

DUAL N-CHANNEL MOSFET FOR SWITCHING

DESCRIPTION

The μ PA2353 is a Dual N-channel MOSFET designed for Lithium-Ion battery protection circuit.

Ecologically Flip chip MOSFET for Lithium-Ion battery Protection (EFLIP).

FEATURES

- Monolithic Dual MOSFET
Connecting the Drains on the circuit board is not required because the Drains of the FET1 and the FET2 are internally connected.
- 1.8 V drive available and low on-state resistance
 $R_{SS(on)1} = 31 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.5 \text{ V, } I_S = 3.0 \text{ A)}$
 $R_{SS(on)2} = 38 \text{ m}\Omega \text{ MAX. (} V_{GS} = 3.1 \text{ V, } I_S = 3.0 \text{ A)}$
 $R_{SS(on)3} = 43 \text{ m}\Omega \text{ MAX. (} V_{GS} = 2.5 \text{ V, } I_S = 3.0 \text{ A)}$
 $R_{SS(on)4} = 79 \text{ m}\Omega \text{ MAX. (} V_{GS} = 1.8 \text{ V, } I_S = 3.0 \text{ A)}$
- Built-in G-S protection diode against ESD
- Pb-free Bump

ORDERING INFORMATION

PART NUMBER	PACKAGE
μ PA2353T1G-E4-A <small>Note</small>	4-pin EFLIP

Note Pb-free (This product does not contain Pb in the external electrode and other parts.)

Remark "-E4" indicates the unit orientation (E4 only).

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

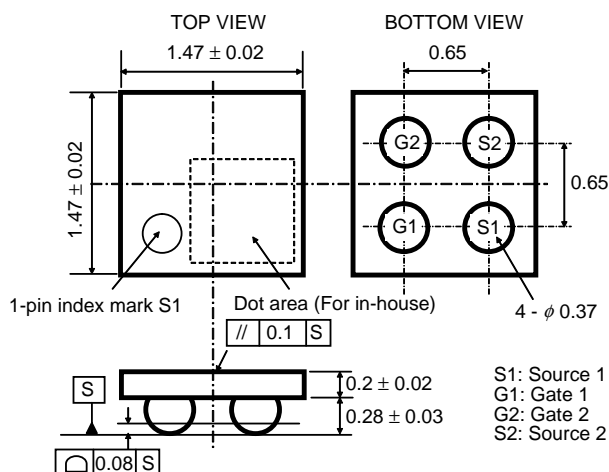
Source to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{SSS}	20	V
Gate to Source Voltage ($V_{SS} = 0 \text{ V}$)	V_{GSS}	± 8	V
Source Current (DC) <small>Note1</small>	$I_{S(DC)}$	± 6.0	A
Source Current (pulse) <small>Note2</small>	$I_{S(pulse)}$	± 50	A
Total Power Dissipation <small>Note1</small>	P_T	1.3	W
Channel Temperature	T_{ch}	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to $+150$	$^\circ\text{C}$

- Notes**
1. Mounted on ceramic board of $50 \text{ cm}^2 \times 1.0 \text{ mm}$
 2. $PW \leq 100 \mu\text{s}$, Single Pulse

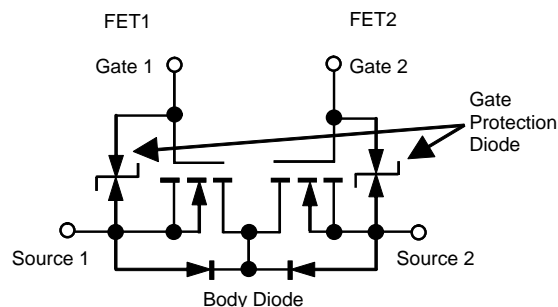
Remark The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

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OUTLINE DRAWING (Unit: mm)



EQUIVALENT CIRCUIT

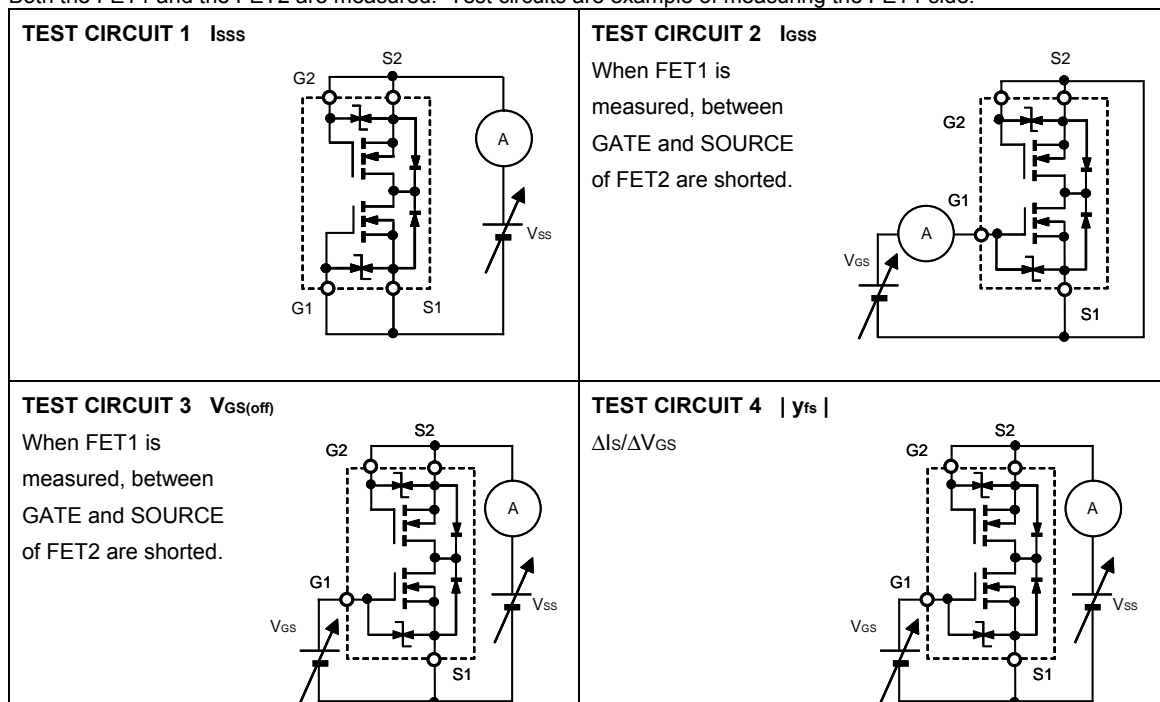


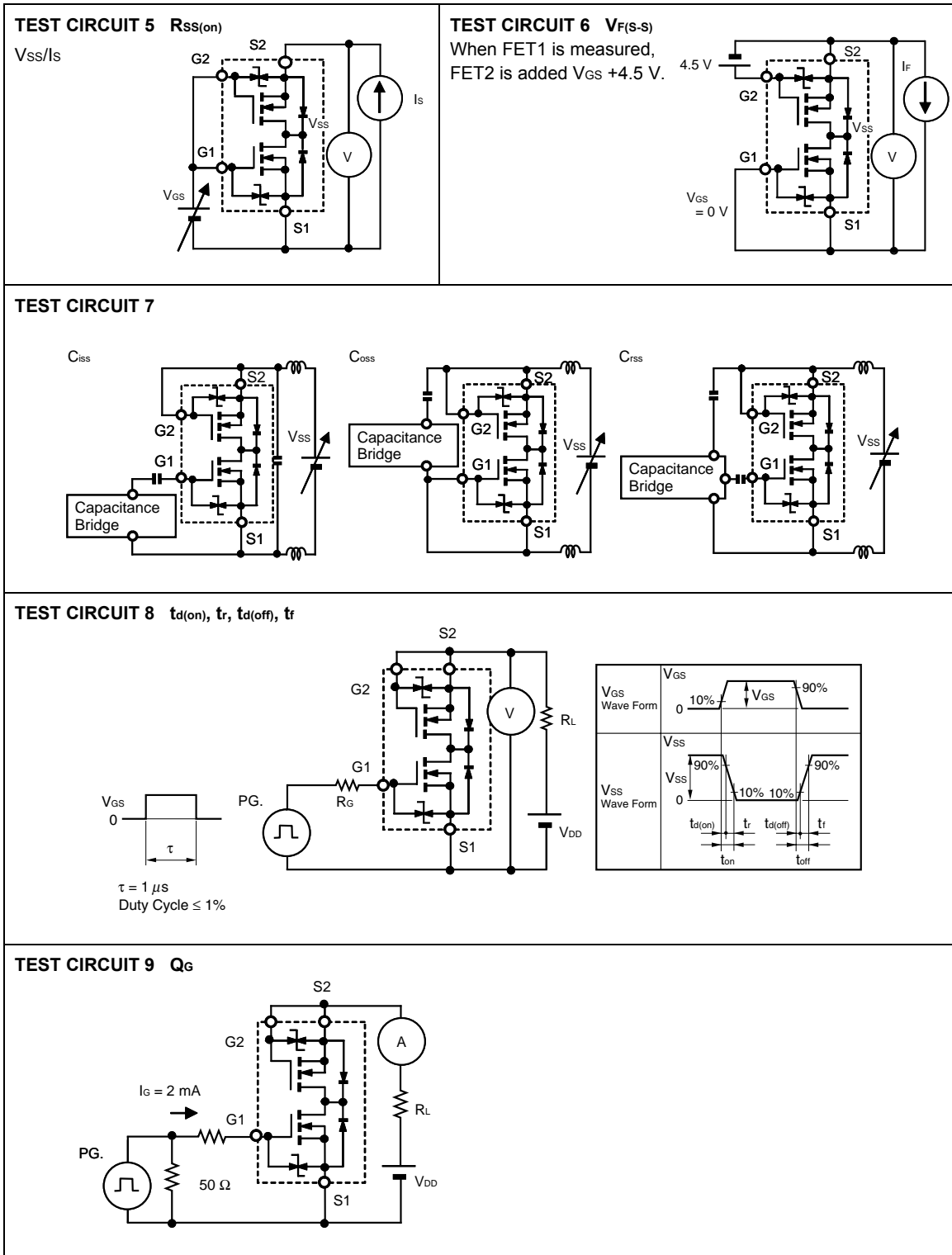
ELECTRICAL CHARACTERISTICS (TA = 25°C) These are common to FET1 and FET2.

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Source Current	I_{SSS}	$V_{SS} = 20\text{ V}$, $V_{GS} = 0\text{ V}$, TEST CIRCUIT 1			1	μA
Gate Leakage Current	I_{GSS}	$V_{GS} = \pm 8\text{ V}$, $V_{SS} = 0\text{ V}$, TEST CIRCUIT 2			±10	μA
Gate to Source Cut-off Voltage	$V_{GS(off)}$	$V_{SS} = 10\text{ V}$, $I_S = 1.0\text{ mA}$, TEST CIRCUIT 3	0.4	0.7	1.2	V
Forward Transfer Admittance ^{Note}	$ y_{fs} $	$V_{SS} = 10\text{ V}$, $I_S = 3.0\text{ A}$, TEST CIRCUIT 4	3.0			S
Source to Source On-state Resistance ^{Note}	$R_{SS(on)1}$	$V_{GS} = 4.5\text{ V}$, $I_S = 3.0\text{ A}$, TEST CIRCUIT 5	19	29	31	mΩ
	$R_{SS(on)2}$	$V_{GS} = 3.1\text{ V}$, $I_S = 3.0\text{ A}$, TEST CIRCUIT 5	20	31	38	mΩ
	$R_{SS(on)3}$	$V_{GS} = 2.5\text{ V}$, $I_S = 3.0\text{ A}$, TEST CIRCUIT 5	22.5	34	43	mΩ
	$R_{SS(on)4}$	$V_{GS} = 1.8\text{ V}$, $I_S = 3.0\text{ A}$, TEST CIRCUIT 5	25	44	79	mΩ
Input Capacitance	C_{iss}	$V_{SS} = 10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$		950		pF
Output Capacitance	C_{oss}	TEST CIRCUIT 7		170		pF
Reverse Transfer Capacitance	C_{rss}			100		pF
Turn-on Delay Time	$t_{d(on)}$		$V_{DD} = 20\text{ V}$, $I_S = 6.0\text{ A}$,		2.4	
Rise Time	t_r	$V_{GS} = 4.0\text{ V}$, $R_G = 6.0\text{ Ω}$,		5.9		μs
Turn-off Delay Time	$t_{d(off)}$	TEST CIRCUIT 8		9.8		μs
Fall Time	t_f			12.3		μs
Total Gate Charge	Q_G	$V_{DD} = 16\text{ V}$, $V_{G1S1} = 4.0\text{ V}$, $I_S = 6.0\text{ A}$, TEST CIRCUIT 9		8.0		nC
Body Diode Forward Voltage ^{Note}	$V_{F(S-S)}$	$I_F = 6.0\text{ A}$, $V_{GS} = 0\text{ V}$, TEST CIRCUIT 6		0.9		V

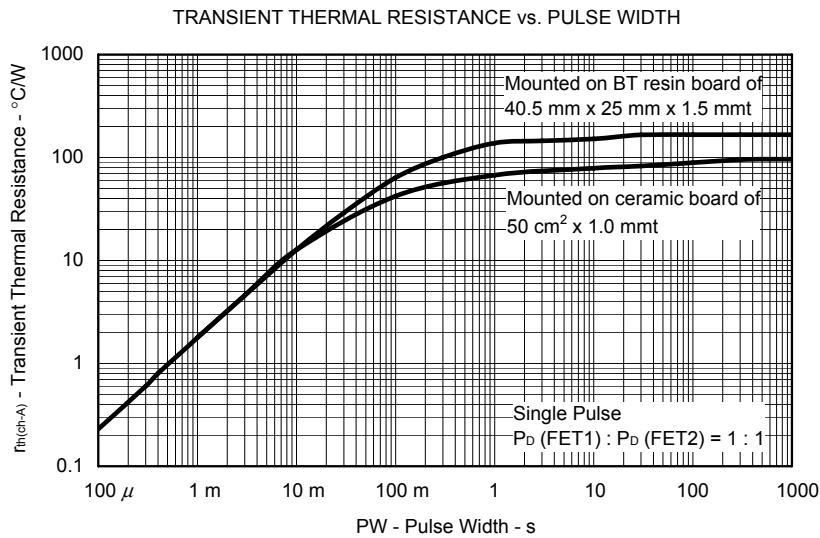
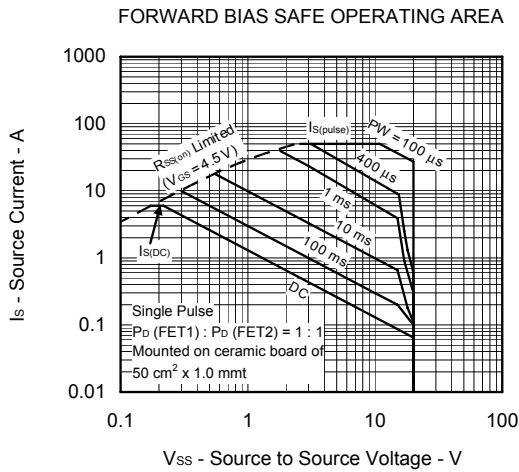
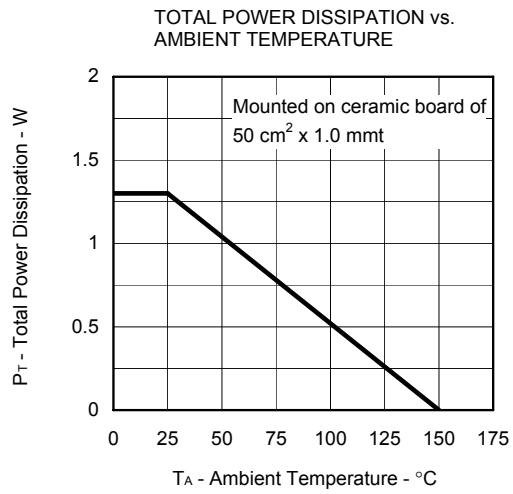
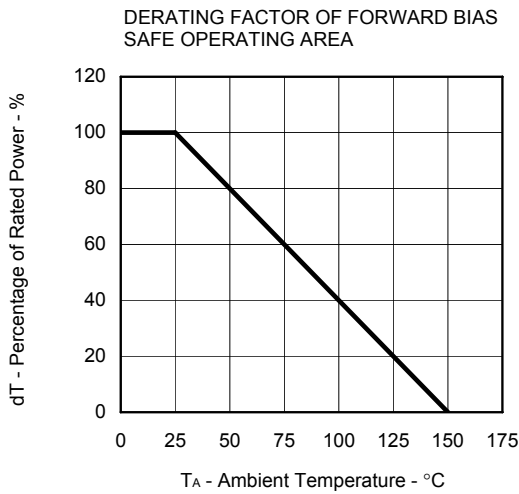
Note Pulsed

Both the FET1 and the FET2 are measured. Test circuits are example of measuring the FET1 side.

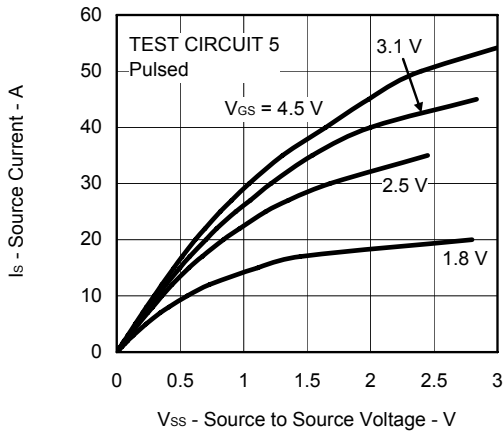




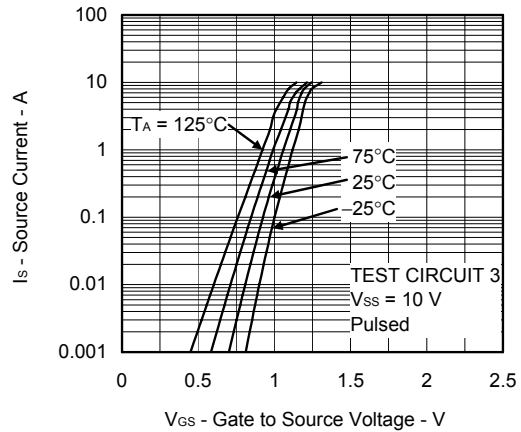
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)



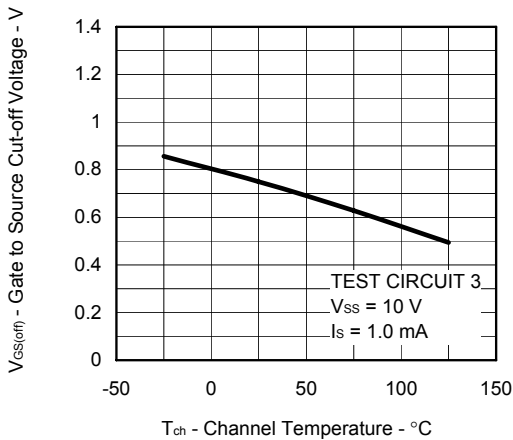
SOURCE CURRENT vs. SOURCE TO SOURCE VOLTAGE



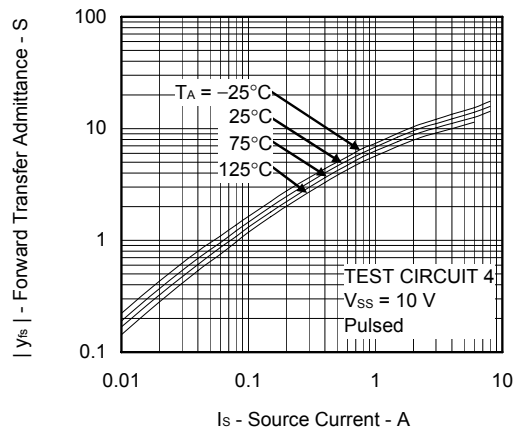
FORWARD TRANSFER CHARACTERISTICS



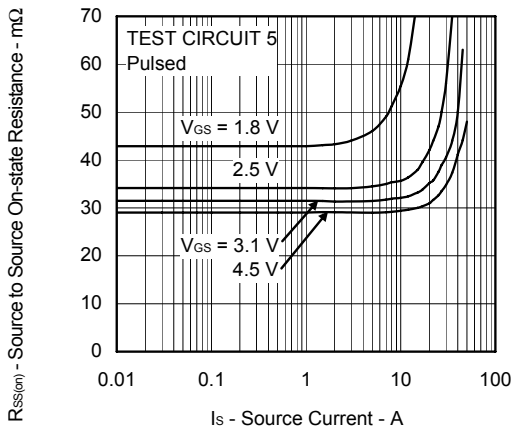
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



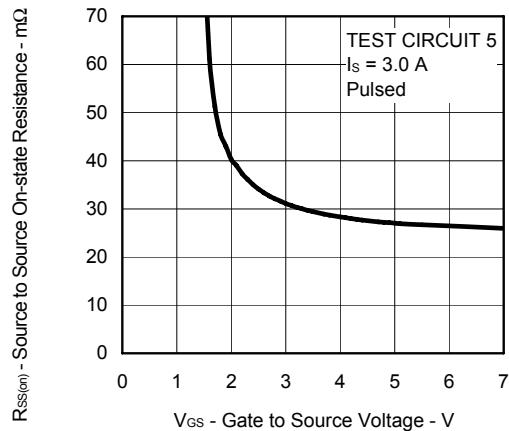
FORWARD TRANSFER ADMITTANCE vs. SOURCE CURRENT



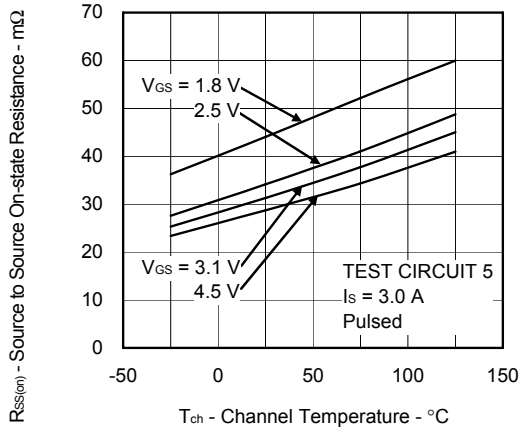
SOURCE TO SOURCE ON-STATE RESISTANCE vs. SOURCE CURRENT



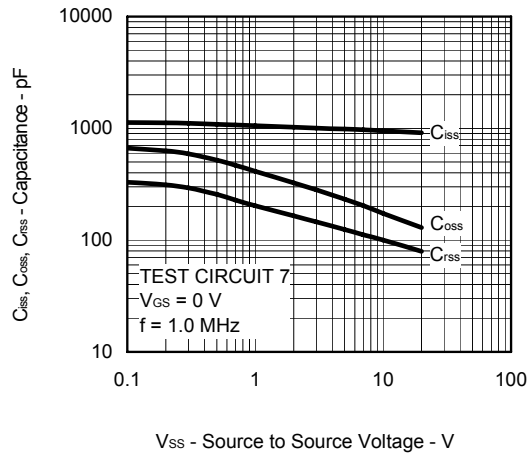
SOURCE TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



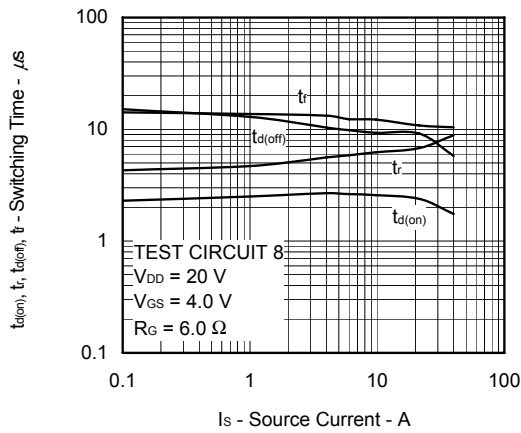
SOURCE TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



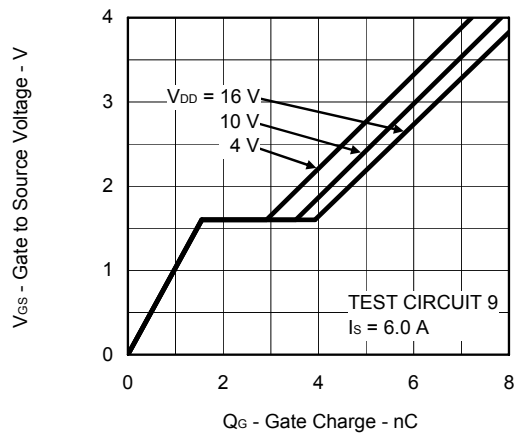
CAPACITANCE vs. SOURCE TO SOURCE VOLTAGE



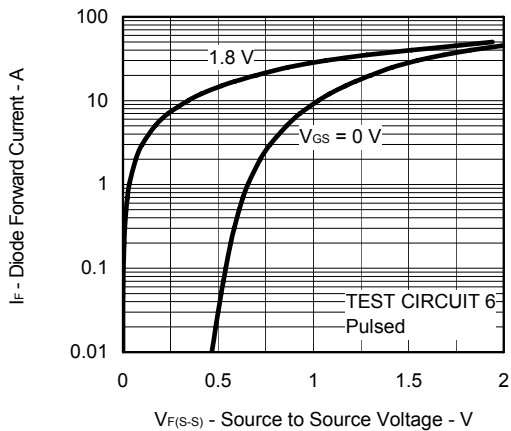
SWITCHING CHARACTERISTICS



DYNAMIC INPUT CHARACTERISTICS



SOURCE TO SOURCE DIODE FORWARD VOLTAGE



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