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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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SWITCHING
 N-CHANNEL POWER MOS FET/SCHOTTKY BARRIER DIODE

DESCRIPTION

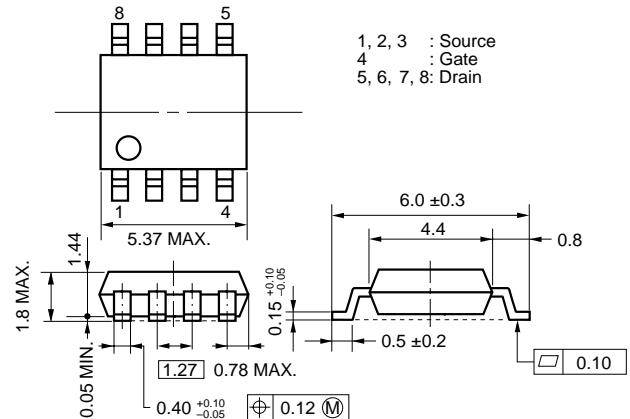
The μ PA2780GR is N-channel Power MOSFET, which built a Schottky Barrier Diode inside.

This product is designed for synchronous DC/DC converter application.

FEATURES

- Built a Schottky Barrier Diode
- Low on-state resistance
 $R_{DS(on)1} = 6.2 \text{ m}\Omega$ TYP. ($V_{GS} = 10 \text{ V}$, $I_D = 7 \text{ A}$)
 $R_{DS(on)2} = 8.7 \text{ m}\Omega$ TYP. ($V_{GS} = 4.5 \text{ V}$, $I_D = 7 \text{ A}$)
 $R_{DS(on)3} = 10.3 \text{ m}\Omega$ TYP. ($V_{GS} = 4.0 \text{ V}$, $I_D = 7 \text{ A}$)
- Low C_{iss} : $C_{iss} = 1200 \text{ pF}$ TYP.
- Small and surface mount package (Power SOP8)

PACKAGE DRAWING (Unit: mm)



ORDERING INFORMATION

PART NUMBER	PACKAGE
μ PA2780GR	Power SOP8

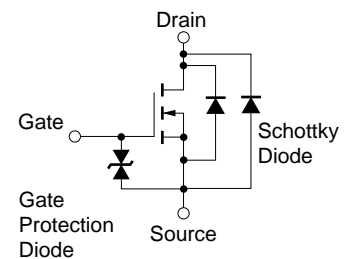
ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$. All terminals are connected.)

Drain to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	30	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	V_{GSS}	± 20	V
Drain Current (DC) [MOSFET]	$I_{D(DC)}$	± 14	A
Drain Current (pulse) ^{Note1}	$I_{D(pulse)}$	± 56	A
Average Forward Current ^{Note2} [SCHOTTKY]	$I_{F(AV)}$	2.5	A
Total Power Dissipation ^{Note3} [MOSFET]	P_T	2	W
Total Power Dissipation ^{Note3} [SCHOTTKY]	P_T	1	W
Channel & Junction Temperature	T_{ch}, T_j	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to + 150	$^\circ\text{C}$

- Notes**
1. $PW \leq 10 \mu\text{s}$, Duty Cycle $\leq 1\%$
 2. Rectangle wave, 50% Duty Cycle
 3. Mounted on ceramic substrate of $1200 \text{ mm}^2 \times 2.2 \text{ mm}$

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.

EQUIVALENT CIRCUIT



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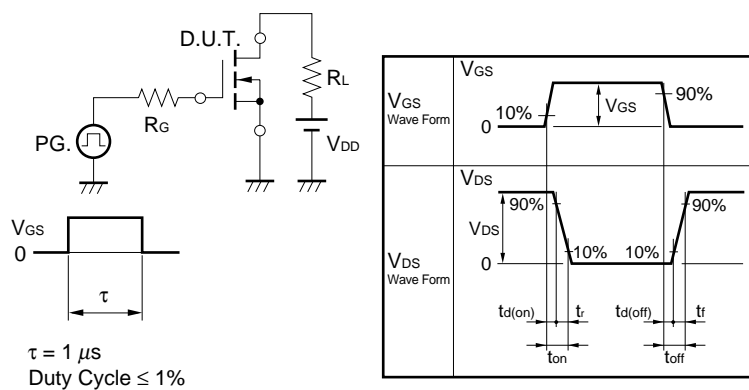
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ELECTRICAL CHARACTERISTICS (T_A = 25°C, unless otherwise noted. All terminals are connected.)

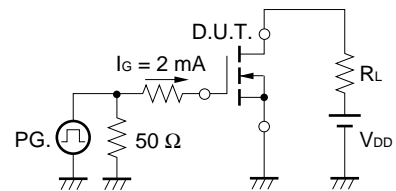
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current ^{Note}	I _{DSS}	V _{DS} = 24 V, V _{GS} = 0 V			50	μA
		V _{DS} = 24 V, V _{GS} = 0 V, T _A = 125°C			10	mA
Gate Leakage Current	I _{GSS}	V _{GS} = ±20 V, V _{DS} = 0 V			±10	μA
Gate Cut-off Voltage	V _{GS(off)}	V _{DS} = 10 V, I _D = 1 mA	1.0		2.5	V
Drain to Source On-state Resistance ^{Note}	R _{DS(on)1}	V _{GS} = 10 V, I _D = 7 A		6.2	7.5	mΩ
	R _{DS(on)2}	V _{GS} = 4.5 V, I _D = 7 A		8.7	11.6	mΩ
	R _{DS(on)3}	V _{GS} = 4.0 V, I _D = 7 A		10.3	13.7	mΩ
Input Capacitance	C _{iss}	V _{DS} = 10 V		1200		pF
Output Capacitance	C _{oss}	V _{GS} = 0 V		570		pF
Reverse Transfer Capacitance	C _{rss}	f = 1 MHz		160		pF
Turn-on Delay Time	t _{d(on)}	V _{DD} = 15 V, I _D = 7 A		10		ns
Rise Time	t _r	V _{GS} = 10 V		13		ns
Turn-off Delay Time	t _{d(off)}	R _G = 10 Ω		44		ns
Fall Time	t _f			11		ns
Total Gate Charge	Q _G	V _{DD} = 15 V		12		nC
Gate to Source Charge	Q _{GS}	V _{GS} = 5 V		4		nC
Gate to Drain Charge	Q _{GD}	I _D = 14 A		6		nC
Body Diode Forward Voltage ^{Note}	V _{F(S-D)}	I _F = 1 A, V _{GS} = 0 V		0.45	0.5	V
		I _F = 1 A, V _{GS} = 0 V, T _A = 125°C		0.37		V
Reverse Recovery Time	t _{rr}	I _F = 7 A, V _{GS} = 0 V		31		ns
Reverse Recovery Charge	Q _{rr}	di/dt = 100 A/μs		22		nC

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

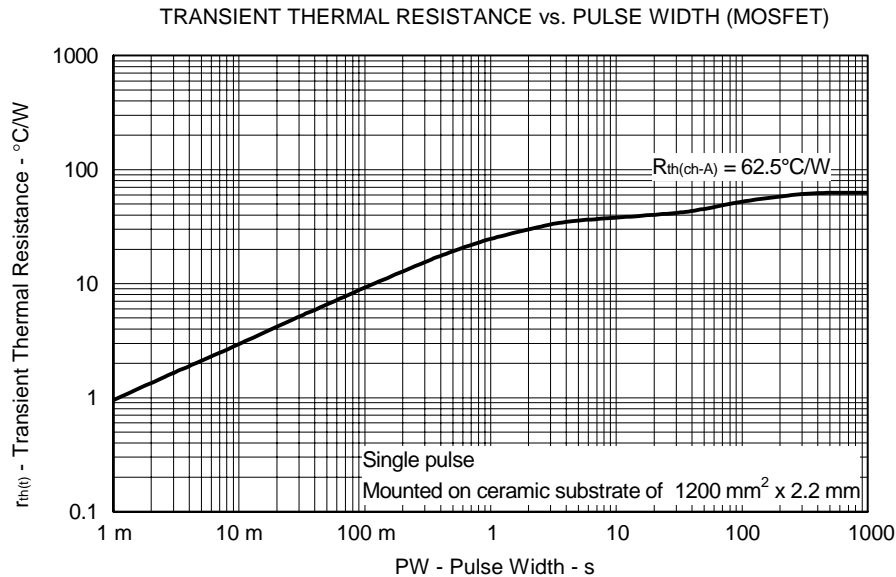
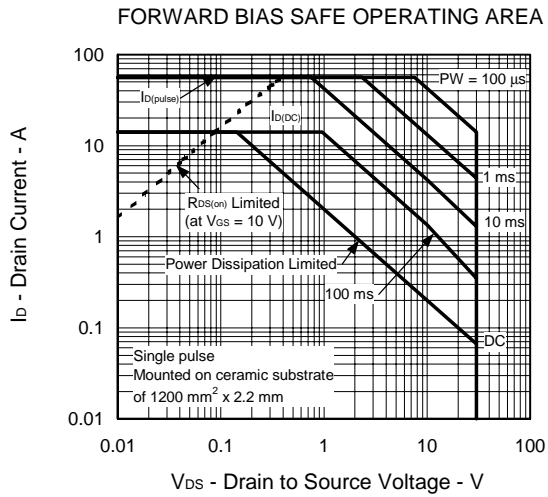
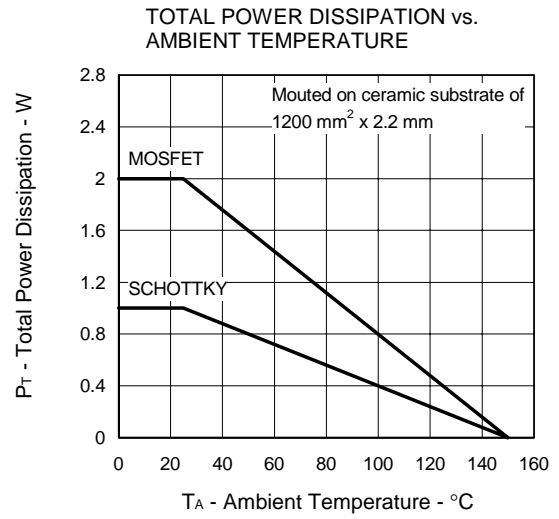
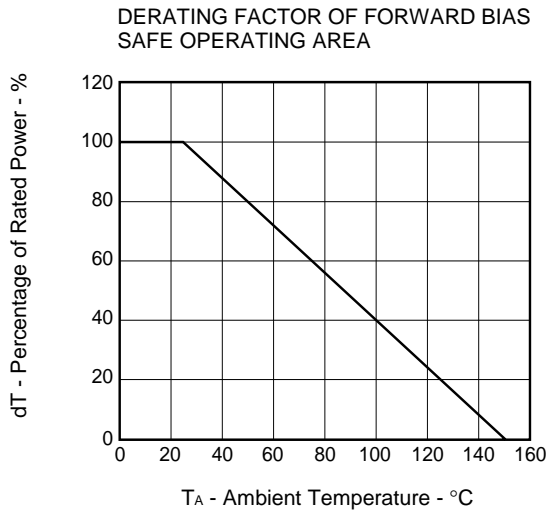
TEST CIRCUIT 1 SWITCHING TIME



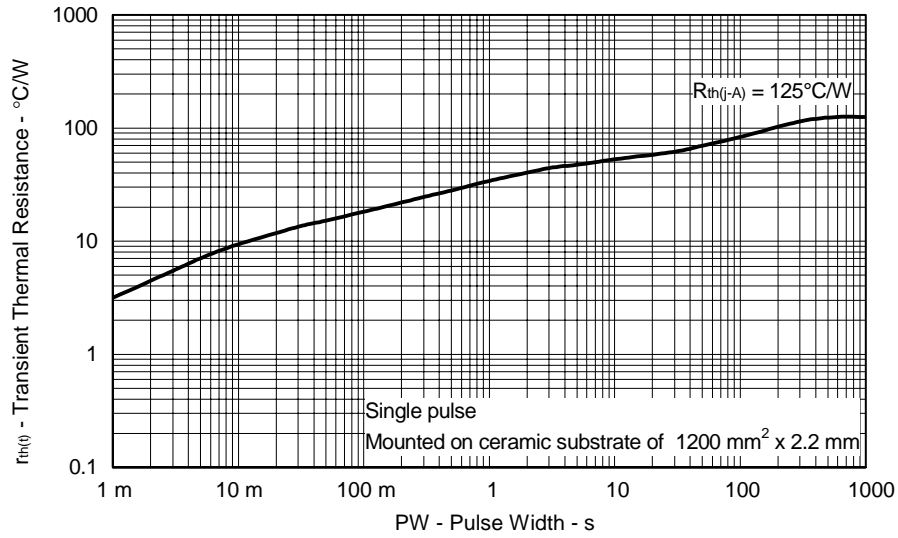
TEST CIRCUIT 2 GATE CHARGE



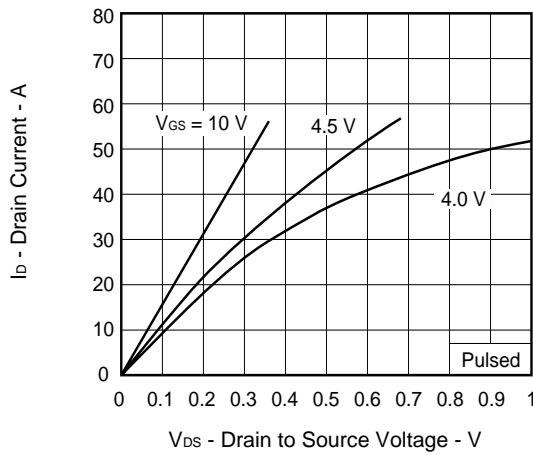
TYPICAL CHARACTERISTICS (T_A = 25°C. All terminals are connected.)



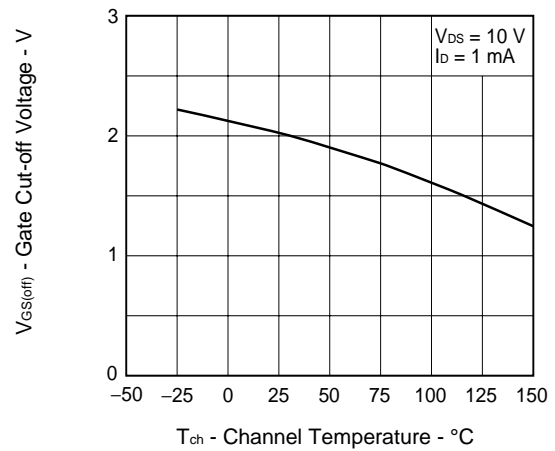
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH (SCHOTTKY)



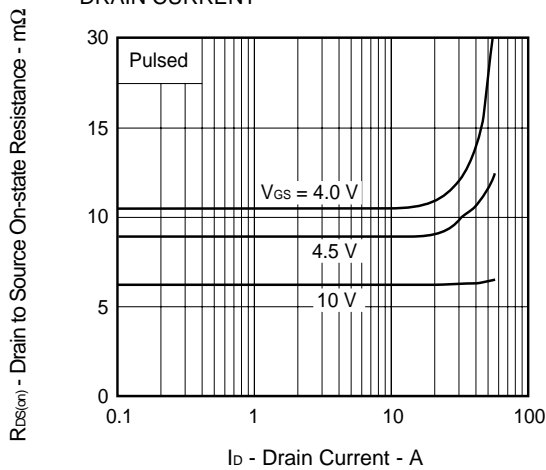
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



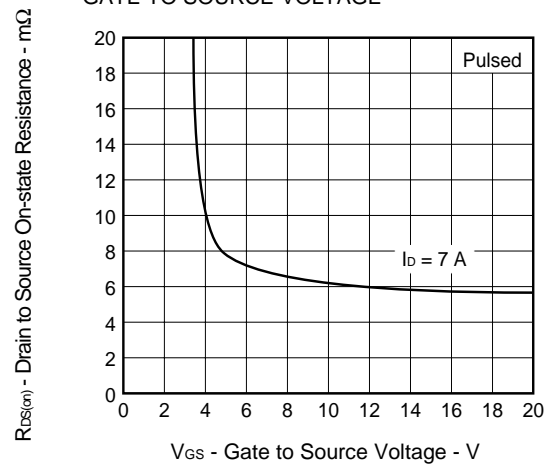
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



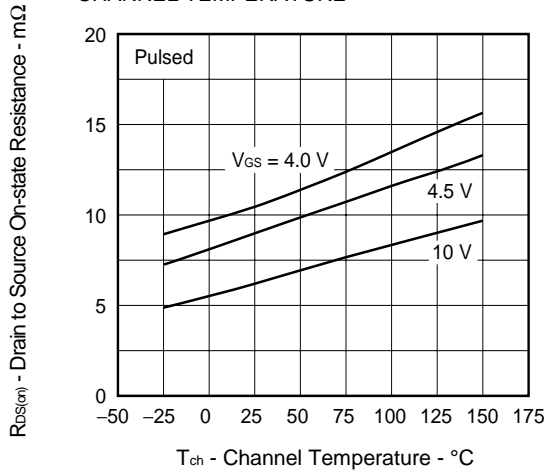
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



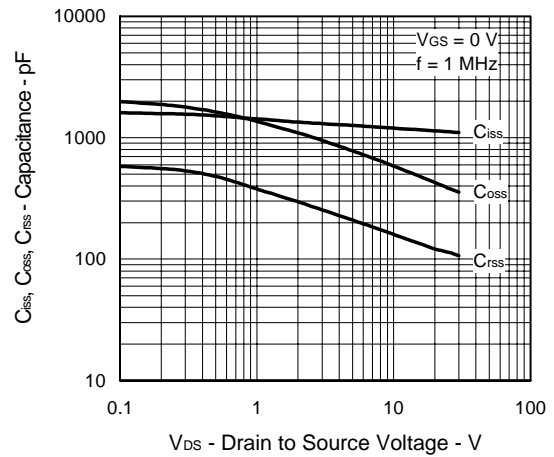
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



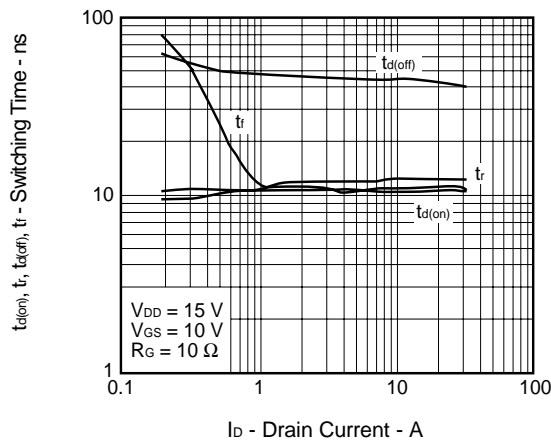
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



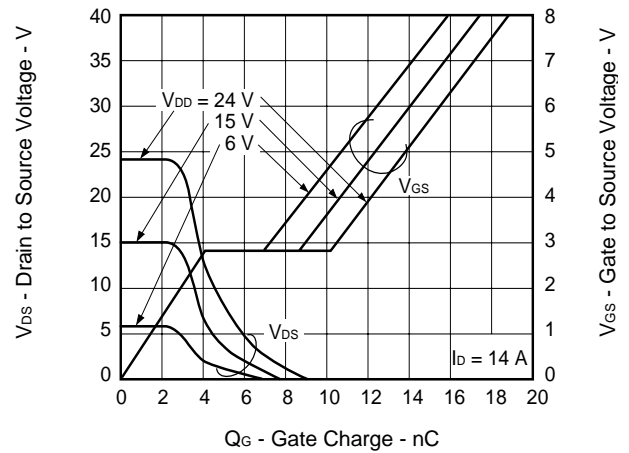
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



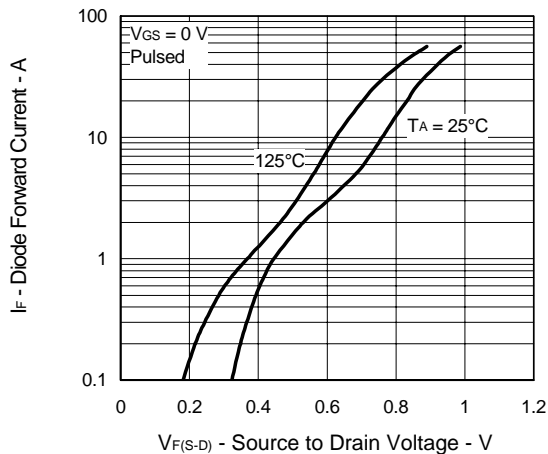
SWITCHING CHARACTERISTICS



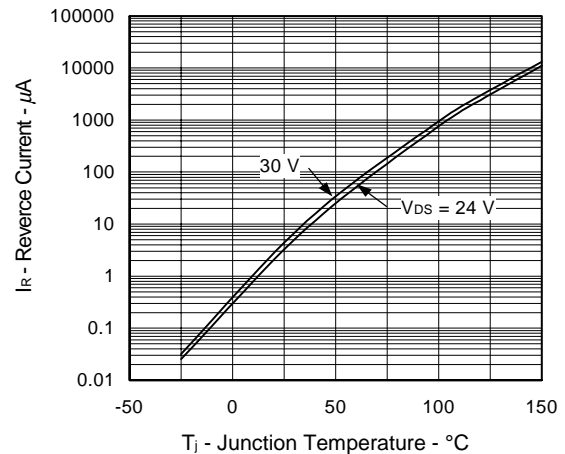
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



SOURCE TO DRAIN DIODE REVERSE CURRENT



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