

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

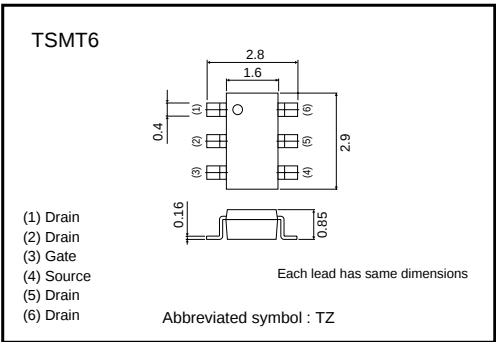
●Structure

Silicon P-channel
MOS FET

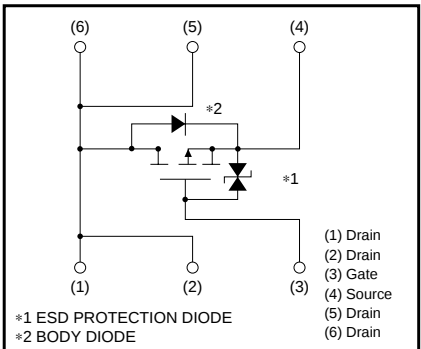
●Packaging specifications

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

●External dimensions (Unit : mm)



●Equivalent circuit



Transistors

●Absolute maximum ratings (Ta=25°C)

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

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

*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	$V_{GS} = \pm 12V$, $V_{DS} = 0V$
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	m Ω	$I_D = -4A$, $V_{GS} = -4.5V$ *
		-	40	55	m Ω	$I_D = -4A$, $V_{GS} = -4V$ *
		-	60	85	m Ω	$I_D = -2.0A$, $V_{GS} = -2.5V$ *
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	$V_{DD} \doteq -15V$ *
Turn-off delay time	$t_d(off)$	-	60	-	ns	$V_{GS} = -4.5V$ *
Fall time	t_f	-	30	-	ns	$R_L = 7.5\Omega$ *
Total gate charge	Q_g	-	12.2	-	nC	$V_{DD} \doteq -15V$ $R_L \doteq 3.75\Omega$
Gate-source charge	Q_{gs}	-	2.6	-	nC	$V_{GS} = -4.5V$ $R_{GS} = 10\Omega$
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	$I_S = -1A$, $V_{GS} = 0V$
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Transistors

●Electrical characteristic curves

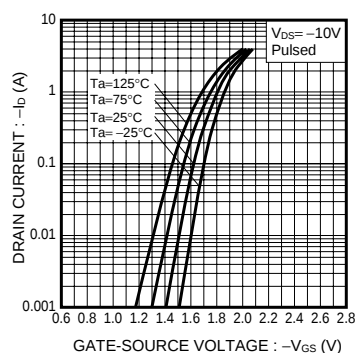


Fig.1 Typical Transfer Characteristics

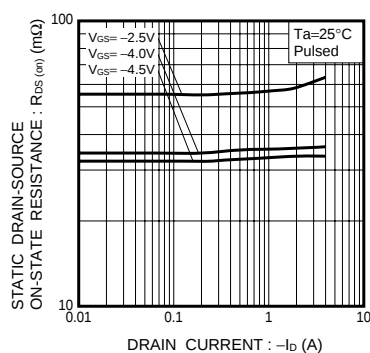


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current

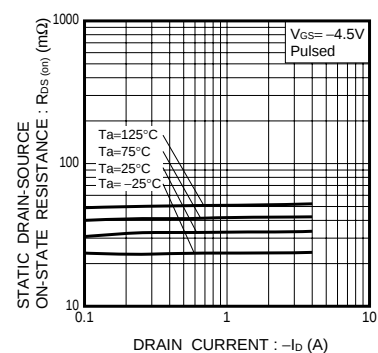


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

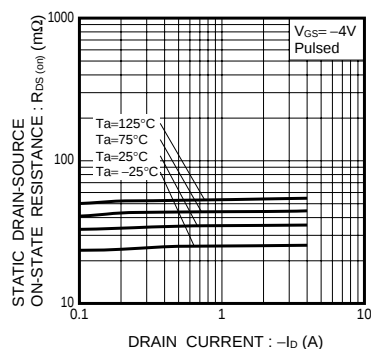


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

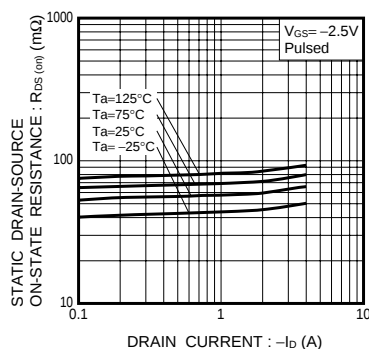


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

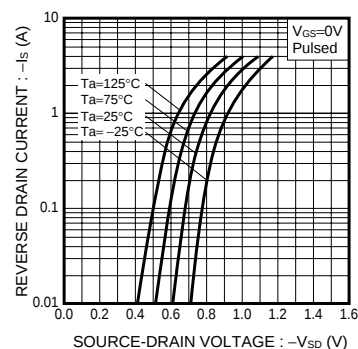


Fig.6 Reverse Drain Current vs. Source-Drain Voltage

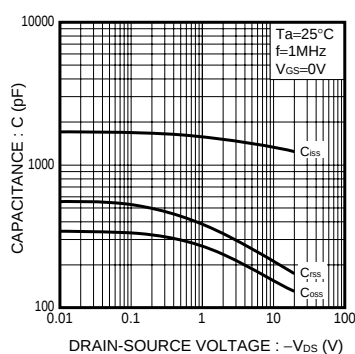


Fig.7 Typical Capacitance vs. Drain-Source Voltage

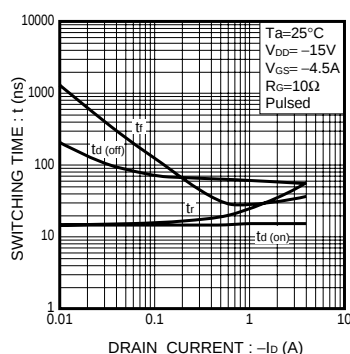


Fig.8 Switching Characteristics

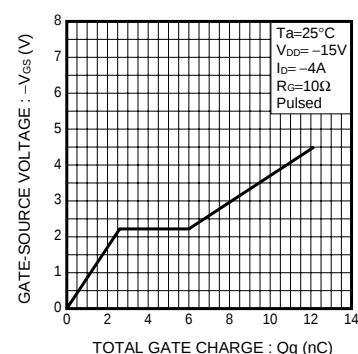


Fig.9 Dynamic Input Characteristics

Transistors

●Measurement circuits

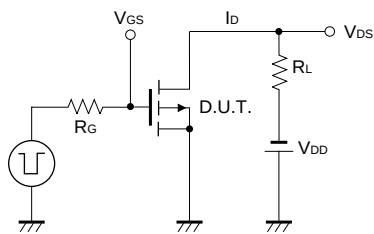


Fig.10 Switching Time Measurement Circuit

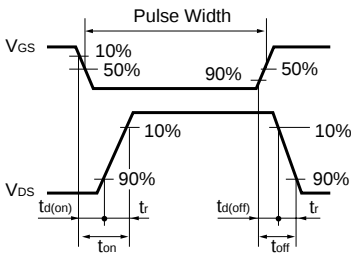


Fig.11 Switching Waveforms

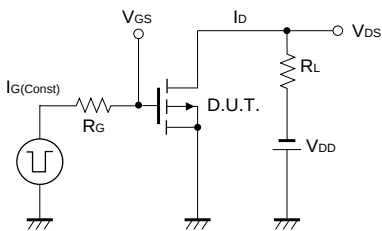


Fig.12 Gate Charge Measurement Circuit

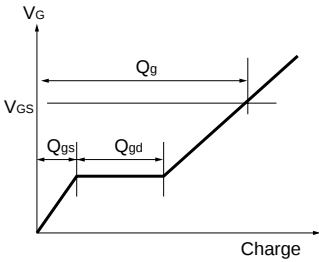


Fig.13 Gate Charge Waveforms

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