

SWITCHING  
N-AND P-CHANNEL POWER MOS FET  
INDUSTRIAL USE

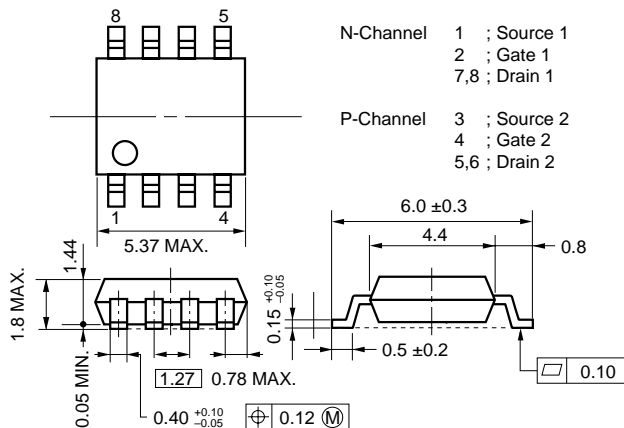
DESCRIPTION

This product is N-and P-Channel MOS Field Effect Transistor designed for motor driver applications.

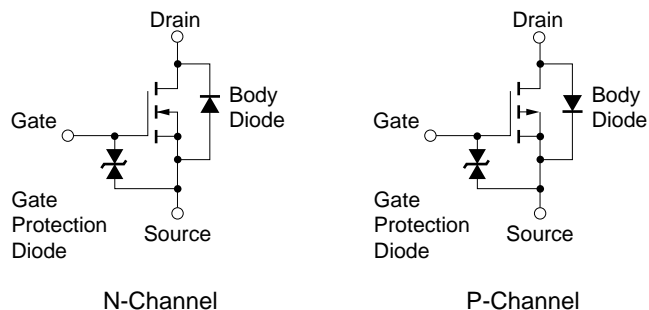
FEATURES

- Dual chip type
- Low on-resistance  
N-Channel  $R_{DS(on)1} = 0.12 \Omega$  TYP. ( $V_{GS} = 10 V, I_D = 0.5 A$ )  
 $R_{DS(on)2} = 0.19 \Omega$  TYP. ( $V_{GS} = 4 V, I_D = 0.5 A$ )  
P-Channel  $R_{DS(on)1} = 0.45 \Omega$  TYP. ( $V_{GS} = -10 V, I_D = -0.35 A$ )  
 $R_{DS(on)2} = 0.74 \Omega$  TYP. ( $V_{GS} = -4 V, I_D = -0.35 A$ )
- Low input capacitance  
N-Channel  $C_{iss} = 180 pF$  TYP.  
P-Channel  $C_{iss} = 230 pF$  TYP.
- Built-in G-S protection diode
- Small and surface mount package (Power SOP8)

PACKAGE DRAWING (Unit : mm)



EQUIVALENT CIRCUIT



ORDERING INFORMATION

PART NUMBER	PACKAGE
$\mu$ PA1790G	Power SOP8

**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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**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C, All terminals are connected.)**

PARAMETER	SYMBOL	N-CHANNEL	P-CHANNEL	UNIT
Drain to Source Voltage (V <sub>GS</sub> = 0 V)	V <sub>DSS</sub>	60	-60	V
Gate to Source Voltage (V <sub>DS</sub> = 0 V)	V <sub>GSS</sub>	±20	∓ 20	V
Drain Current (DC)	I <sub>D(DC)</sub>	±1.0	∓ 0.7	A
Drain Current (pulse) <sup>Note1</sup>	I <sub>D(pulse)</sub>	±4.0	∓ 2.8	A
Total Power Dissipation (1 unit) <sup>Note2</sup>	P <sub>T</sub>	1.7		W
Total Power Dissipation (2 unit) <sup>Note2</sup>	P <sub>T</sub>	2.0		W
Channel Temperature	T <sub>ch</sub>	150		°C
Storage Temperature	T <sub>stg</sub>	-55 to +150		°C

**Notes 1.** PW ≤ 10 μs, Duty Cycle ≤ 1 %

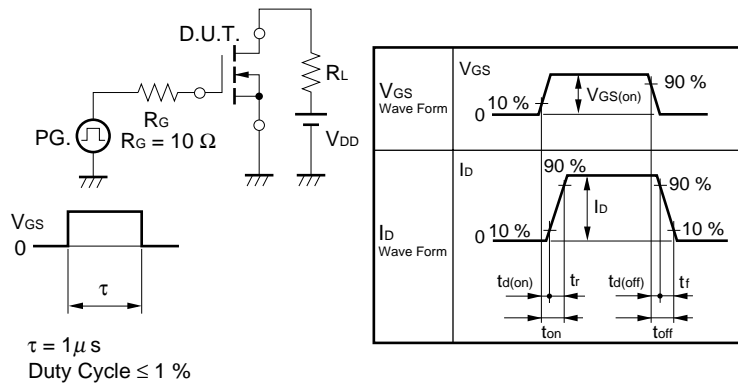
**2.** Mounted on ceramic substrate of 2000 mm<sup>2</sup> x 2.25 mm

ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, All terminals are connected.)

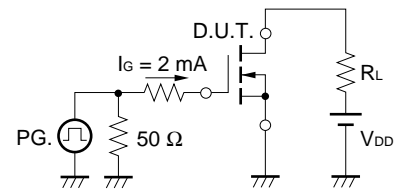
N-CHANNEL

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain to Source On-state Resistance	R <sub>DS(on)1</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 0.5 A		0.12	0.26	Ω
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4 V, I <sub>D</sub> = 0.5 A		0.19	0.34	Ω
Gate to Source Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	1.0	1.7	2.5	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.5 A	1.0	1.7		S
Drain Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V			10	μA
Gate to Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±16 V, V <sub>DS</sub> = 0 V			±10	μA
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V		180		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		100		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1 MHz		35		pF
Turn-on Delay Time	t <sub>d(on)</sub>	I <sub>D</sub> = 0.5 A		1		ns
Rise Time	t <sub>r</sub>	V <sub>GS(on)</sub> = 10 V		1.4		ns
Turn-off Delay Time	t <sub>d(off)</sub>	V <sub>DD</sub> = 30 V		23		ns
Fall Time	t <sub>f</sub>	R <sub>G</sub> = 10 Ω		17		ns
Total Gate Charge	Q <sub>G</sub>	I <sub>D</sub> = 1.0 A		8		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>DD</sub> = 48 V		1		nC
Gate to Drain Charge	Q <sub>GD</sub>	V <sub>GS</sub> = 10 V		3.5		nC
Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 1.0 A, V <sub>GS</sub> = 0 V		0.75		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 1.0 A, V <sub>GS</sub> = 0 V		30		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100 A/μs		33		nC

TEST CIRCUIT 1 SWITCHING TIME



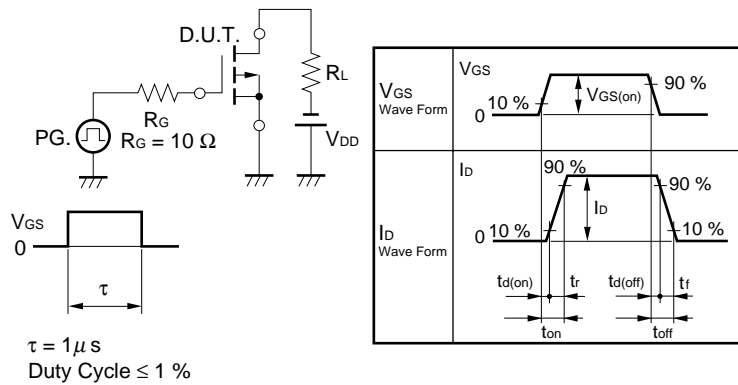
TEST CIRCUIT 2 GATE CHARGE



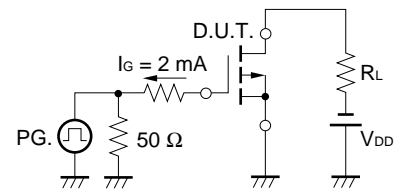
**P-CHANNEL**

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain to Source On-state Resistance	$R_{DS(on)1}$	$V_{GS} = -10\text{ V}, I_D = -0.35\text{ A}$		0.45	0.6	$\Omega$
	$R_{DS(on)2}$	$V_{GS} = -4\text{ V}, I_D = -0.35\text{ A}$		0.74	1.1	$\Omega$
Gate to Source Cut-off Voltage	$V_{GS(off)}$	$V_{DS} = -10\text{ V}, I_D = -1\text{ mA}$	-1.0	-1.7	-2.5	V
Forward Transfer Admittance	$ y_{fs} $	$V_{DS} = -10\text{ V}, I_D = -0.35\text{ A}$	5.0			S
Drain Leakage Current	$I_{DSS}$	$V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}$			-10	$\mu\text{A}$
Gate to Source Leakage Current	$I_{GSS}$	$V_{GS} = \mp 16\text{ V}, V_{DS} = 0\text{ V}$			$\mp 10$	$\mu\text{A}$
Input Capacitance	$C_{iss}$	$V_{DS} = -10\text{ V}$		230		pF
Output Capacitance	$C_{oss}$	$V_{GS} = 0\text{ V}$		100		pF
Reverse Transfer Capacitance	$C_{rss}$	$f = 1\text{ MHz}$		25		pF
Turn-on Delay Time	$t_{d(on)}$	$I_D = -0.35\text{ A}$		1.9		ns
Rise Time	$t_r$	$V_{GS(on)} = -10\text{ V}$		1.7		ns
Turn-off Delay Time	$t_{d(off)}$	$V_{DD} = -30\text{ V}$		30		ns
Fall Time	$t_f$	$R_G = 10\ \Omega$		15		ns
Total Gate Charge	$Q_G$	$I_D = -0.7\text{ A}$		7.6		nC
Gate to Source Charge	$Q_{GS}$	$V_{DD} = -48\text{ V}$		1		nC
Gate to Drain Charge	$Q_{GD}$	$V_{GS} = -10\text{ V}$		2		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	$I_F = 0.7\text{ A}, V_{GS} = 0\text{ V}$		0.85		V
Reverse Recovery Time	$t_{rr}$	$I_F = 0.7\text{ A}, V_{GS} = 0\text{ V}$		58		ns
Reverse Recovery Charge	$Q_{rr}$	$di/dt = 100\text{ A}/\mu\text{s}$		130		nC

**TEST CIRCUIT 1 SWITCHING TIME**



**TEST CIRCUIT 2 GATE CHARGE**



[MEMO]

[MEMO]

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