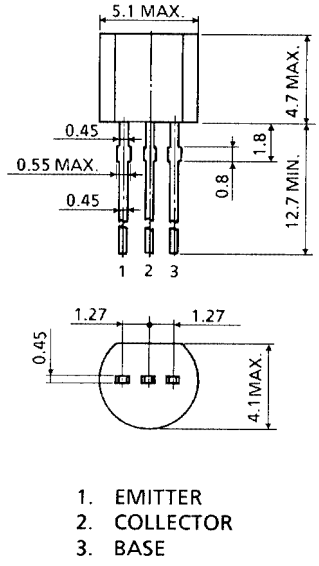
TOSHIBA Transistor Silicon NPN Epitaxial Planar Type (PCT process)

2SC380TM

High Frequency Amplifier Applications

- High power gain: G_{pe} = 29dB (typ.) (f = 10.7 MHz)
- Recommended for FM IF, OSC stage and AM CONV. IF stage.

Unit: mm



JEDEC	TO-92
JEITA	SC-43
TOSHIBA	2-5F1B

Weight: 0.21 g (typ.)

Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	35	V
Collector-emitter voltage	V_{CEO}	30	V
Emitter-base voltage	V_{EBO}	4	V
Collector current	I_C	50	mA
Emitter current	I_E	−50	mA
Collector power dissipation	P_C	300	mW
Junction temperature	T_j	125	°C
Storage temperature range	T_{stg}	−55~125	°C

Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = 35 V, I_E = 0	—	—	0.1	μA
Emitter cut-off current	I_{EBO}	V_{EB} = 4 V, I_C = 0	—	—	0.1	μA
DC current gain	h_{FE} (Note)	V_{CE} = 12 V, I_C = 2 mA	40	—	240	
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	I_C = 10 mA, I_B = 1 mA	—	—	0.4	V
Base-emitter voltage	V_{BE}	I_C = 10 mA, I_B = 1 mA	—	—	1.0	V
Transition frequency	f_T	V_{CE} = 10 V, I_C = 1 mA	100	—	400	MHz
Collector output capacitance	C_{ob}	V_{CB} = 10 V, I_E = 0, f = 1 MHz	1.4	2.0	3.2	pF
Collector-base time constant	$C_c.r_{bb'}$	V_{CE} = 10 V, I_E = −1 mA, f = 30 MHz	10	—	50	ps
Power gain	G_{pe}	V_{CC} = 6 V, I_E = −1 mA, f = 10.7 MHz (Figure 1)	27	29	33	dB

Note: h_{FE} classification R: 40~80, O: 70~140, Y: 120~240

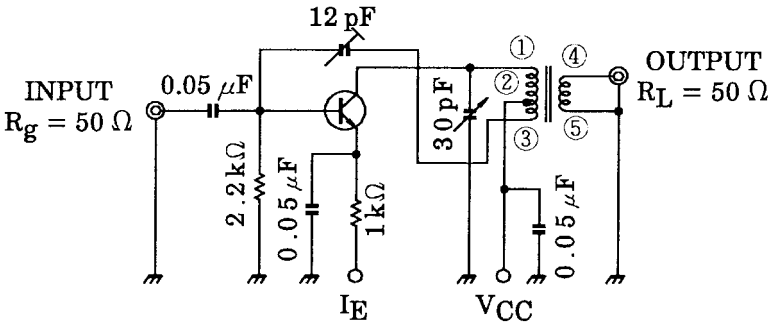
y Parameters (typ.)

(1) (common emitter f = 455 kHz, Ta = 25°C)

Characteristics	Symbol	2SC380TM-R	2SC380TM-O	2SC380TM-Y	Unit
Collector-emitter voltage	V_{CE}	6	6	6	V
Emitter current	I_E	−1	−1	−1	mA
Input conductance	g_{ie}	0.58	0.41	0.26	mS
Input capacitance	C_{ie}	53	46	38	pF
Output conductance	g_{oe}	1.9	2.7	4.8	μS
Output capacitance	C_{oe}	2.6	2.8	3.6	pF
Forward transfer admittance	$\|y_{fe}\|$	38	38	38	mS
Phase angle of forward transfer admittance	θ_{fe}	−0.79	−0.83	−0.92	°
Reverse transfer admittance	$\|y_{re}\|$	5.7	5.7	6.2	μS
Phase angle of reverse transfer admittance	θ_{re}	−90	−90	−90	°

(2) (common emitter f = 10.7 MHz, Ta = 25°C)

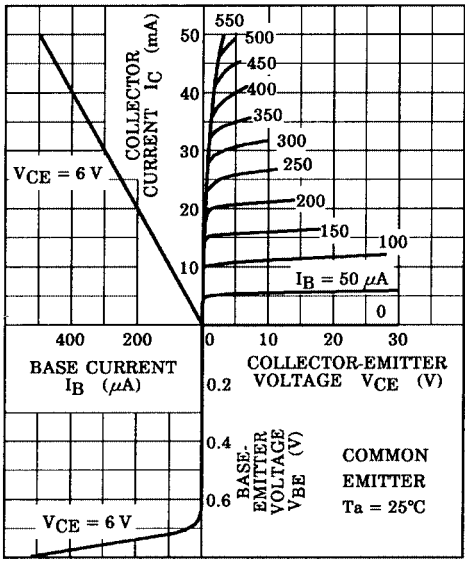
Characteristics	Symbol	2SC380TM-R	2SC380TM-O	2SC380TM-Y	Unit
Collector-emitter voltage	V_{CE}	6	6	6	V
Emitter current	I_E	−1	−1	−1	mA
Input conductance	g_{ie}	1.04	0.85	0.65	mS
Input capacitance	C_{ie}	49	43	36	pF
Output conductance	g_{oe}	10	15	28	μS
Output capacitance	C_{oe}	2.7	2.9	3.6	pF
Forward transfer admittance	$\|y_{fe}\|$	37	37	37	mS
Phase angle of forward transfer admittance	θ_{fe}	−9.6	−10.4	−11.5	°
Reverse transfer admittance	$\|y_{re}\|$	120	120	140	μS
Phase angle of reverse transfer admittance	θ_{re}	−90	−90	−90	°



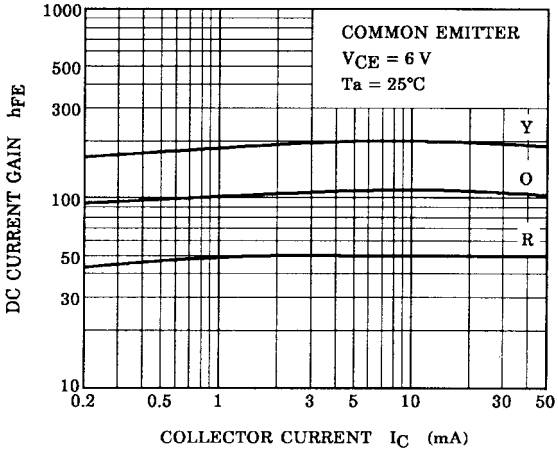
T : ①-② 0.1 mmϕ UEW 20T
②-③ 0.1 mmϕ UEW 8T
④-⑤ 0.1 mmϕ UEW 2T

Figure 1 G_{pe} Test Circuit

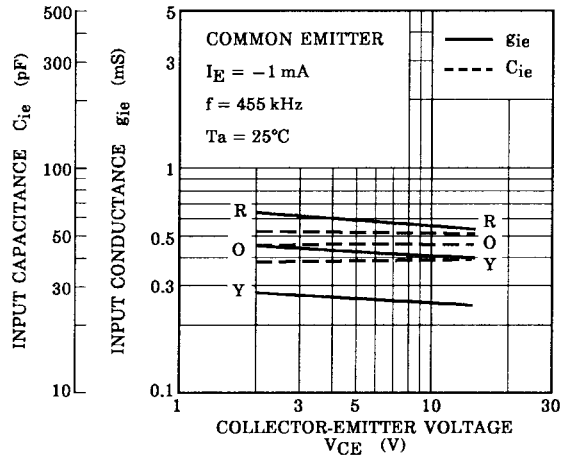
STATIC CHARACTERISTICS



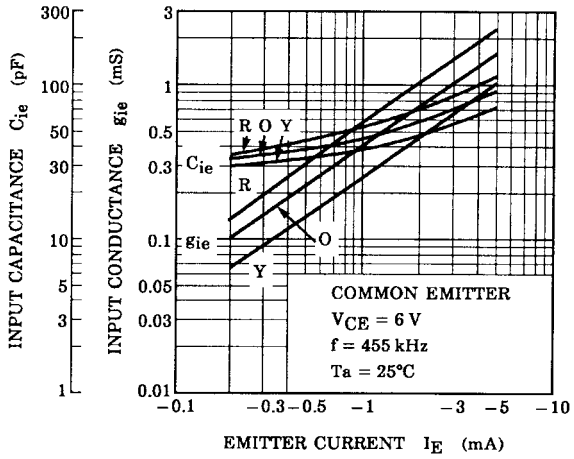
h_{FE} – I_C



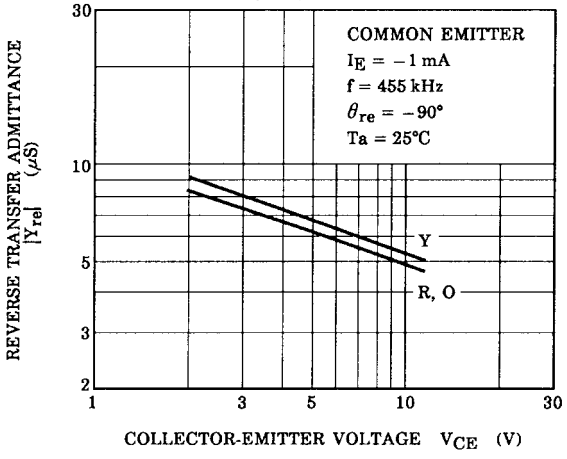
gie, Cie – V_{CE}



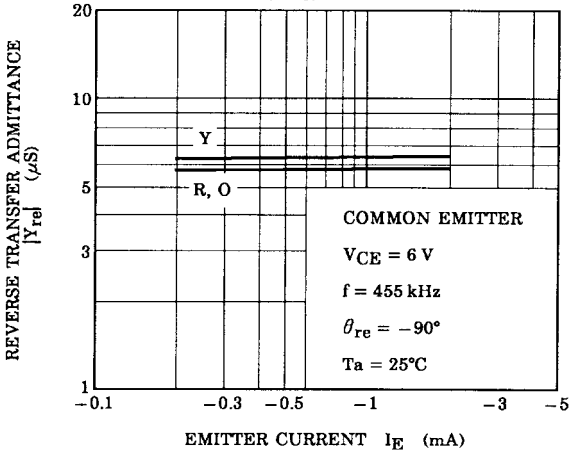
gie, Cie – I_E

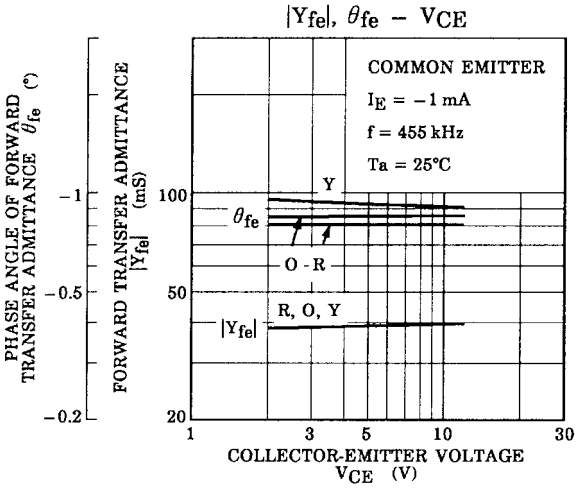


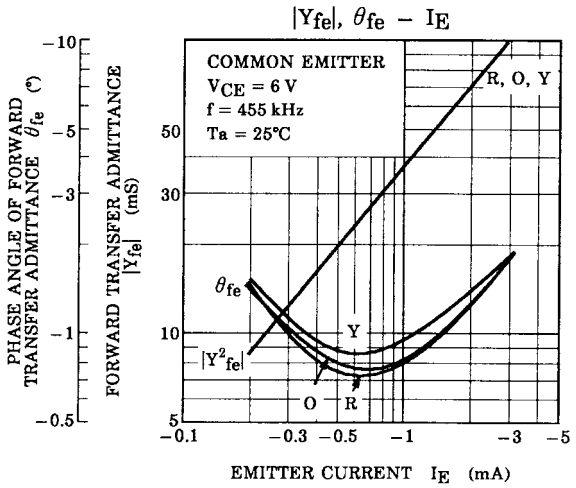
$|Y_{re}|$ – V_{CE}

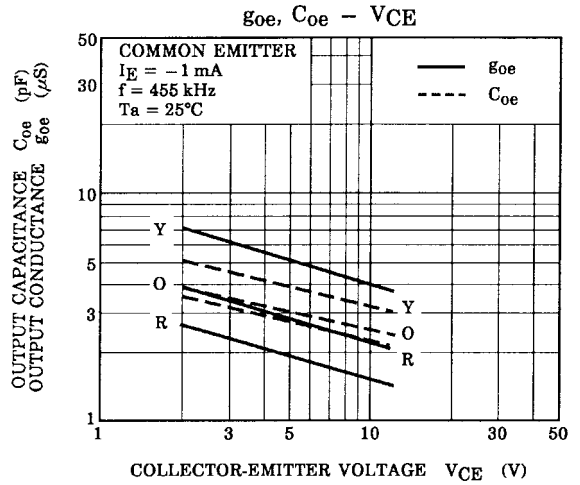


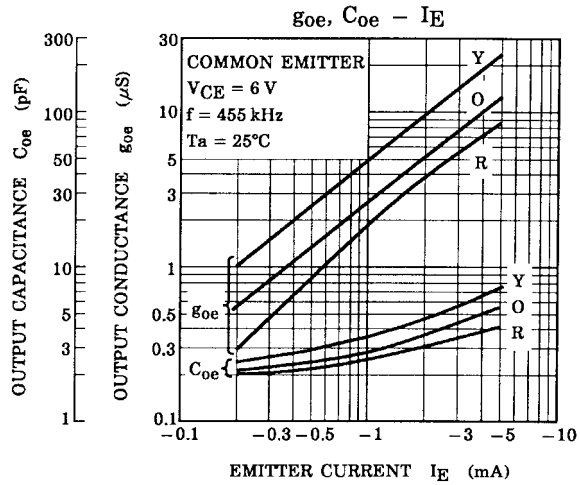
$|Y_{re}|$ – I_E

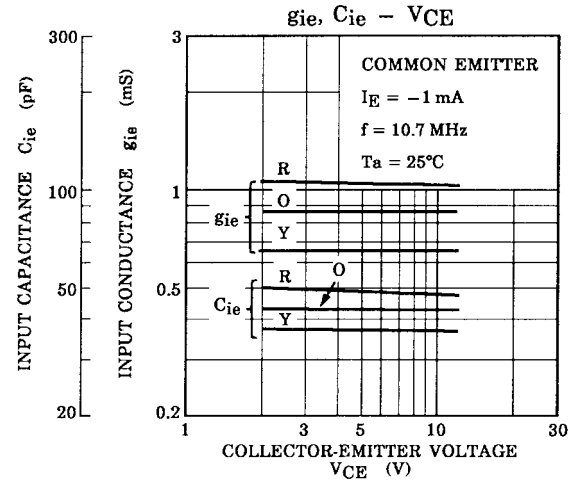


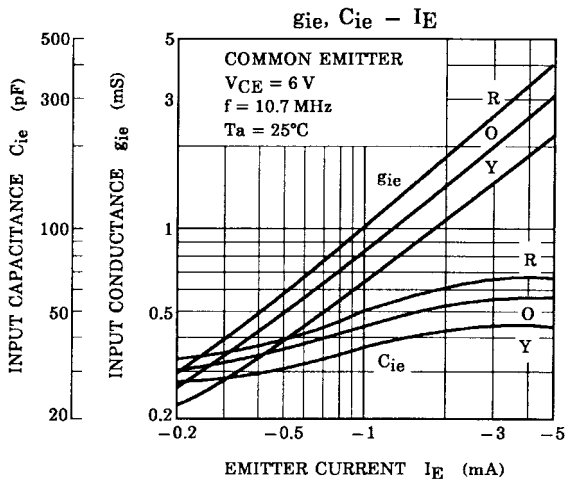

|Yfe|, θfe – VCE
COMMON EMITTER
IE = −1 mA
f = 455 kHz
Ta = 25°C
PHASE ANGLE OF FORWARD TRANSFER ADMITTANCE θfe (°)
FORWARD TRANSFER ADMITTANCE |Yfe| (mS)
θfe
|Yfe|
Y
O
R
R, O, Y
COLLECTOR-EMITTER VOLTAGE VCE (V)

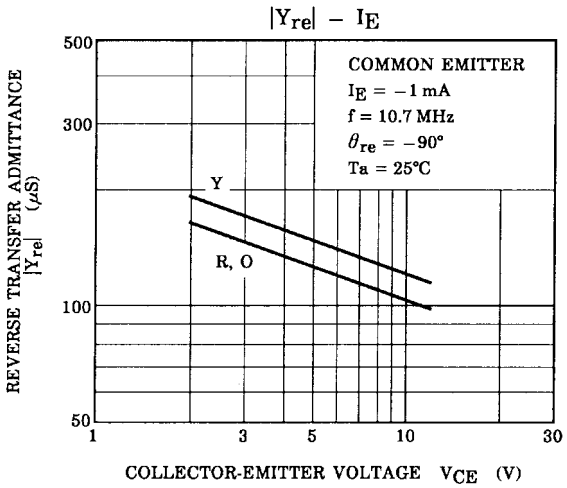

|Yfe|, θfe – IE
COMMON EMITTER
VCE = 6 V
f = 455 kHz
Ta = 25°C
PHASE ANGLE OF FORWARD TRANSFER ADMITTANCE θfe (°)
FORWARD TRANSFER ADMITTANCE |Yfe| (mS)
θfe
|Y²fe|
R, O, Y
Y
O
R
EMITTER CURRENT IE (mA)

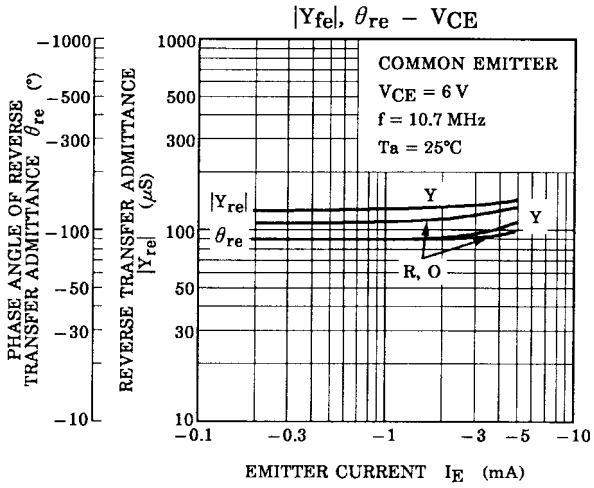

goe, Coe – VCE
COMMON EMITTER
IE = −1 mA
f = 455 kHz
Ta = 25°C
goe
Coe
OUTPUT CAPACITANCE Coe (pF)
OUTPUT CONDUCTANCE goe (μS)
Y
O
R
COLLECTOR-EMITTER VOLTAGE VCE (V)

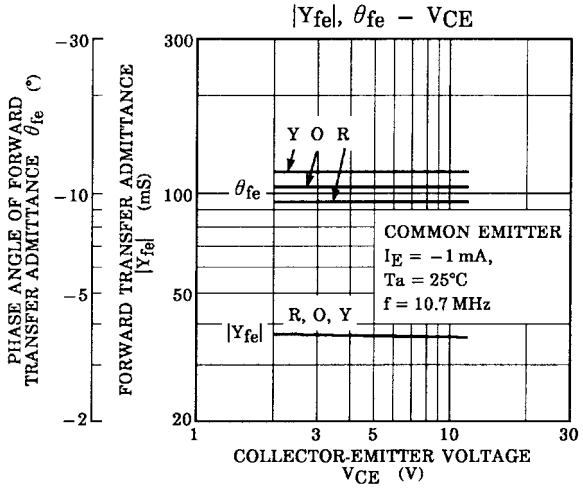

goe, Coe – IE
COMMON EMITTER
VCE = 6 V
f = 455 kHz
Ta = 25°C
OUTPUT CAPACITANCE Coe (pF)
OUTPUT CONDUCTANCE goe (μS)
goe
Coe
Y
O
R
EMITTER CURRENT IE (mA)

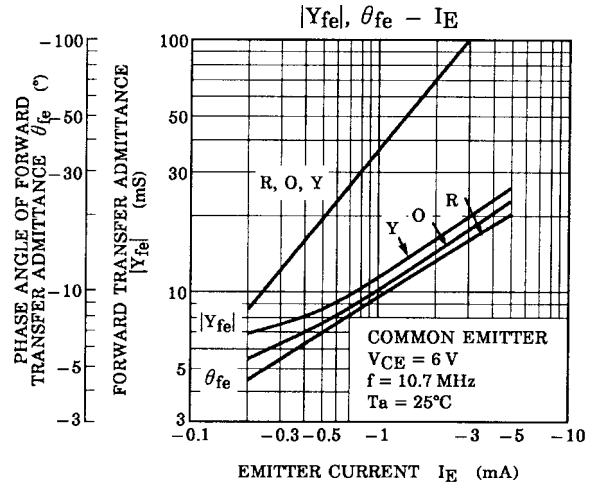

gie, Cie – VCE
COMMON EMITTER
IE = −1 mA
f = 10.7 MHz
Ta = 25°C
INPUT CAPACITANCE Cie (pF)
INPUT CONDUCTANCE gie (mS)
gie
Cie
R
O
Y
COLLECTOR-EMITTER VOLTAGE VCE (V)

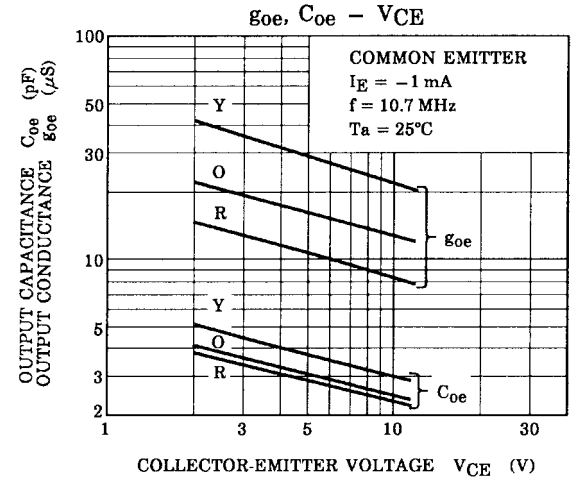

gie, Cie – IE
COMMON EMITTER
VCE = 6 V
f = 10.7 MHz
Ta = 25°C
INPUT CAPACITANCE Cie (pF)
INPUT CONDUCTANCE gie (mS)
gie
Cie
R
O
Y
EMITTER CURRENT IE (mA)

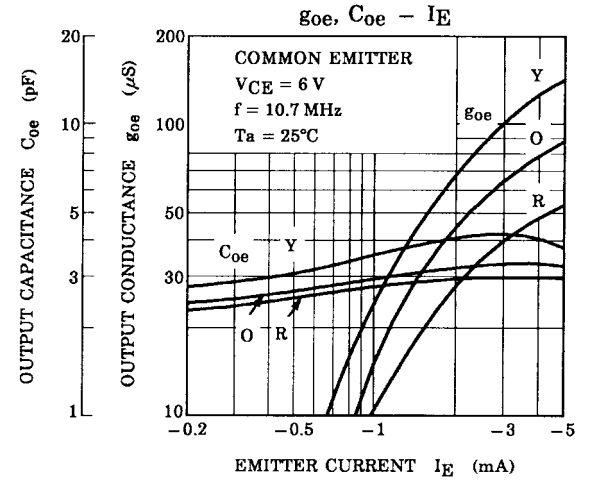

$|Y_{re}|$ – I_E
COMMON EMITTER
I_E = −1 mA
f = 10.7 MHz
θ_{re} = −90°
Ta = 25°C
Y
R, O
REVERSE TRANSFER ADMITTANCE $|Y_{re}|$ (μS)
COLLECTOR-EMITTER VOLTAGE V_{CE} (V)

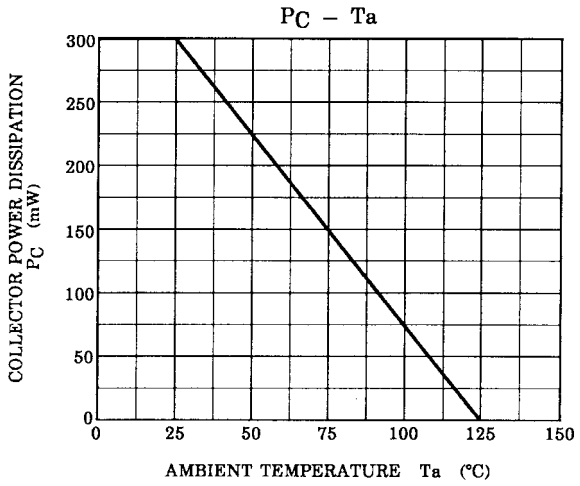

$|Y_{fe}|$, θ_{re} – V_{CE}
COMMON EMITTER
V_{CE} = 6 V
f = 10.7 MHz
Ta = 25°C
$|Y_{re}|$
θ_{re}
Y
R, O
PHASE ANGLE OF REVERSE TRANSFER ADMITTANCE θ_{re} (°)
REVERSE TRANSFER ADMITTANCE $|Y_{re}|$ (μS)
EMITTER CURRENT I_E (mA)


$|Y_{fe}|$, θ_{fe} – V_{CE}
COMMON EMITTER
I_E = −1 mA,
Ta = 25°C
f = 10.7 MHz
Y O R
θ_{fe}
$|Y_{fe}|$
R, O, Y
PHASE ANGLE OF FORWARD TRANSFER ADMITTANCE θ_{fe} (°)
FORWARD TRANSFER ADMITTANCE $|Y_{fe}|$ (mS)
COLLECTOR-EMITTER VOLTAGE V_{CE} (V)


$|Y_{fe}|$, θ_{fe} – I_E
COMMON EMITTER
V_{CE} = 6 V
f = 10.7 MHz
Ta = 25°C
R, O, Y
Y
O
R
$|Y_{fe}|$
θ_{fe}
PHASE ANGLE OF FORWARD TRANSFER ADMITTANCE θ_{fe} (°)
FORWARD TRANSFER ADMITTANCE $|Y_{fe}|$ (mS)
EMITTER CURRENT I_E (mA)


g_{oe}, C_{oe} – V_{CE}
COMMON EMITTER
I_E = −1 mA
f = 10.7 MHz
Ta = 25°C
Y
O
R
g_{oe}
C_{oe}
OUTPUT CAPACITANCE C_{oe} (pF)
OUTPUT CONDUCTANCE g_{oe} (μS)
COLLECTOR-EMITTER VOLTAGE V_{CE} (V)


g_{oe}, C_{oe} – I_E
COMMON EMITTER
V_{CE} = 6 V
f = 10.7 MHz
Ta = 25°C
g_{oe}
C_{oe}
Y
O
R
OUTPUT CAPACITANCE C_{oe} (pF)
OUTPUT CONDUCTANCE g_{oe} (μS)
EMITTER CURRENT I_E (mA)


P_C – Ta
COLLECTOR POWER DISSIPATION P_C (mW)
300
250
200
150
100
50
0
0
25
50
75
100
125
150
AMBIENT TEMPERATURE Ta (°C)

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