

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

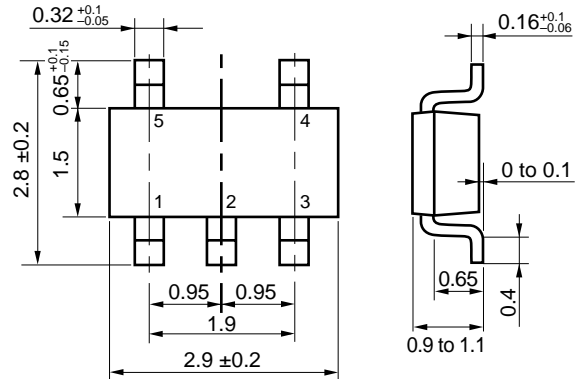
- 2.5 V drive available (MOS FET)
- Low on-state resistance (MOS FET)
 - $R_{DS(on)1} = 40 \text{ m}\Omega$ TYP. ($V_{GS} = 4.5 \text{ V}$, $I_D = 1.0 \text{ A}$)
 - $R_{DS(on)2} = 42 \text{ m}\Omega$ TYP. ($V_{GS} = 4.0 \text{ V}$, $I_D = 1.0 \text{ A}$)
 - $R_{DS(on)3} = 59 \text{ m}\Omega$ TYP. ($V_{GS}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

ORDERING INFORMATION

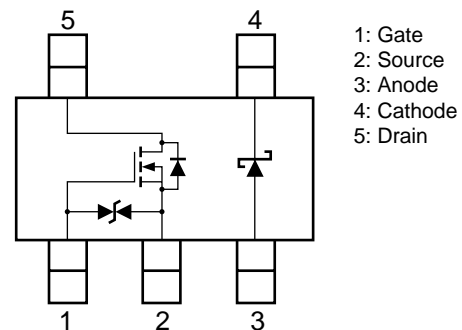
PART NUMBER	PACKAGE
μ PA508TE	SC-95_5p (Mini Mold Thin Type)

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°C)

Drain to Source Voltage (V _{GS} = 0 V)	V _{DSS}	20	V
Gate to Source Voltage (V _{DS} = 0 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	°C

Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1%

2. Mounted on FR-4 board of 2500 mm² x 1.6 mm, t ≤ 5 sec.

SCHOTTKY BARRIER DIODE ABSOLUTE MAXIMUM RATINGS (T_A = 25°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	°C
Storage Temperature	T _{stg}	-55 to +125	°C

Notes 1. Mounted on FR-4 board of 2500 mm² x 1.6 mm, t ≤ 5 sec

2. 50 Hz sine wave, 1 cycle

MOS FET ELECTRICAL CHARACTERISTICS (T_A = 25°C)

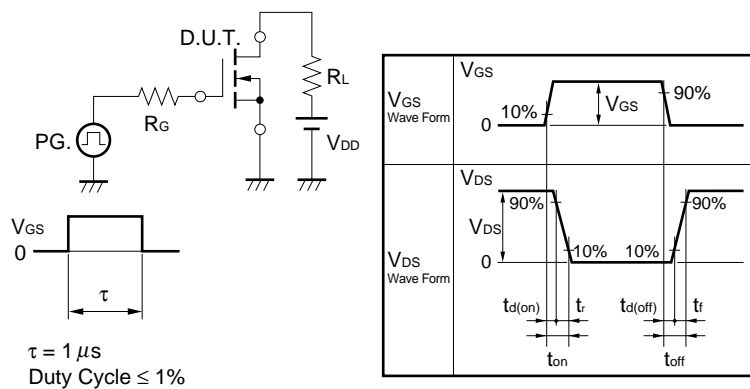
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 20 V, V _{GS} = 0 V			1	μA
Gate Leakage Current	I _{GSS}	V _{GS} = ±12 V, V _{DS} = 0 V			±10	μA
Gate Cut-off Voltage ^{Note}	V _{GS(off)}	V _{DS} = 10 V, I _D = 1.0 mA	0.5	1.0	1.5	V
Forward Transfer Admittance ^{Note}	y _{fs}	V _{DS} = 10 V, I _D = 1.0 A	1.0	3.3		S
Drain to Source On-state Resistance ^{Note}	R _{DS(on)1}	V _{GS} = 4.5 V, I _D = 1.0 A		40	51	mΩ
	R _{DS(on)2}	V _{GS} = 4.0 V, I _D = 1.0 A		42	57	mΩ
	R _{DS(on)3}	V _{GS} = 2.5 V, I _D = 1.0 A		59	90	mΩ
Input Capacitance	C _{iss}	V _{DS} = 10 V		170		pF
Output Capacitance	C _{oss}	V _{GS} = 0 V		80		pF
Reverse Transfer Capacitance	C _{rss}	f = 1.0 MHz		40		pF
Turn-on Delay Time	t _{d(on)}	V _{DD} = 10 V, I _D = 1.0 A		9		ns
Rise Time	t _r	V _{GS} = 4.0 V		9		ns
Turn-off Delay Time	t _{d(off)}	R _G = 10 Ω		15		ns
Fall Time	t _f			4		ns
Total Gate Charge	Q _G	V _{DD} = 16 V		2.7		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		1.0		nC
Body Diode Forward Voltage	V _{F(S-D)}	I _F = 2.0 A, V _{GS} = 0 V		0.81		V

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

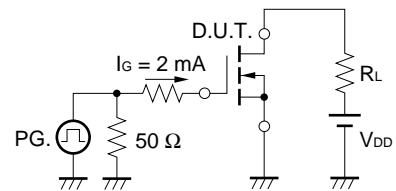
SCHOTTKY BARRIER DIODE ELECTRICAL CHARACTERISTICS (T_A = 25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Forward Voltage	V _F	I _F = 1.0 A		0.35	0.38	V
Reverse Current	I _R	V _R = 10 V			200	μA
Terminal Capacitance	C _T	f = 1.0 MHz, V _R = 10 V		36		pF

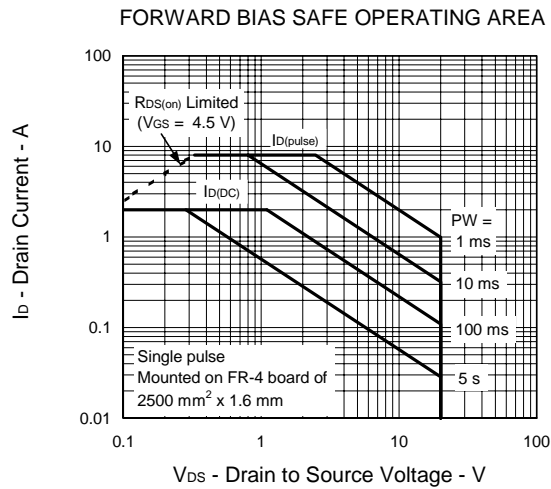
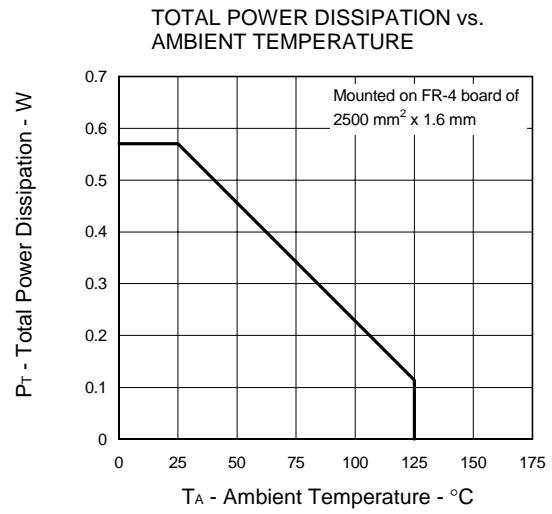
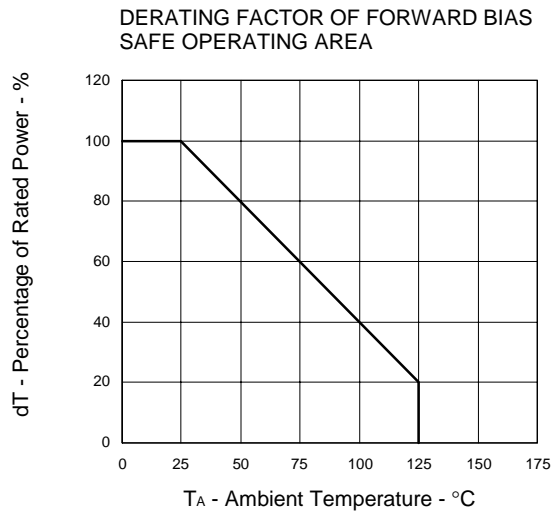
TEST CIRCUIT 1 SWITCHING TIME



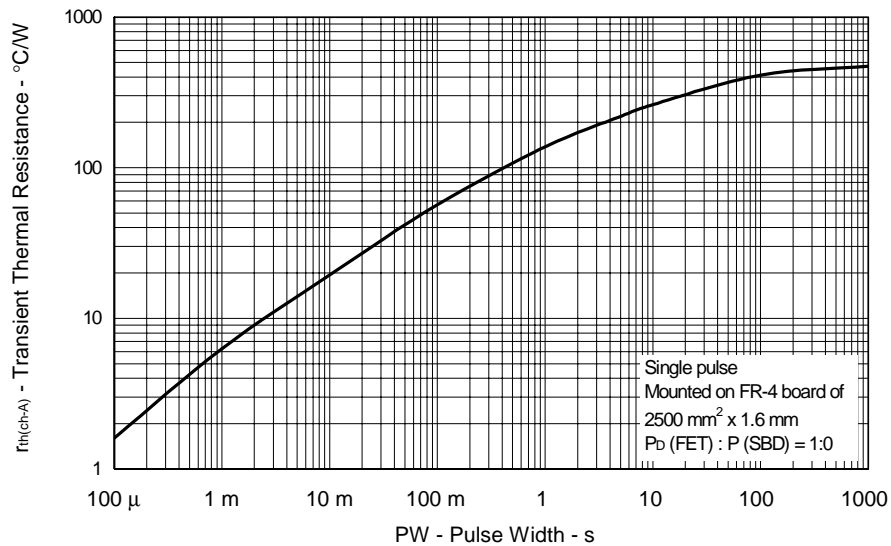
TEST CIRCUIT 2 GATE CHARGE



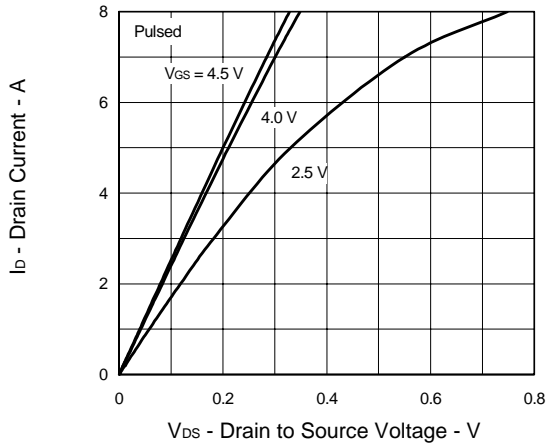
MOS FET TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)



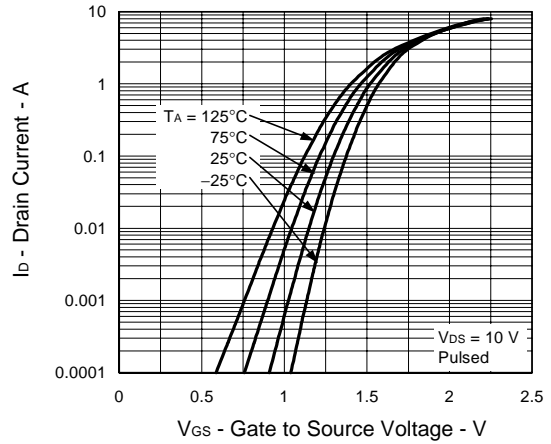
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



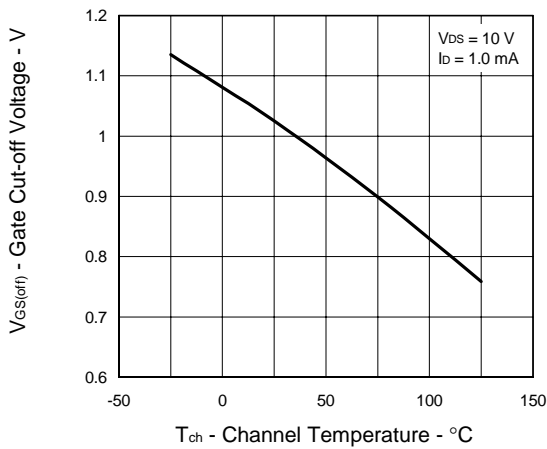
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



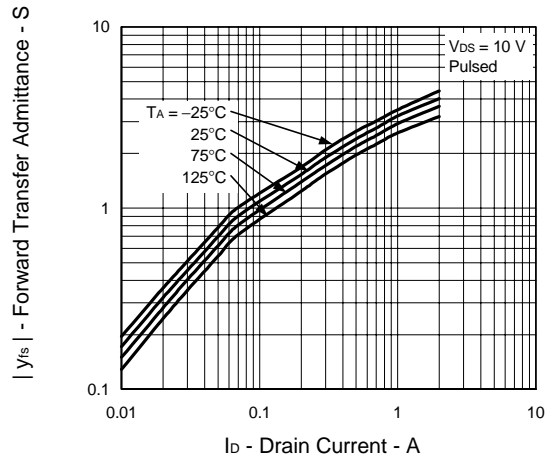
FORWARD TRANSFER CHARACTERISTICS



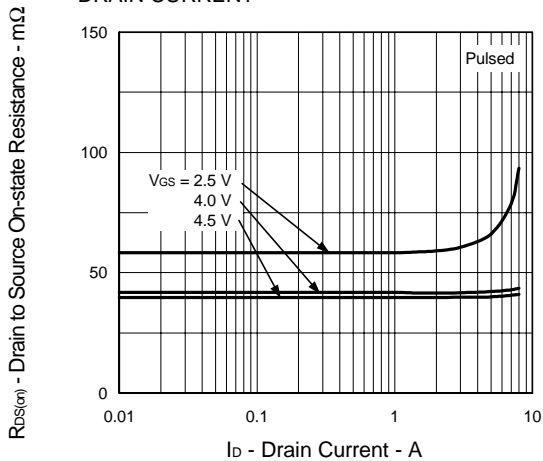
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



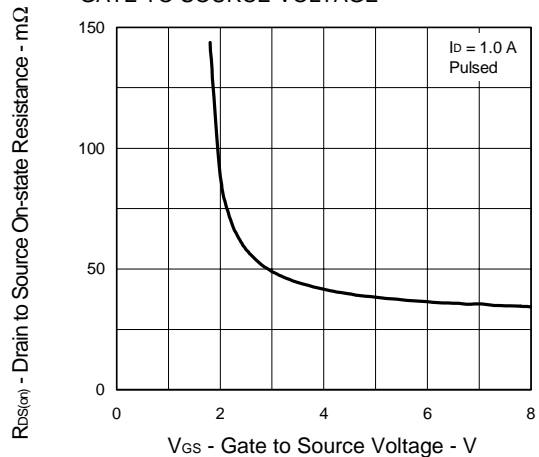
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



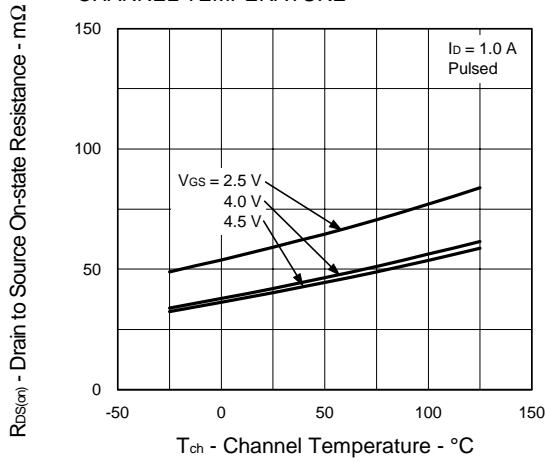
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



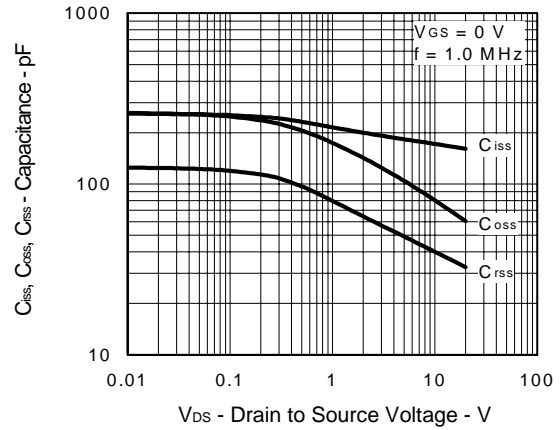
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



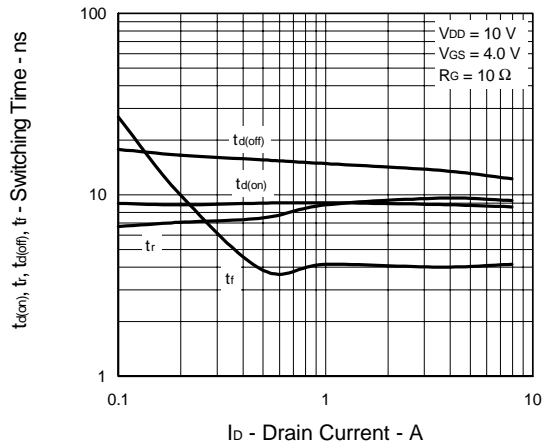
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



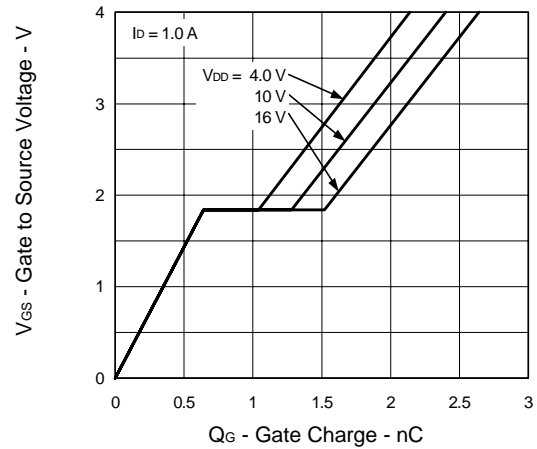
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



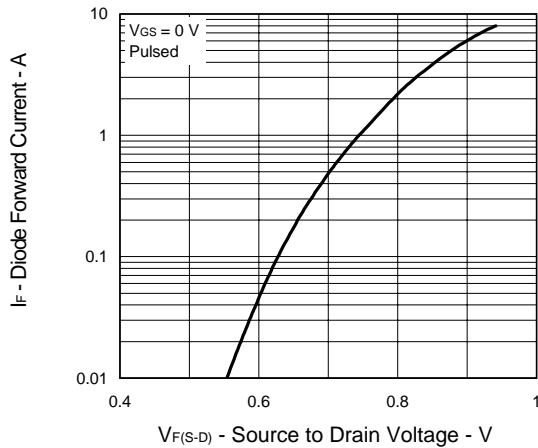
SWITCHING CHARACTERISTICS



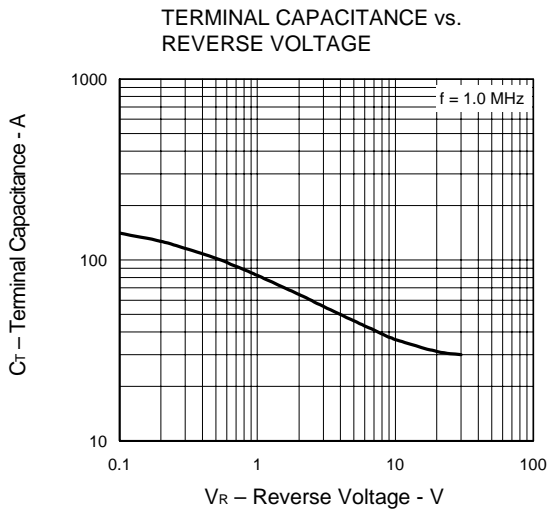
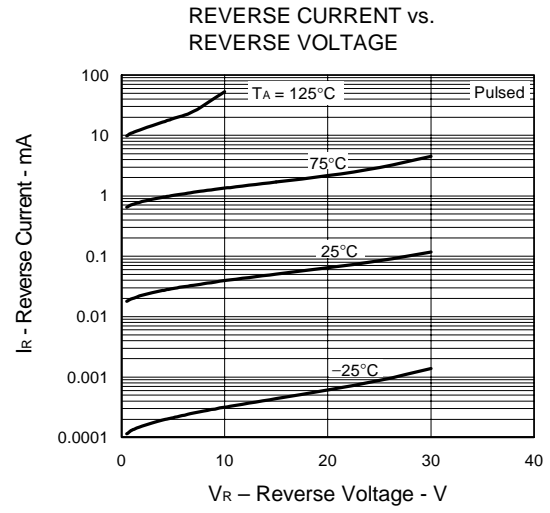
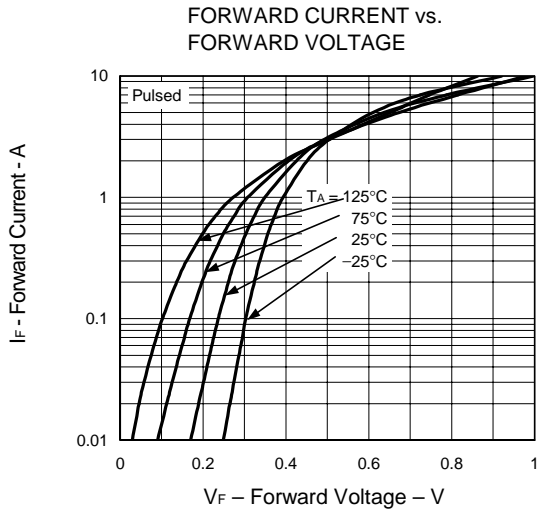
DYNAMIC INPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



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



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