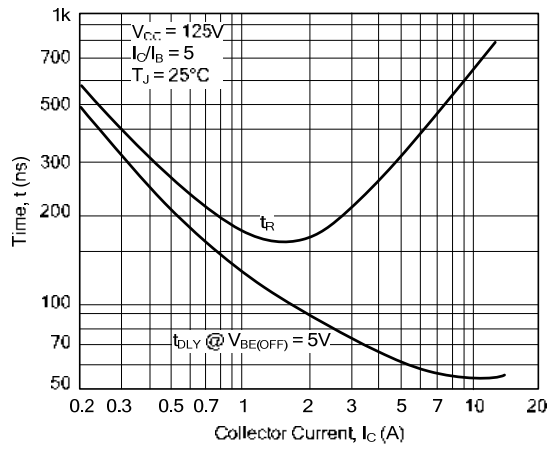


Fig. 12 Turn-Off Time

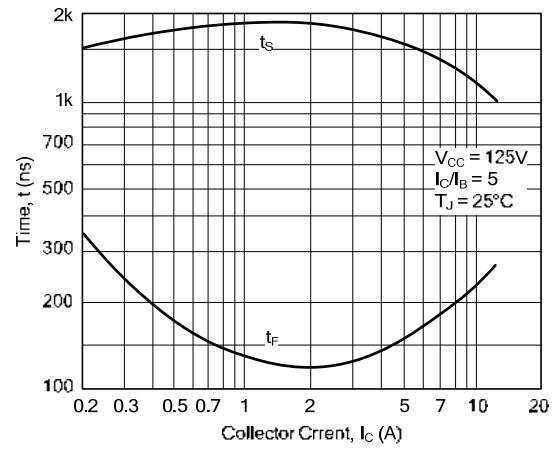
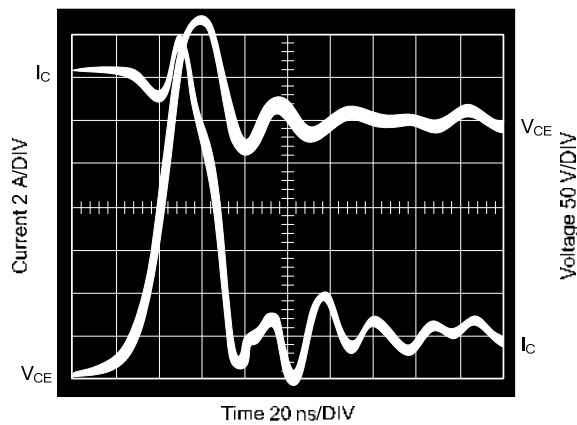


Fig. 13 Typical Inductive Switching Waveforms (at 300V and 12A with  $I_{B1} = 2.4A$  and  $V_{BE(OFF)} = 5V$ )



■ TO-3PB PACKAGE OUTLINE DIMENSIONS

