

**TOSHIBA**



**POWER  
TRANSISTOR  
SEMICONDUCTOR DATA BOOK**

**TOSHIBA CORPORATION**



GENERAL PURPOSE POWER TRANSISTOR.

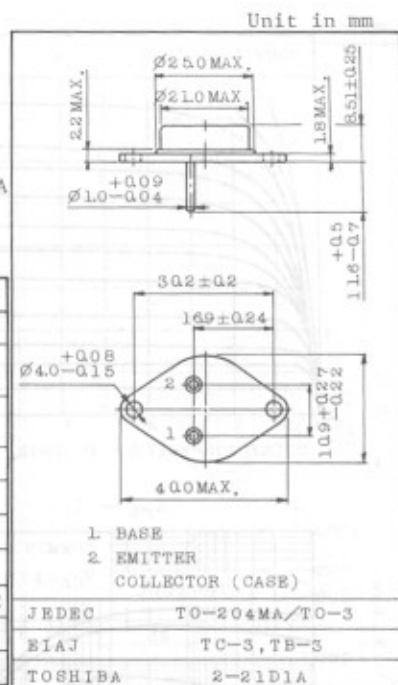
POWER REGULATOR, SWITCHING AND SOLLENOID  
DRIVES APPLICATIONS.

## FEATURES:

- High Gain at High Current
- Low Saturation Voltage :  $V_{CE(sat)} < 1.1V$ , @  $I_C=4A, I_B=0.4A$
- Excellent Area of Safe Operatings

MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT																
Collector-Base Voltage	$V_{CBO}$	100	V																
Collector-Emitter Sustaining Voltage ( $R_{BE}=100\ \Omega$ )	$V_{CER(SUS)}$	70	V																
Collector-Emitter Sustaining Voltage	$V_{CEO(SUS)}$	60	V																
Emitter-Base Voltage	$V_{EBO}$	7	V																
Collector Current	$I_C$	15	A																
Base Current	$I_B$	7	A </tr <tr> <td>Collector Power Dissipation (<math>T_c=25^\circ C</math>) Derate Linearly</td> <td><math>P_C</math></td> <td>115</td> <td>W</td> </tr> <tr> <td></td> <td></td> <td>0.66</td> <td>W / <math>^\circ C</math></td> </tr> <tr> <td>Junction Temperature</td> <td><math>T_j</math></td> <td>200</td> <td><math>^\circ C</math></td> </tr> <tr> <td>Storage Temperature Range</td> <td><math>T_{stg}</math></td> <td>-65 ~ 200</td> <td><math>^\circ C</math></td> </tr>	Collector Power Dissipation ( $T_c=25^\circ C$ ) Derate Linearly	$P_C$	115	W			0.66	W / $^\circ C$	Junction Temperature	$T_j$	200	$^\circ C$	Storage Temperature Range	$T_{stg}$	-65 ~ 200	$^\circ C$
Collector Power Dissipation ( $T_c=25^\circ C$ ) Derate Linearly	$P_C$	115	W																
		0.66	W / $^\circ C$																
Junction Temperature	$T_j$	200	$^\circ C$																
Storage Temperature Range	$T_{stg}$	-65 ~ 200	$^\circ C$																

ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ C$ )

Weight : 12.6g

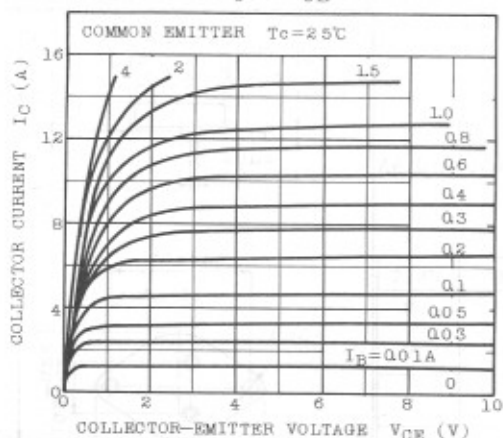
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current	$I_{CEX}$	$V_{CE}=100V, V_{BE}=-1.5V$	-	-	5	mA
Collector Cut-off Current	$I_{CEX}$	$V_{CE}=100V, V_{BE}=-1.5V, T_c=150^\circ C$	-	-	30	mA
Collector Cut-off Current	$I_{CEO}$	$V_{CE}=30V, I_B=0$	-	-	0.7	mA
Emitter Cut-off Current	$I_{EBO}$	$V_{EB}=7V, I_C=0$	-	-	5	mA
Collector-Emitter Sustaining Voltage	$V_{CER(SUS)}^{**}$	$I_C=0.2A, R_{BE}=100\ \Omega$	70	-	-	V
Collector-Emitter Sustaining Voltage	$V_{CEO(SUS)}^{**}$	$I_C=0.2A, I_B=0$	60	-	-	V
DC Current Gain	$h_{FE}$	$V_{CE}=4V, I_C=4A$ $V_{CE}=4V, I_C=10A$	20 5	-	70	
Base-Emitter Voltage	$V_{BE}$	$V_{CE}=4V, I_C=4A$	-	-	1.8	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=4A, I_B=0.4A$ $I_C=10A, I_B=3.3A$	-	-	1.1 8	V
Small Signal Current Gain Cut-off Frequency	$f_{hfe}$	$V_{CE}=4V, I_C=1A, f=10kHz$	20	-	-	kHz
Small Signal Current Gain	$ h_{fe} $	$V_{CE}=4V, I_C=1A, f=1MHz$	2.5	-	-	
Second Breakdown Collector Current (Base Forward Bias)	$I_{s/b}$	$V_{CE}=40V, t=1s$ (non repetitive)	2.87	-	-	A

\* In Accordance With JEDEC Registration Data.

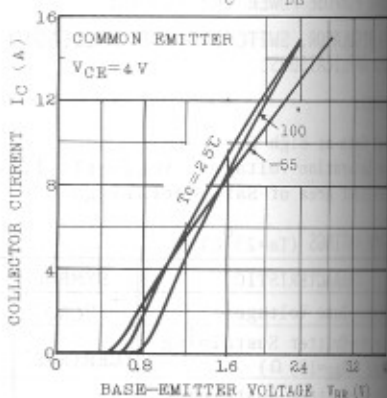
\*\* The sustaining voltages  $V_{CER(SUS)}$  and  $V_{CEO(SUS)}$  MUST NOT be measured on a curve tracer.

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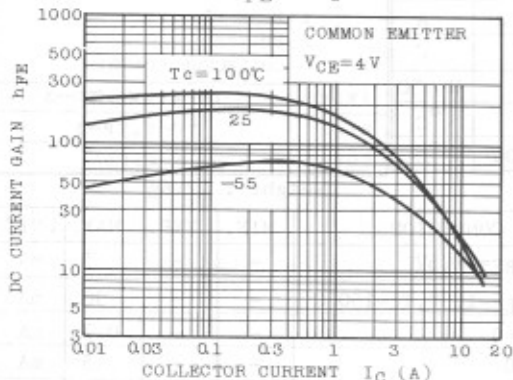
$I_C - V_{CE}$



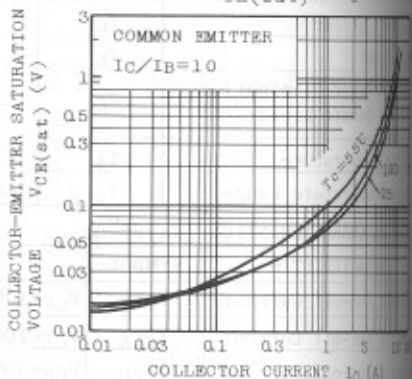
$I_C - V_{BE}$



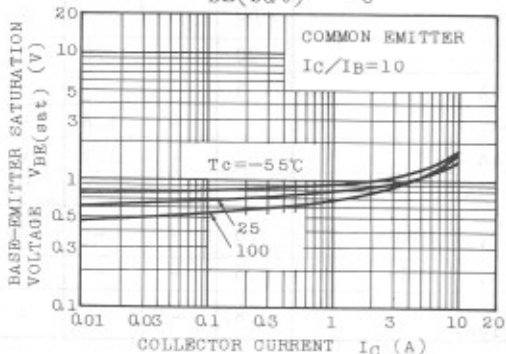
$h_{FE} - I_C$



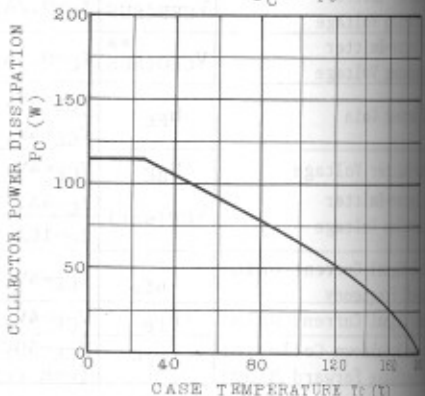
$V_{CE(sat)} - I_C$



$V_{BE(sat)} - I_C$



$P_C - T_c$



Unit in mm

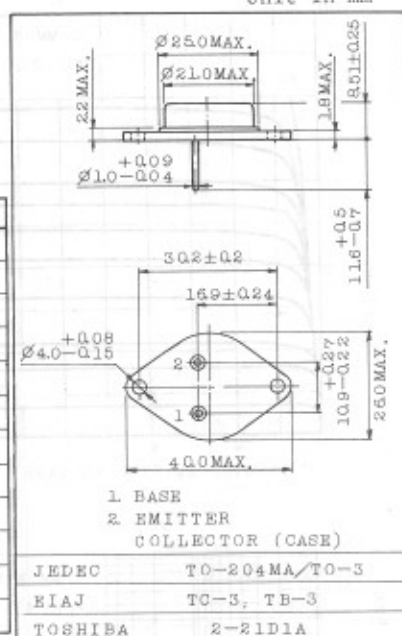
HIGH POWER AMPLIFIER, POWER SWITCHING,  
DC-DC CONVERTER AND REGULATOR APPLICATIONS

## FEATURES:

- High Collector-Emitter Sustaining Voltage:  
 $V_{CEO(SUS)}=140V$  (Min.) @  $I_C=0.2A$ ,  $I_B=0$
- Excellent Area of Safe Operatings.

MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Collector-Base Voltage	$V_{CBO}$	160	V
Collector-Emitter Voltage	$V_{CEX}$	160	V
Collector-Emitter Voltage	$V_{CEO}$	140	V
Emitter-Base Voltage	$V_{EBO}$	7	V
Collector Current	DC	$I_C$	16
	Peak	$I_{CM}$	30
Base Current	DC	$I_B$	4
	Peak	$I_{BM}$	15
Collector Power Dissipation ( $T_c=25^\circ C$ )	$P_C$	150	W
Derate Linearly above $25^\circ C$		0.855	W/ $^\circ C$
Junction Temperature	$T_j$	200	$^\circ C$
Storage Temperature	$T_{stg}$	-65 ~ 200	$^\circ C$



1. BASE  
2. EMITTER  
COLLECTOR (CASE)

JEDEC TO-204MA/TO-3

EIAJ TC-3, TB-3

TOSHIBA 2-21D1A

Weight : 12.6g

ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current	$I_{CBO}$	$V_{CB}=140V$ , $I_E=0$	-	-	2.0	mA
Collector Cut-off Current	$I_{CEX}$	$V_{CE}=140V$ , $V_{BE}=-1.5V$	-	-	2.0	mA
Collector Cut-off Current	$I_{CEX}$	$V_{CE}=140V$ , $V_{BE}=-1.5V$ , $T_c=150^\circ C$	-	-	10	mA
Collector Cut-off Current	$I_{CEO}$	$V_{CE}=120V$ , $I_B=0$	-	-	10	mA
Emitter Cut-off Current	$I_{EBO}$	$V_{EB}=7V$ , $I_C=0$	-	-	5.0	mA
Collector-Emitter Sustaining Voltage	$V_{CEX(SUS)}$	$I_C=0.1A$ , $V_{BE}=-1.5V$ $R_{BE}=100\Omega$	160	-	-	V
Collector-Emitter Sustaining Voltage	$V_{CER(SUS)}$	$I_C=0.2A$ , $R_{BE}=100\Omega$	150	-	-	V
Collector-Emitter Sustaining Voltage	$V_{CEO(SUS)}$	$I_C=0.2A$ , $I_B=0$	140	-	-	V
DC Current Gain	$h_{FE}$	$V_{CE}=4.0V$ , $I_C=8A$	15	-	60	
		$V_{CE}=4.0V$ , $I_C=16A$	5	-	-	
Base-Emitter Voltage	$V_{BE}$	$V_{CE}=4.0V$ , $I_C=8A$	-	-	2.2	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=8A$ , $I_B=0.8A$	-	-	1.4	V
		$I_C=16A$ , $I_B=3.2A$	-	-	4.0	V
Small Signal Current Gain	$h_{fe}$	$V_{CE}=4V$ , $I_C=1.0A$ , $f=1kHz$	40	-	-	
Small Signal Forward Current Transfer Ratio	$ h_{fe} $	$V_{CE}=4V$ , $I_C=1.0A$ , $f=50kHz$	4	-	-	

In Accordance with JEDEC Registration Data.

The sustaining voltages  $V_{CEX(SUS)}$ ,  $V_{CER(SUS)}$  and  $V_{CEO(SUS)}$  MUST NOT be measured on a curve tracer.

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