DATA SHEET

NEC

MOS FIELD EFFECT TRANSISTOR
μPA1870B

N-CHANNEL MOS FIELD EFFECT TRANSISTOR FOR SWITCHING

DESCRIPTION

The μPA1870B is a switching device which can be driven directly by a 2.5 V power source.

The μPA1870B features a low on-state resistance and excellent switching characteristics, and is suitable for applications such as power switch of portable machine and so on.

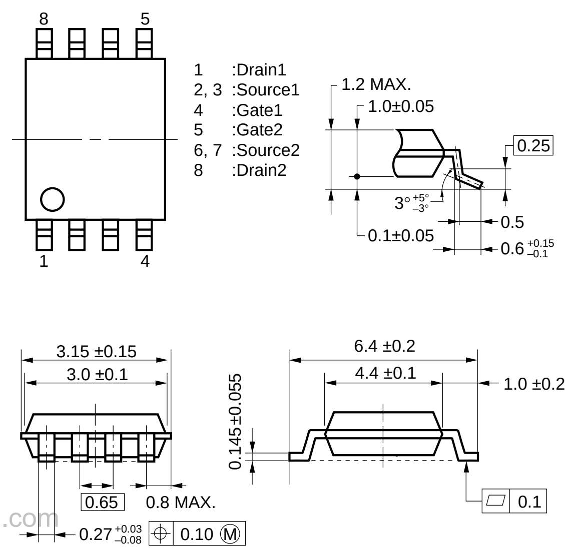
FEATURES

- 2.5 V drive available
- Low on-state resistance
  $R_{DS(on)1}$ = 16.0 mΩ TYP. (V_{GS} = 4.5 V, I_D = 3.0 A)
  $R_{DS(on)2}$ = 16.5 mΩ TYP. (V_{GS} = 4.0 V, I_D = 3.0 A)
  $R_{DS(on)3}$ = 20.0 mΩ TYP. (V_{GS} = 2.5 V, I_D = 3.0 A)
- Built-in G-S protection diode against ESD

ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA1870BGR-9JG	Power TSSOP8

PACKAGE DRAWING (Unit: mm)



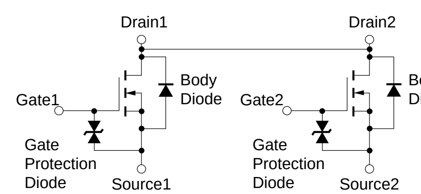
ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	20.0	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	±12.0	V
Drain Current (DC) Note 1	$I_{D(DC)}$	±6.0	A
Drain Current (pulse) Note 2	$I_{D(pulse)}$	±80.0	A
Total Power Dissipation Note 1	P_T	2.0	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to +150	°C

Notes 1. Mounted on ceramic substrate of 50 cm^2 x 1.1 mm

2. PW ≤ 10 μs, Duty Cycle ≤ 1%

EQUIVALENT CIRCUIT



Remark The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

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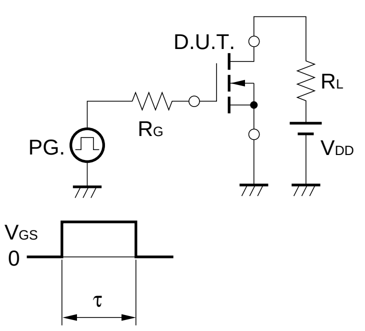
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

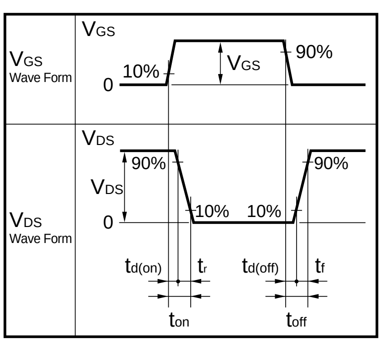
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20.0 V, V_{GS} = 0 V			1.0	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ±12.0 V, V_{DS} = 0 V			±10.0	μA
Gate Cut-off Voltage	$V_{GS(off)}$	V_{DS} = 10.0 V, I_D = 1.0 mA	0.5	1.0	1.5	V
Forward Transfer Admittance Note	$\| y_{fs} \|$	V_{DS} = 10.0 V, I_D = 3.0 A	5			S
Drain to Source On-state Resistance Note	$R_{DS(on)1}$	V_{GS} = 4.5 V, I_D = 3.0 A	12.0	16.0	20.0	mΩ
	$R_{DS(on)2}$	V_{GS} = 4.0 V, I_D = 3.0 A	13.0	16.5	21.0	mΩ
	$R_{DS(on)3}$	V_{GS} = 2.5 V, I_D = 3.0 A	15.0	20.0	27.0	mΩ
Input Capacitance	C_{iss}	V_{DS} = 10.0 V		720		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		166		pF
Reverse Transfer Capacitance	C_{rss}	f = 1.0 MHz		125		pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 10.0 V, I_D = 3.0 A		48		ns
Rise Time	t_r	V_{GS} = 4.0 V		245		ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 10 Ω		315		ns
Fall Time	t_f			305		ns
Total Gate Charge	Q_G	V_{DD} = 16.0 V		8.0		nC
Gate to Source Charge	Q_{GS}	I_D = 6.0 A		1.7		nC
Gate to Drain Charge	Q_{GD}	V_{GS} = 4.0 V		3.5		nC
Body Diode Forward Voltage Note	$V_{F(S-D)}$	I_F = 6.0 A, V_{GS} = 0 V		0.8		V
Reverse Recovery Time	t_{rr}	I_F = 6.0 A, V_{GS} = 0 V		295		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 50 A/μs		450		nC

Note Pulsed: PW ≤ 350 μs, Duty Cycle ≤ 2%

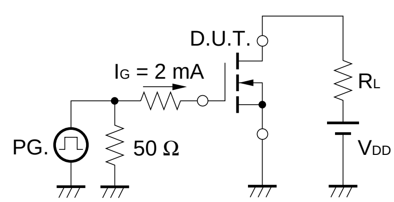
TEST CIRCUIT 1 SWITCHING TIME



τ = 1 μs
Duty Cycle ≤ 1%

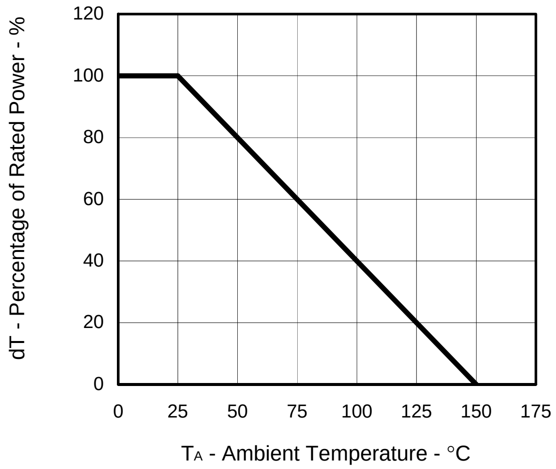


TEST CIRCUIT 2 GATE CHARGE

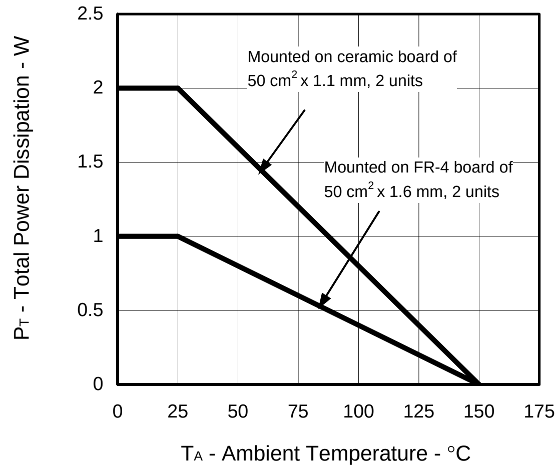


TYPICAL CHARACTERISTICS (T_A = 25°C)

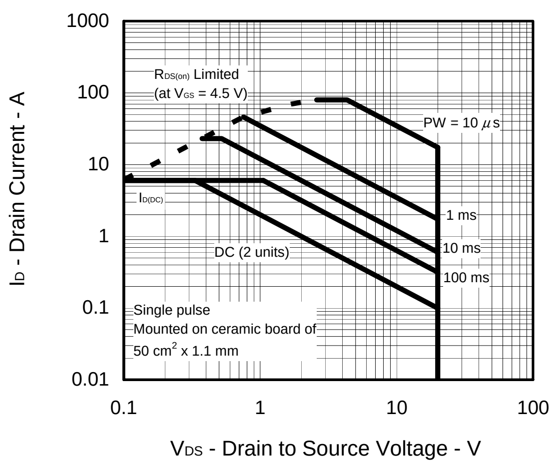
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



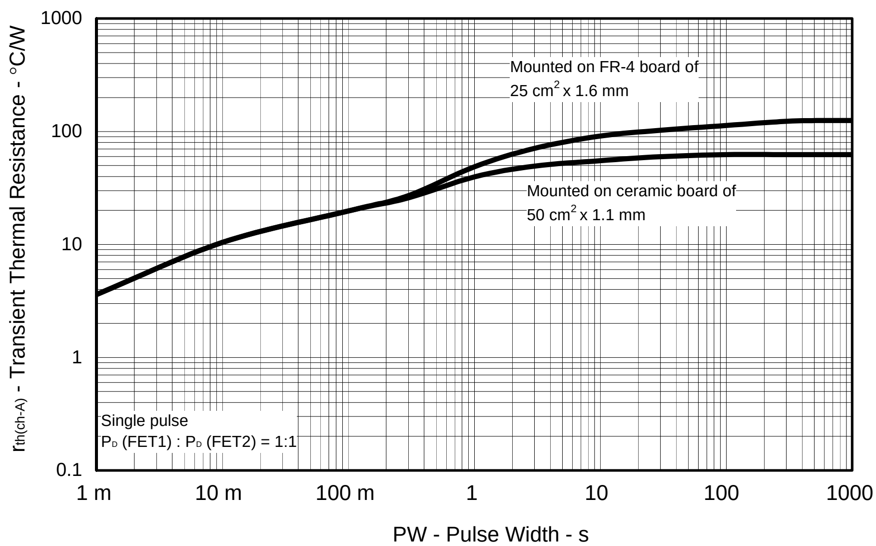
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



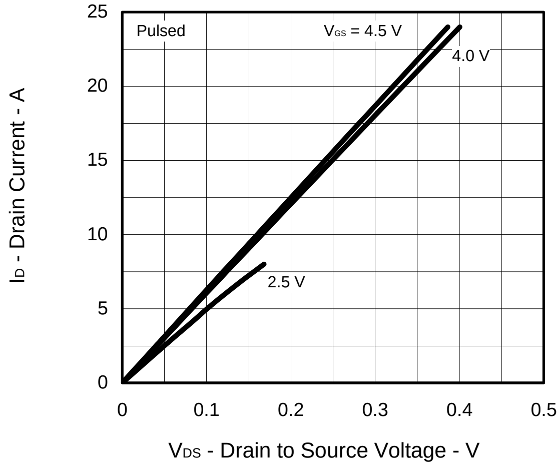
FORWARD BIAS SAFE OPERATING AREA



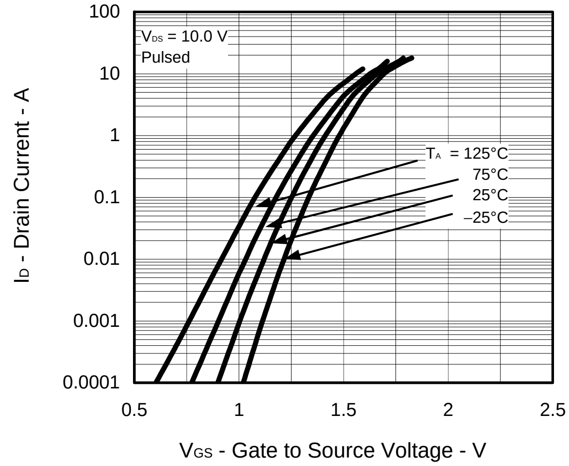
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



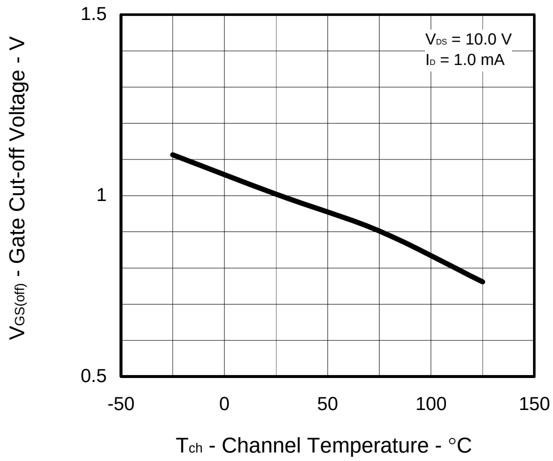
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



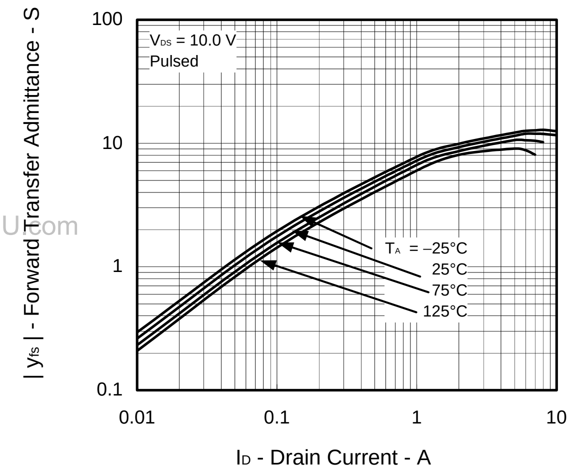
FORWARD TRANSFER CHARACTERISTICS



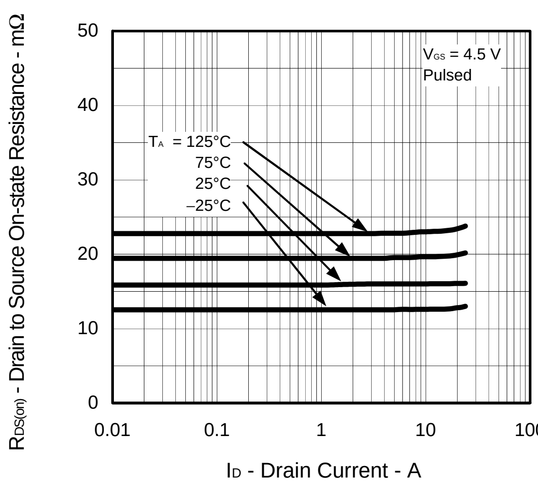
GATE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



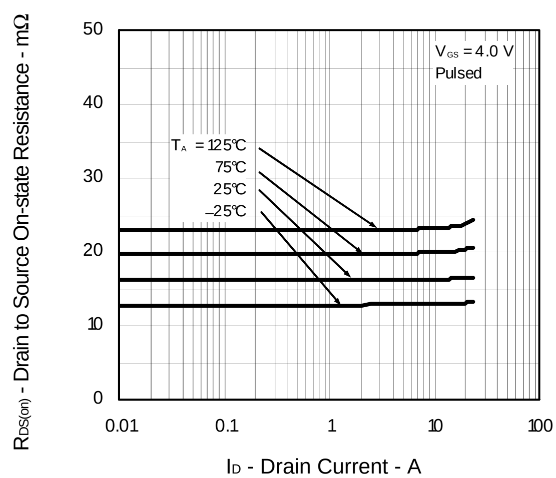
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



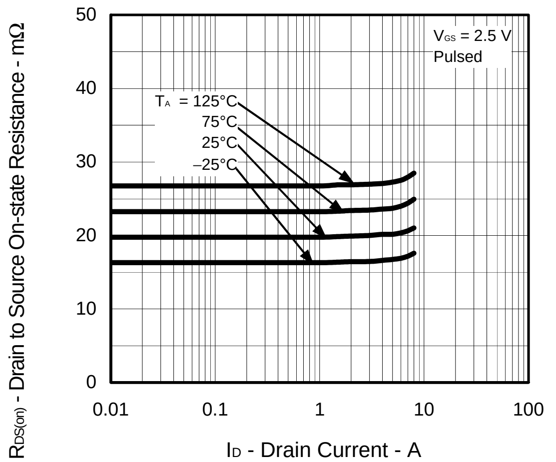
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



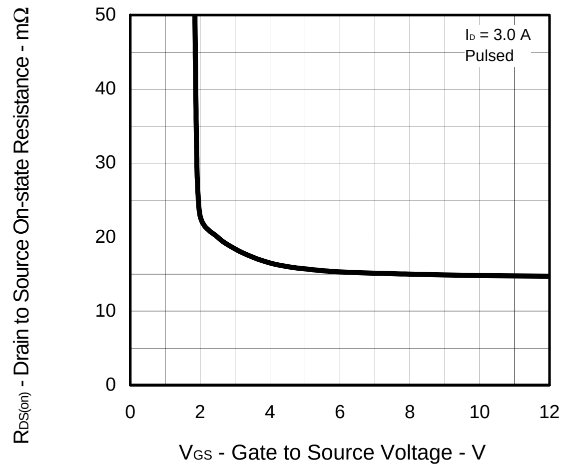
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



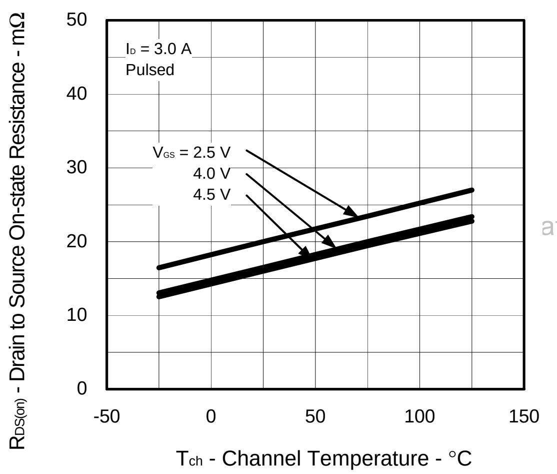
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



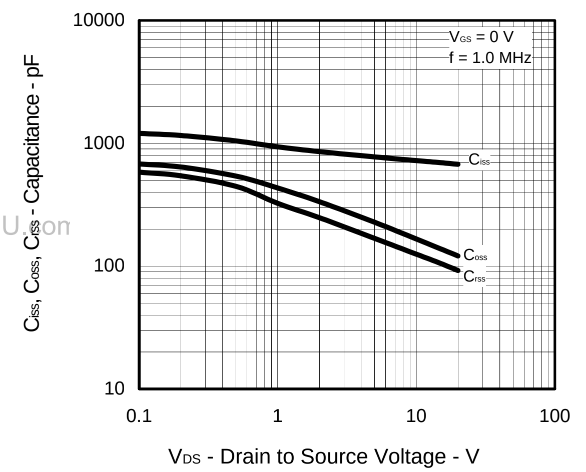
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



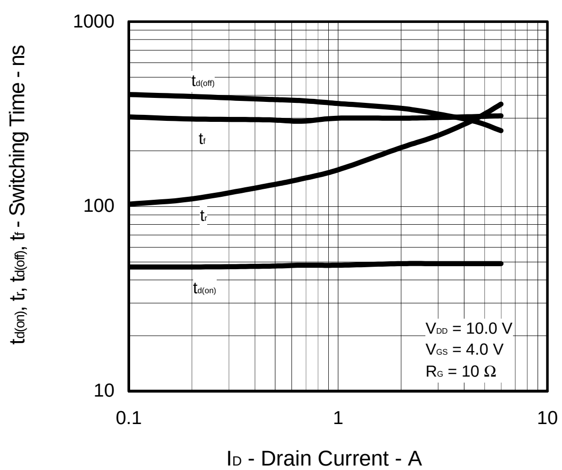
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



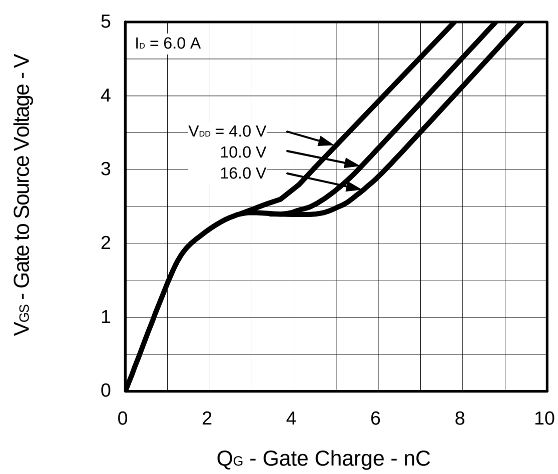
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



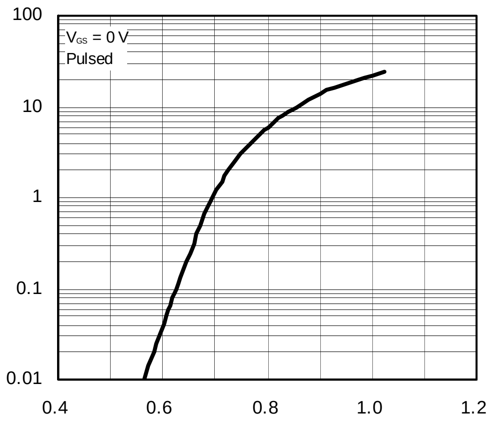
SWITCHING CHARACTERISTICS



DYNAMIC INPUT CHARACTERISTICS



SOURCE TO DRAIN FORWARD VOLTAGE



$V_{F(S-D)}$ - Source to Drain Voltage - V

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