DC-DC Converter (–20V, –4.0A)

RTQ040P02

●Features

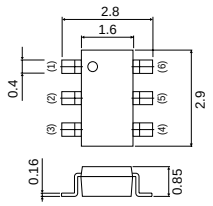
1) Low on-resistance. (110mΩ at 2.5V)
2) High power package.
3) High speed switching.
4) Low voltage drive. (2.5V)

●Applications

DC-DC converter

●External dimensions (Unit : mm)

TSMT6



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

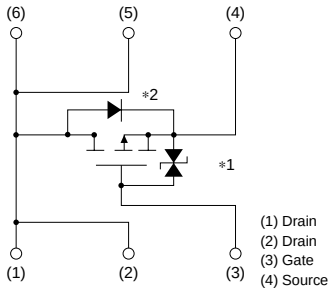
Each lead has same dimensions

Abbreviated symbol : TZ

●Structure

Silicon P-channel
MOS FET

●Equivalent circuit



∗1 ESD PROTECTION DIODE
∗2 BODY DIODE

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

●Packaging specifications

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

●**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 characteristics (source-drain characteristics)

Forward voltage	VSD	−	−	−1.2	V	I_S= −1A, V_{GS}=0V

●**Electrical characteristic curves**

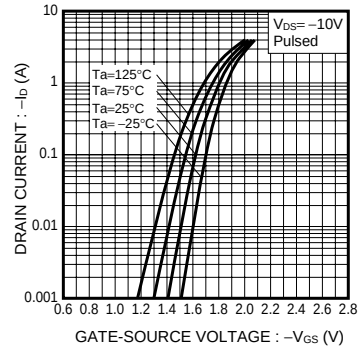


Fig.1 Typical Transfer Characteristics

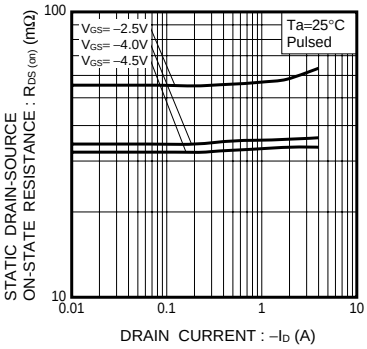


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current

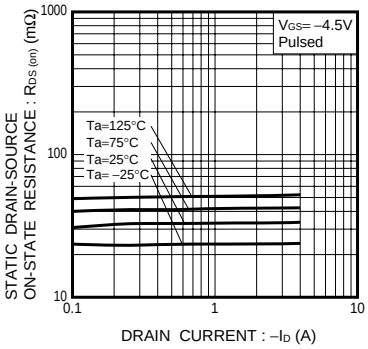


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

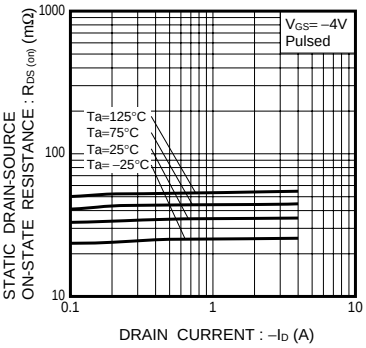


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

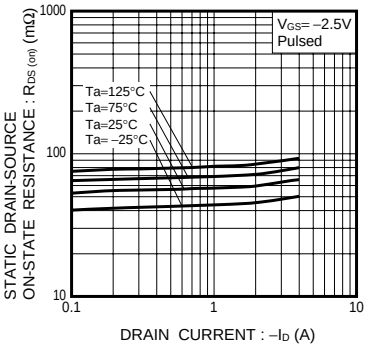


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

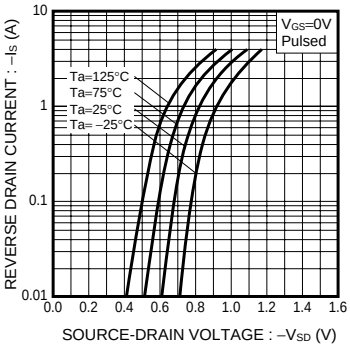


Fig.6 Reverse Drain Current vs. Source-Drain Voltage

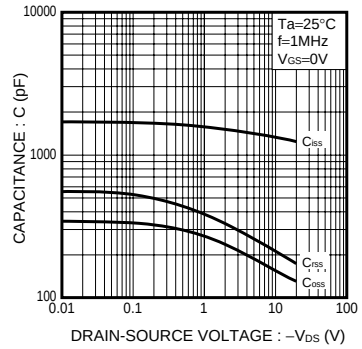


Fig.7 Typical Capacitance vs. Drain-Source Voltage

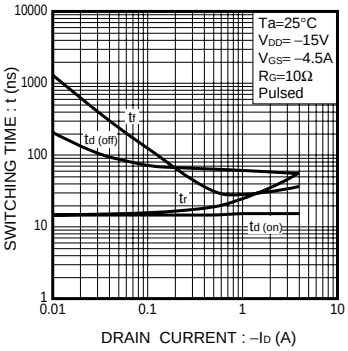


Fig.8 Switching Characteristics

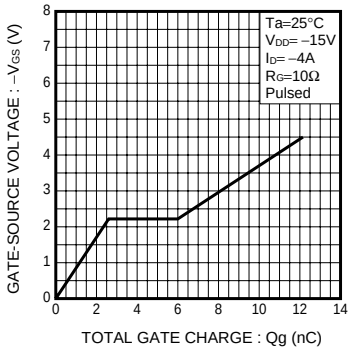


Fig.9 Dynamic Input Characteristics

●**Measurement circuits**

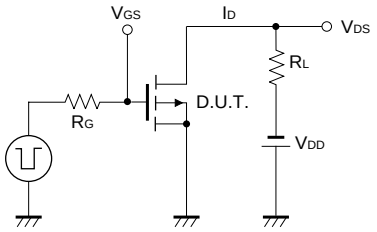


Fig.10 Switching Time Measurement Circuit

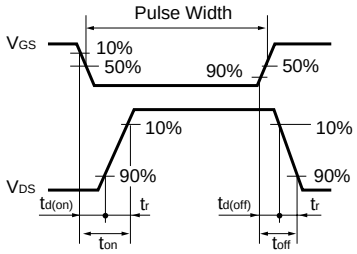


Fig.11 Switching Waveforms

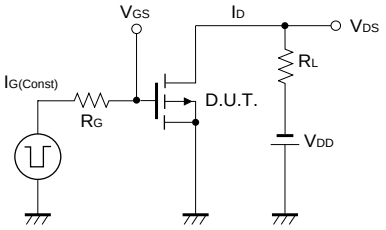


Fig.12 Gate Charge Measurement Circuit

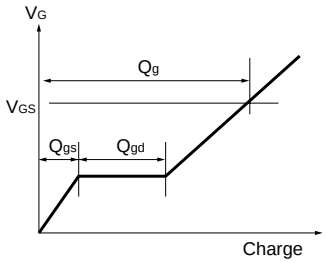


Fig.13 Gate Charge Waveforms

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