NEC

MOS FIELD EFFECT TRANSISTOR

μPA2780GR

SWITCHING
N-CHANNEL POWER MOS FET/SCHOTTKY BARRIER DIODE

DESCRIPTION

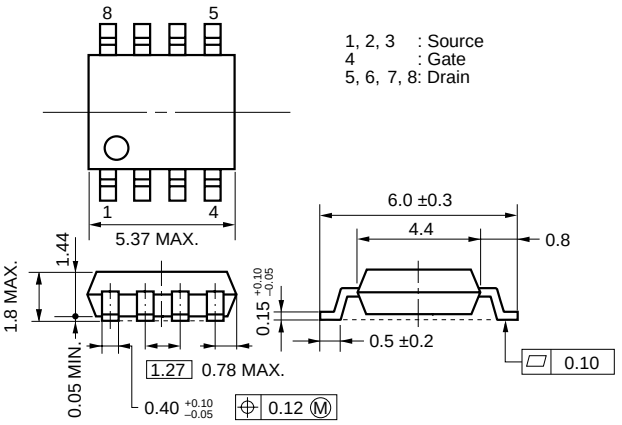
The μPA2780GR is N-channel Power MOSFET, which built a Schottky Barrier Diode inside.

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 mΩ TYP. (V_{GS} = 10 V, I_D = 7 A)
  $R_{DS(on)2}$ = 8.7 mΩ TYP. (V_{GS} = 4.5 V, I_D = 7 A)
  $R_{DS(on)3}$ = 10.3 mΩ TYP. (V_{GS} = 4.0 V, I_D = 7 A)
- Low C_{iss}: C_{iss} = 1200 pF TYP.
- Small and surface mount package (Power SOP8)

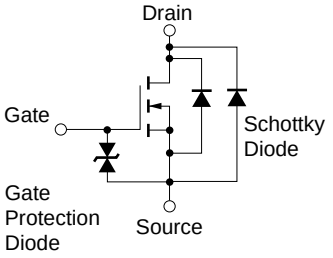
PACKAGE DRAWING (Unit: mm)



ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA2780GR	Power SOP8

EQUIVALENT CIRCUIT



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) [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	°C
Storage Temperature	T_{stg}	–55 to + 150	°C

Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1%

2. Rectangle wave, 50% Duty Cycle

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

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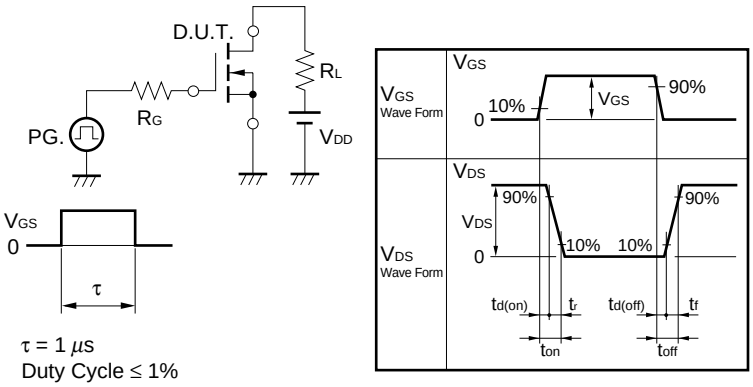
ELECTRICAL CHARACTERISTICS (T_A = 25°C, unless otherwise noted. All terminals are connected.)

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

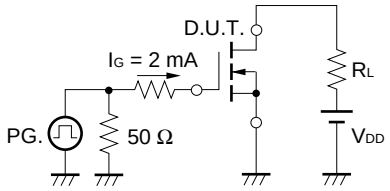
Note Pulsed: PW ≤ 350 μs, Duty Cycle ≤ 2%

TEST CIRCUIT 1 SWITCHING TIME



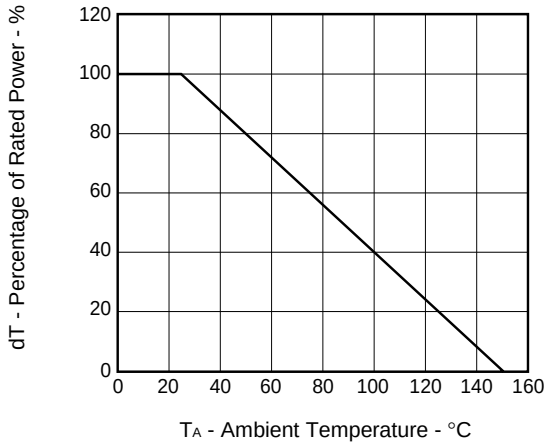
τ = 1 μs
Duty Cycle ≤ 1%

TEST CIRCUIT 2 GATE CHARGE

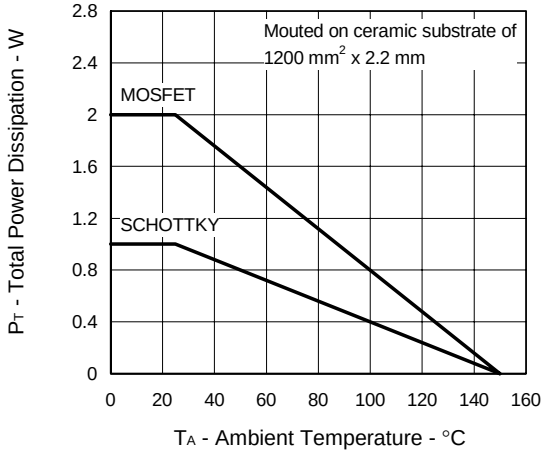


TYPICAL CHARACTERISTICS (T_A = 25°C. All terminals are connected.)

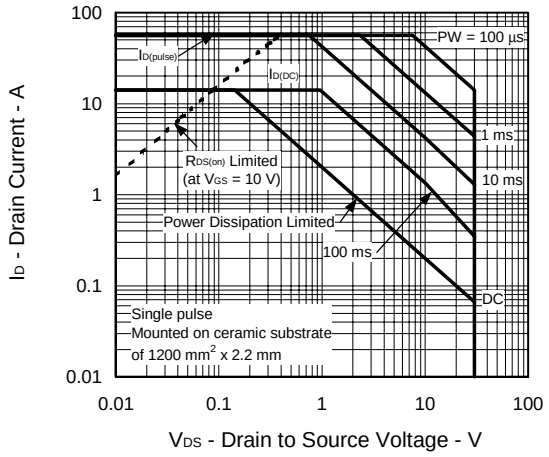
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



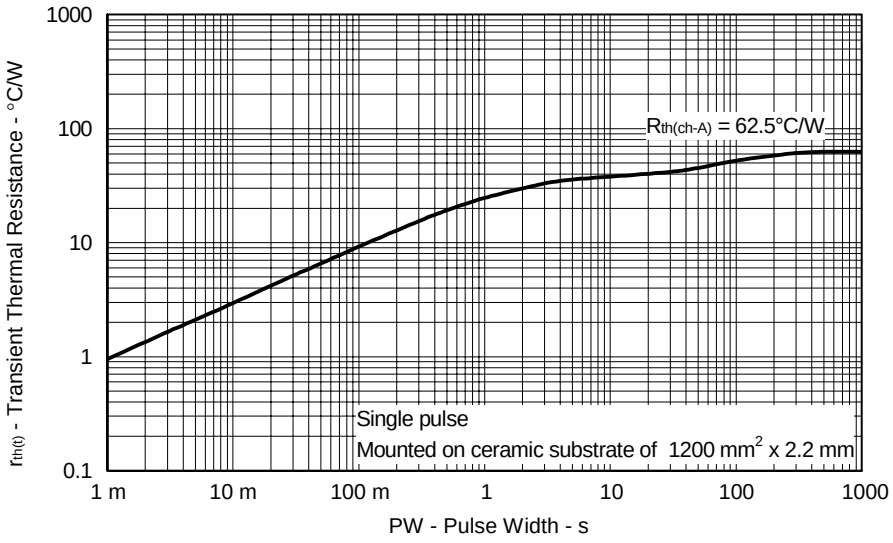
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



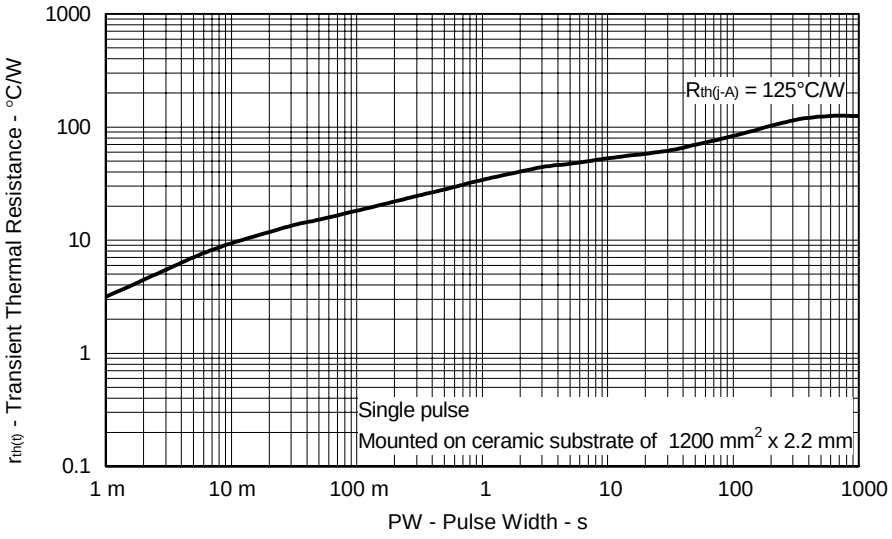
FORWARD BIAS SAFE OPERATING AREA



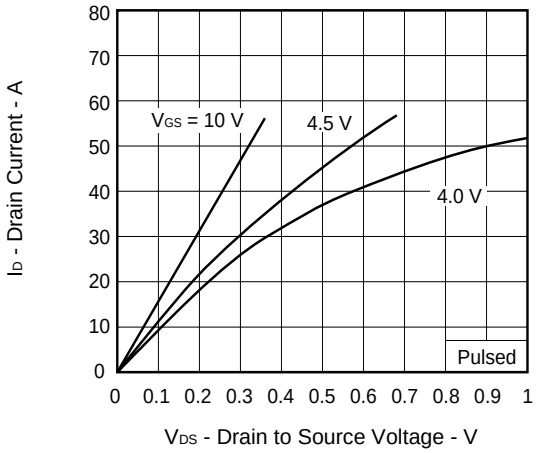
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH (MOSFET)



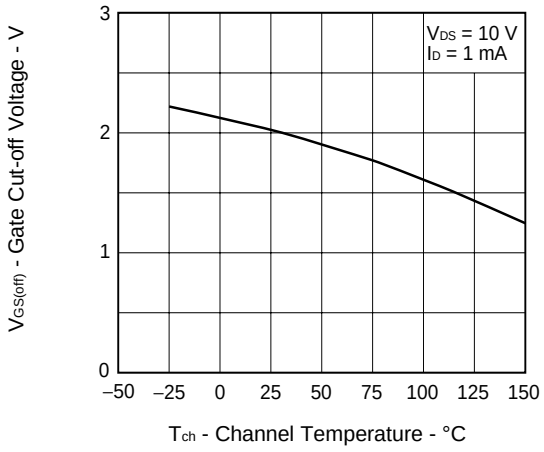
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH (SCHOTTKY)



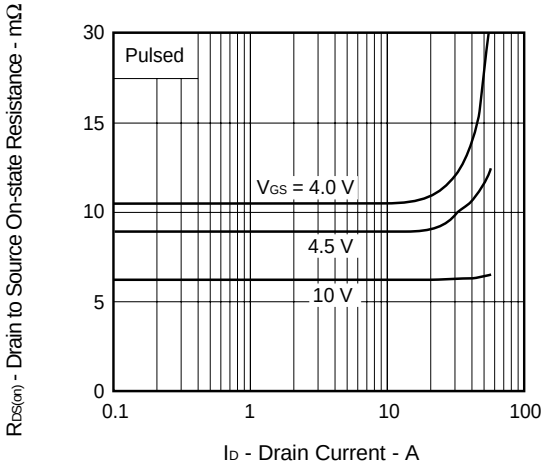
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



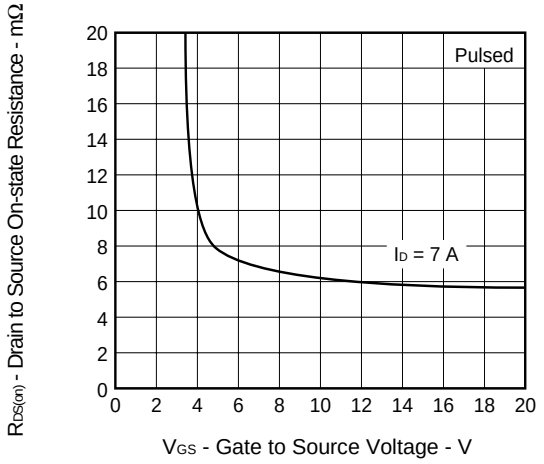
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



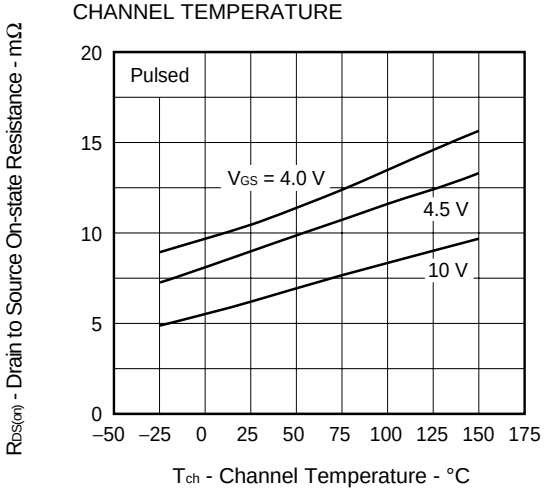
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



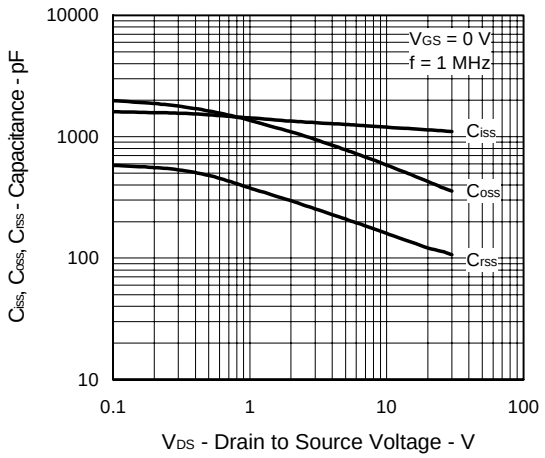
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



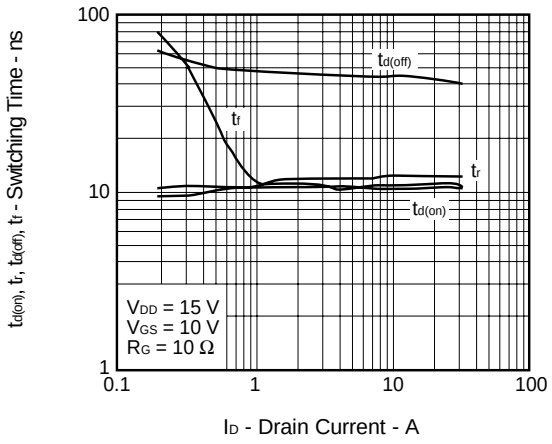
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



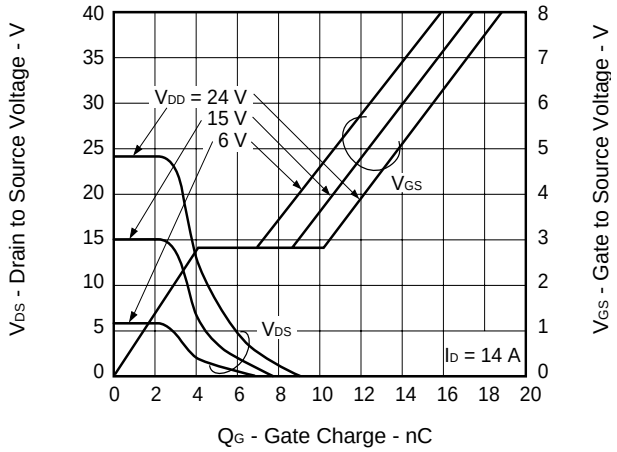
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



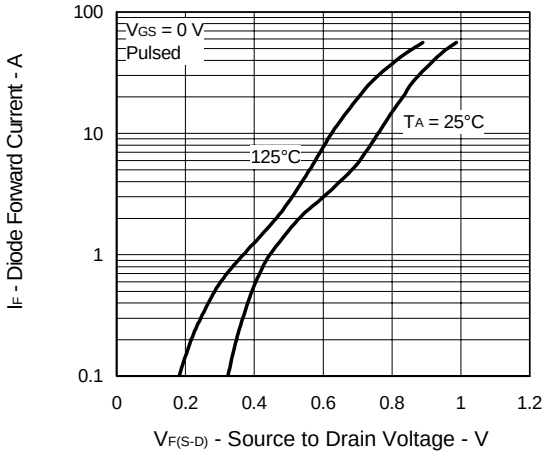
SWITCHING CHARACTERISTICS



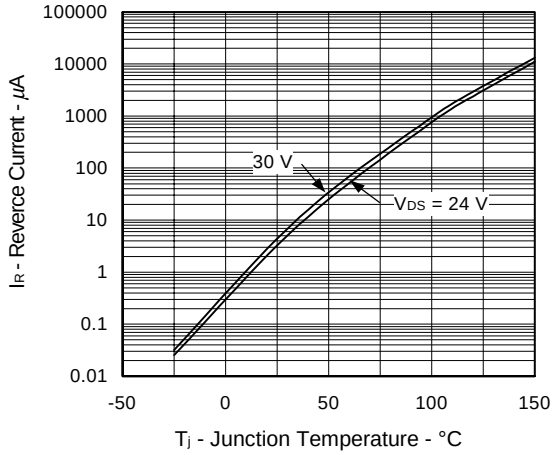
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



SOURCE TO DRAIN DIODE REVERCE CURRENT



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