

1.5V Drive Pch MOSFET + PNP TRANSISTOR

QS8F2

● **Structure**

Silicon P-channel MOSFET/
PNP TRANSISTOR

● **Features**

- 1) Low on-resistance.
- 2) High power package(TSMT8).
- 3) Low voltage drive(1.5V drive).

● **Application**

Switching

● **Packaging specifications**

Type	Package	Taping
	Code	TR
	Basic ordering unit (pieces)	3000
QS8F2		O

● **Absolute maximum ratings** (Ta = 25°C)

<Tr1(Pch MOSFET)>

Parameter	Symbol	Limits	Unit	
Drain-source voltage	V_{DSS}	-12	V	
Gate-source voltage	V_{GSS}	±10	V	
Drain current	Continuous	I_D	±2.5	A
	Pulsed	I_{DP}^*	±10	A
Source current (Body Diode)	Continuous	I_s	-1	A
	Pulsed	I_{sp}^*	-10	A

* $P_w \leq 10\mu s$, Duty cycle $\leq 1\%$

<Tr2(PNP Tr)>

Parameter	Symbol	Limits	Unit	
Collector-Emitter voltage	V_{CEO}	-30	V	
Collector-Base voltage	V_{CBO}	-30	V	
Emitter-Base voltage	V_{EBO}	-6	V	
Collector current	Continuous	I_C	-2	A
	Pulsed	I_{CP}^*	-4	A

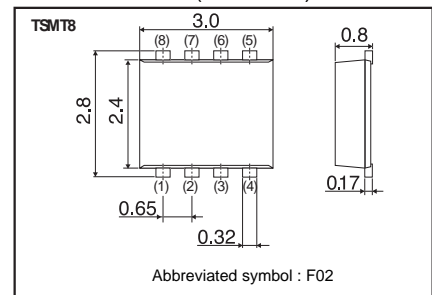
* $P_w = 1ms$, Pulsed

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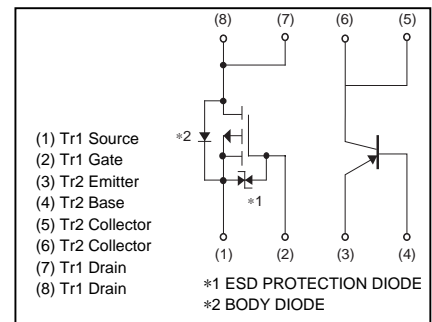
Parameter	Symbol	Limits	Unit
Power dissipation	P_D^*	1.5	W / TOTAL
		1.25	W / ELEMENT
Junction temperature	T_j	150	°C
Range of storage temperature	T_{stg}	-55 to +150	°C

* Mounted on a ceramic board.

● **Dimensions** (Unit : mm)



● **Inner circuit**



- (1) Tr1 Source
- (2) Tr1 Gate
- (3) Tr2 Emitter
- (4) Tr2 Base
- (5) Tr2 Collector
- (6) Tr1 Drain
- (7) Tr1 Drain
- (8) Tr1 Drain

*1 ESD PROTECTION DIODE
*2 BODY DIODE

● **Electrical characteristics** (Ta = 25°C)

<Tr1(Pch MOSFET)>

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I_{GSS}	-	-	±10	μA	$V_{GS}=\pm 10V, V_{DS}=0V$
Drain-source breakdown voltage	$V_{(BR)DSS}$	-12	-	-	V	$I_D=-1mA, V_{GS}=0V$
Zero gate voltage drain current	I_{DSS}	-	-	-1	μA	$V_{DS}=-12V, V_{GS}=0V$
Gate threshold voltage	$V_{GS(th)}$	-0.3	-	-1.0	V	$V_{DS}=-6V, I_D=-1mA$
Static drain-source on-state resistance	$R_{DS(on)^*}$	-	44	61	mΩ	$I_D=-2.5A, V_{GS}=-4.5V$
		-	60	84		$I_D=-1.2A, V_{GS}=-2.5V$
		-	81	121		$I_D=-1.2A, V_{GS}=-1.8V$
		-	110	220		$I_D=-0.5A, V_{GS}=-1.5V$
Forward transfer admittance	$ Y_{fs} ^*$	3.5	-	-	S	$V_{DS}=-6V, I_D=-2.5A$
Input capacitance	C_{iss}	-	1350	-	pF	$V_{DS}=-6V$
Output capacitance	C_{oss}	-	130	-	pF	$V_{GS}=0V$
Reverse transfer capacitance	C_{rss}	-	125	-	pF	$f=1MHz$
Turn-on delay time	$t_{d(on)^*}$	-	9	-	ns	$I_D=-1.2A, V_{DD}=-6V$
Rise time	t_r^*	-	35	-	ns	$V_{GS}=-4.5V$
Turn-off delay time	$t_{d(off)^*}$	-	130	-	ns	$R_L=5\Omega$
Fall time	t_f^*	-	85	-	ns	$R_G=10\Omega$
Total gate charge	Q_g^*	-	13	-	nC	$I_D=-2.5A,$
Gate-source charge	Q_{gs}^*	-	2.5	-	nC	$V_{DD}=-6V$
Gate-drain charge	Q_{gd}^*	-	2.0	-	nC	$V_{GS}=-4.5V$

*Pulsed

● **Body diode characteristics** (Source-Drain) (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward Voltage	V_{SD}^*	-	-	-1.2	V	$I_S=-2.5A, V_{GS}=0V$

*Pulsed

<Tr2(PNP Tr)>

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-Emitter breakdown voltage	BV_{CEO}	-30	-	-	V	$I_C=-1mA$
Collector-Base breakdown voltage	BV_{CBO}	-30	-	-	V	$I_C=-10\mu A$
Emitter-Base breakdown voltage	BV_{EBO}	-6	-	-	V	$I_E=-10\mu A$
Collector cut-off current	I_{CBO}	-	-	-100	nA	$V_{CB}=-30V$
Emitter cut-off current	I_{EBO}	-	-	-100	nA	$V_{EB}=-6V$
Collector-Emitter saturation voltage	$V_{CE(sat)^*}$	-	-180	-370	mV	$I_C=-1.5A, I_B=-75mA$
DC current gain	h_{FE}	270	-	680	-	$V_{CE}=-2V, I_C=-200mA$
Transistor frequency	f_T	-	280	-	MHz	$V_{CE}=-2V, I_E=200mA,$ $f=100MHz$
Collector output capacitance	C_{ob}	-	20	-	pF	$V_{CB}=-10V, I_E=0mA,$ $f=1MHz$

*Pulsed

●Electrical characteristic curves (Ta=25°C)

<Tr.1>

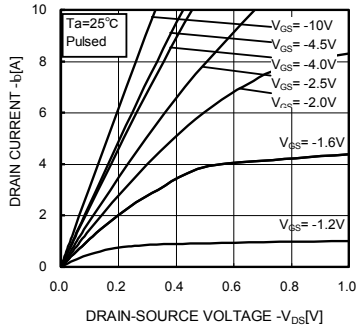


Fig.1 Typical Output Characteristics (I)

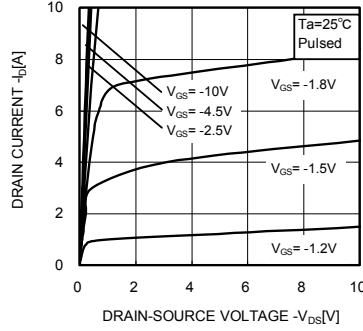


Fig.2 Typical Output Characteristics (II)

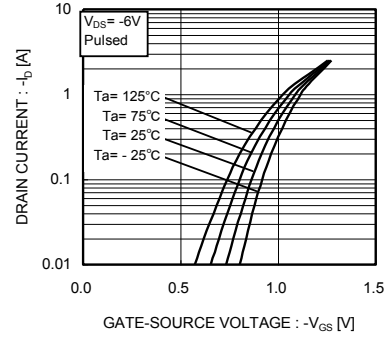


Fig.3 Typical Transfer Characteristics

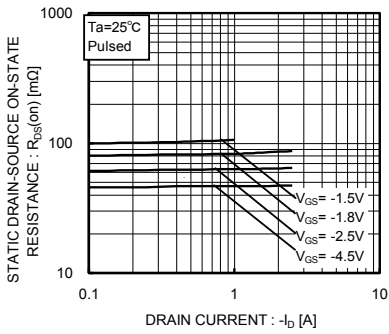


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current (I)

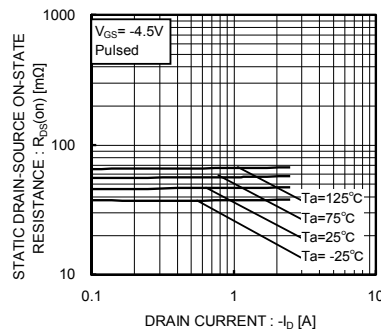


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current (II)

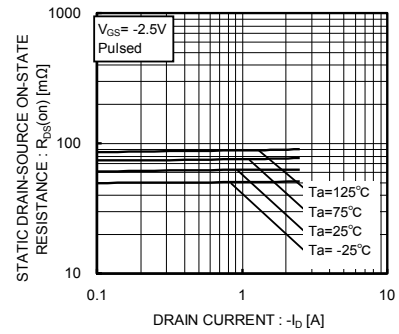


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current (III)

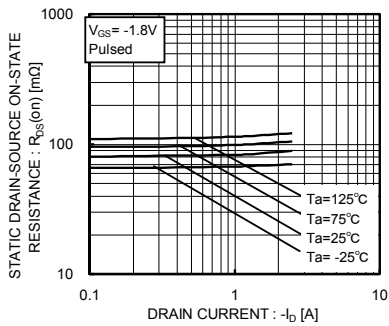


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current (IV)

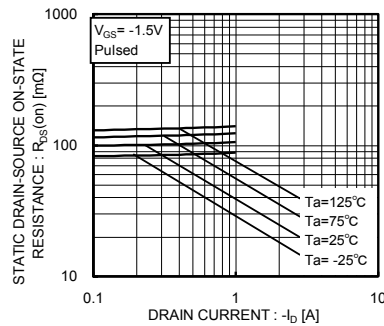


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current (V)

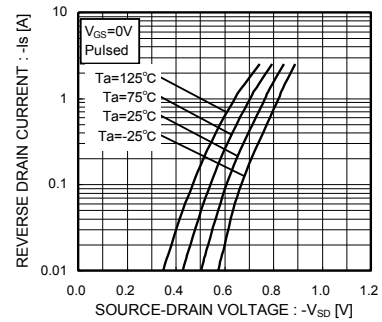


Fig.9 Reverse Drain Current vs. Source-Drain Voltage

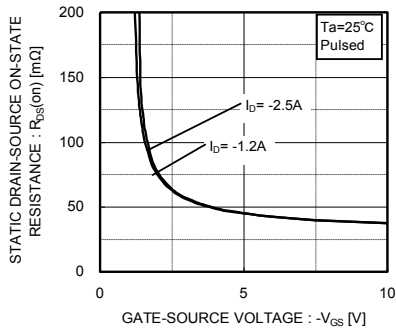


Fig.10 Static Drain-Source On-State Resistance vs. Gate Source Voltage

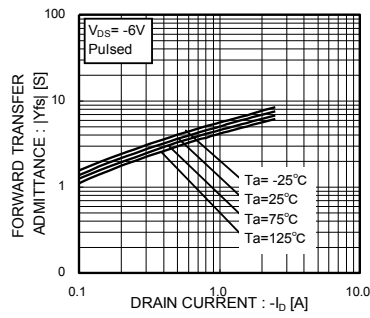


Fig.11 Forward Transfer Admittance vs. Drain Current

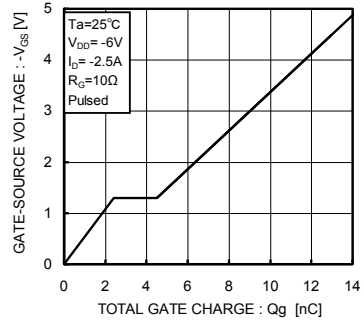


Fig.12 Dynamic Input Characteristics

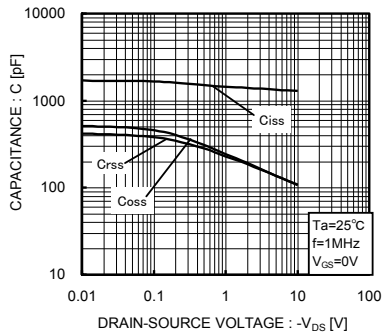


Fig.13 Typical Capacitance vs. Drain-Source Voltage

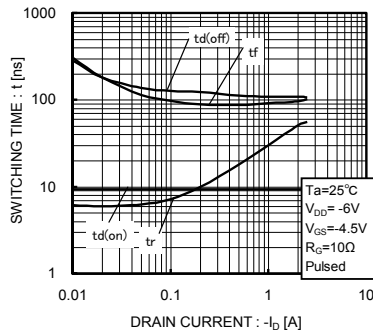
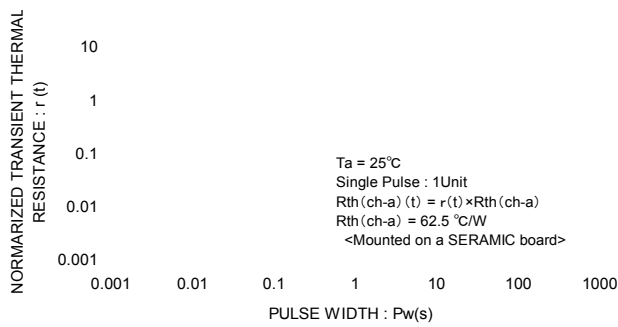


Fig.14 Switching Characteristics



<Tr.2>

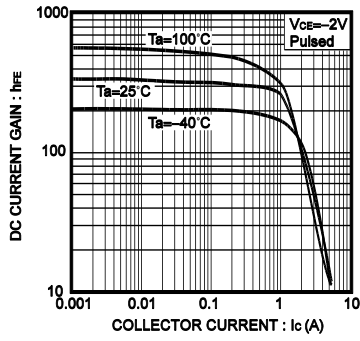


Fig.1 DV current gain vs. collector current

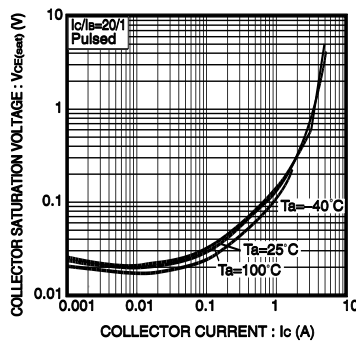


Fig.2 Collector-emitter saturation voltage vs. collector current

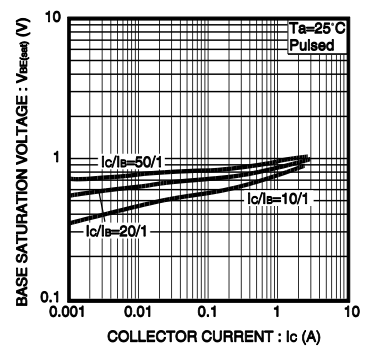


Fig.3 Base-emitter saturation voltage vs. collector current

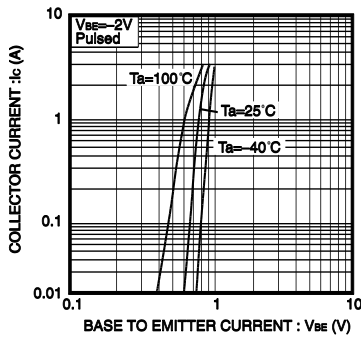


Fig.4 Grounded emitter propagation characteristics

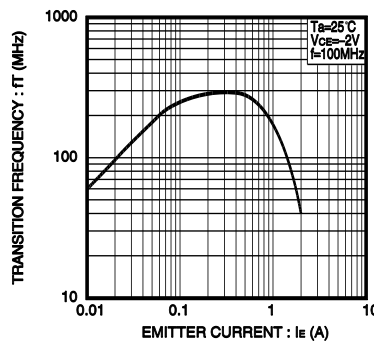


Fig.5 Gain bandwidth product vs. emitter current

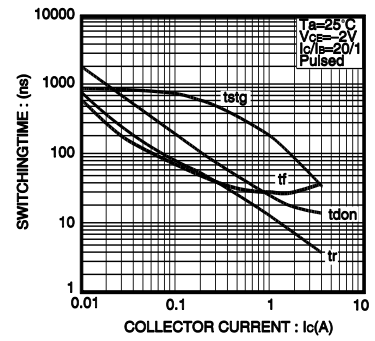


Fig.6 Switching time

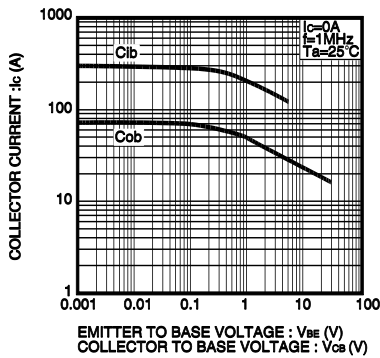


Fig.7 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

● Measurement circuits

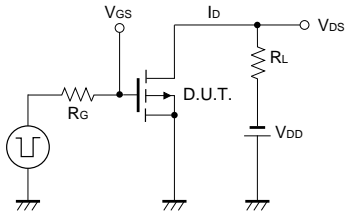


Fig.1-1 Switching Time Measurement Circuit

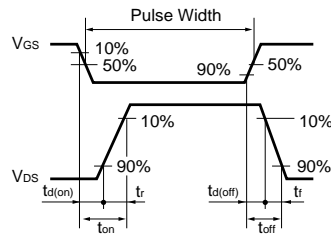


Fig.1-2 Switching Waveforms

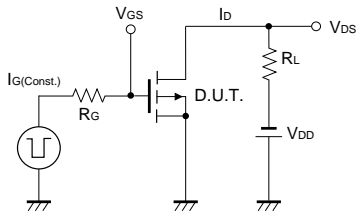


Fig.2-1 Gate Charge Measurement Circuit

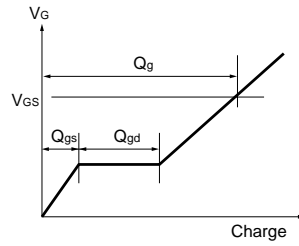


Fig.2-2 Gate Charge Waveform

● Notice

This product might cause chip aging and breakdown under the large electrified environment. Please consider to design ESD protection circuit.

Notes

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