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4V Drive Nch MOSFET

RSD050N10

● **Structure**

Silicon N-channel MOSFET

● **Features**

1) Low on-resistance.
2) Fast switching speed.
3) Drive circuits can be simple.
3) Parallel use is easy.

● **Applications**

Switching

● **Dimensions** (Unit : mm)

CPT3
(SC-63)
<SOT-428>

● **Packaging specifications**

Type	Package	CPT3
	Code	TL
	Basic ordering unit (pieces)	2500

● **Inner circuit**

(1) Gate
(2) Drain
(3) Source

*1 ESD Protection Diode
*2 Body Diode

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

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	100	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	Continuous	I_D	±5.0	A
	Pulsed	I_{DP} *1	±20	A
Source current (Body Diode)	Continuous	I_S	5.0	A
	Pulsed	I_{SP} *1	20	A
Power dissipation		P_D *2	15	W
Channel temperature		T_{ch}	150	°C
Range of storage temperature		T_{stg}	−55 to +150	°C

*1 Pw≦10μs, Duty cycle≦1%

*2 T_c=25°C

● **Thermal resistance**

Parameter	Symbol	Limits	Unit
Channel to Case	$R_{th(ch-c)}$ *	8.33	°C / W

* T_c=25°C
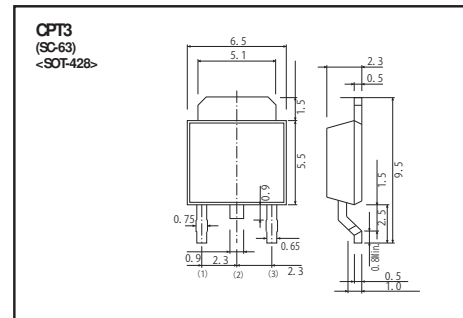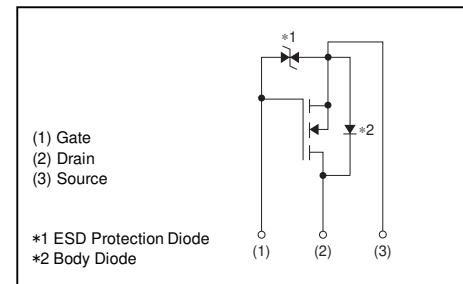
●**Electrical characteristics** (T$_a$=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I$_{GSS}$	-	-	±10	μA	V$_{GS}$=±20V, V$_{DS}$=0V
Drain-source breakdown voltage	V$_{(BR)DSS}$	100	-	-	V	I$_D$=1mA, V$_{GS}$=0V
Zero gate voltage drain current	I$_{DSS}$	-	-	10	μA	V$_{DS}$=100V, V$_{GS}$=0V
Gate threshold voltage	V$_{GS (th)}$	1.0	-	2.5	V	V$_{DS}$=10V, I$_D$=1mA
Static drain-source on-state resistance	R$_{DS (on)}$ *	-	135	190	mΩ	I$_D$=5.0A, V$_{GS}$=10V
		-	142	200		I$_D$=5.0A, V$_{GS}$=4.5V
		-	145	205		I$_D$=5.0A, V$_{GS}$=4.0V
Forward transfer admittance	I Y$_{fs}$ I*	2.5	-	-	S	I$_D$=5.0A, V$_{DS}$=10V
Input capacitance	C$_{iss}$	-	530	-	pF	V$_{DS}$=25V
Output capacitance	C$_{oss}$	-	50	-	pF	V$_{GS}$=0V
Reverse transfer capacitance	C$_{rss}$	-	30	-	pF	f=1MHz
Turn-on delay time	t$_{d(on)}$*	-	10	-	ns	I$_D$=2.5A, V$_{DD}$≒ 50V
Rise time	t$_r$ *	-	15	-	ns	V$_{GS}$=10V
Turn-off delay time	t$_{d(off)}$*	-	45	-	ns	R$_L$=20Ω
Fall time	t$_f$ *	-	15	-	ns	R$_G$=10Ω
Total gate charge	Q$_g$ *	-	14	-	nC	V$_{DD}$≒ 50V
Gate-source charge	Q$_{gs}$ *	-	1.7	-	nC	I$_D$=5.0A,
Gate-drain charge	Q$_{gd}$ *	-	3.0	-	nC	V$_{GS}$=10V

*Pulsed

●**Body diode characteristics** (Source-Drain) (T$_a$=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward Voltage	V$_{SD}$ *	-	-	1.2	V	I$_s$=5.0A, V$_{GS}$=0V

*Pulsed

●**Electrical characteristic curves** (T_a=25°C)

Fig.1 Typical Output Characteristics (Ⅰ)
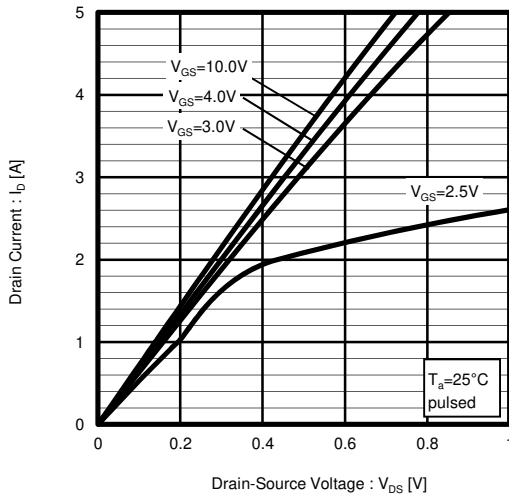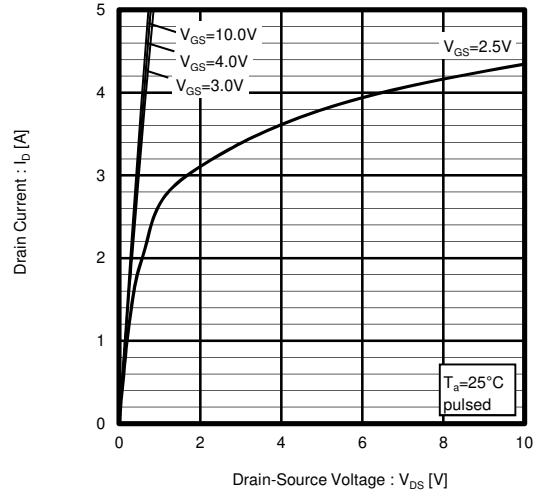
V_{GS}=10.0V
V_{GS}=4.0V
V_{GS}=3.0V
V_{GS}=2.5V
T_a=25°C pulsed

Drain Current : I_D [A]
Drain-Source Voltage : V_{DS} [V]

Fig.2 Typical Output Characteristics (Ⅱ)

V_{GS}=10.0V
V_{GS}=4.0V
V_{GS}=3.0V
V_{GS}=2.5V
T_a=25°C pulsed

Drain Current : I_D [A]
Drain-Source Voltage : V_{DS} [V]

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

T_a=25°C pulsed
V_{GS}=4.0V
V_{GS}=4.5V
V_{GS}=10V

Static Drain-Source On-State Resistance $R_{DS(on)}$ [mΩ]
Drain Current : I_D [A]

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

V_{GS}=10V pulsed
T_a=125°C
T_a=75°C
T_a=25°C
T_a=-25°C

Static Drain-Source On-State Resistance $R_{DS(on)}$ [mΩ]
Drain Current : I_D [A]

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

V_{GS}=4.5V pulsed
T_a=125°C
T_a=75°C
T_a=25°C
T_a=-25°C
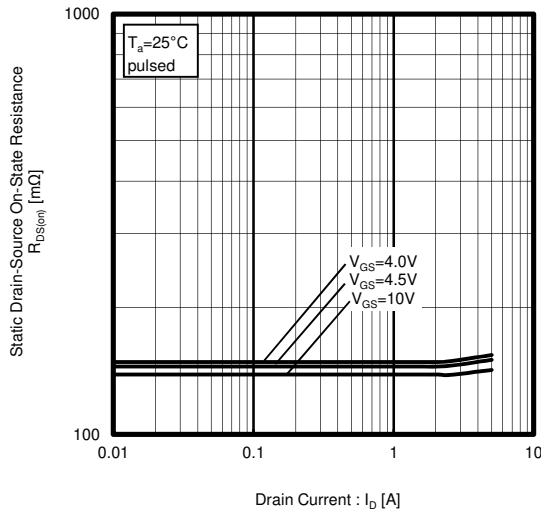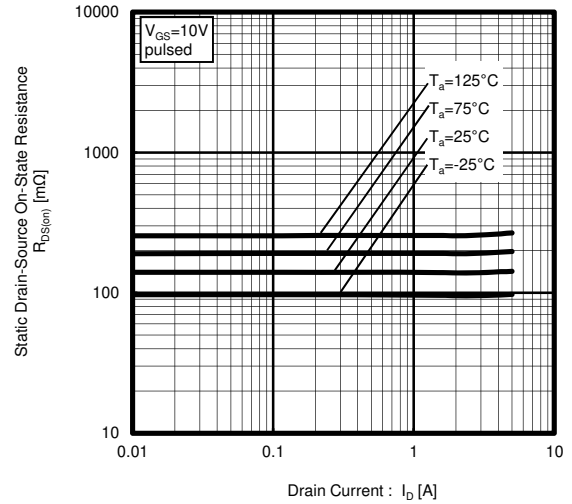
Static Drain-Source On-State Resistance $R_{DS(on)}$ [mΩ]
Drain Current : I_D [A]
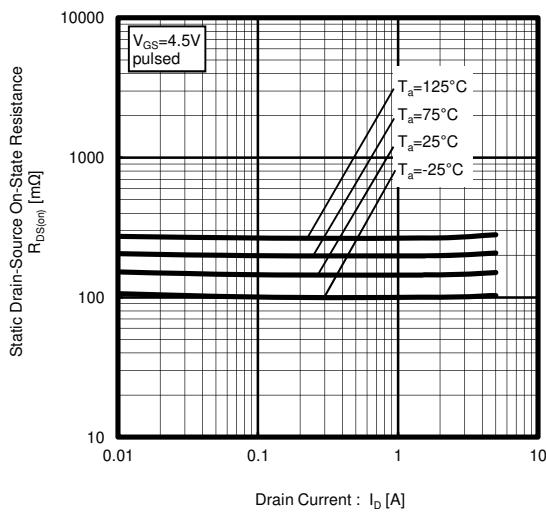
Fig.6 Static Drain-Source On-State Resistance vs. Drain Current

V_{GS}=4V pulsed
T_a=125°C
T_a=75°C
T_a=25°C
T_a=-25°C

Static Drain-Source On-State Resistance $R_{DS(on)}$ [mΩ]
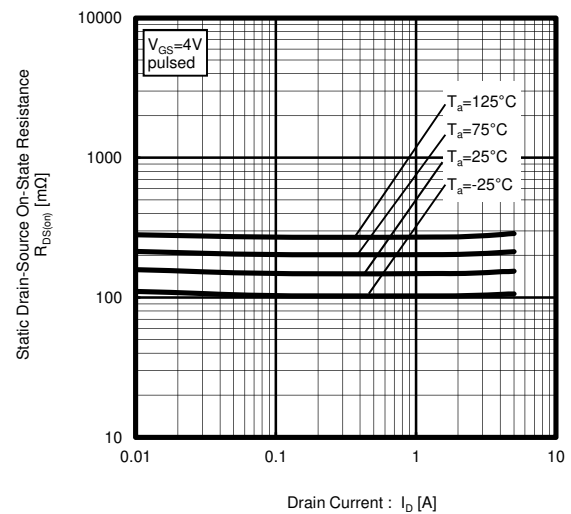Drain Current : I_D [A]

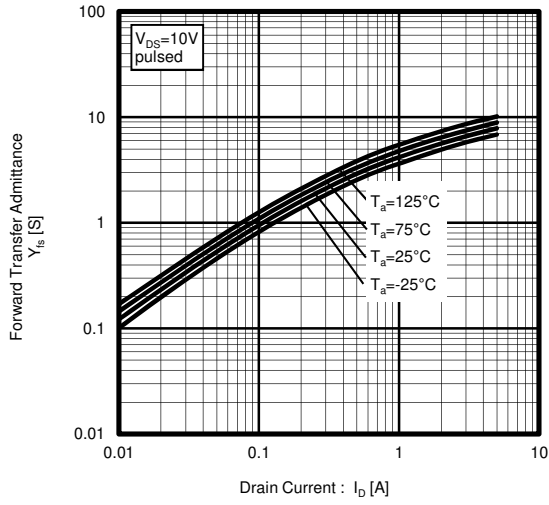Fig.7 Forward Transfer Admittance vs. Drain Current

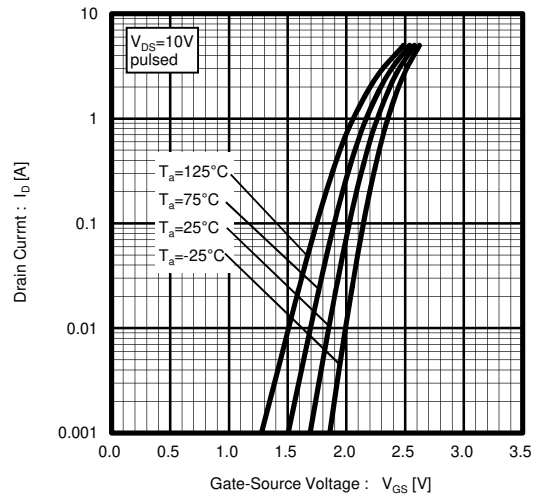
Fig.8 Typical Transfer Characteristics

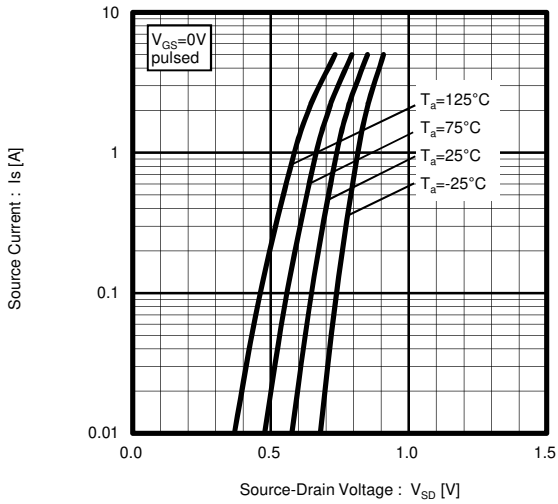Fig.9 Source Current vs. Source-Drain Voltage

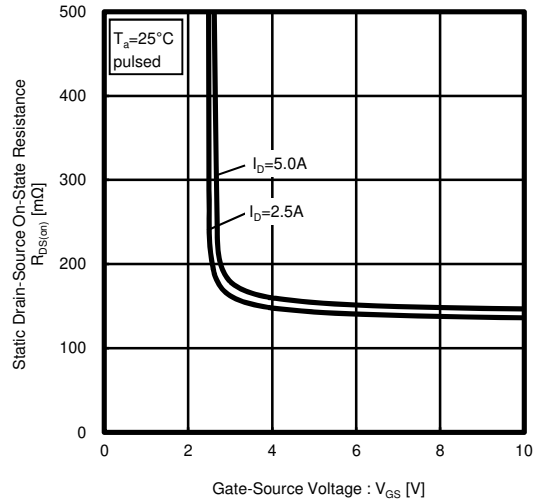Fig.10 Static Drain-Source On-State Resistance vs. Gate-Source Voltage
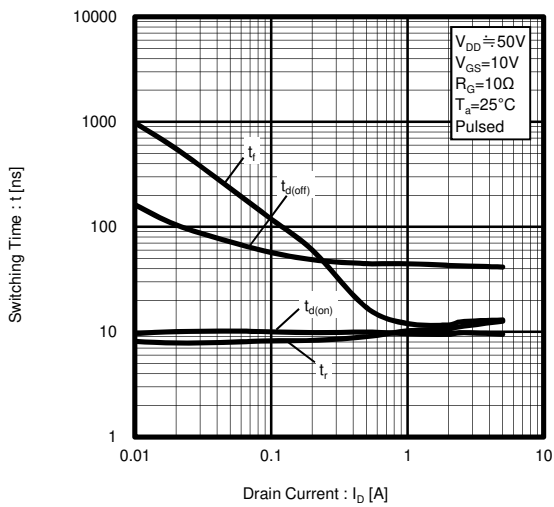

Fig.11 Switching Characteristics

Fig.12 Dynamic Input Characteristics
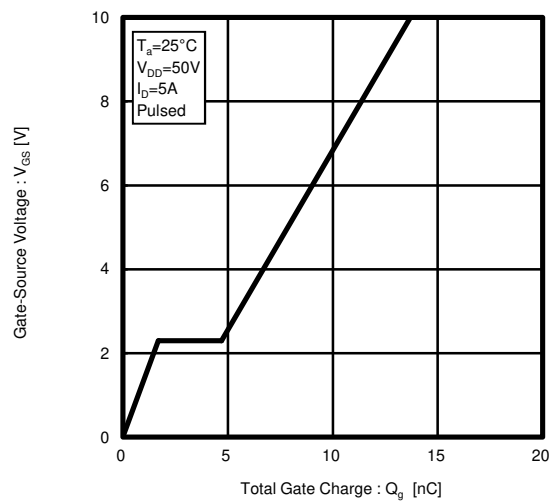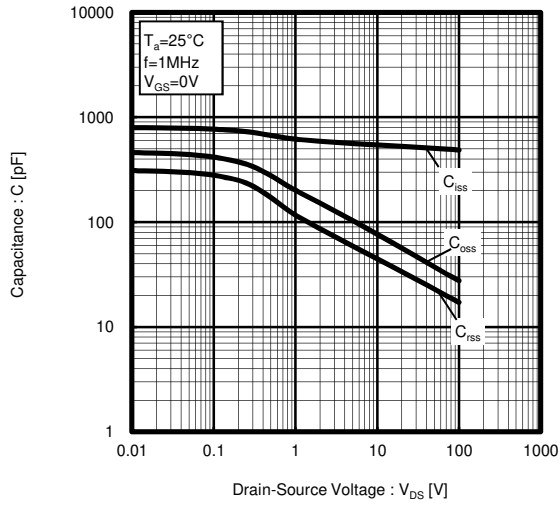
Fig.13 Typical Capacitance vs. Drain-Source Voltage

$T_a=25°C$
$f=1MHz$
$V_{GS}=0V$

Capacitance : C [pF]

C_{iss}

C_{oss}

C_{rss}

Drain-Source Voltage : V_{DS} [V]

Fig.14 Maximum Safe Operating Area

Operation in this area
is limited by $R_{DS(on)}$ (V_{GS} = 10V)

Drain Current : I_D [A]

P_W = 100μs

P_W = 1ms

P_W = 10ms

$T_a=25°C$
Single Pulse
Mounted on a ceramic board.
(30mm × 30mm × 0.8mm)

DC
Operation

Drain-Source Voltage : V_{DS} [V]
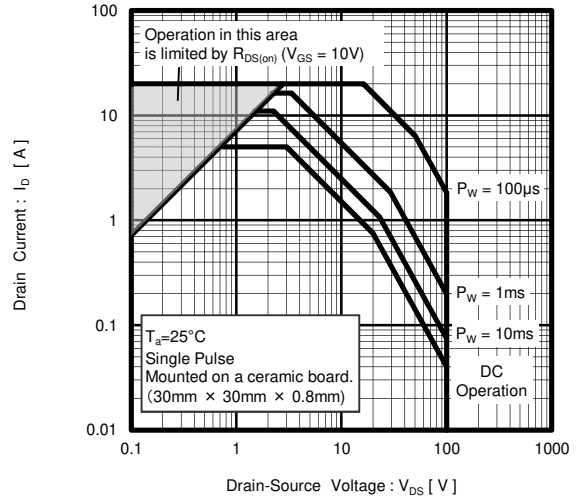
Fig.15 Normalized Transient Thermal Resistance v.s. Pulse Width

Normalized Transient Thermal Resistance : r (t)

$T_c=25°C$
Single Pulse

$Rth_{(ch-a)}=8.33°C/W$
$Rth_{(ch-a)}(t)=r(t) × Rth_{(ch-a)}$

Pulse width : Pw (s)
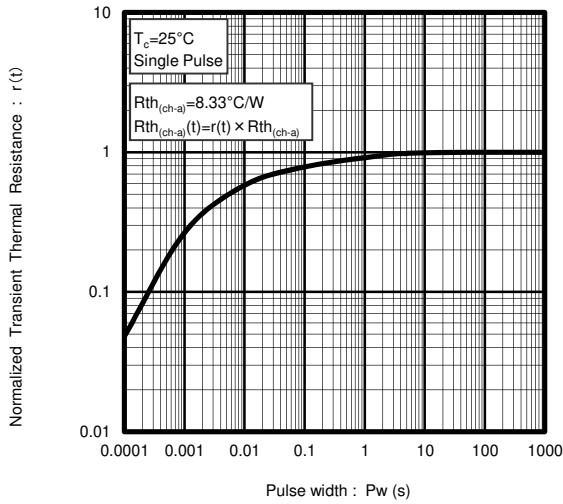
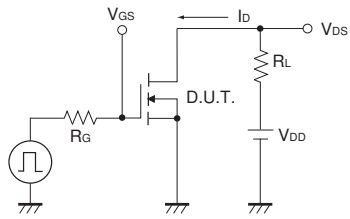●**Measurement circuits**

Fig.1-1 Switching time measurement circuit
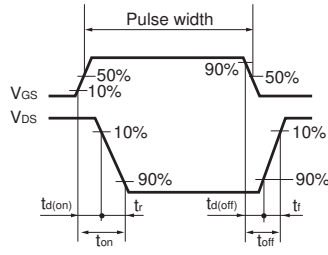
Fig.1-2 Switching waveforms
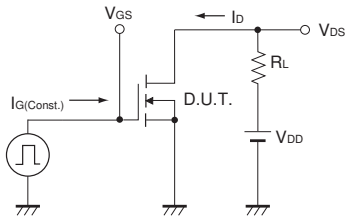
Fig.2-1 Gate charge measurement circuit

Fig.2-2 Gate Charge Waveform

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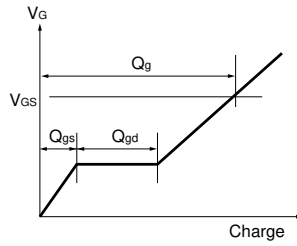## N o t e s

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