NEC

MOS FIELD EFFECT TRANSISTOR

μPA1731

SWITCHING
P-CHANNEL POWER MOS FET
INDUSTRIAL USE

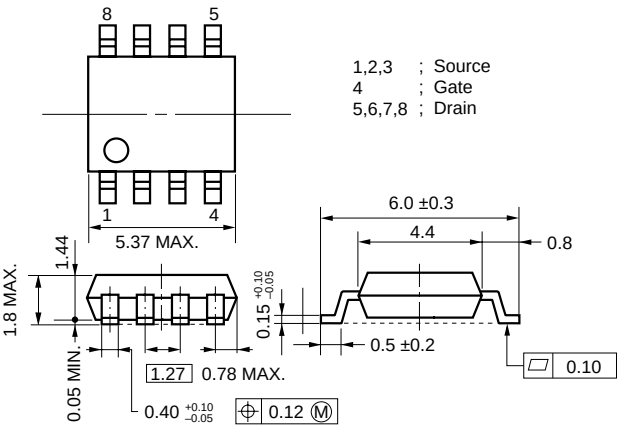
DESCRIPTION

The μPA1731 is P-Channel MOS Field Effect Transistor designed for power management applications of notebook computers and Li-ion battery protection circuit.

FEATURES

- Low on-resistance
  $R_{DS(on)1}$ = 10.3 mΩ TYP. (V_{GS} = –10 V, I_D = –5.0 A)
  $R_{DS(on)2}$ = 14.6 mΩ TYP. (V_{GS} = –4.5 V, I_D = –5.0 A)
★ $R_{DS(on)3}$ = 16.5 mΩ TYP. (V_{GS} = –4.0 V, I_D = –5.0 A)
★ • Low C_{iss} : C_{iss} =2600 pF TYP.
- Built-in G-S protection diode
- Small and surface mount package (Power SOP8)

PACKAGE DRAWING (Unit : mm)



ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA1731G	Power SOP8

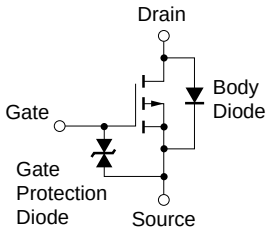
ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, All terminals are connected.)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	–30	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	∓ 20	V
Drain Current (DC)	$I_{D(DC)}$	∓ 10	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	∓ 40	A
Total Power Dissipation (T_A = 25°C) Note2	P_T	2.0	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to + 150	°C

Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1 %

2. Mounted on ceramic substrate of 1200 mm^2 x 2.2 mm

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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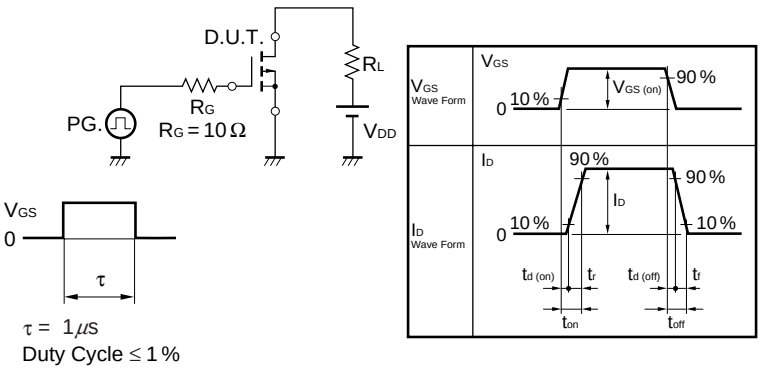
The mark ★ shows major revised points.

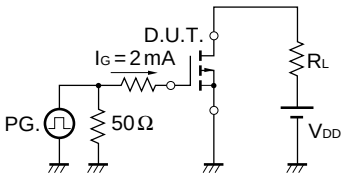
★ ELECTRICAL CHARACTERISTICS (T_A = 25 °C, All terminals are connected.)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = –10 V, I_D = –5.0 A		10.3	13.0	mΩ
	$R_{DS(on)2}$	V_{GS} = –4.5 V, I_D = –5.0 A		14.6	19.5	mΩ
	$R_{DS(on)3}$	V_{GS} = –4.0 V, I_D = –5.0 A		16.5	22.0	mΩ
Gate to Source Cut-off Voltage	$V_{GS(off)}$	V_{DS} = –10 V, I_D = –1 mA	–1.0	–1.6	–2.5	V
Forward Transfer Admittance	$\|y_{fs}\|$	V_{DS} = –10 V, I_D = –5.0 A	8.0	18.0		S
Drain Leakage Current	I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V			–1	μA
Gate to Source Leakage Current	I_{GSS}	V_{GS} = ∓ 20 V, V_{DS} = 0 V			∓ 10	μA
Input Capacitance	C_{iss}	V_{DS} = –10 V		2600		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		810		pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		350		pF
Turn-on Delay Time	$t_{d(on)}$	I_D = –5.0 A		32		ns
Rise Time	t_r	$V_{GS(on)}$ = –10 V		185		ns
Turn-off Delay Time	$t_{d(off)}$	V_{DD} = –15 V		155		ns
Fall Time	t_f	R_G = 10 Ω		110		ns
Total Gate Charge	Q_G	I_D = –10 A		46		nC
Gate to Source Charge	Q_{GS}	V_{DD} = –24 V		6.5		nC
Gate to Drain Charge	Q_{GD}	V_{GS} = –10 V		12		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	I_F = 10 A, V_{GS} = 0 V		0.80		V
Reverse Recovery Time	t_{rr}	I_F = 10 A, V_{GS} = 0 V		50		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 100 A/ μs		46		nC

TEST CIRCUIT 1 SWITCHING TIME

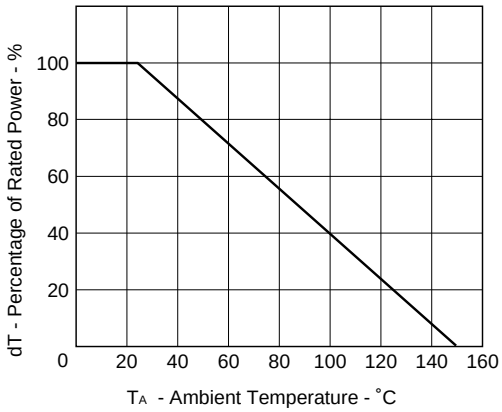


TEST CIRCUIT 2 GATE CHARGE

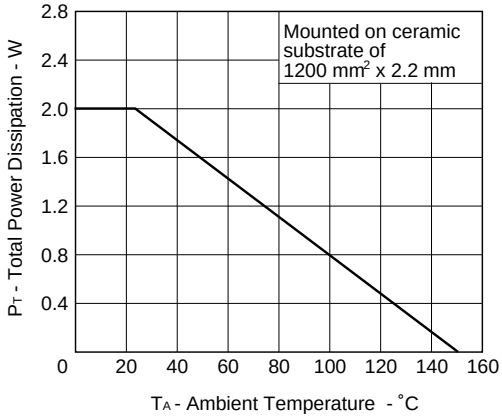


★ TYPICAL CHARACTERISTICS (T_A = 25 °C)

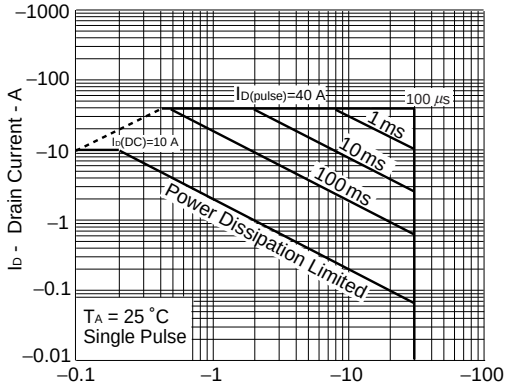
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE

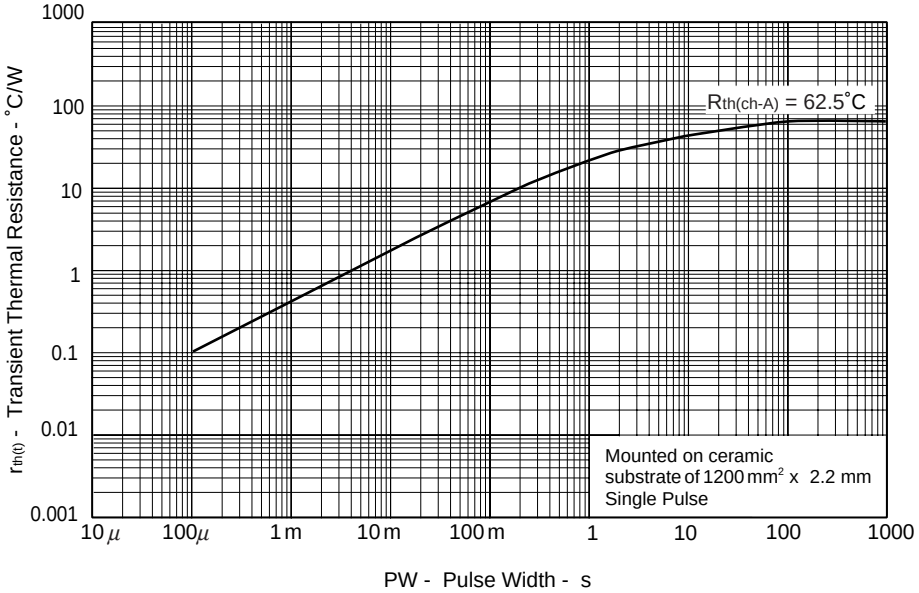


FORWARD BIAS SAFE OPERATING AREA

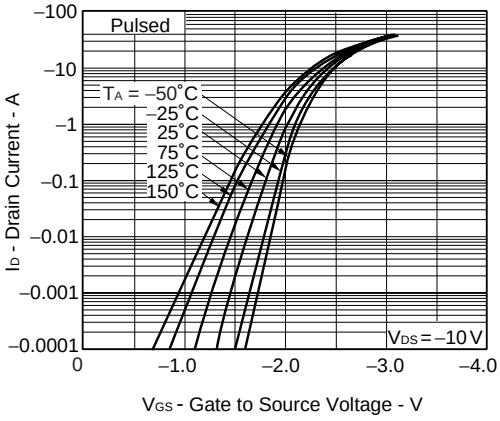


Remark Mounted on ceramic substrate of 1200 mm^2 x 2.2 mm

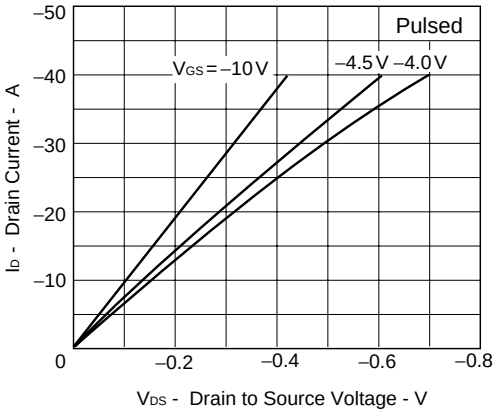
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



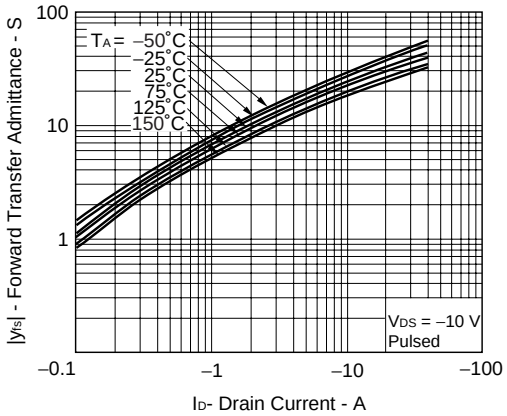
FORWARD TRANSFER CHARACTERISTICS



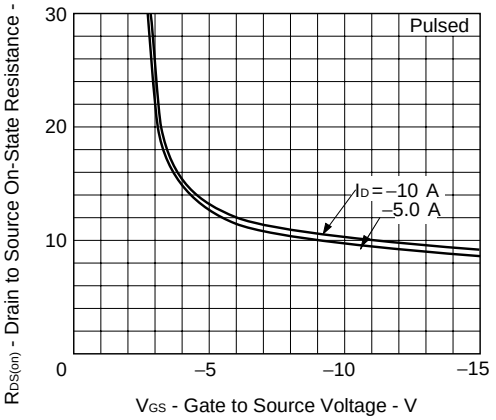
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



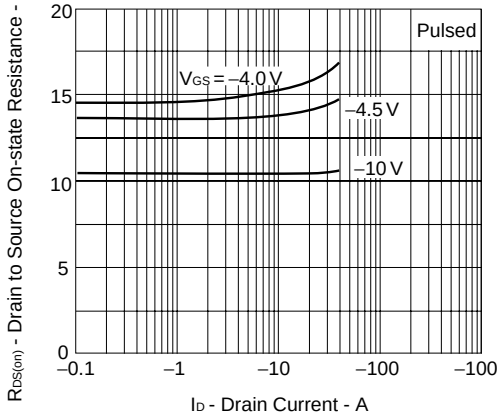
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



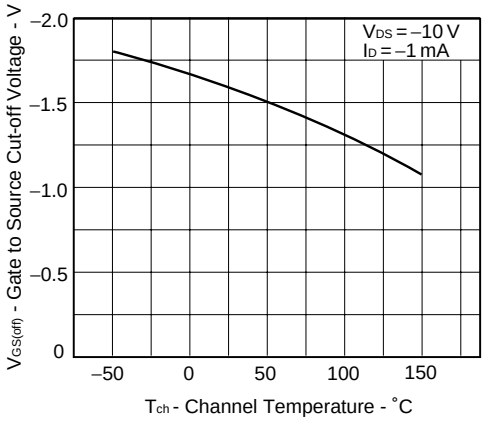
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



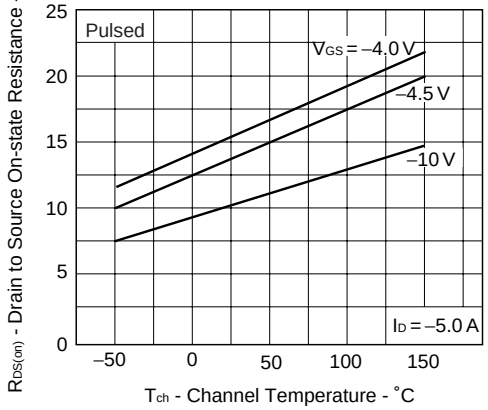
DRAIN TO SOURCE ON-STATE
RESISTANCE vs. DRAIN CURRENT



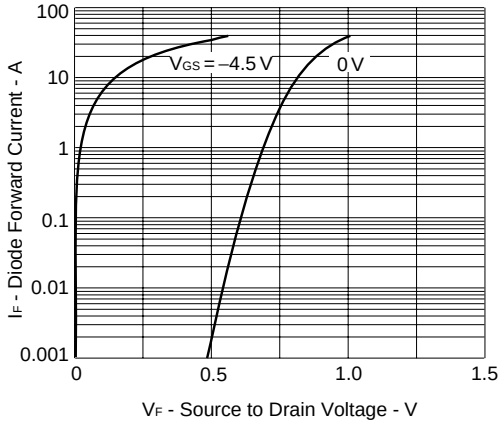
GATE TO SOURCE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



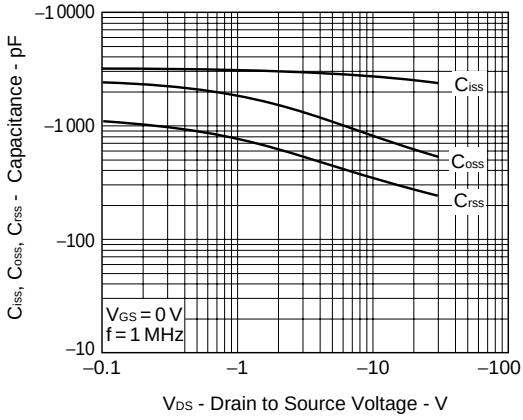
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



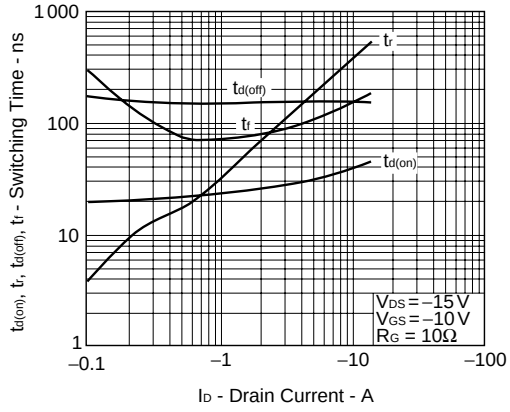
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



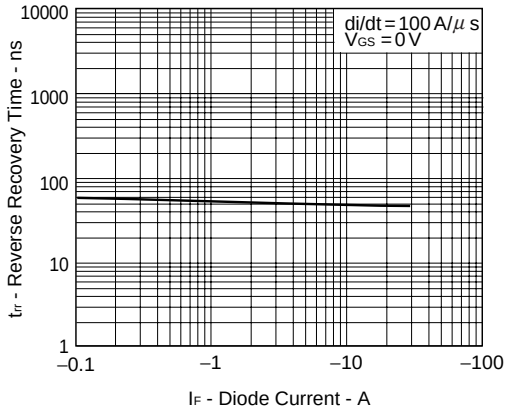
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



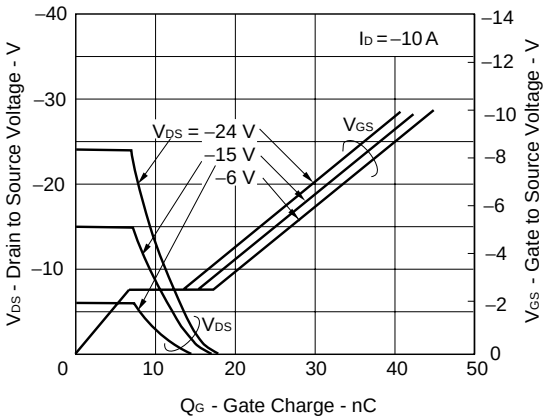
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs. DIODE CURRENT



DYNAMIC INPUT/OUTPUT CHARACTERISTICS



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