

NEC

MOS FET WITH SCHOTTKY BARRIER DIODE

μ PA508TE

N-CHANNEL MOS FET WITH SCHOTTKY BARRIER DIODE FOR SWITCHING

DESCRIPTION

The μ PA508TE is a switching device, which can be driven directly by a 2.5 V power source.

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

FEATURES

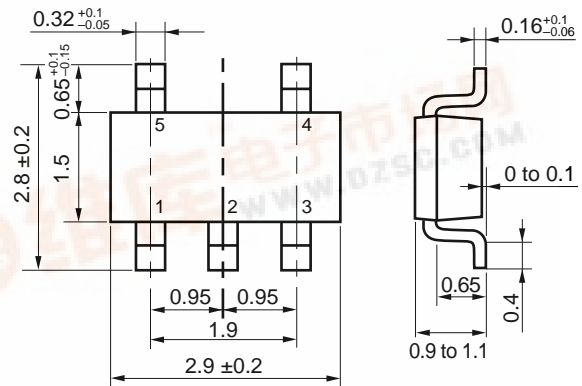
- 2.5 V drive available (MOS FET)
- Low on-state resistance (MOS FET)
 - $R_{DS(on)1} = 40 \text{ m}\Omega$ TYP. ($V_{GS} = 4.5 \text{ V}$, $I_D = 1.0 \text{ A}$)
 - $R_{DS(on)2} = 42 \text{ m}\Omega$ TYP. ($V_{GS} = 4.0 \text{ V}$, $I_D = 1.0 \text{ A}$)
 - $R_{DS(on)3} = 59 \text{ m}\Omega$ TYP. ($V_{GS} = 2.5 \text{ V}$, $I_D = 1.0 \text{ A}$)
- Low forward voltage (Schottky barrier diode)
 - $V_F = 0.35 \text{ V}$ TYP. ($I_F = 1.0 \text{ A}$)

ORDERING INFORMATION

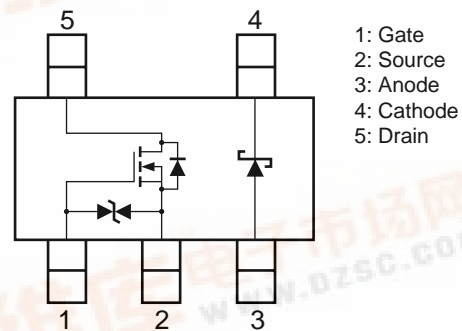
PART NUMBER	PACKAGE
μ PA508TE	SC-95_5p (Mini Mold Thin Type)

Marking: ZB

PACKAGE DRAWING (Unit: mm)



★ 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.

$V_{ESD} \pm 150 \text{ V}$ TYP. ($C = 200 \text{ pF}$, $R = 0 \Omega$, Single pulse)

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MOS FET ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$)

Drain to Source Voltage ($V_{GS} = 0\text{ V}$)	V_{DSS}	20	V
Gate to Source Voltage ($V_{DS} = 0\text{ V}$)	V_{GSS}	± 12	V
Drain Current (DC)	$I_{D(DC)}$	± 2	A
Drain Current (pulse) ^{Note1}	$I_{D(pulse)}$	± 8	A
Total Power Dissipation ^{Note2}	P_T	0.57	W
Channel Temperature	T_{ch}	150	$^\circ\text{C}$

Notes 1. $PW \leq 10\text{ }\mu\text{s}$, Duty Cycle $\leq 1\%$

2. Mounted on FR-4 board of $2500\text{ mm}^2 \times 1.6\text{ mm}$, $t \leq 5\text{ sec}$.

SCHOTTKY BARRIER DIODE ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$)

Repetitive Peak Reverse Voltage	V_{RRM}	30	V
Average Forward Current ^{Note1}	$I_{F(AV)}$	1	A
Surge Current ^{Note2}	I_{FSM}	10	A
Junction Temperature	T_j	+125	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to +125	$^\circ\text{C}$

Notes 1. Mounted on FR-4 board of $2500\text{ mm}^2 \times 1.6\text{ mm}$, $t \leq 5\text{ sec}$

2. 50 Hz sine wave, 1 cycle

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

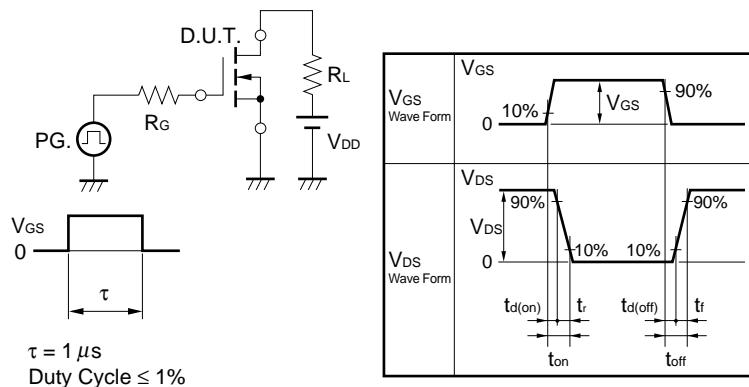
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$			1	μA
Gate Leakage Current	I_{GSS}	$V_{GS} = \pm 12\text{ V}, V_{DS} = 0\text{ V}$			± 10	μA
Gate Cut-off Voltage ^{Note}	$V_{GS(off)}$	$V_{DS} = 10\text{ V}, I_D = 1.0\text{ mA}$	0.5	1.0	1.5	V
Forward Transfer Admittance ^{Note}	$ y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 1.0\text{ A}$	1.0	3.3		S
Drain to Source On-state Resistance ^{Note}	$R_{DS(on)1}$	$V_{GS} = 4.5\text{ V}, I_D = 1.0\text{ A}$		40	51	$\text{m}\Omega$
	$R_{DS(on)2}$	$V_{GS} = 4.0\text{ V}, I_D = 1.0\text{ A}$		42	57	$\text{m}\Omega$
	$R_{DS(on)3}$	$V_{GS} = 2.5\text{ V}, I_D = 1.0\text{ A}$		59	90	$\text{m}\Omega$
Input Capacitance	C_{iss}	$V_{DS} = 10\text{ V}$		170		pF
Output Capacitance	C_{oss}	$V_{GS} = 0\text{ V}$		80		pF
Reverse Transfer Capacitance	C_{rss}	$f = 1.0\text{ MHz}$		40		pF
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, I_D = 1.0\text{ A}$		9		ns
Rise Time	t_r	$V_{GS} = 4.0\text{ V}$		9		ns
Turn-off Delay Time	$t_{d(off)}$	$R_G = 10\ \Omega$		15		ns
Fall Time	t_f			4		ns
Total Gate Charge	Q_G	$V_{DD} = 16\text{ V}$		2.7		nC
Gate to Source Charge	Q_{GS}	$V_{GS} = 4.0\text{ V}$		0.6		nC
Gate to Drain Charge	Q_{GD}	$I_D = 2.0\text{ A}$		1.0		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	$I_F = 2.0\text{ A}, V_{GS} = 0\text{ V}$		0.81		V

Note Pulsed: $PW \leq 350\ \mu\text{s}$, Duty Cycle $\leq 2\%$

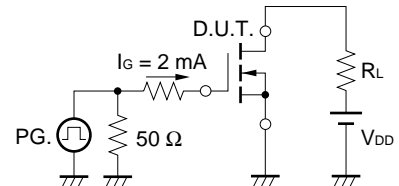
SCHOTTKY BARRIER DIODE ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Forward Voltage	V_F	$I_F = 1.0\text{ A}$		0.35	0.38	V
Reverse Current	I_R	$V_R = 10\text{ V}$			200	μA
Terminal Capacitance	C_T	$f = 1.0\text{ MHz}, V_R = 10\text{ V}$		36		pF

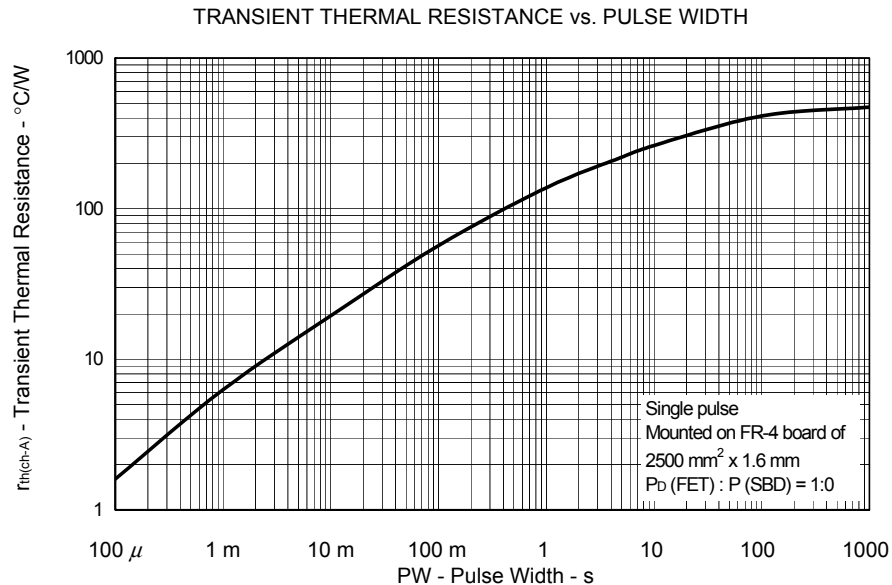
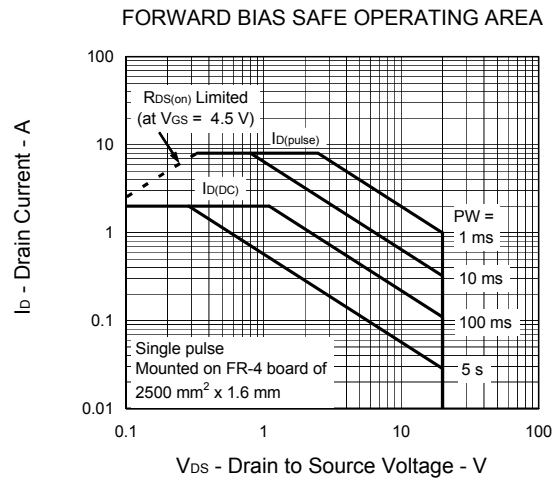
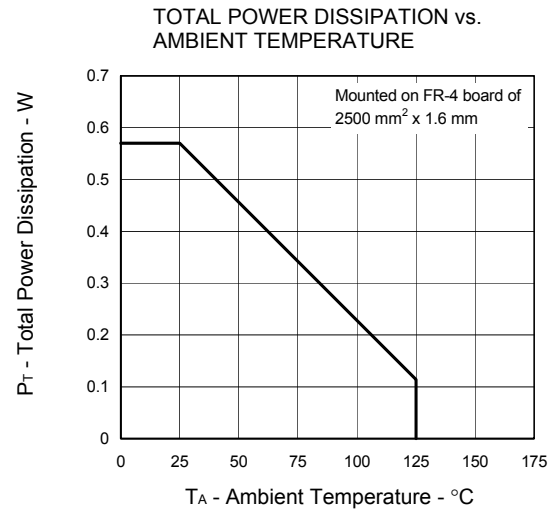
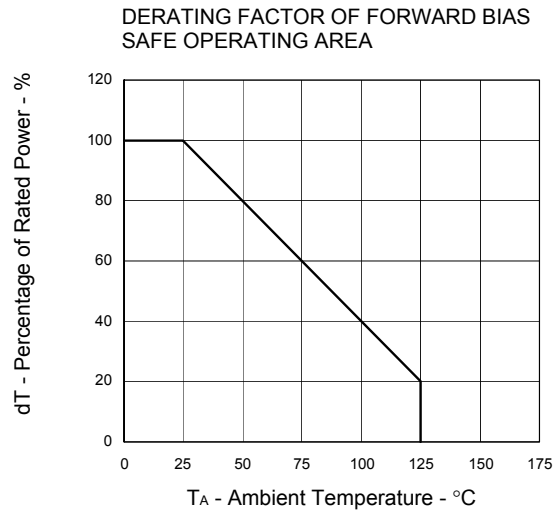
TEST CIRCUIT 1 SWITCHING TIME



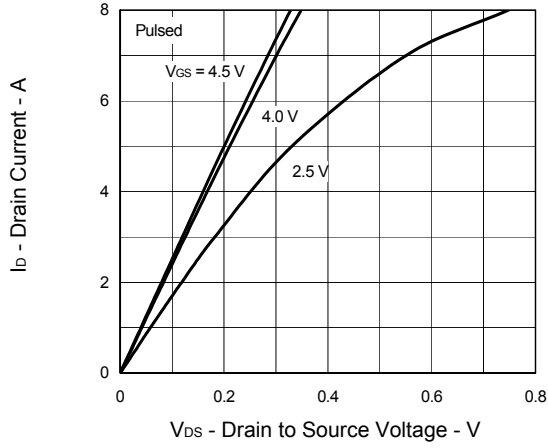
TEST CIRCUIT 2 GATE CHARGE



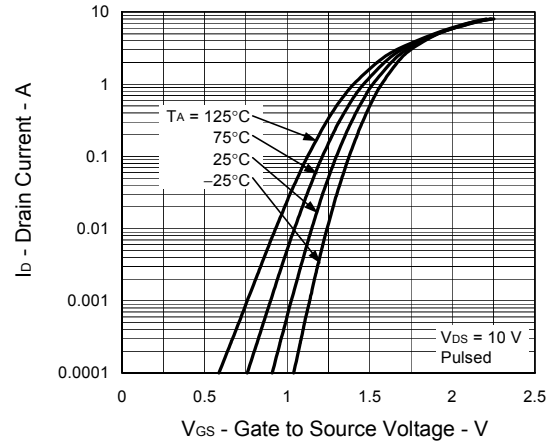
MOS FET TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)



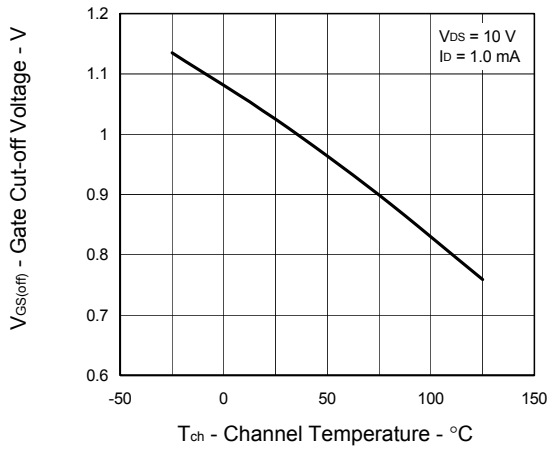
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



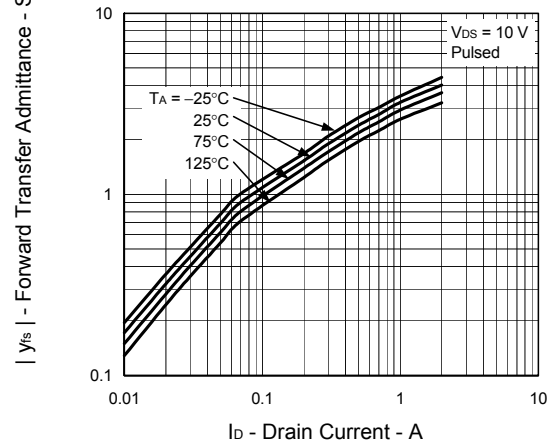
FORWARD TRANSFER CHARACTERISTICS



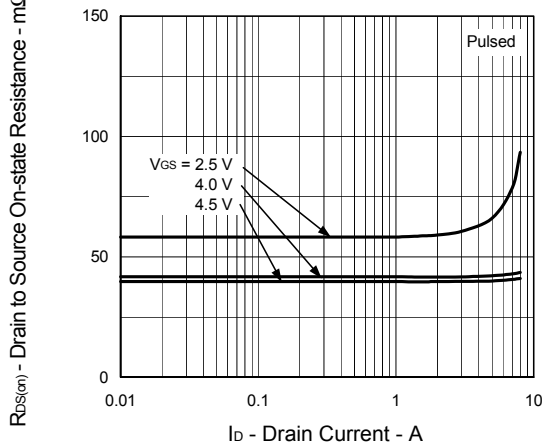
GATE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



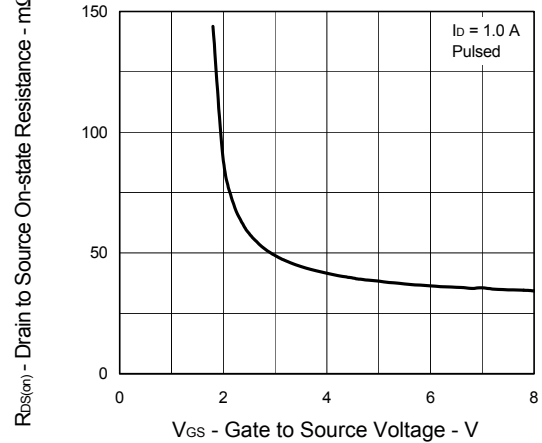
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT

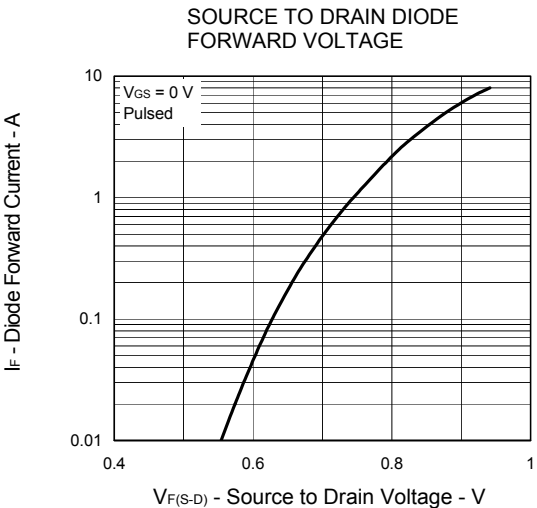
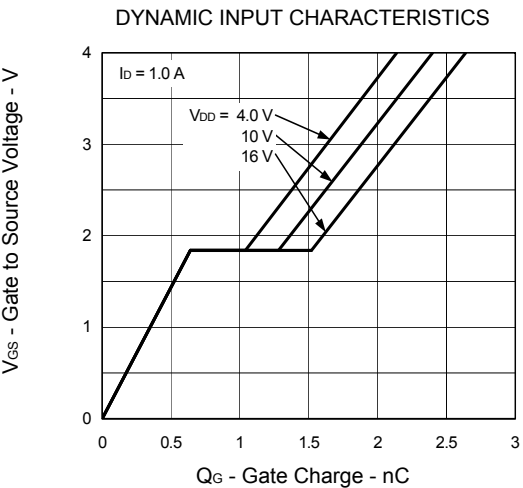
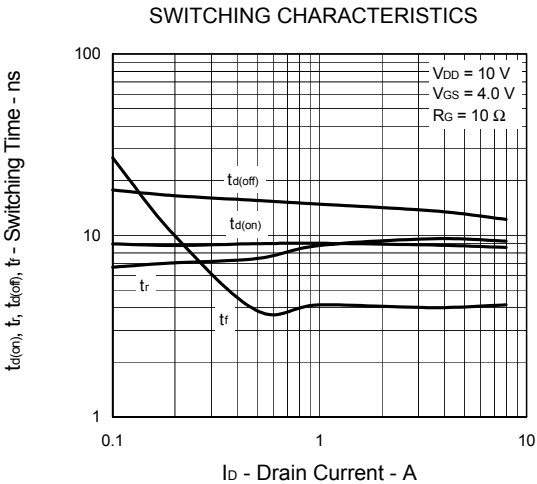
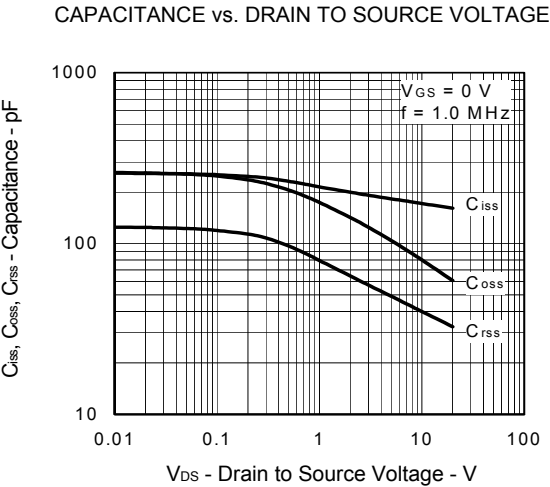
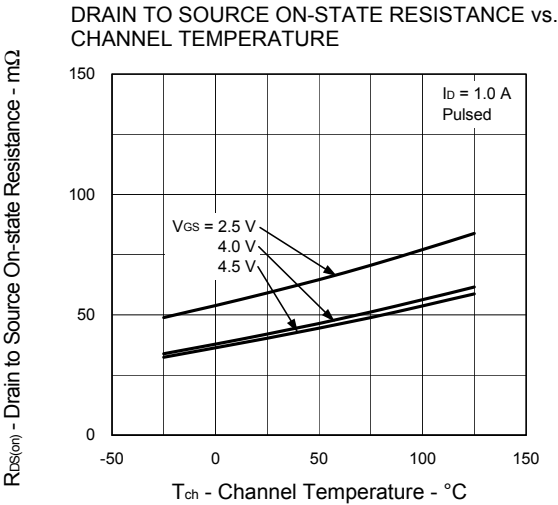


DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT

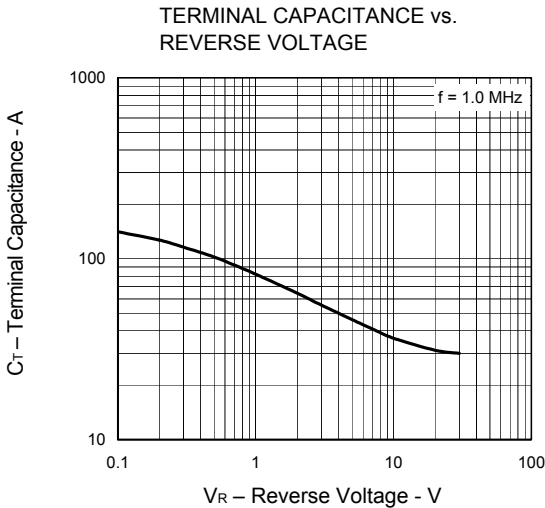
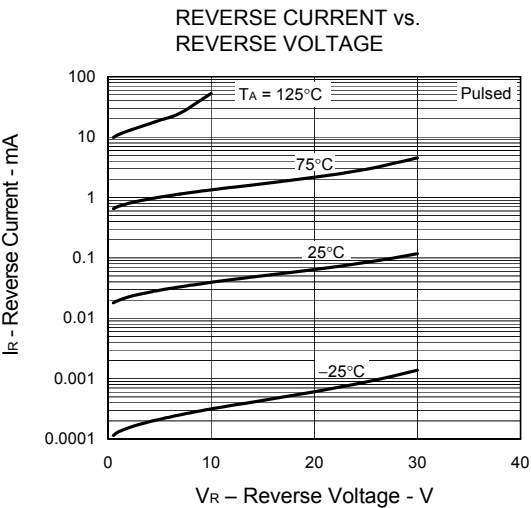
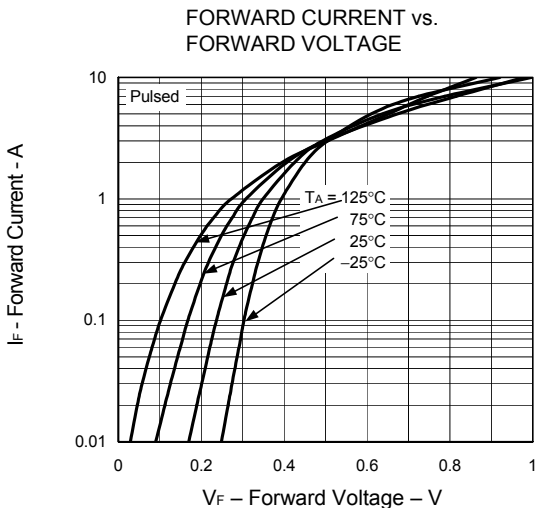


DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE





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



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