NEC

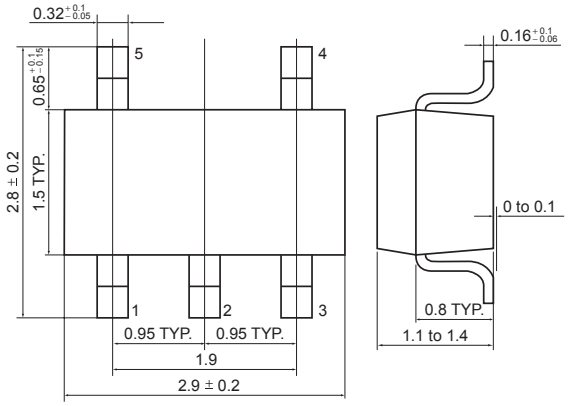
μPA509TA

NPN EPITAXIAL SILICON TRANSISTOR
N-CHANNEL SILICON JUNCTION FIELD EFFECT TRANSISTOR
HIGH FREQUENCY AMPLIFIER, AM HIGH FREQUENCY
AUDIO FREQUENCY AMPLIFIER APPLICATION

FEATURES

- Composite type J-FET and NPN Transistor

PACKAGE DRAWING (Unit: mm)



ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA509TA	SC-74A

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

FET

Drain to Source Voltage [Note]	V_{DSX}	22	V
Gate To Drain Voltage	V_{GDO}	−22	V
Drain Current	I_D	50	mA
Gate Current	I_G	10	mA
Total Power Dissipation	P_T	200	mW

Notes V_{GS} = −2.5 V

TRANSISTOR

Collector to Base Voltage	V_{CBO}	60	V
Collector to Emitter Voltage	V_{CEO}	50	V
Emitter to Base Voltage	V_{EBO}	5	V
Collector Current	$I_{C(DC)}$	100	mA
Collector Current (pulse) [Note]	$I_{C(pulse)}$	200	mA
Base Current	I_B	20	mA
Total Power Dissipation	P_T	200	mW

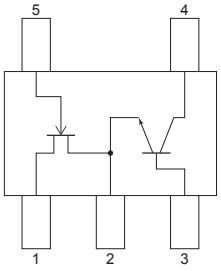
Notes PW ≤ 10 ms, Duty Cycle ≤ 50 %

COMMON RATINGS

Total Power Dissipation	P_T	300	mW
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	−55 ~ +150	°C

EQUIVALENT CIRCUIT

(Top View)



1 : Source
2 : Drain / Emitter
3 : Base
4 : Collector
5 : Gate

Remark Please take care of ESD (Electro Static Discharge) when you handle the device in this document.

Document No. G17694EJ1V0DS00 (1st edition)
Date Published August 2005 NS CP(K)
Printed in Japan

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

FET

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Gate Current	I_{GSS}	V_{GS} = −15 V, V_{DS} = 0 V			−1.0	nA
Drain Current	I_{DSS}	V_{DS} = 5.0 V, V_{GS} = 0 V	10		30	mA
Gate Cut-off Voltage	$V_{GS(off)}$	V_{DS} = 5.0 V, I_D = 10 μA		−1.1	−2.5	V
Forward Transfer Admittance	$\|y_{fs1}\|$	V_{DS} = 5.0 V, I_D = 10 mA, f = 1.0 kHz	20	28		mS
	$\|y_{fs2}\|$	V_{DS} = 5.0 V, V_{GS} = 0 V, f = 1.0 kHz	20	35		mS
Input Capacitance	C_{iss}	V_{DS} = 5.0 V, V_{GS} = 0 V, f = 1.0 MHz		8.3		pF
Capacitance	C_{rss}	V_{DS} = 5.0 V, V_{GS} = 0 V, f = 1.0 MHz		2.75		pF
Noise Voltage	NV	Refer to the test circuit		16.8		mV

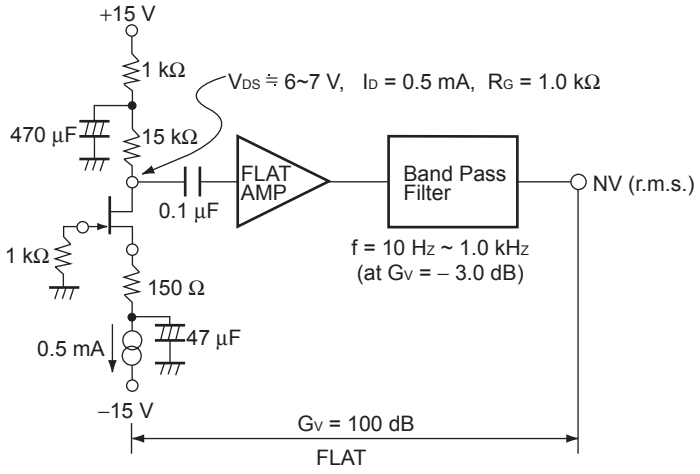
TRANSISTOR

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current	I_{CBO}	V_{CB} = 60 V, I_E = 0 mA			100	nA
Emitter Cut-off Current	I_{EBO}	V_{EB} = 5.0 V, I_C = 0 V			100	nA
DC Current Gain	h_{FE}	V_{CE} = 6.0 V, I_C = 1 mA	135		400	
Base to Emitter Voltage	V_{BE}	V_{CE} = 6.0 V, I_C = 1 mA	0.55		0.65	V
Base to Emitter Saturation Voltage	$V_{BE(sat)}$	I_C = 100 mA, I_B = 10 mA		0.86	1.0	V
Collector to Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 100 mA, I_B = 10 mA		0.15	0.3	V
Gain Bandwidth Product	f_T	V_{CE} = 6.0 V, I_E = −10 mA		250		MHz
Output Capacitance	C_{ob}	V_{CB} = 60 V, I_E = 0, f = 1.0 MHz		3.0		pF

I_{DSS} Classification

Rank Marking	UV	UW
I_{DSS}(mA)	10~20	15~30

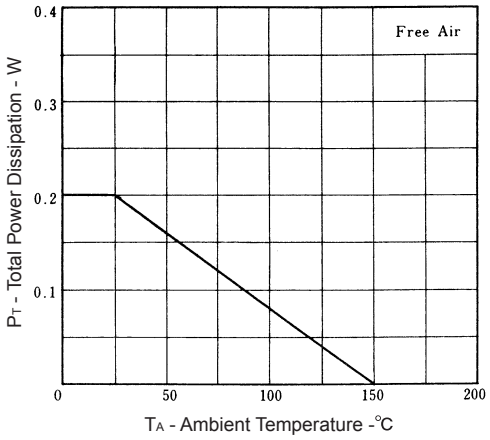
Noise Voltage Test Circuit



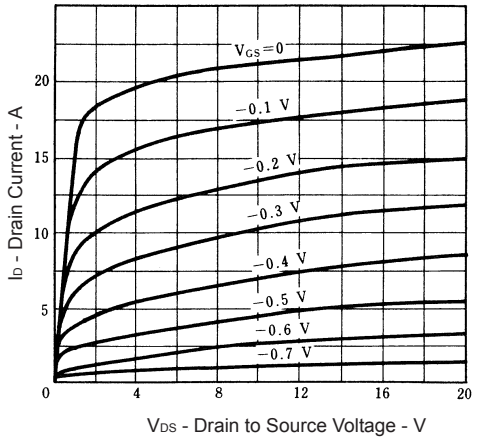
TYPICAL CHARACTERISTICS (T_A = 25°C)

FET

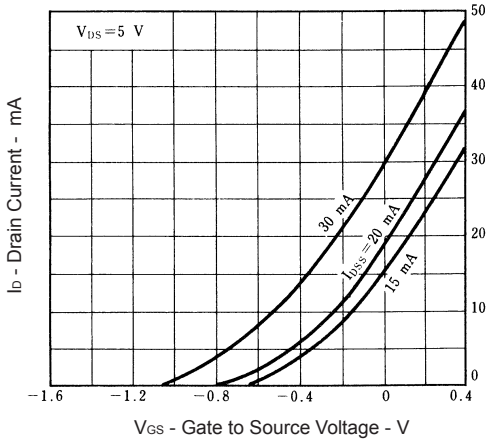
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



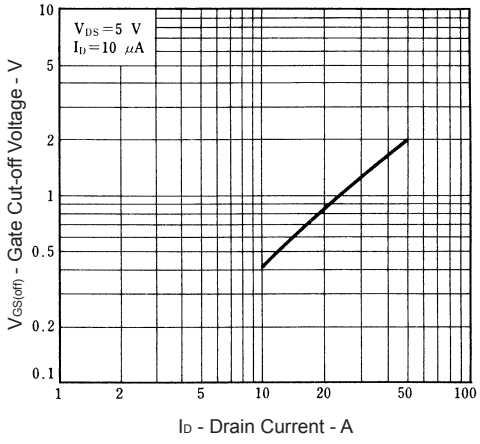
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



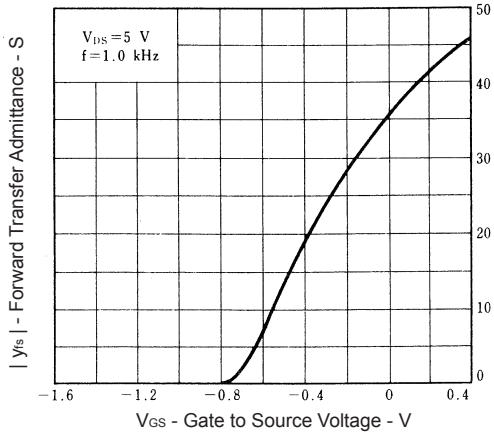
DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE



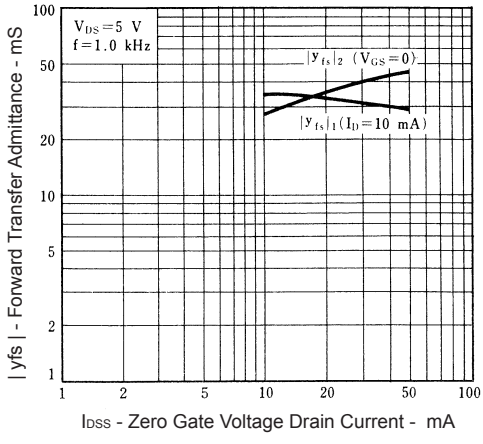
GATE TO SOURCE CUTOFF VOLTAGE vs. ZERO-GATE VOLTAGE DRAIN CURRENT



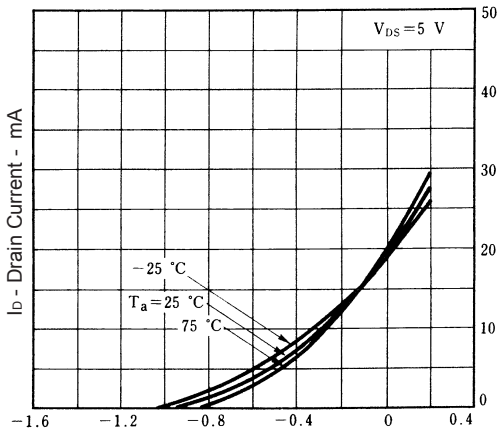
FORWARD TRANSFER ADMITTANCE vs. GATE TO SOURCE VOLTAGE



FORWARD TRANSFER ADMITTANCE vs. ZERO-GATE VOLTAGE DRAIN CURRENT

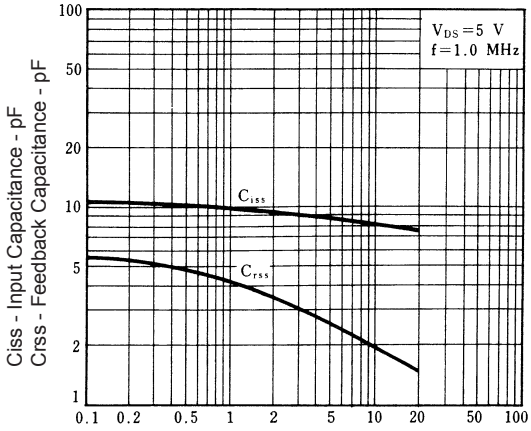


DRAIN CURRENT vs.
GATE TO SOURCE VOLTAGE



V_{GS} - Gate to Source Voltage - V

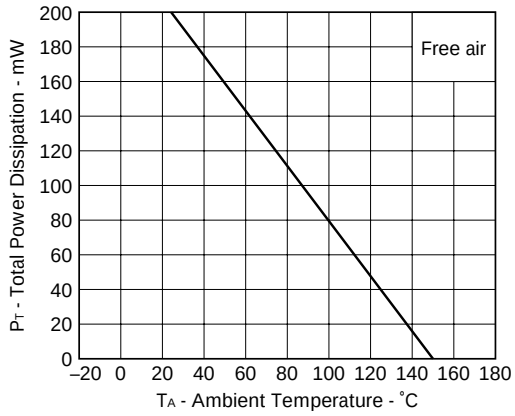
INPUT AND FEEDBACK CAPACITANCE vs.
DRAIN TO SOURCE VOLTAGE



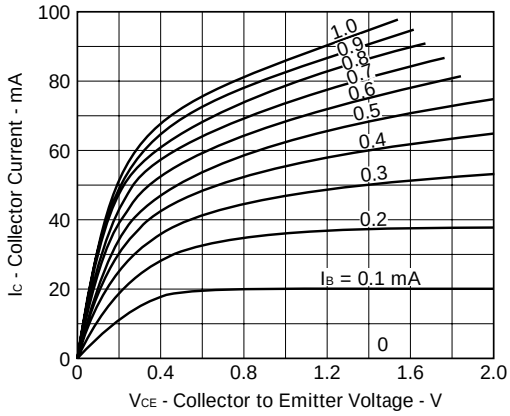
V_{DS} - Drain to Source Voltage - V

TRANSISTOR

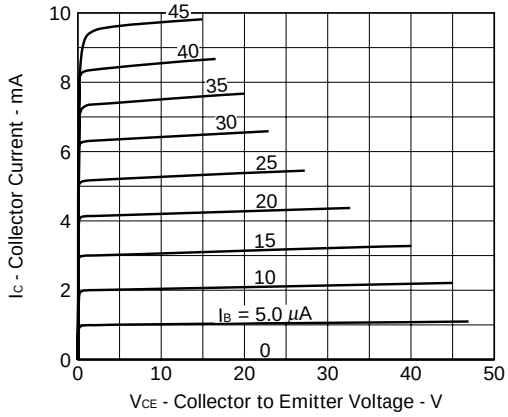
TOTAL POWER DISSIPATION vs.
AMBIENT TEMPERATURE



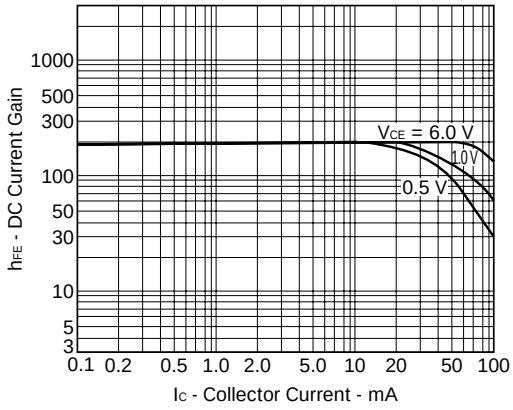
COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



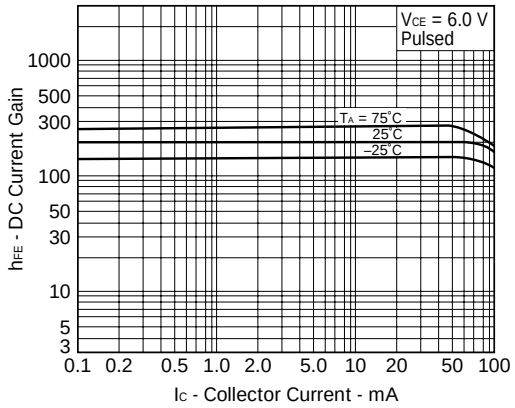
COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



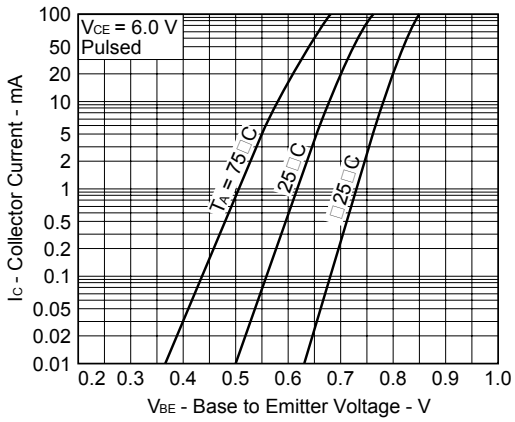
DC CURRENT GAIN vs.
COLLECTOR CURRENT



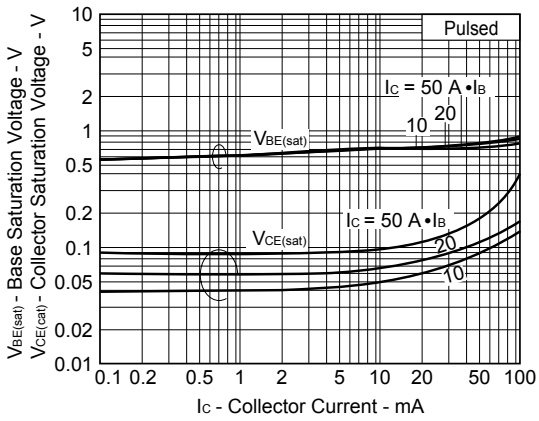
DC CURRENT GAIN vs.
COLLECTOR CURRENT



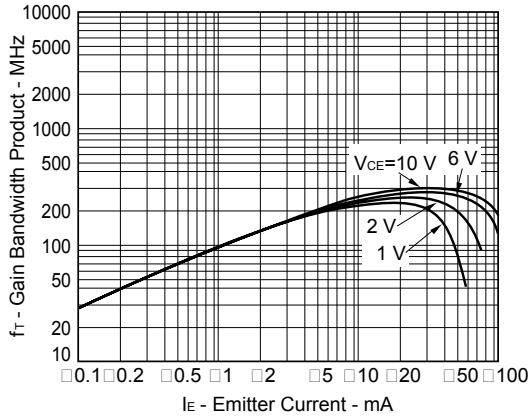
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



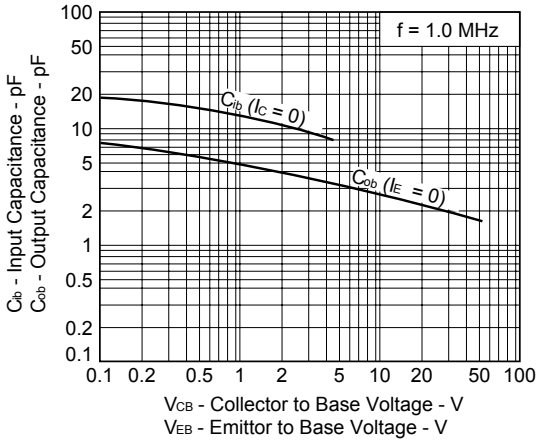
COLLECTOR AND BASE SATURATION
VOLTAGE vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT vs.
EMITTER CURRENT



INPUT AND OUTPUT CAPACITANCE
vs. REVERSE VOLTAGE



- **The information in this document is current as of August, 2005. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC Electronics data sheets or data books, etc., for the most up-to-date specifications of NEC Electronics products. Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.**
- No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Electronics. NEC Electronics assumes no responsibility for any errors that may appear in this document.
- NEC Electronics does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC Electronics products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Electronics or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of a customer's equipment shall be done under the full responsibility of the customer. NEC Electronics assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC Electronics endeavors to enhance the quality, reliability and safety of NEC Electronics products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC Electronics products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment and anti-failure features.
- NEC Electronics products are classified into the following three quality grades: "Standard", "Special" and "Specific".

  The "Specific" quality grade applies only to NEC Electronics products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of an NEC Electronics product depend on its quality grade, as indicated below. Customers must check the quality grade of each NEC Electronics product before using it in a particular application.

  "Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots.

  "Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support).

  "Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

The quality grade of NEC Electronics products is "Standard" unless otherwise expressly specified in NEC Electronics data sheets or data books, etc. If customers wish to use NEC Electronics products in applications not intended by NEC Electronics, they must contact an NEC Electronics sales representative in advance to determine NEC Electronics' willingness to support a given application.

(Note)

(1) "NEC Electronics" as used in this statement means NEC Electronics Corporation and also includes its majority-owned subsidiaries.

(2) "NEC Electronics products" means any product developed or manufactured by or for NEC Electronics (as defined above).