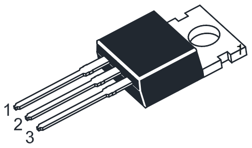
FEATURES

- High voltage, high speed switching
- High reliability

TO-220



1.Base 2.Collector 3.Emitter

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Absolute Maximum Rating (T_C=25℃)

Parameter		Symbol	Value	Unit
Collector-Base Voltage		BV_{CBO}	700	V
Collector-Emitter Voltage		BV_{CEO}	410	V
Emitter-Base Voltage		BV_{EBO}	9	V
Collector Current		I_C	12	A
Collector Current pulse		I_{CM}	24	A
Base Current		I_B	6	A
Base Current pulse		I_{BM}	12	A
Power Dissipation	Ta=25℃	P_D	2	W
	T_C=25℃		80	
Junction Temperature		T_j	150	℃
Storage Temperature		T_{stg}	-55～150	℃

Note: 1. Pulse Test: Pulse Width = 5ms, Duty Cycle≤10%

2. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

ELECTRICAL CHARACTERISTICS(Ta=25℃ unless otherwise specified)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Collector-base breakdown voltage	BV_{CBO}	I_C = 1mA，I_E = 0	700			V
Collector-emitter breakdown voltage	BV_{CEO}	I_C = 5mA，I_B = 0	410			V
Emitter-base breakdown voltage	BV_{EBO}	I_E =0.1mA，I_C = 0	9			V
Collector cut-off current	I_{CBO}	V_{CB} = 700V，I_E = 0			1	mA
Emitter cut-off current	I_{EBO}	V_{EB} = 9V，I_C = 0			1	mA
DC current gain	$h_{FE}(1)$	V_{CE}= 5V，I_C= 3A	10		35	
	$h_{FE}(2)$	V_{CE}= 5V，I_C= 2mA	10			
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 5A，I_B = 1A I_C = 8A，I_B = 1.6A I_C = 12A，I_B = 3A			1.0 1.5 3	V
Base-emitter on voltage	$V_{BE(sat)}$	I_C = 5A，I_B = 1A I_C = 8A，I_B = 1.6A			1.2 1.6	V
Transition frequency	f_T	I_C= 0.5A, V_{CE}=10V, f=1MHz	4			MHz
Output Capacitance	C_{ob}	V_{CB} = 10V,I_E = 0 f=0.1MHz		180		pF
Delay Time	t_d	V_C = 125V, I_C= 8A, I_{B1}= I_{B2} = 1.6A t_p= 25μs, Duty ≤ 1%			0.1	μs
Rise Time	t_R				1	μs
Fall Time	t_F				0.7	μs
Switching Time	t_S	I_C= 500mA			0.7	μs

*Pulse Test: Pulse Wieth = 300μs, Duty Cycle = 2%

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance Junction to Ambient	θ_{JA}	54	℃/W
Thermal Resistance Junction to Case	θ_{JC}	4	℃/W

RATING AND CHARACTERISTIC CURVES

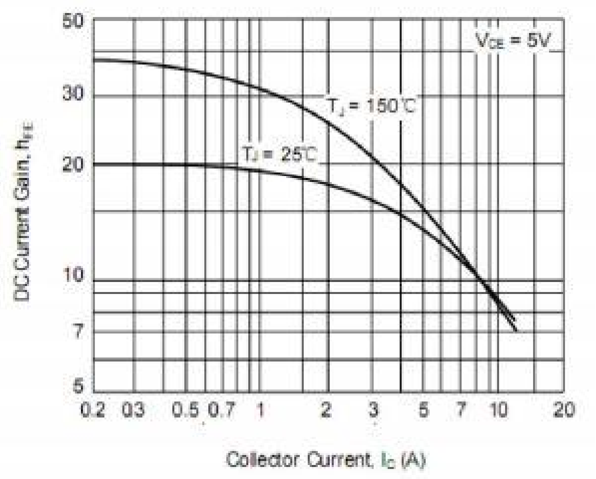


Figure 1. DC current Gain

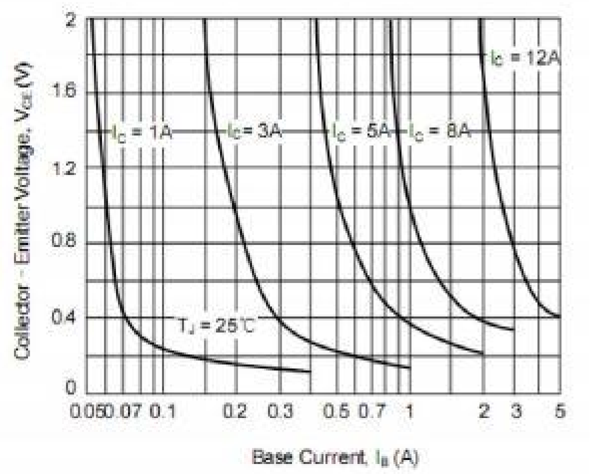


Figure 2. Collector Saturation Region

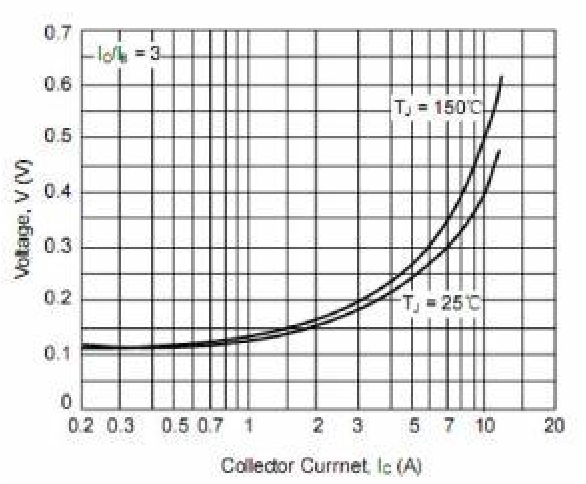


Figure 3. Collector Saturation Voltage

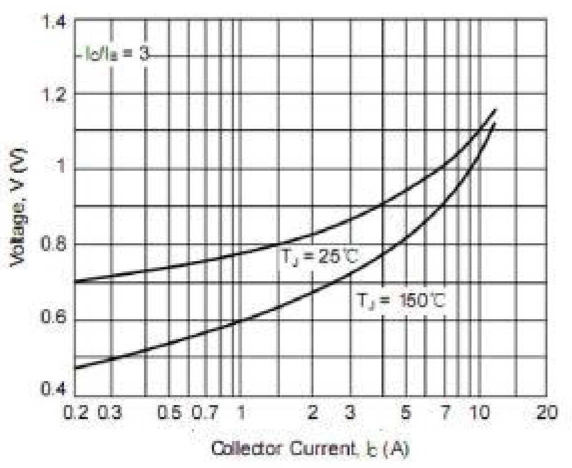


Figure 4. Safe Operating Area Base and

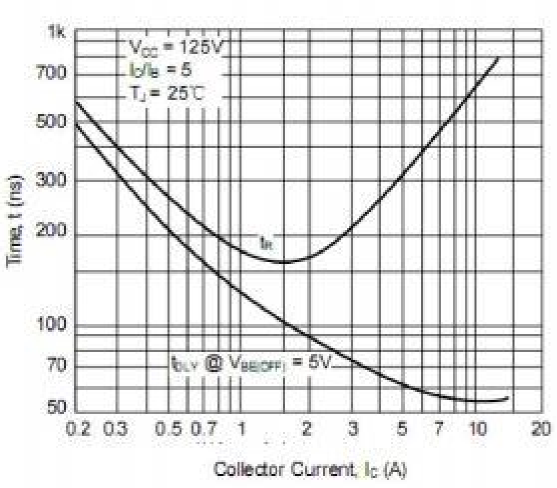


Figure 5. Turn-On Time

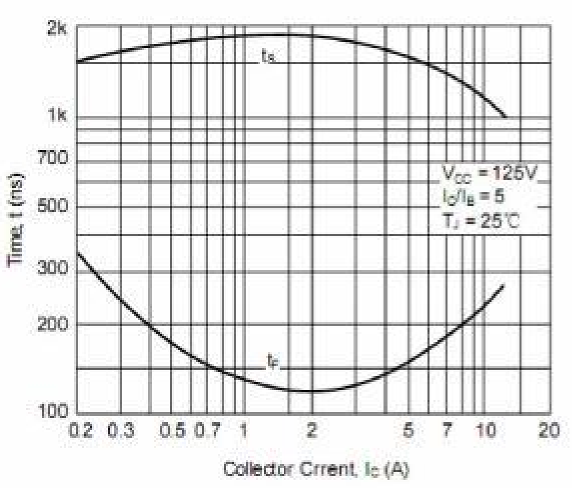
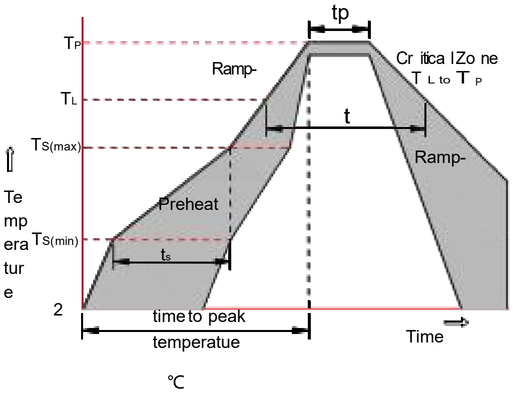


Figure 6. Turn-Off Time

Soldering parameters

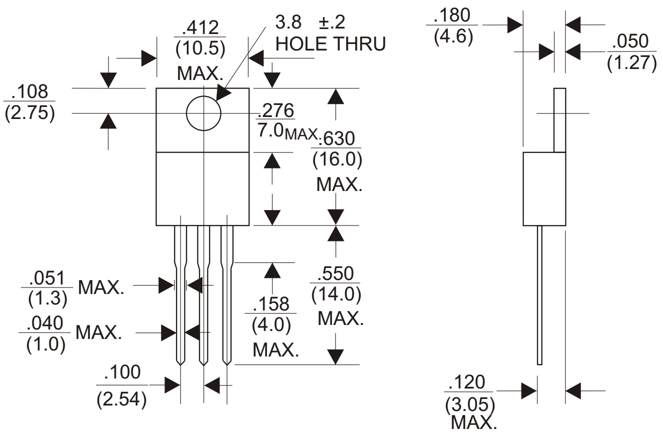
Reflow Condition		Pb-Free assembly (see as bellow)
Pre Heat	-Temperature Min ($T_{s(min)}$)	+150℃
	-Temperature Max($T_{s(max)}$)	+200℃
	-Time (Min to Max) (ts)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3℃/sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3℃/sec. Max
Reflow	-Temperature(T_L)(Liquid us)	+217℃
	-Temperature(t_L)	60-150 secs.
Peak Temp (T_p)		+260(+0/-5)℃
Time within 5℃ of actual Peak Temp (t_p)		30 secs. Max
Ramp-down Rate		6℃/sec. Max
Time 25℃ to Peak Temp (T_P)		8 min. Max
Do not exceed		+260℃

FIG5: Reflow condition



Package Dimensions & Suggested Pad Layout

TO-220



Dimensions in inches and (millimeters)