

MOS FET WITH SCHOTTKY BARRIER DIODE

μ PA1980

P-CHANNEL MOS FET WITH SCHOTTKY BARRIER DIODE FOR SWITCHING

DESCRIPTION

The μ PA1980 is a switching device, which can be driven directly by a 1.8 V power source.

This device incorporates a MOS FET, which features a low on-state resistance and excellent switching characteristics, and a low leakage Schottky barrier diode, and is suitable for applications such as DC/DC converter of portable machine and so on.

FEATURES

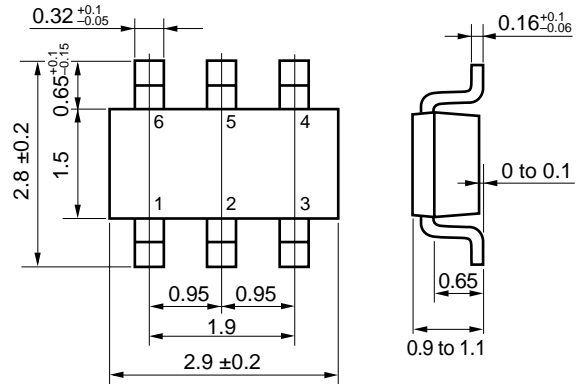
- 1.8 V drive available (MOS FET)
- Low on-state resistance (MOS FET)
 - $R_{DS(on)1} = 135 \text{ m}\Omega \text{ MAX. (} V_{GS} = -4.5 \text{ V, } I_D = -1.0 \text{ A)}$
 - $R_{DS(on)2} = 183 \text{ m}\Omega \text{ MAX. (} V_{GS} = -2.5 \text{ V, } I_D = -1.0 \text{ A)}$
 - $R_{DS(on)3} = 284 \text{ m}\Omega \text{ MAX. (} V_{GS} = -1.8 \text{ V, } I_D = -0.5 \text{ A)}$
- Low reverse current (Schottky barrier diode)
 - $I_R = 20 \text{ }\mu\text{A MAX. (} V_R = 40 \text{ V)}$

ORDERING INFORMATION

PART NUMBER	PACKAGE
μ PA1980TE	SC-95 (Mini Mold Thin Type)

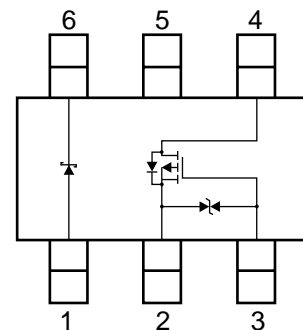
Marking: TW

PACKAGE DRAWING (Unit: mm)



- 1: Anode 4: Drain
 2: Source 5: N/C
 3: Gate 6: Cathode

PIN CONNECTION (Top View)



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.

Caution This product is electrostatic-sensitive device due to low ESD capability and should be handled with caution for electrostatic discharge.

$V_{ESD} \pm 100 \text{ V TYP. (} C = 200 \text{ pF, } R = 0 \text{ }\Omega, \text{ Single pulse)}$

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MOS FET 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}	±8.0	V
Drain Current (DC)	I _{D(DC)}	±2.0	A
Drain Current (pulse) ^{Note1}	I _{D(pulse)}	±8.0	A
Total Power Dissipation ^{Note2}	P _T	0.57	W
Channel Temperature	T _{ch}	150	°C
Storage Temperature	T _{stg}	-55 to +125	°C

Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1%

2. Mounted on FR-4 board of 5000 mm² x 1.1 mm, t ≤ 5 sec.

SCHOTTKY BARRIER DIODE ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Repetitive Peak Reverse Voltage	V _{RRM}	40	V
Average Forward Current ^{Note3}	I _{F(AV)}	0.5	A
Surge Current ^{Note4}	I _{FSM}	5.5	A
Junction Temperature	T _j	+125	°C
Storage Temperature	T _{stg}	-55 to +125	°C

Notes 3. Mounted on FR-4 board of 5000 mm² x 1.1 mm

4. 50 Hz sine wave, 1 cycle

MOS FET ELECTRICAL CHARACTERISTICS (T_A = 25°C)

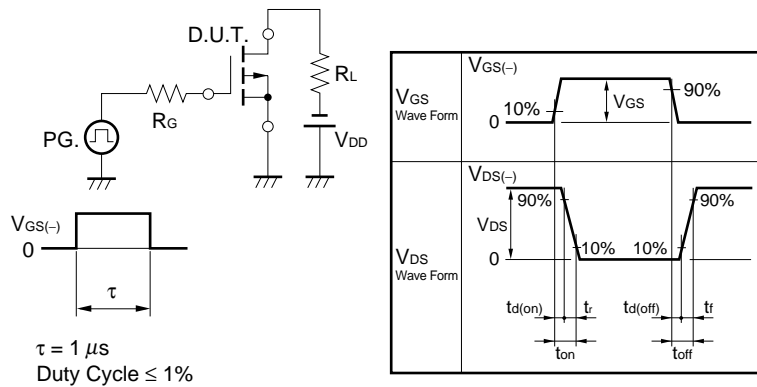
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = -20.0 V, V _{GS} = 0 V			-10	μA
Gate Leakage Current	I _{GSS}	V _{GS} = ±8.0 V, V _{DS} = 0 V			±10	μA
Gate Cut-off Voltage ^{Note}	V _{GS(off)}	V _{DS} = -10.0 V, I _D = -1.0 mA	-0.45	-0.75	-1.50	V
Forward Transfer Admittance ^{Note}	y _{fs}	V _{DS} = -10.0 V, I _D = -1.0 A	1.0	4.1		S
Drain to Source On-state Resistance ^{Note}	R _{DS(on)1}	V _{GS} = -4.5 V, I _D = -1.0 A		116	135	mΩ
	R _{DS(on)2}	V _{GS} = -2.5 V, I _D = -1.0 A		142	183	mΩ
	R _{DS(on)3}	V _{GS} = -1.8 V, I _D = -0.5 A		170	284	mΩ
Input Capacitance	C _{iss}	V _{DS} = -10.0 V		272		pF
Output Capacitance	C _{oss}	V _{GS} = 0 V		60		pF
Reverse Transfer Capacitance	C _{rss}	f = 1.0 MHz		30		pF
Turn-on Delay Time	t _{d(on)}	V _{DD} = -10.0 V, I _D = -1.0 A		9		ns
Rise Time	t _r	V _{GS} = -4.0 V		5		ns
Turn-off Delay Time	t _{d(off)}	R _G = 10 Ω		33		ns
Fall Time	t _f			9		ns
Total Gate Charge	Q _G	V _{DD} = -16.0 V		2.3		nC
Gate to Source Charge	Q _{GS}	V _{GS} = -4.0 V		0.6		nC
Gate to Drain Charge	Q _{GD}	I _D = -2.0 A		0.6		nC
Body Diode Forward Voltage	V _{F(S-D)}	I _F = 2.0 A, V _{GS} = 0 V		0.90		V

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

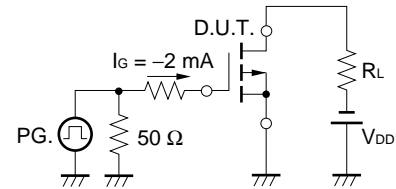
SCHOTTKY BARRIER DIODE ELECTRICAL CHARACTERISTICS (T_A = 25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Forward Voltage	V _F	I _F = 0.5 A		0.44	0.51	V
Reverse Current	I _R	V _R = 40.0 V		3	20	μA

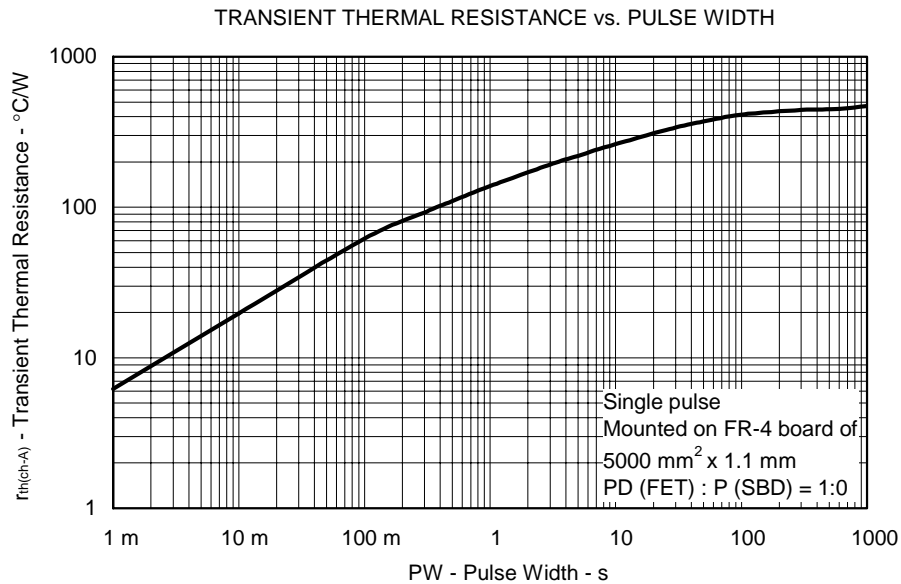
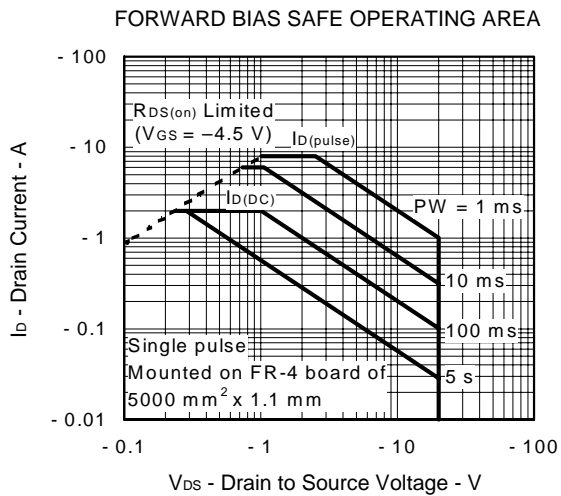
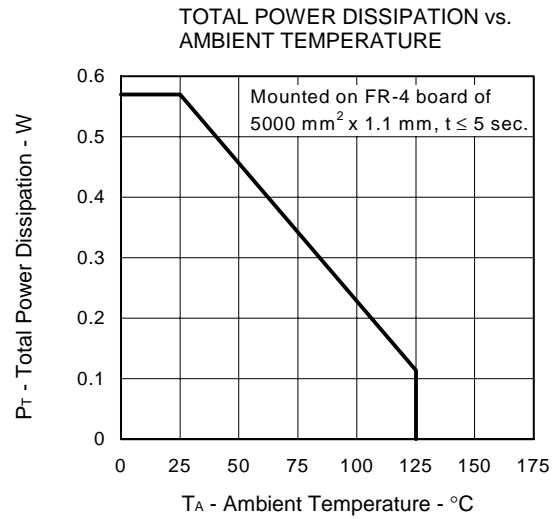
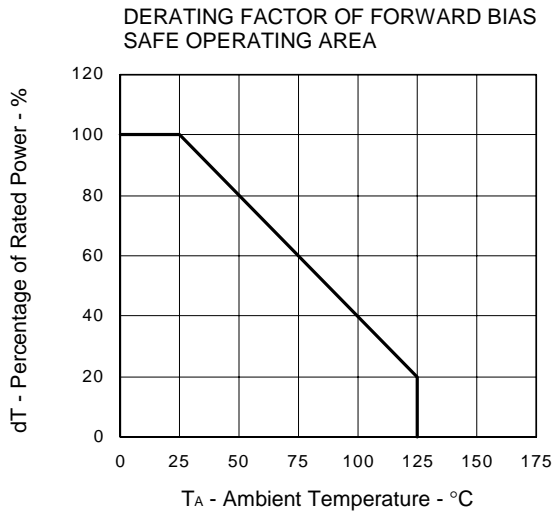
TEST CIRCUIT 1 SWITCHING TIME



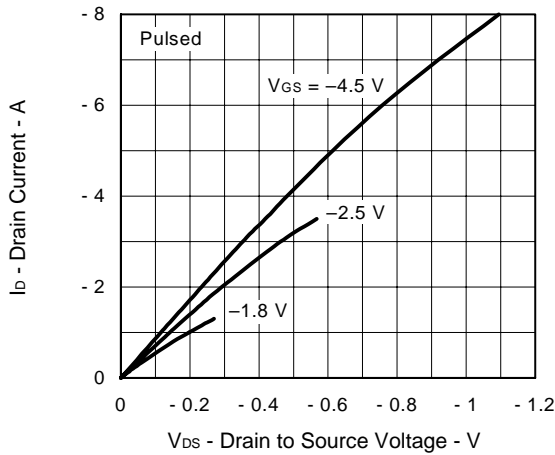
TEST CIRCUIT 2 GATE CHARGE



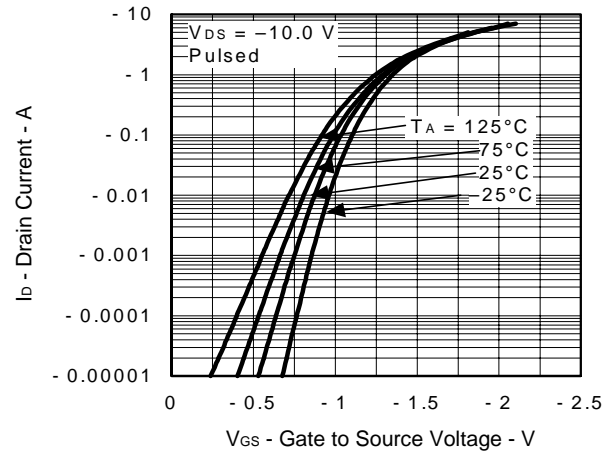
MOS FET TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)



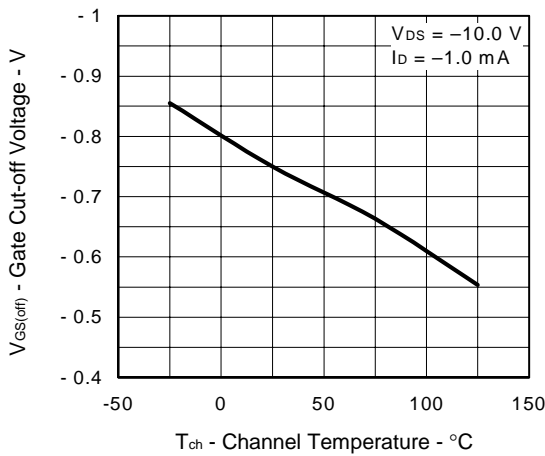
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



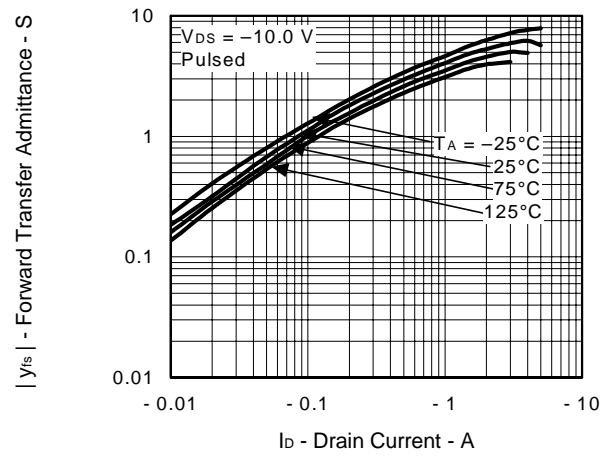
FORWARD TRANSFER CHARACTERISTICS



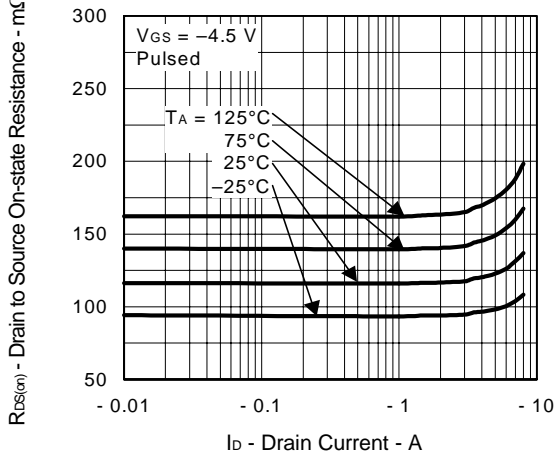
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



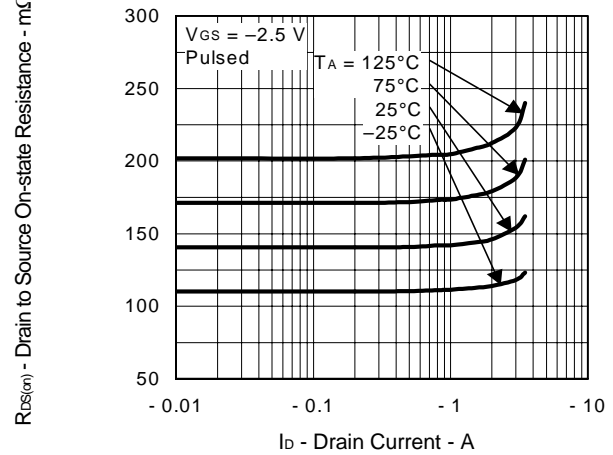
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT

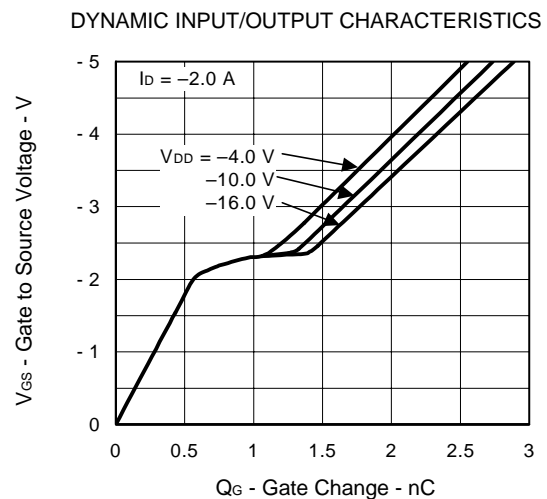
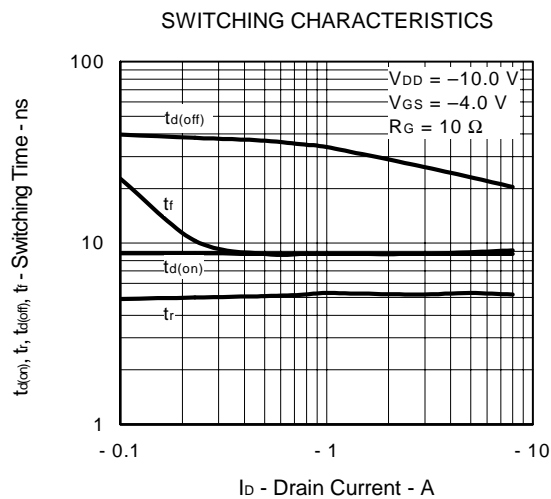
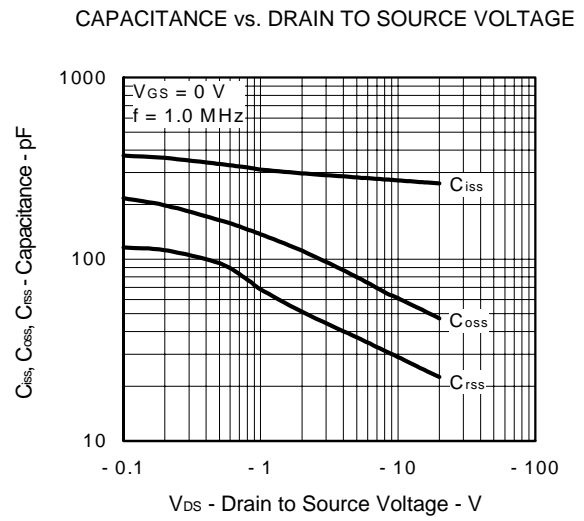
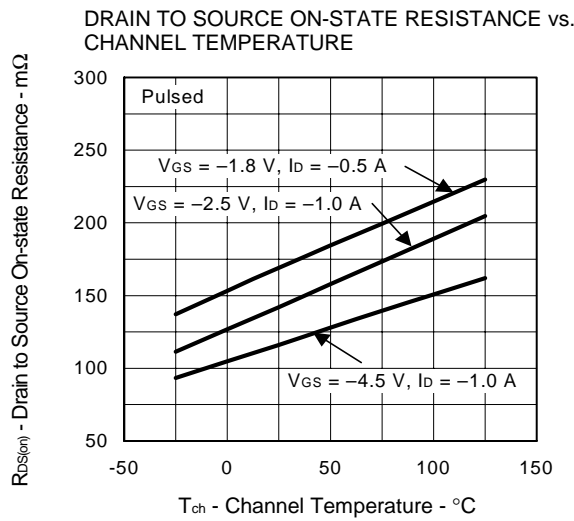
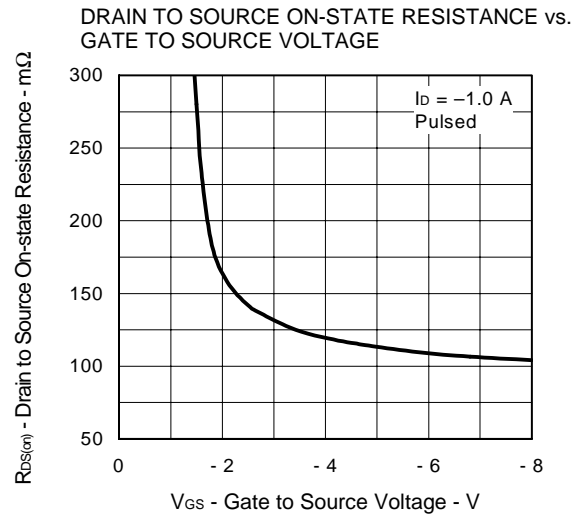
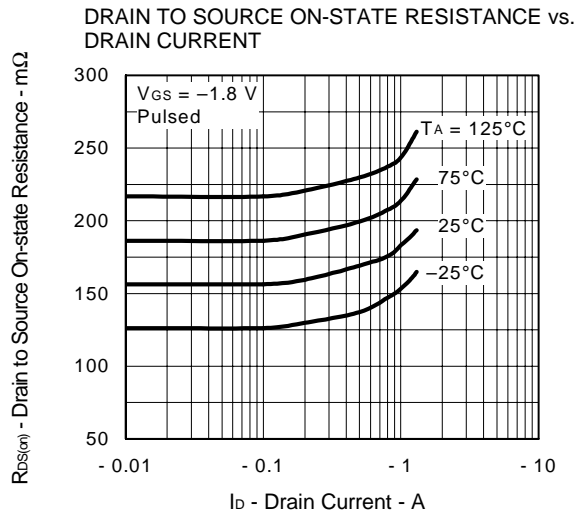


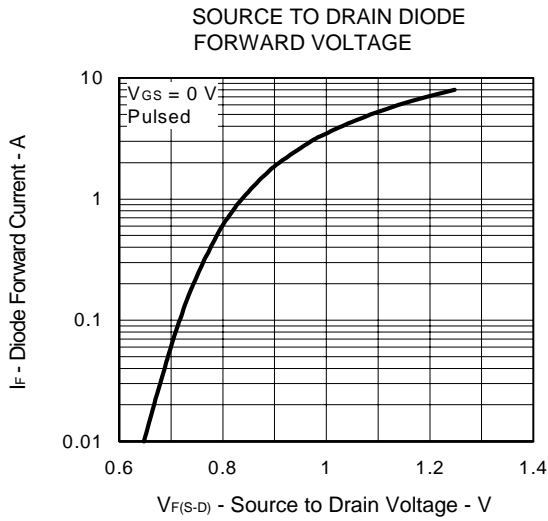
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



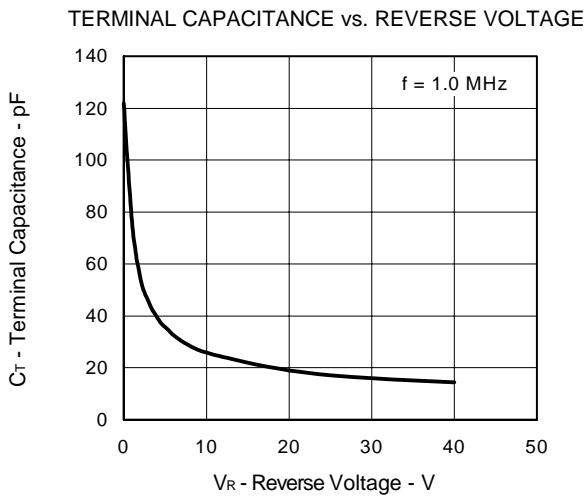
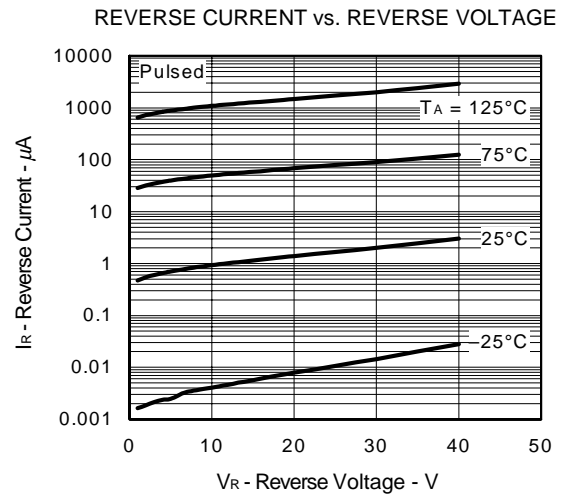
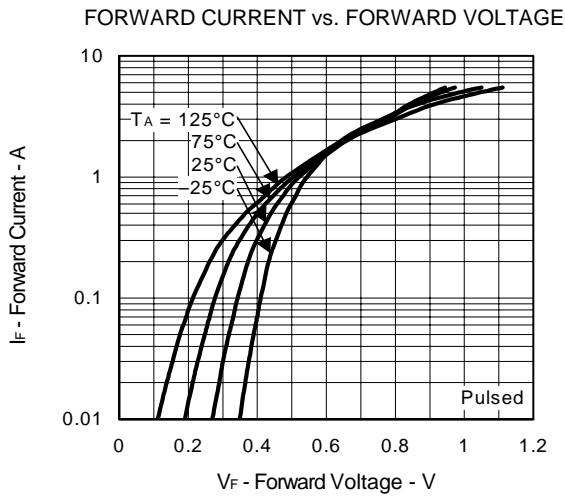
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT







SCHOTTKY BARRIER DIODE TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)



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