SCT2750NY

N-channel SiC power MOSFET

Datasheet

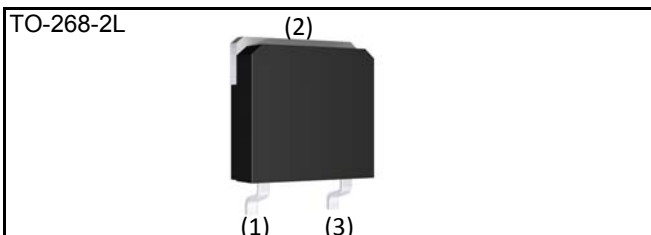|	
V_{DSS}	1700V
$R_{DS(on)}$ (Typ.)	750mΩ
I_D	6A
P_D	57W

● **Features**

1) Low on-resistance

2) Fast switching speed

3) Long creepage distance with no center lead

4) Simple to drive

5) Pb-free lead plating ; RoHS compliant

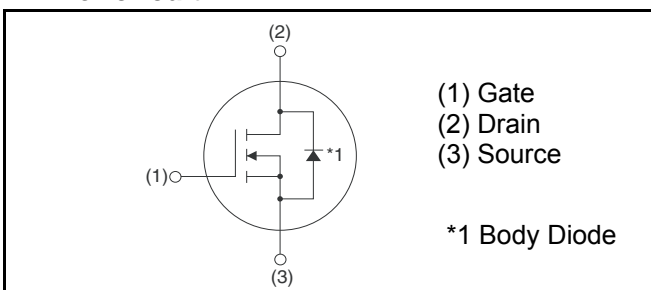● **Application**

・Auxilialy power supplies

・Switch mode power supplies

● **Outline**

TO-268-2L

(2)

(1)   (3)

● **Inner circuit**

(2)
(1)
(3)

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

*1 Body Diode

● **Packaging specifications**

Type	Packing	Embossed tape
	Reel size (mm)	330
	Tape width (mm)	24
	Basic ordering unit (pcs)	400
	Taping code	TB
	Marking	SCT2750NY

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

Parameter		Symbol	Value	Unit
Drain - Source voltage		V_{DSS}	1700	V
Continuous drain current	T_c = 25°C	I_D [*1]	5.9	A
	T_c = 100°C	I_D [*1]	4	A
Pulsed drain current		$I_{D,pulse}$ [*2]	14	A
Gate - Source voltage (DC)		V_{GSS}	−6 to 22	V
Gate - Source surge voltage (t_{surge}<300nsec)		V_{GSS_surge} [*3]	−10 to 26	V
Power dissipation (T_c = 25°C)		P_D	57	W
Junction temperature		T_j	175	°C
Range of storage temperature		T_{stg}	−55 to +175	°C

●**Thermal resistance**

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case	R_{thJC}	-	2.04	2.65	°C/W

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 1mA	1700	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS} = 1700V, V_{GS} = 0V T_j = 25°C	-	0.1	10	μA
		T_j = 150°C	-	0.2	-	
Gate - Source leakage current	I_{GSS+}	V_{GS} = +22V, V_{DS} = 0V	-	-	100	nA
Gate - Source leakage current	I_{GSS-}	V_{GS} = −6V, V_{DS} = 0V	-	-	-100	nA
Gate threshold voltage	$V_{GS (th)}$	V_{DS} = V_{GS}, I_D = 0.63mA	1.6	2.8	4.0	V

*1 Limited only by maximum temperature allowed.
*2 PW ≤ 10μs, Duty cycle ≤ 1%

*3 Example of acceptable Vgs waveform
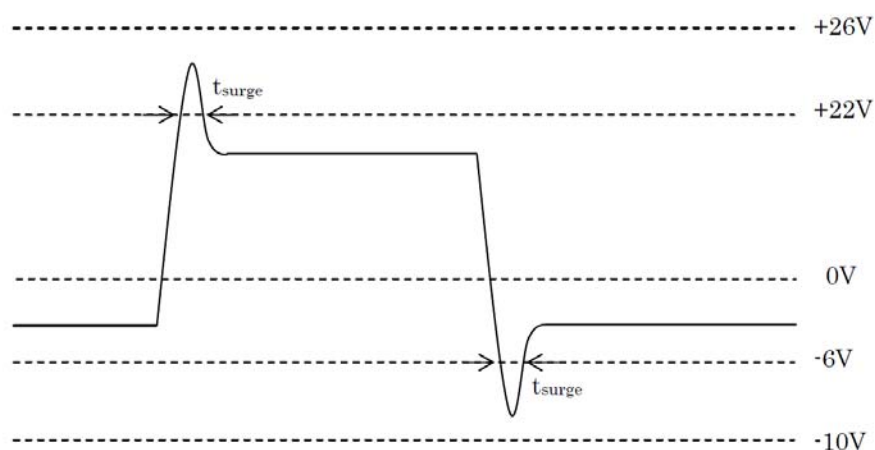
*4 Pulsed

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Static drain - source on - state resistance	$R_{DS(on)}$ [*4]	V_{GS} = 18V, I_D = 1.7A; T_j = 25°C	-	750	975	mΩ
		T_j = 125°C	-	1088	-	
Gate input resistance	R_G	f = 1MHz, open drain	-	49	-	Ω
Transconductance	g_{fs} [*4]	V_{DS} = 10V, I_D = 1.7A	-	0.6	-	S
Input capacitance	C_{iss}	V_{GS} = 0V	-	275	-	pF
Output capacitance	C_{oss}	V_{DS} = 800V	-	19	-	
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	7	-	
Effective output capacitance, energy related	$C_{o(er)}$	V_{GS} = 0V, V_{DS} = 0V to 800V	-	21	-	pF
Turn - on delay time	$t_{d(on)}$ [*4]	V_{DD} = 500V, I_D = 1.7A	-	19	-	ns
Rise time	t_r [*4]	V_{GS} = 18V/0V	-	24	-	
Turn - off delay time	$t_{d(off)}$ [*4]	R_L = 294Ω	-	41	-	
Fall time	t_f [*4]	R_G = 0Ω	-	63	-	
Turn - on switching loss	E_{on} [*4]	V_{DD} = 800V, I_D=1.7A, V_{GS} = 18V/0V	-	76	-	µJ
Turn - off switching loss	E_{off} [*4]	R_G = 0Ω, L=2mH *E_{on} includes diode reverse recovery	-	33	-	

●**Gate Charge characteristics** (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g [*4]	V_{DD} = 500V	-	17	-	nC
Gate - Source charge	Q_{gs} [*4]	I_D = 1.5A	-	5	-	
Gate - Drain charge	Q_{gd} [*4]	V_{GS} = 18V	-	6.5	-	
Gate plateau voltage	$V_{(plateau)}$	V_{DD} = 500V, I_D = 1.5A	-	11.0	-	V

SCT2750NY

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Inverse diode continuous, forward current	I_S [*1]	T_c = 25°C	-	-	5.9	A
Inverse diode direct current, pulsed	I_{SM} [*2]		-	-	14	A
Forward voltage	V_{SD} [*4]	V_{GS} = 0V, I_S = 1.7A	-	4.3	-	V
Reverse recovery time	t_{rr} [*4]	I_F = 1.7A, V_R = 800V di/dt = 290A/µs	-	26	-	ns
Reverse recovery charge	Q_{rr} [*4]		-	18	-	nC
Peak reverse recovery current	I_{rrm} [*4]		-	1.3	-	A

●**Typical Transient Thermal Characteristics**

Symbol	Value	Unit
R_{th1}	243m	
R_{th2}	1529m	K/W
R_{th3}	268m	

Symbol	Value	Unit
C_{th1}	352µ	
C_{th2}	1.57m	Ws/K
C_{th3}	68.7m	
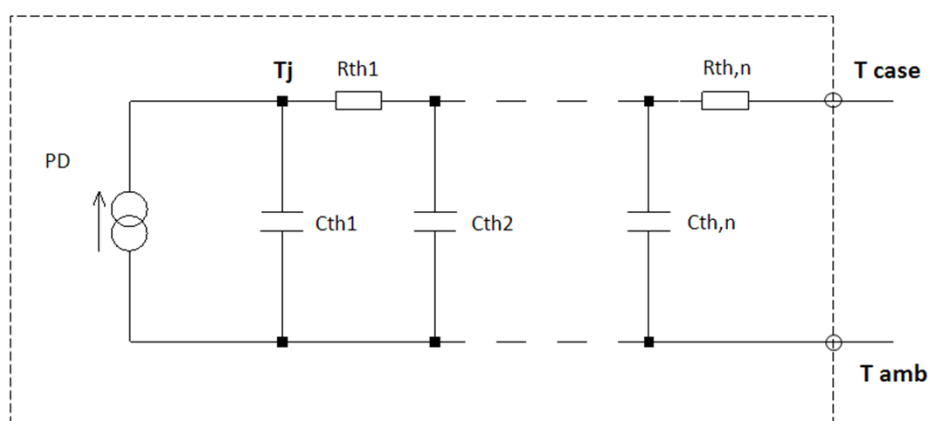
● **Electrical characteristic curves**

Fig.1 Power Dissipation Derating Curve

Power Dissipation : P_D [W]

Junction Temperature : T_j [°C]
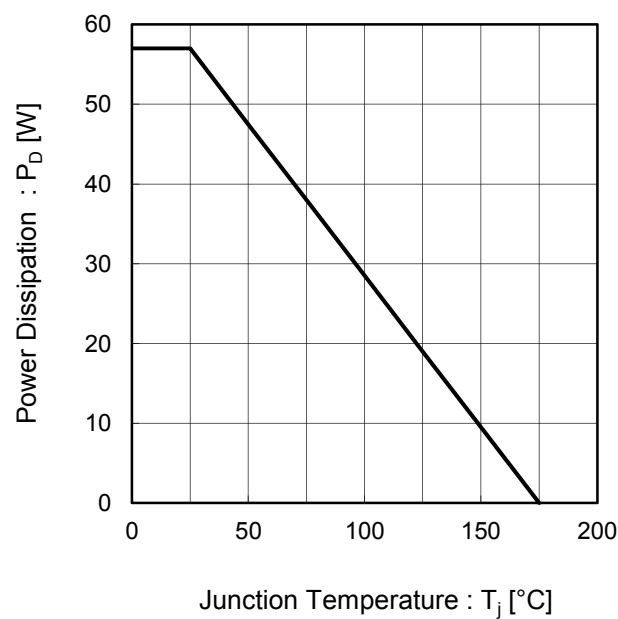
Fig.2 Maximum Safe Operating Area

Operation in this area is limited by $R_{DS(on)}$

P_W = 100μs
P_W = 1ms
P_W = 10ms
P_W = 100ms

T_a = 25°C
Single Pulse

Drain Current : I_D [A]

Drain - Source Voltage : V_{DS} [V]
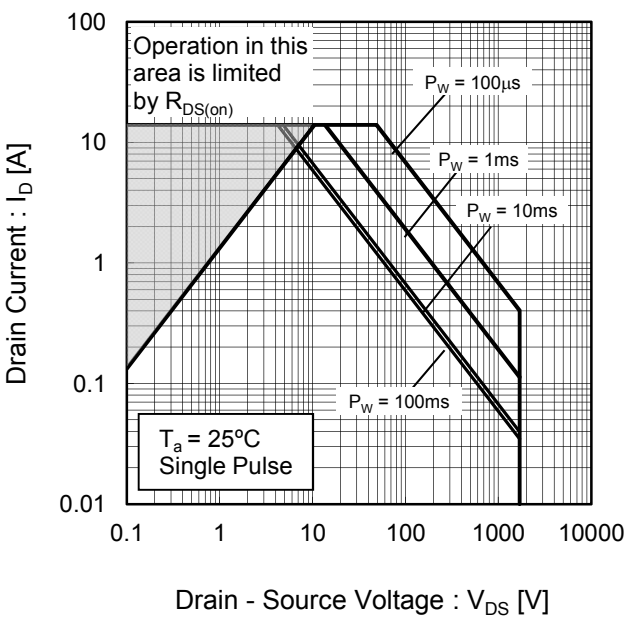
Fig.3 Typical Transient Thermal
Resistance vs. Pulse Width

T_a = 25°C
Single Pulse

Transient Thermal Resistance : R_{th} [K/W]

Pulse Width : P_W [s]
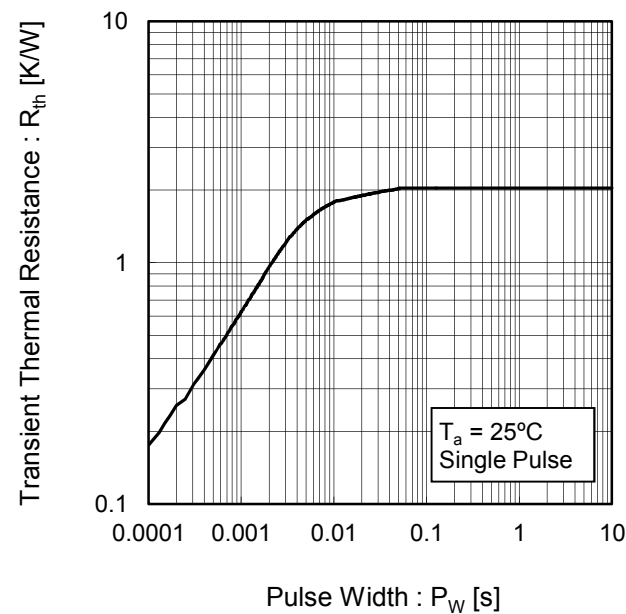
● **Electrical characteristic curves**

Fig.4 Typical Output Characteristics(I)
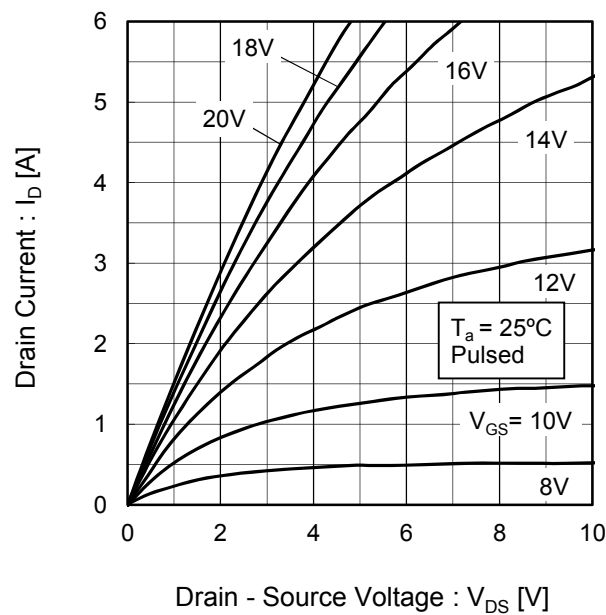
Fig.5 Typical Output Characteristics(II)
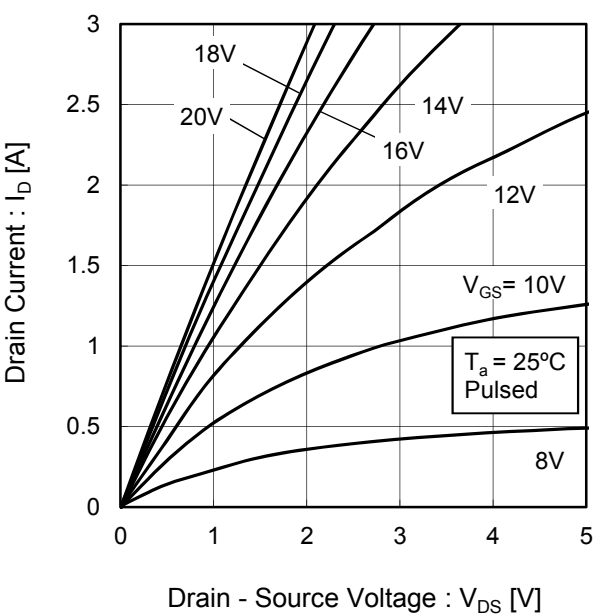
Fig.6 T_j = 150°C Typical Output Characteristics(I)
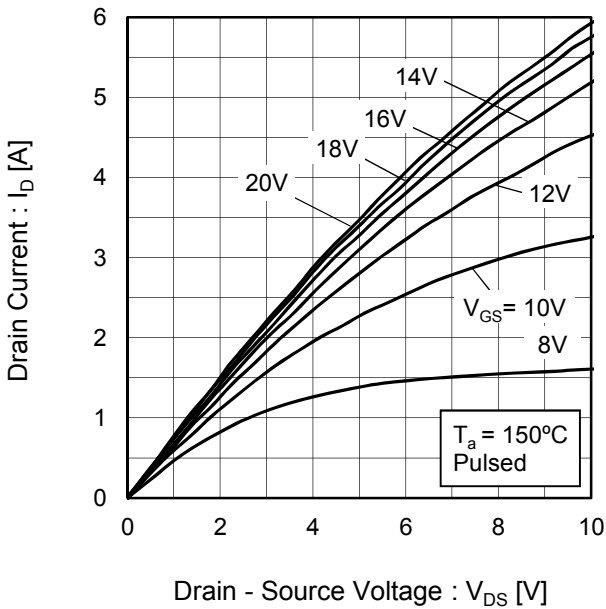
Fig.7 T_j = 150°C Typical Output Characteristics(II)
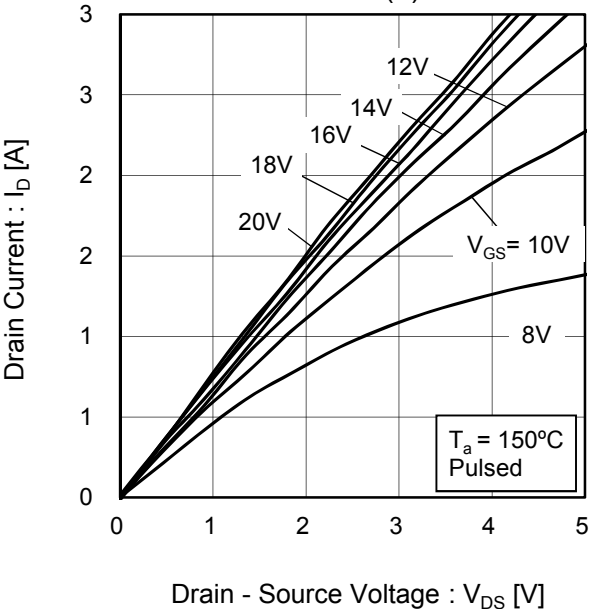
●**Electrical characteristic curves**
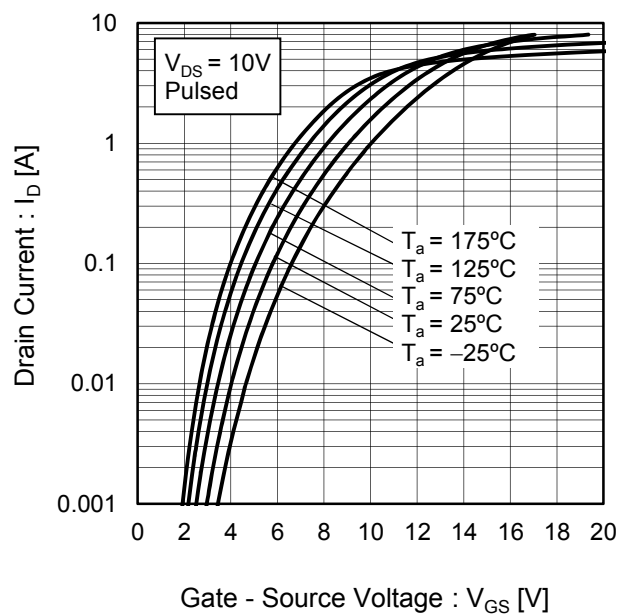
Fig.8 Typical Transfer Characteristics (I)

V_{DS} = 10V
Pulsed

T_a = 175ºC
T_a = 125ºC
T_a = 75ºC
T_a = 25ºC
T_a = −25ºC

Gate - Source Voltage : V_{GS} [V]

Drain Current : I_D [A]

Fig.9 Typical Transfer Characteristics (II)

V_{DS} = 10V
Pulsed

T_a = 175ºC
T_a = 125ºC
T_a = 75ºC
T_a = 25ºC
T_a = −25ºC

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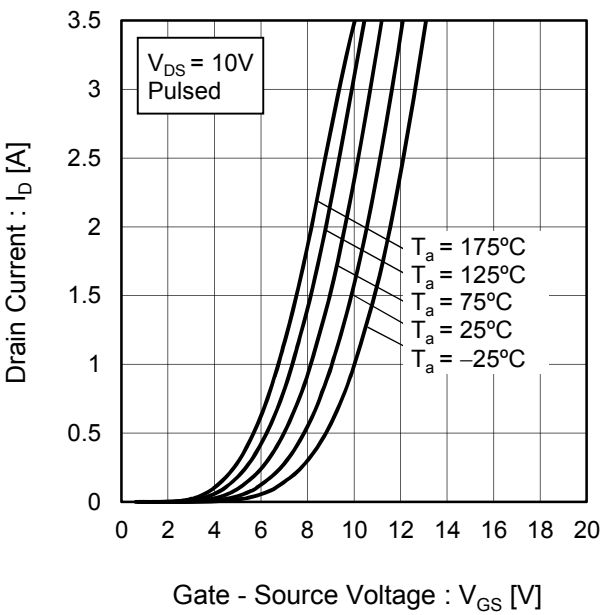
Drain Current : I_D [A]

Fig.10 Gate Threshold Voltage
vs. Junction Temperature

V_{GS} = V_{DS}
I_D = 0.63mA

Junction Temperature : T_j [°C]

Gate Threshold Voltage : $V_{GS(th)}$ [V]
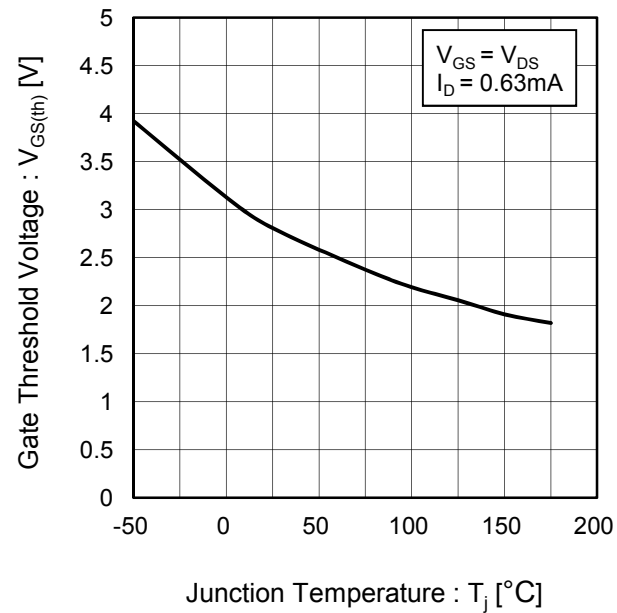
Fig.11 Transconductance vs. Drain Current

V_{DS} = 10V
Pulsed

T_a = 175ºC
T_a = 125ºC
T_a = 75ºC
T_a = 25ºC
T_a = −25ºC

Drain Current : I_D [A]

Transconductance : g_{fs} [S]
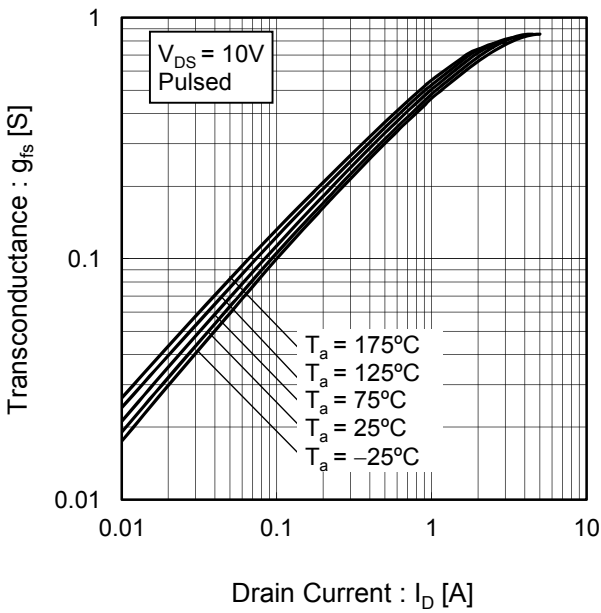
● **Electrical characteristic curves**

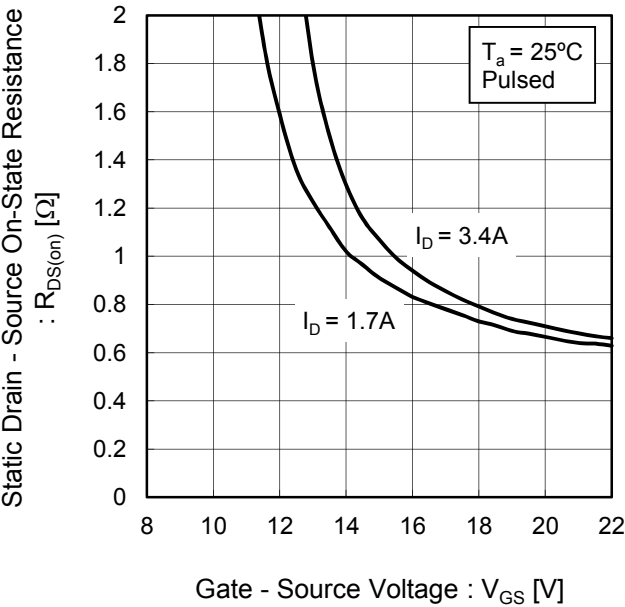Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage

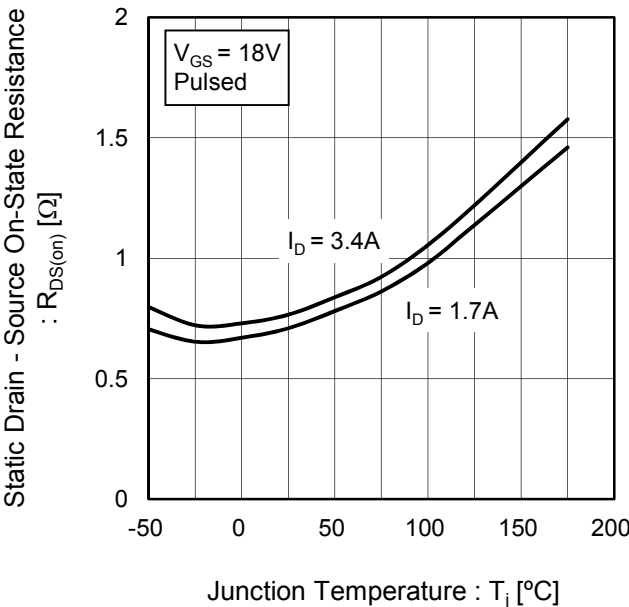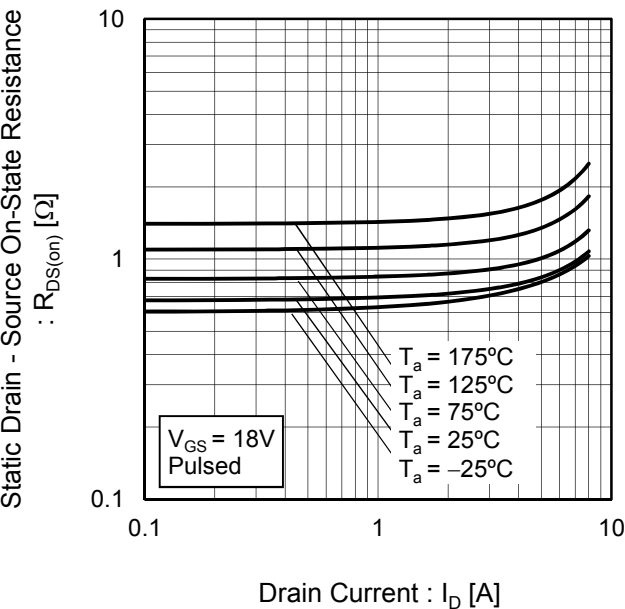Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

Fig.14 Static Drain - Source On - State Resistance vs. Drain Current

● **Electrical characteristic curves**

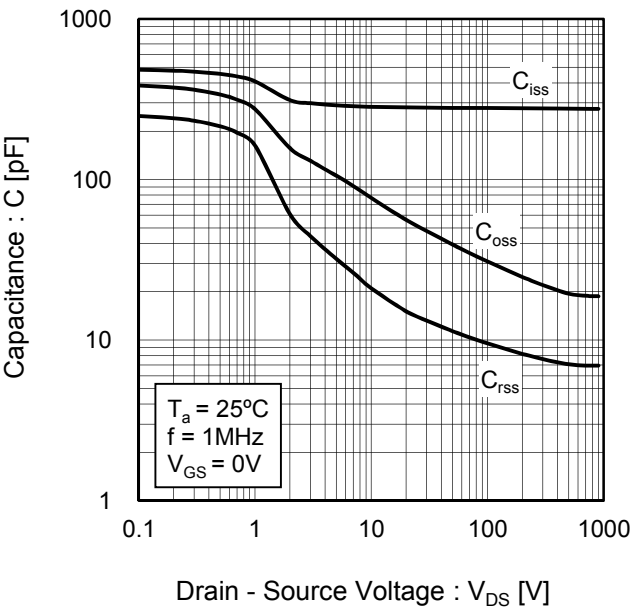Fig.15 Typical Capacitance
       vs. Drain - Source Voltage

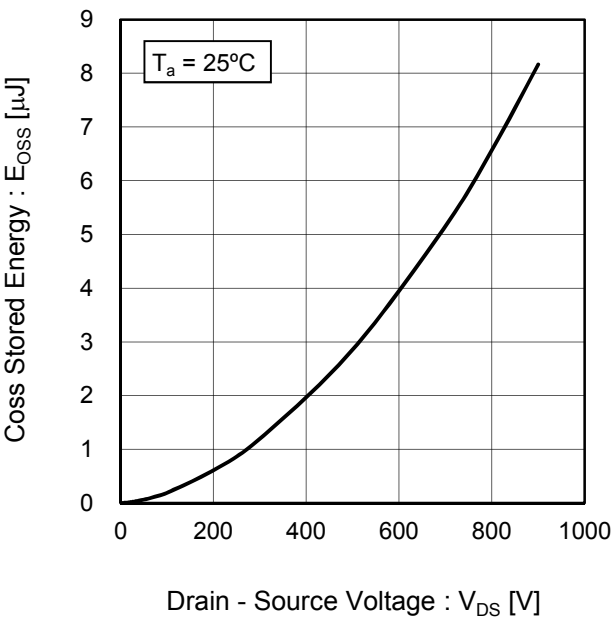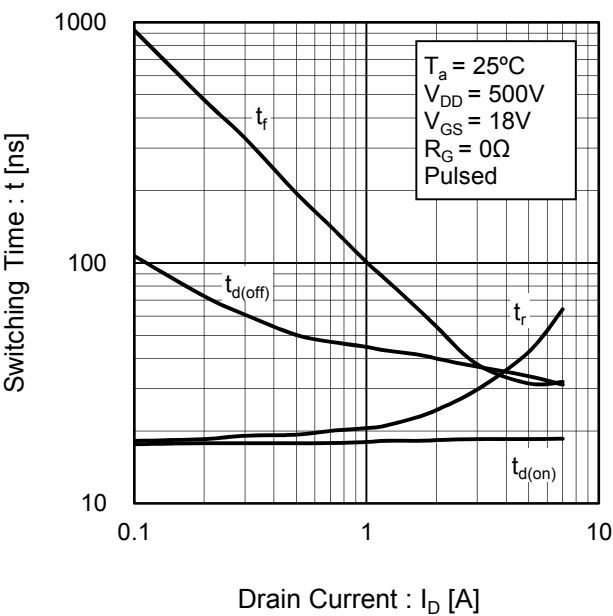Fig.16 Coss Stored Energy
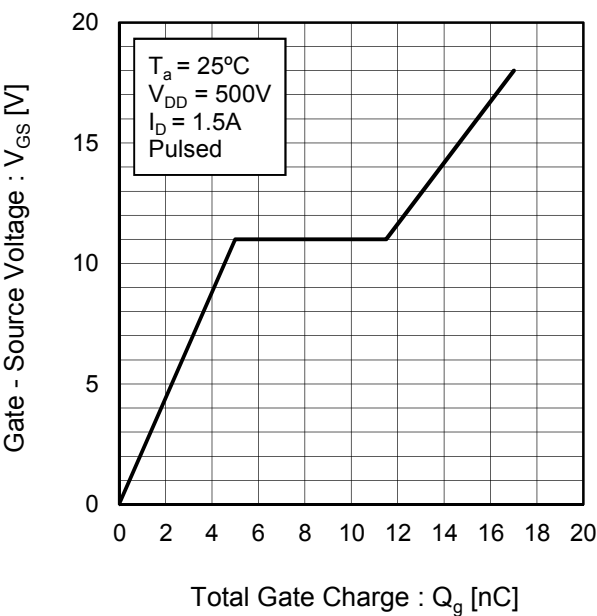

Fig.17 Switching Characteristics

Fig.18 Dynamic Input Characteristics

●**Electrical characteristic curves**

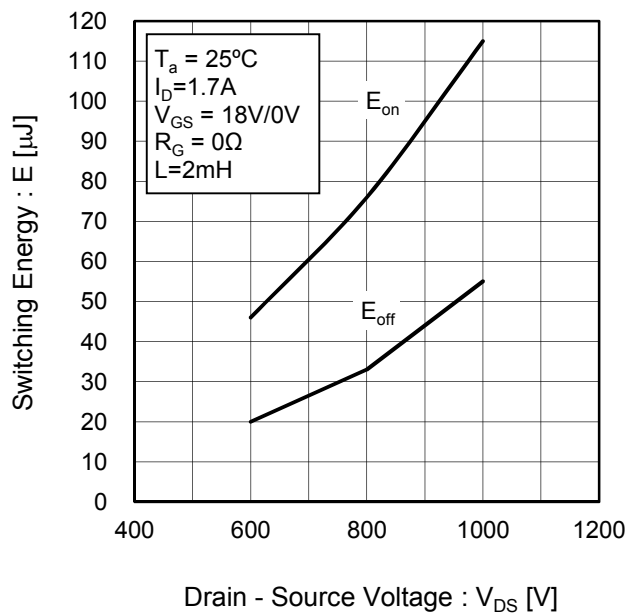Fig.19 Typical Switching Loss
      vs. Drain - Source Voltage

$T_a = 25ºC$
$I_D = 1.7A$
$V_{GS} = 18V/0V$
$R_G = 0Ω$
$L = 2mH$

E_{on}

E_{off}

Switching Energy : E [µJ]

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

Fig.20 Typical Switching Loss
      vs. Drain Current

$T_a = 25ºC$
$V_{DD} = 800V$
$V_{GS} = 18V/0V$
$R_G = 0Ω$
$L = 2mH$

E_{on}

E_{off}

Switching Energy : E [µJ]

Drain Current : I_D [A]
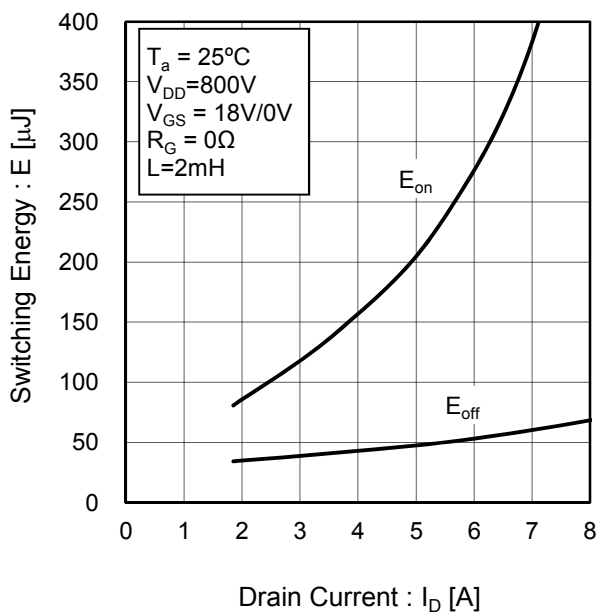
Fig.21 Typical Switching Loss
      vs. External Gate Resistance

$T_a = 25ºC$
$V_{DD} = 800V$
$I_D = 1.7A$
$V_{GS} = 18V/0V$
$L = 2mH$

E_{on}

E_{off}

Switching Energy : E [µJ]

External Gate Resistance : R_G [Ω]
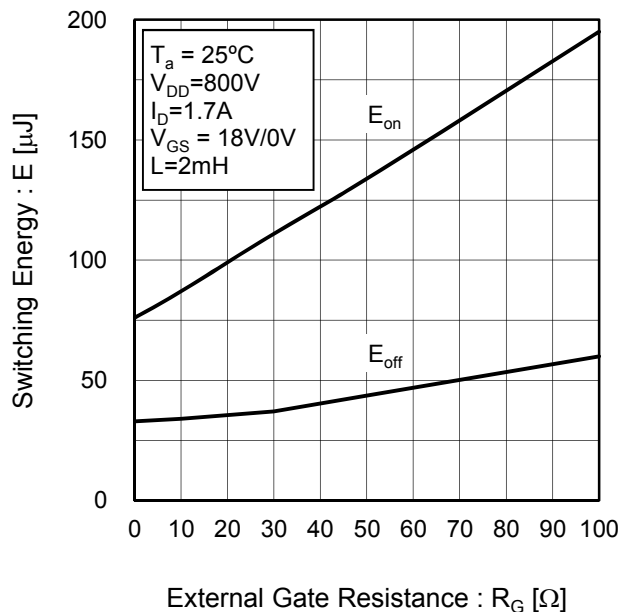
● **Electrical characteristic curves**

Fig.22 Inverse Diode Forward Current
vs. Source - Drain Voltage

Inverse Diode Forward Current : I_S [A]

V_{GS} = 0V
Pulsed

T_a = 175ºC
T_a = 125ºC
T_a = 75ºC
T_a = 25ºC
T_a = −25ºC

Source - Drain Voltage : V_{SD} [V]
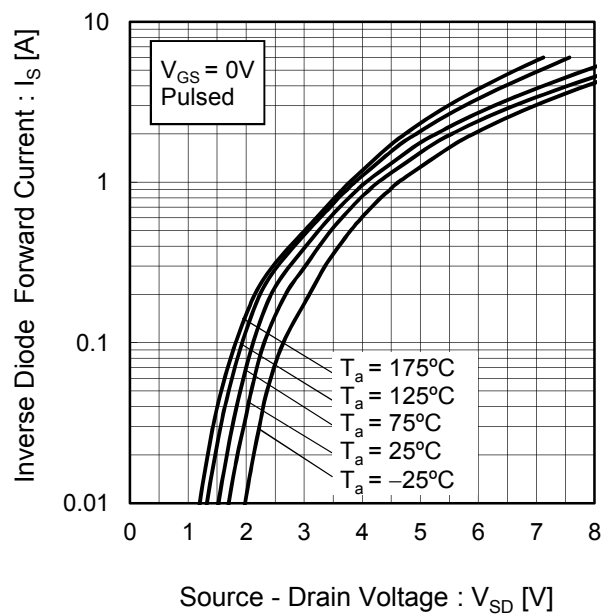
Fig.23 Reverse Recovery Time
vs.Inverse Diode Forward Current

Reverse Recovery Time : t_{rr} [ns]

T_a = 25ºC
di / dt = 290A / μs
V_R = 800V
V_{GS} = 0V
Pulsed

Inverse Diode Forward Current : I_S [A]
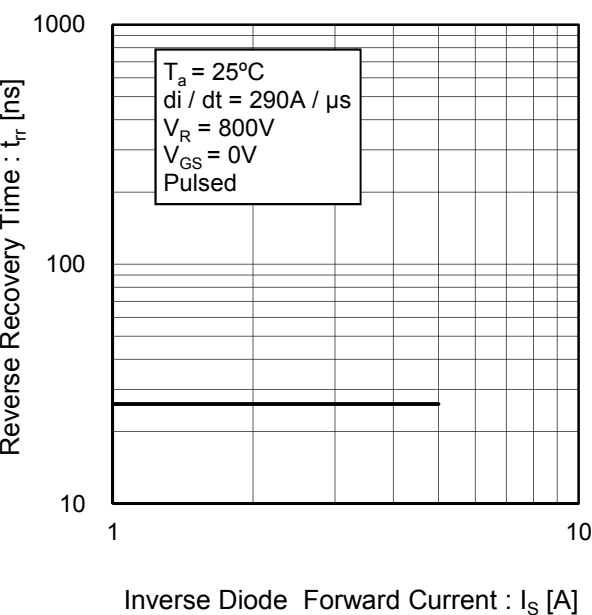
●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit
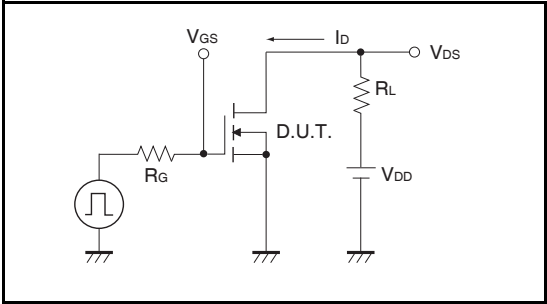

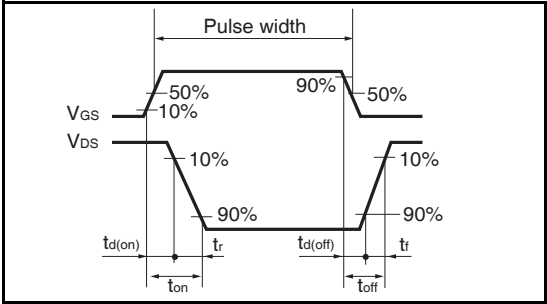Fig.1-2 Switching Waveforms

Fig.2-1 Gate Charge Measurement Circuit
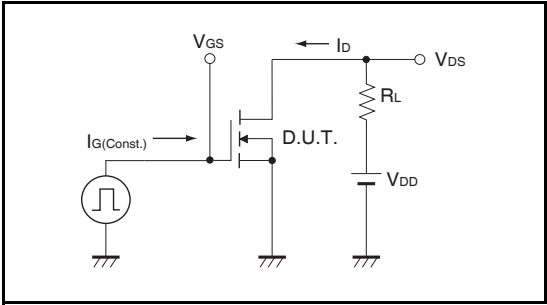

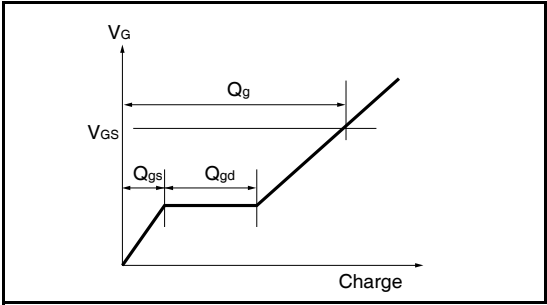Fig.2-2 Gate Charge Waveform

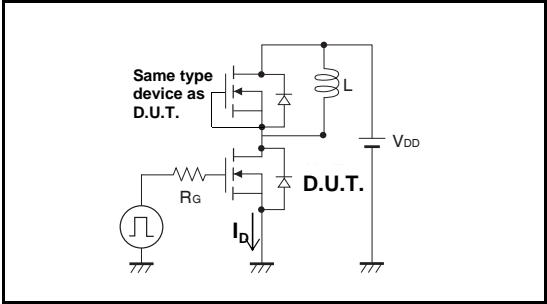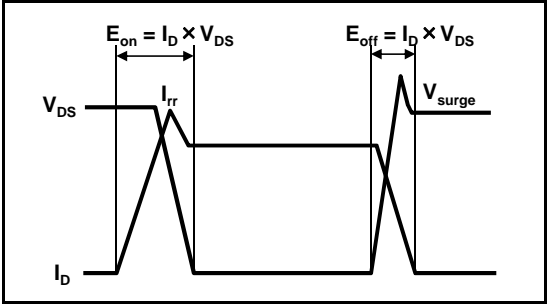Fig.3-1 Switching Energy Measurement Circuit

Fig.3-2 Switching Waveforms

Fig.4-1 Reverse Recovery Time Measurement Circuit

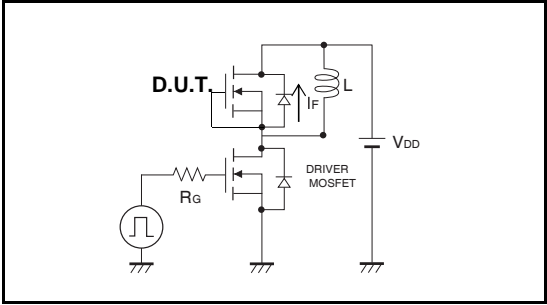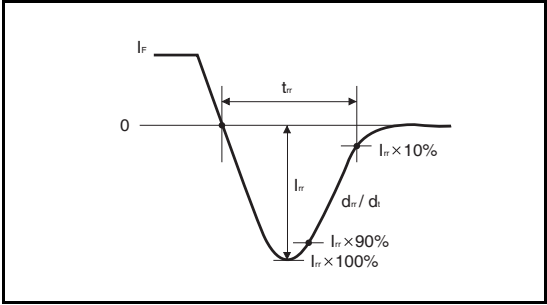Fig.4-2 Reverse Recovery Waveform

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