DC-DC Converter (−20V, −4.0A)

RTQ040P02

●**Features**

1) Low on-resistance. (110mΩ at 2.5V)
2) High power package.
3) High speed switching.
4) Low voltage drive. (2.5V)

●**Applications**

DC-DC converter
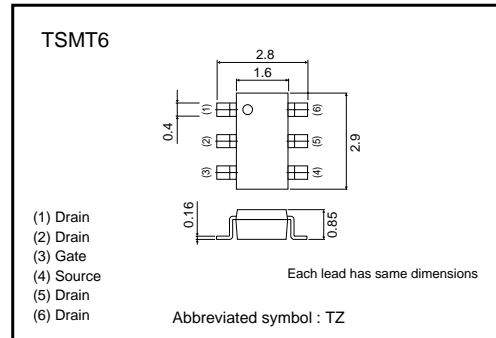
●**External dimensions** (Unit : mm)

TSMT6

2.8
1.6
0.4
2.9
0.16
0.85

(1) Drain
(2) Drain
(3) Gate
(4) Source
(5) Drain
(6) Drain

Each lead has same dimensions

Abbreviated symbol : TZ

●**Structure**

Silicon P-channel
MOS FET

●**Packaging specifications**

Type	Package		Taping
	Code		TR
	Basic ordering unit (pieces)		3000
RTQ040P02			◯

●**Equivalent circuit**

(6) (5) (4)

*2

*1

(1) (2) (3)

(1) Drain
(2) Drain
(3) Gate
(4) Source
(5) Drain
(6) Drain

*1 ESD PROTECTION DIODE
*2 BODY DIODE

Transistors

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

Parameter		Symbol	Limits	Unit	
Drain-source voltage		V_{DSS}	−20	V	
Gate-source voltage		V_{GSS}	±12	V	
Drain current	Continuous	I_D	±4.0	A	
	Pulsed	I_{DP}	±16	A	*1
Source current (Body diode)	Continuous	I_S	−1	A	*1
	Pulsed	I_{SP}	−16	A	
Total power dissipation		P_D	1.25	W	*2
Channel temperature		Tch	150	°C	
Range of Storage temperature		Tstg	−55 to +150	°C	

*1 Pw≤10μs, Duty cycle≤1%
*2 Mounted on a ceramic board

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Gate-source leakage	I_{GSS}	–	–	±10	μA	V_{GS}=±12V, V_{DS}=0V	
Drain-source breakdown voltage	$V_{(BR)DSS}$	−20	–	–	V	I_D= −1mA, V_{GS}=0V	
Zero gate voltage drain current	I_{DSS}	–	–	−1	μA	V_{DS}= −20V, V_{GS}=0V	
Gate threshold voltage	$V_{GS(th)}$	−0.7	–	−2.0	V	V_{DS}= −10V, I_D= −1mA	
Static drain-source on-state resistance	$R_{DS(on)}$	–	35	50	mΩ	I_D= −4A, V_{GS}= −4.5V	*
		–	40	55	mΩ	I_D= −4A, V_{GS}= −4V	*
		–	60	85	mΩ	I_D= −2.0A, V_{GS}= −2.5V	*
Forward transfer admittance	$|Y_{fs}|$	3.5	–	–	S	V_{DS}= −10V, I_D= −2.0A	*
Input capacitance	C_{iss}	–	1350	–	pF	V_{DS}= −10V	
Output capacitance	C_{oss}	–	210	–	pF	V_{GS}=0V	
Reverse transfer capacitance	C_{rss}	–	150	–	pF	f=1MHz	
Turn-on delay time	$t_{d(on)}$	–	15	–	ns	I_D= −2.0A	*
Rise time	t_r	–	35	–	ns	V_{DD}≒ −15V	*
Turn-off delay time	$t_{d(off)}$	–	60	–	ns	V_{GS}= −4.5V R_L=7.5Ω	*
Fall time	t_f	–	30	–	ns	R_{GS}=10Ω	*
Total gate charge	Q_g	–	12.2	–	nC	V_{DD}≒ −15V R_L≒3.75Ω	
Gate-source charge	Q_{gs}	–	2.6	–	nC	V_{GS}= −4.5V R_{GS}=10Ω	
Gate-drain charge	Q_{gd}	–	3.4	–	nC	I_D= −4.0A	

*Pulsed

Body diode charactersitics (source-drain characteristics)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward voltage	VSD	–	–	−1.2	V	I_S= −1A, V_{GS}=0V

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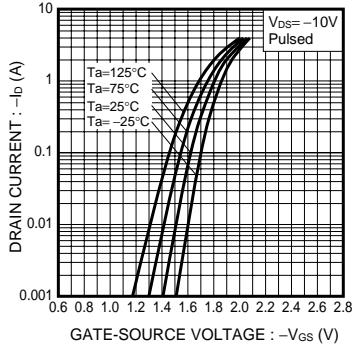● **Electrical characteristic curves**

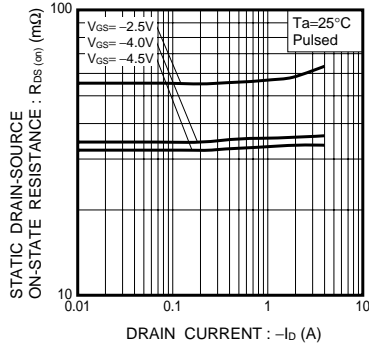

Fig.1 Typical Transfer Characteristics

Fig.2 Static Drain-Source On-State
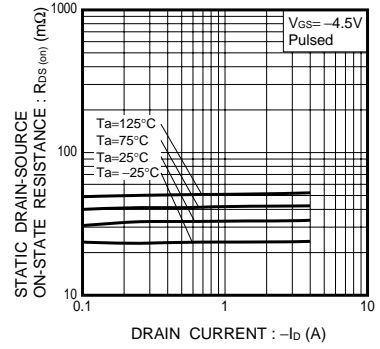Resistance vs. Drain Current

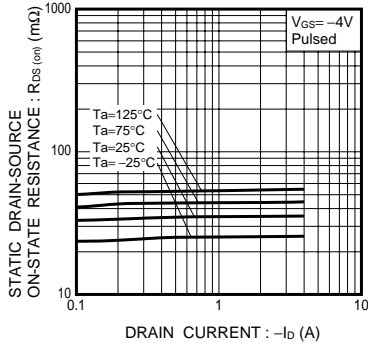Fig.3 Static Drain-Source On-State
Resistance vs. Drain Current

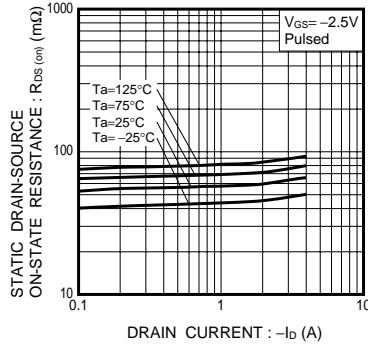Fig.4 Static Drain-Source On-State
Resistance vs. Drain Current

Fig.5 Static Drain-Source On-State
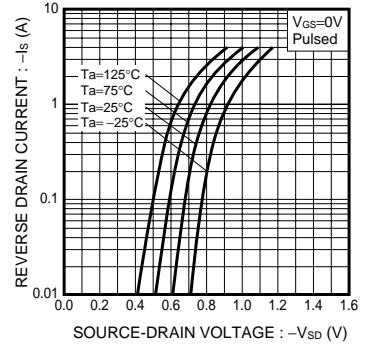Resistance vs. Drain Current
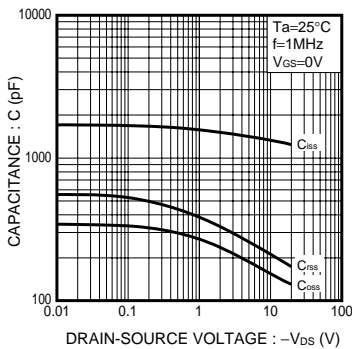
Fig.6 Reverse Drain Current vs.
Source-Drain Voltage

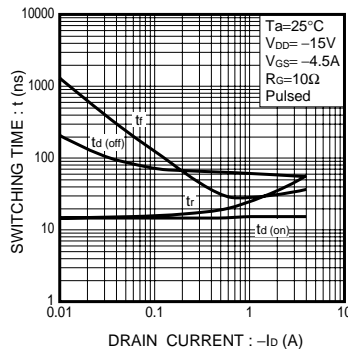Fig.7 Typical Capacitance
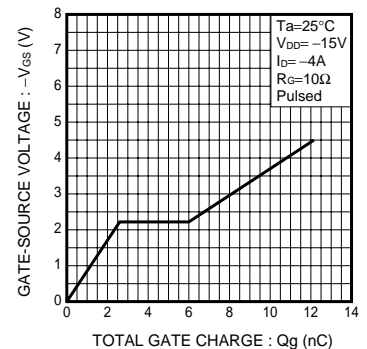vs. Drain-Source Voltage

Fig.8 Switching Characteristics

Fig.9 Dynamic Input Characteristics

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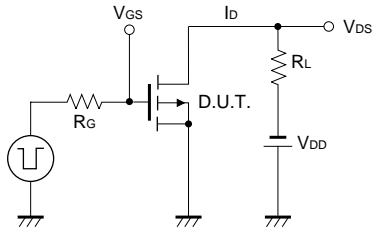
● **Measurement circuits**

Fig.10 Switching Time Measurement Circuit
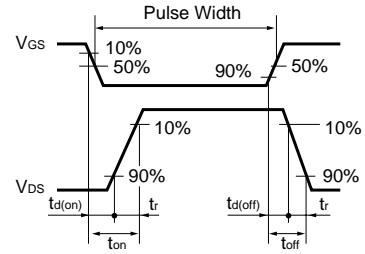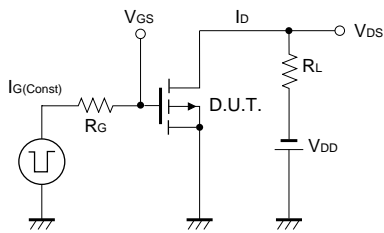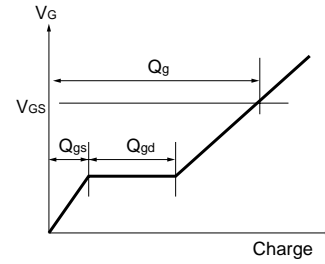

Fig.11 Switching Waveforms

Fig.12 Gate Charge Measurement Circuit

Fig.13 Gate Charge Waveforms

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