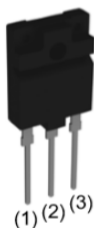


●Outline
TO-3PF



V_{DSS}	1500 V
$I_D @ 25^{\circ}C$	3.7 A
$R_{DS(on)}$	1 Ω
P_D	35W

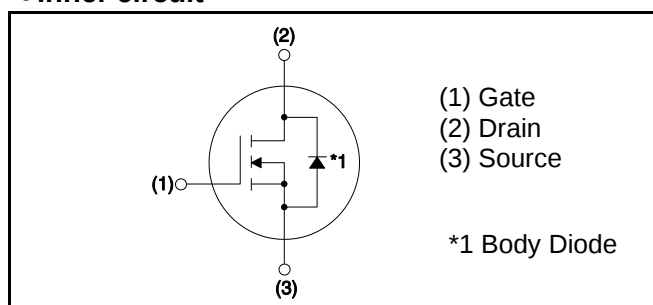
●Features

- 1) Low on-resistance
- 2) Fast switching speed
- 3) Long creepage distance
- 4) Simple to drive
- 5) Pb-free lead plating ; RoHS compliant

●Application

- Auxiliary power supplies
- Switch mode power supplies

●Inner circuit



●Packaging specifications

Marking	Basic ordering unit (pcs)	Packing
GC3N150PF	30	Tube

●Absolute maximum ratings ($T_{vj} = 25^{\circ}C$ unless otherwise specified)

Parameter		Symbol	Value	Unit
Drain - Source voltage		V_{DSS}	1500	V
Continuous drain current	$T_c = 25^{\circ}C$	I_D^{*1}	3.7	A
	$T_c = 100^{\circ}C$	I_D^{*1}	2.6	A
Pulsed drain current		$I_{D,pulse}^{*2}$	9.2	A
Gate - Source voltage (DC)		V_{GSS}	-4 to 20	V
Gate - Source surge voltage ($t_{surge} < 300nsec$)		$V_{GSS,surge}^{*3}$	-10 to 22	V
Power dissipation ($T_c = 25^{\circ}C$)		P_D	35	W
Virtual Junction temperature		T_{vj}	175	$^{\circ}C$
Range of storage temperature		T_{stg}	-55 to +175	$^{\circ}C$

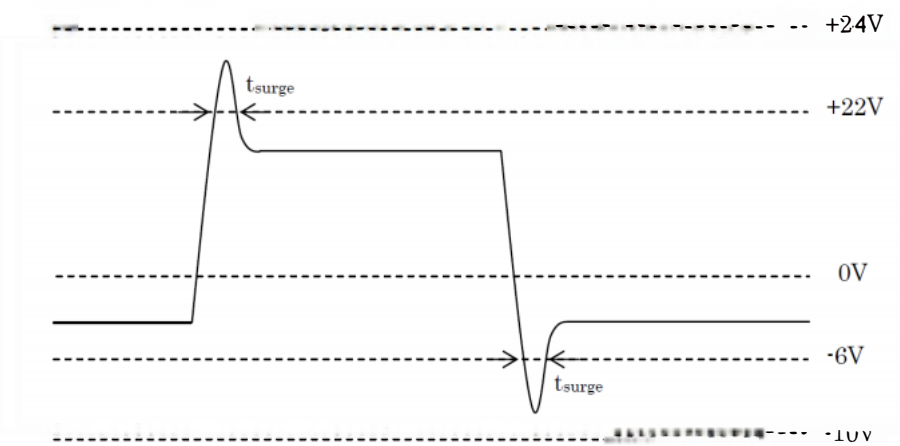
●Electrical characteristics ($T_{vj} = 25^{\circ}\text{C}$ unless otherwise spesified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 1mA$	1500	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 1500V, V_{GS} = 0V$ $T_{vj} = 25^{\circ}\text{C}$	-	0.1	10	μA
		$T_{vj} = 150^{\circ}\text{C}$	-	0.2	-	
Gate - Source leakage current	I_{GSS+}	$V_{GS} = +20V, V_{DS} = 0V$	-	-	100	nA
Gate - Source leakage current	I_{GSS-}	$V_{GS} = -4V, V_{DS} = 0V$	-	-	-100	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 0.41mA$	1.8	2.8	4.0	V

*1 Limited by maximum T_{vj} and for Max. R_{thJC}

*2 $PW \leq 10\mu\text{s}$, Duty cycle $\leq 1\%$

*3 Example of acceptable V_{GS} waveform



*4 Pulsed

●Electrical characteristics ($T_{vj} = 25^{\circ}\text{C}$ unless otherwise spesified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Static drain - source on - state resistance	$R_{DS(on)}^{*4}$	$V_{GS} = 18\text{V}, I_D = 1.1\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	-	1.00 1.50	1.20 -	Ω
Gate input resistance	R_G	$f = 1\text{MHz}$, open drain	-	64	-	Ω
Transconductance	g_{fs}^{*4}	$V_{DS} = 10\text{V}, I_D = 1.1\text{A}$	-	0.4	-	S
Input capacitance	C_{iss}	$V_{GS} = 0\text{V}$	-	184	-	pF
Output capacitance	C_{oss}	$V_{DS} = 800\text{V}$	-	16	-	
Reverse transfer capacitance	C_{rss}	$f = 1\text{MHz}$	-	6	-	
Effective output capacitance, energy related	$C_{o(er)}$	$V_{GS} = 0\text{V}$ $V_{DS} = 0\text{V to } 800\text{V}$	-	17	-	pF
Turn - on delay time	$t_{d(on)}^{*4}$	$V_{DD} = 500\text{V}, I_D = 1.1\text{A}$	-	16	-	ns
Rise time	t_r^{*4}	$V_{GS} = 18\text{V}/0\text{V}$	-	21	-	
Turn - off delay time	$t_{d(off)}^{*4}$	$R_L = 455\Omega$	-	35	-	
Fall time	t_f^{*4}	$R_G = 0\Omega$	-	74	-	
Turn - on switching loss	E_{on}^{*4}	$V_{DD} = 800\text{V}, I_D = 1.1\text{A}$ $V_{GS} = 18\text{V}/0\text{V}$ $R_G = 0\Omega, L = 2\text{mH}$	-	57	-	μJ
Turn - off switching loss	E_{off}^{*4}	* E_{on} includes diode reverse recovery	-	32	-	

●Gate Charge characteristics ($T_{vj} = 25^{\circ}\text{C}$ unless otherwise spesified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g^{*4}	$V_{DD} = 500\text{V}$	-	14	-	nC
Gate - Source charge	Q_{gs}^{*4}	$I_D = 1\text{A}$	-	4	-	
Gate - Drain charge	Q_{gd}^{*4}	$V_{GS} = 18\text{V}$	-	5	-	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 500\text{V}, I_D = 1\text{A}$	-	10.5	-	V

●**Body diode electrical characteristics (Source-Drain) ($T_{vj} = 25^{\circ}\text{C}$ unless otherwise specified)**

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	I_S^{*1}	$T_c = 25^\circ C$	-	-	3.7	A
Inverse diode direct current, pulsed	I_{SM}^{*2}		-	-	9.2	A
Forward voltage	V_{SD}^{*4}	$V_{GS} = 0V, I_S = 1.1A$	-	4.3	-	V
Reverse recovery time	t_{rr}^{*4}	$I_F = 1.1A, V_R = 800V$ $di/dt = 300A/\mu s$	-	21	-	ns
Reverse recovery charge	Q_{rr}^{*4}		-	13	-	nC
Peak reverse recovery current	I_{rrm}^{*4}		-	1.1	-	A

- Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case	R _{thJC}	-	3.32	4.32	K/W

●Typical Transient Thermal Characteristics

Symbol	Value	Unit
R_{th1}	816m	K/W
R_{th2}	1939m	
R_{th3}	567m	

Symbol	Value	Unit
C_{th1}	127 μ	Ws/K
C_{th2}	1.64m	
C_{th3}	64.5m	

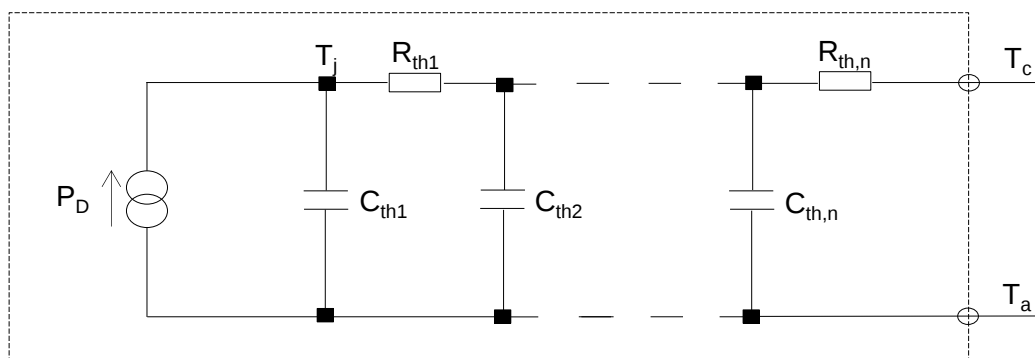


Fig.1 Power Dissipation Derating Curve

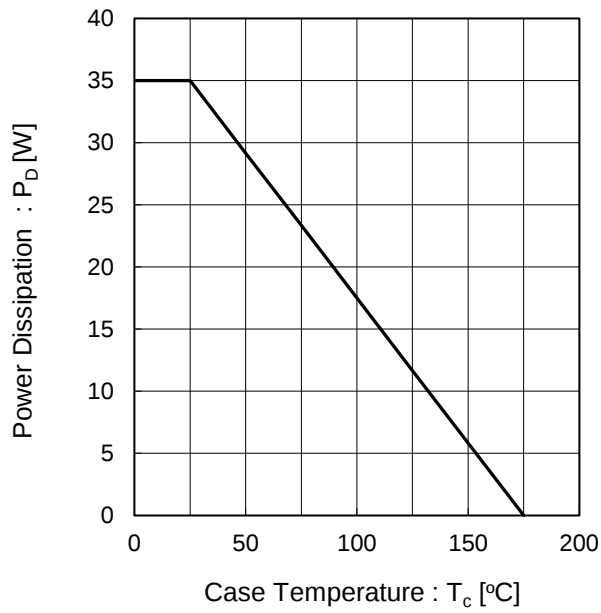


Fig.2 Maximum Safe Operating Area

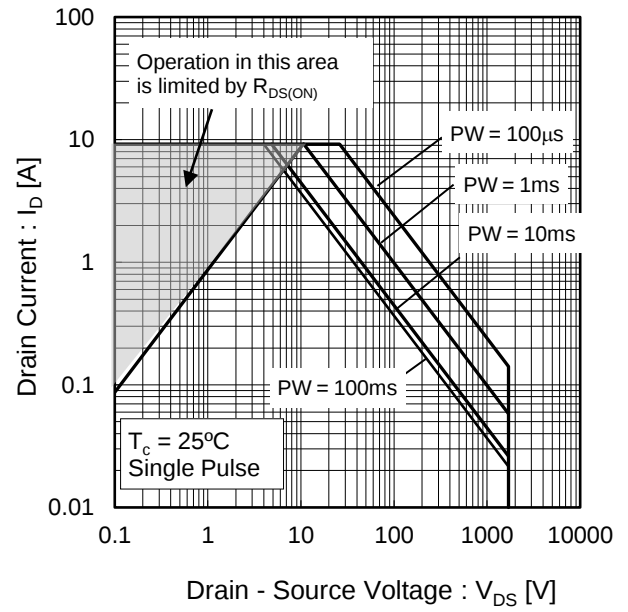
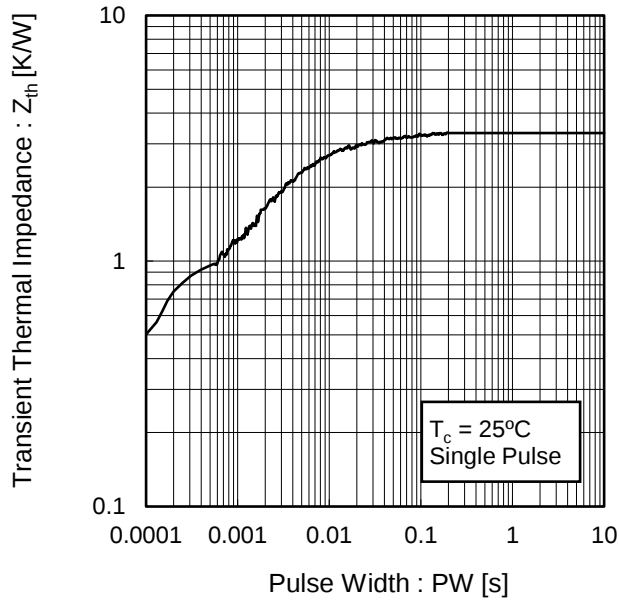


Fig.3 Typical Transient Thermal Impedance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

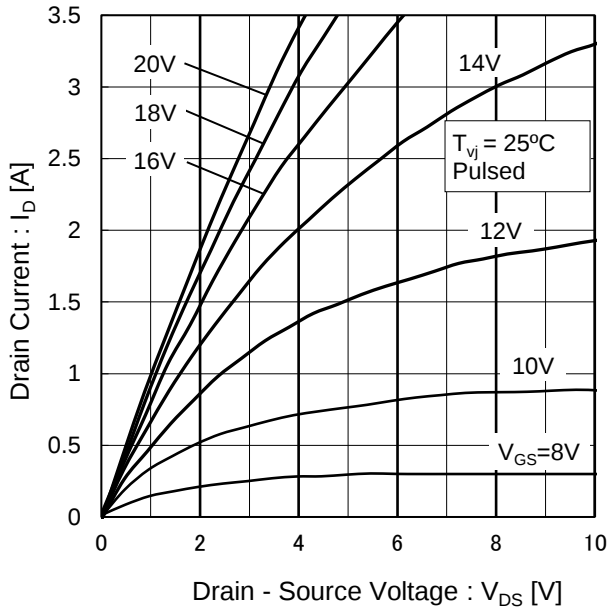


Fig.5 Typical Output Characteristics(II)

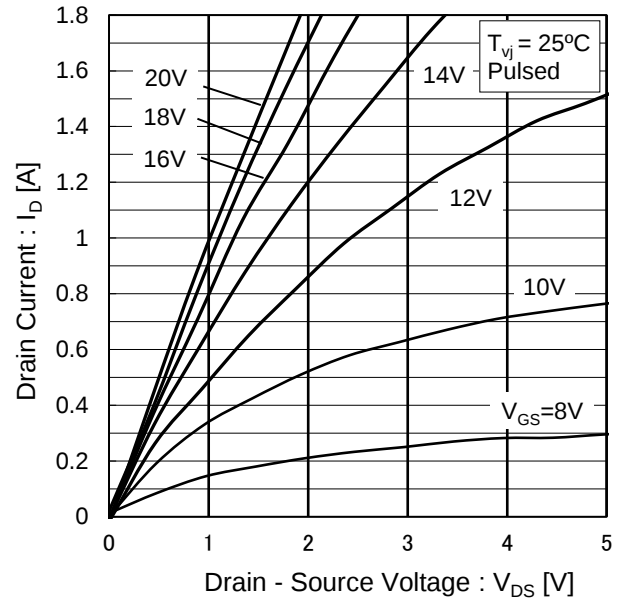


Fig.6 $T_{vj} = 150^\circ\text{C}$ Typical Output Characteristics(I)

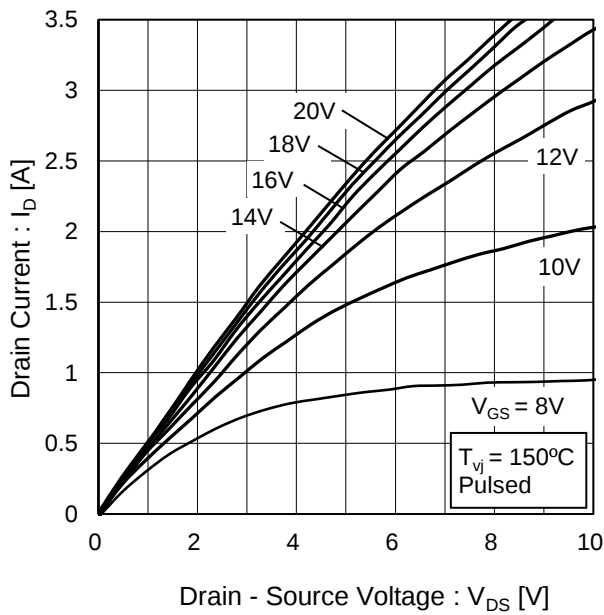
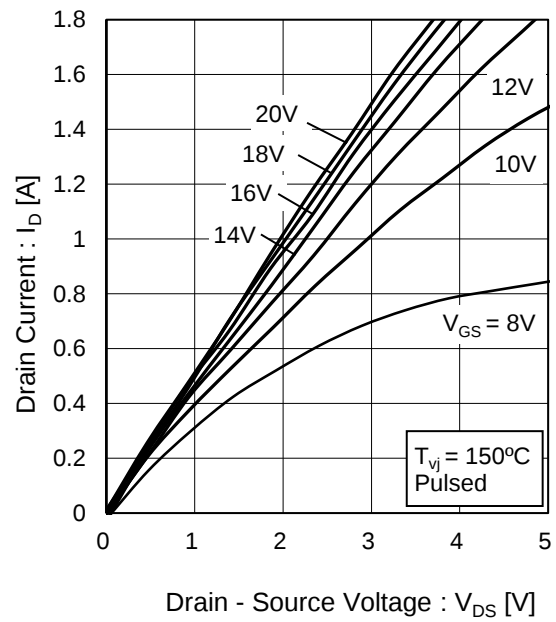


Fig.7 $T_{vj} = 150^\circ\text{C}$ Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics (I)

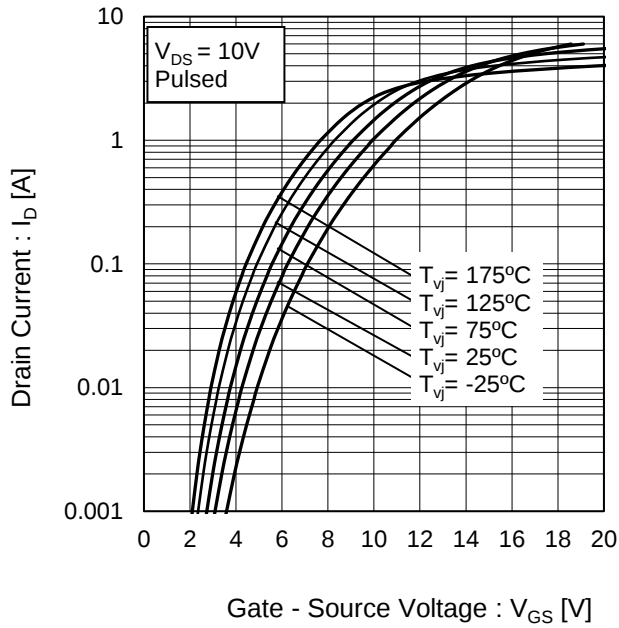


Fig.9 Typical Transfer Characteristics (II)

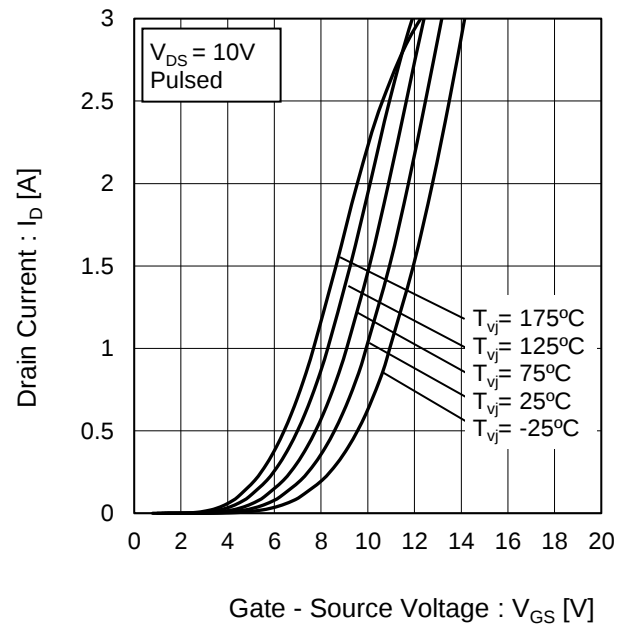


Fig.10 Gate Threshold Voltage vs. Virtual Junction Temperature

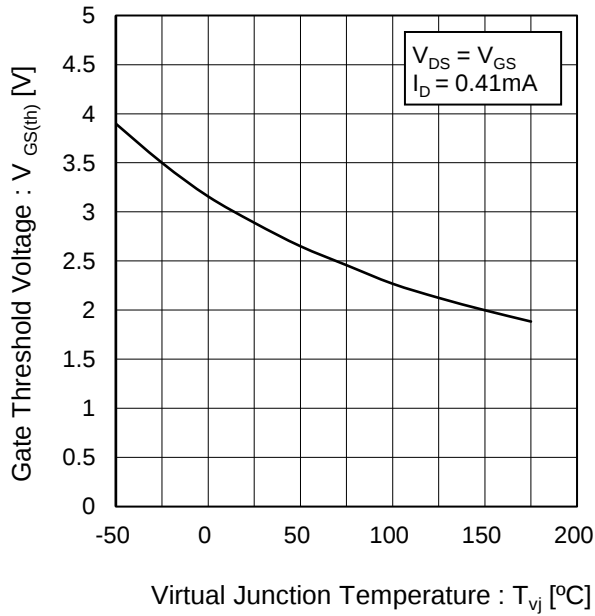
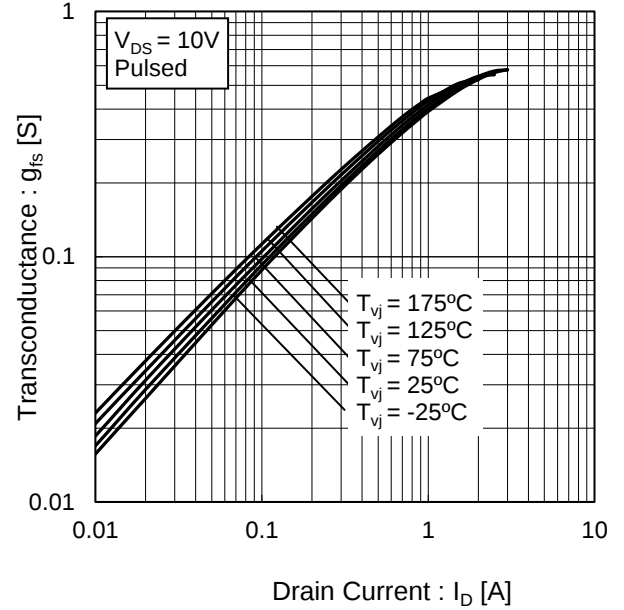


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

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

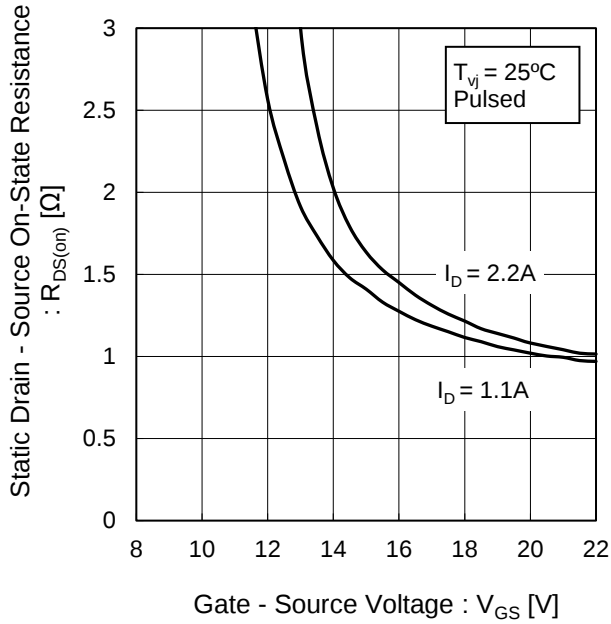


Fig.13 Static Drain - Source On - State Resistance vs. Virtual Junction Temperature

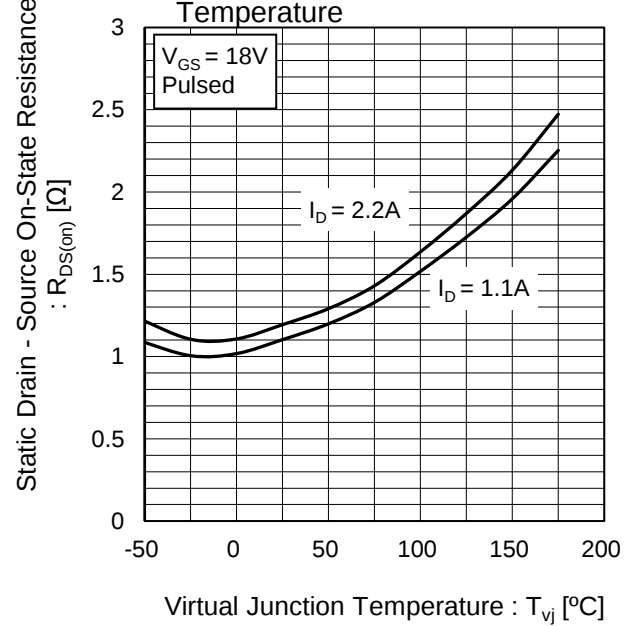
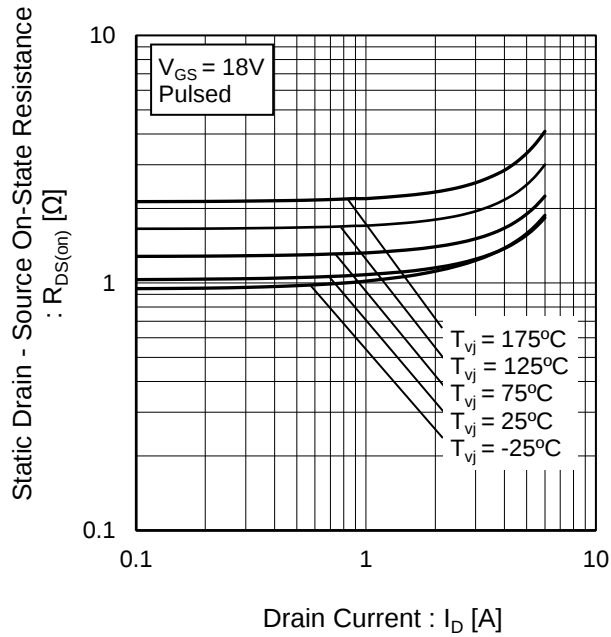


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current



●Electrical characteristic curves

Fig.15 Typical Capacitance vs. Drain - Source Voltage

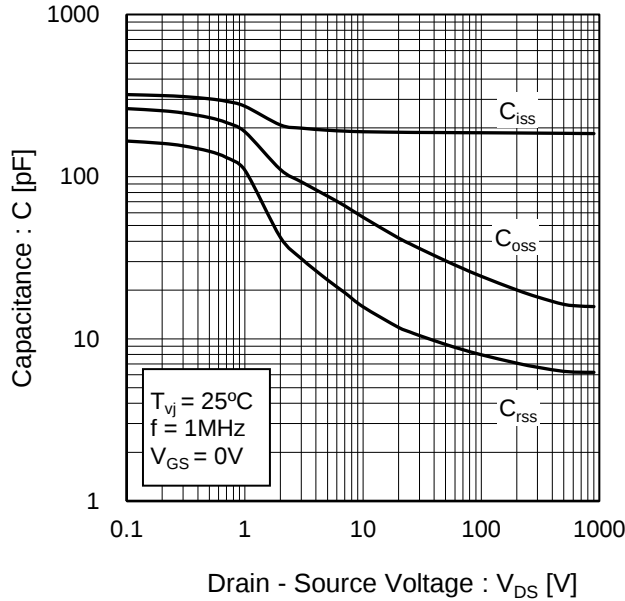


Fig.16 Coss Stored Energy

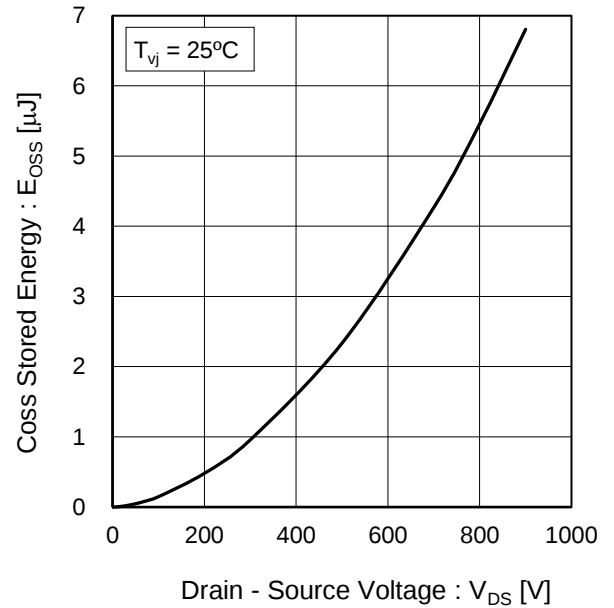


Fig.17 Switching Characteristics

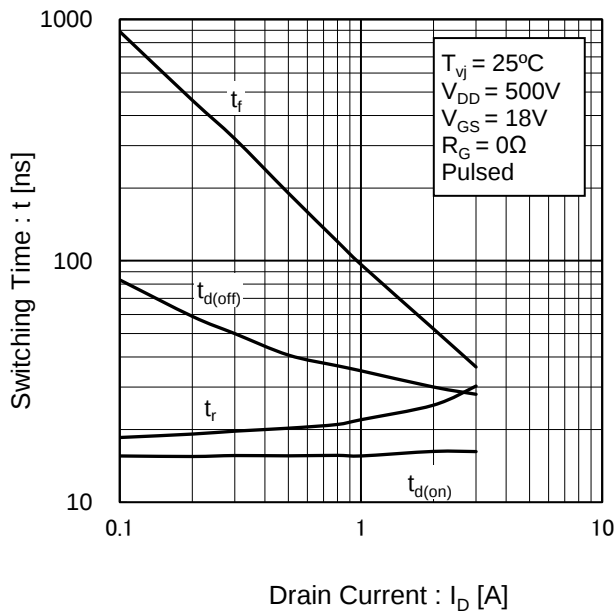
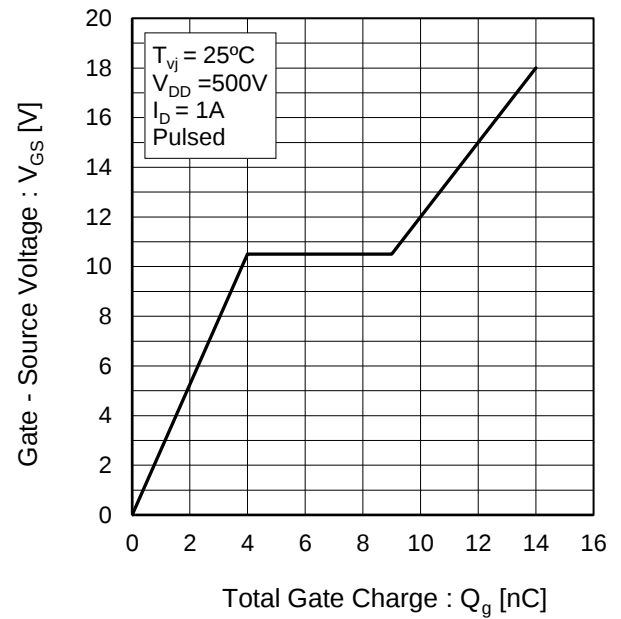


Fig.18 Dynamic Input Characteristics



●Electrical characteristic curves

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

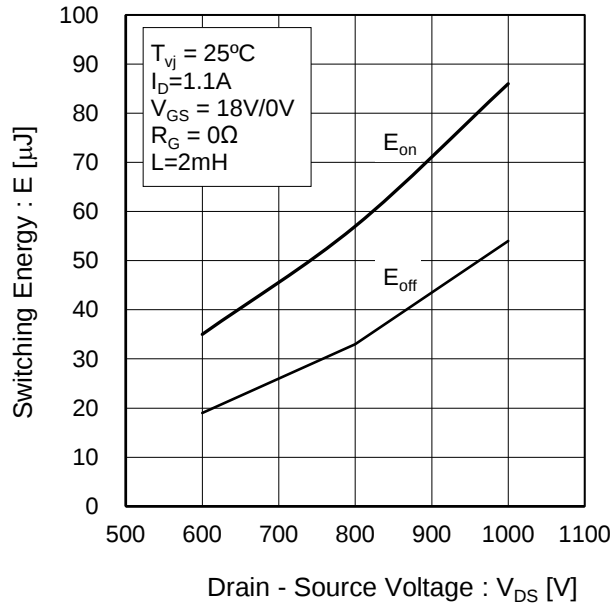


Fig.20 Typical Switching Loss
vs. Drain Current

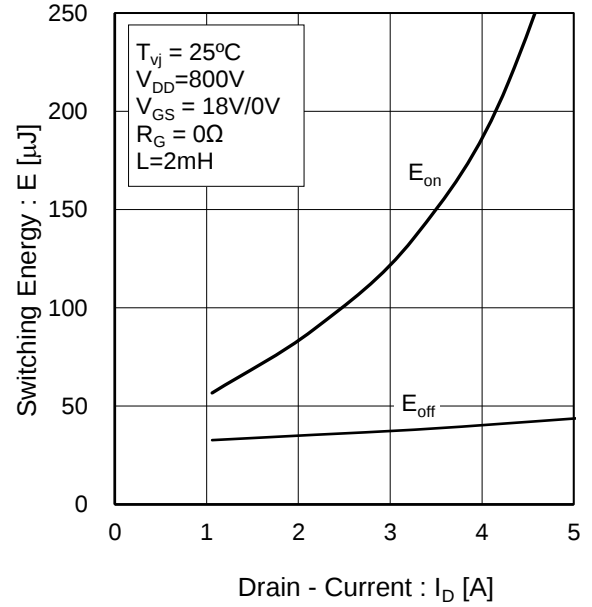
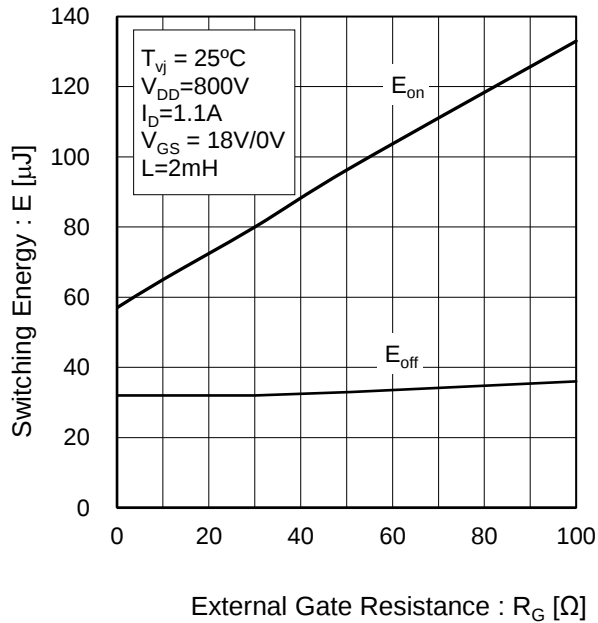


Fig.21 Typical Switching Loss
vs. External Gate Resistance



●Electrical characteristic curves

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

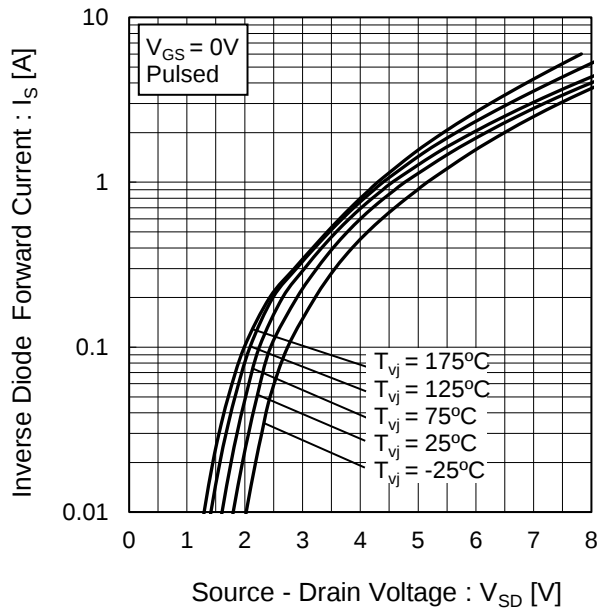
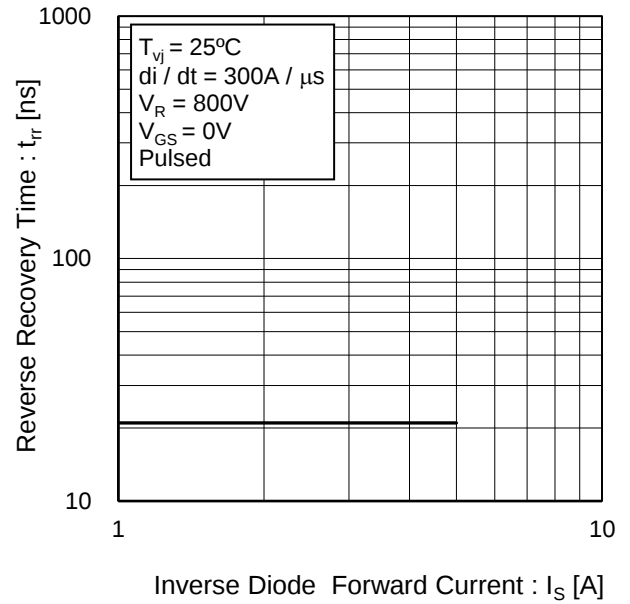


Fig.23 Reverse Recovery Time vs. Inverse Diode Forward Current



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

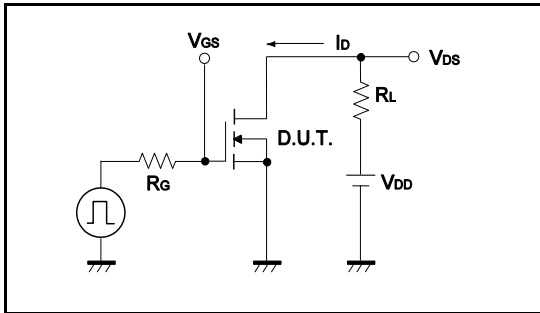


Fig.1-2 Switching Waveforms

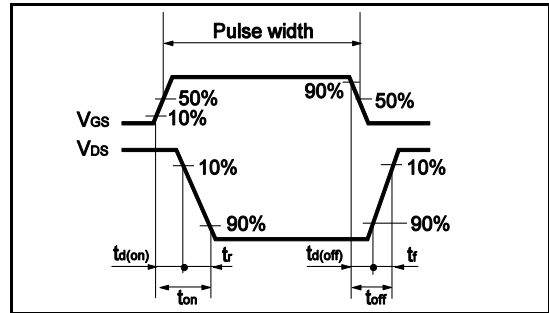


Fig.2-1 Gate Charge Measurement Circuit

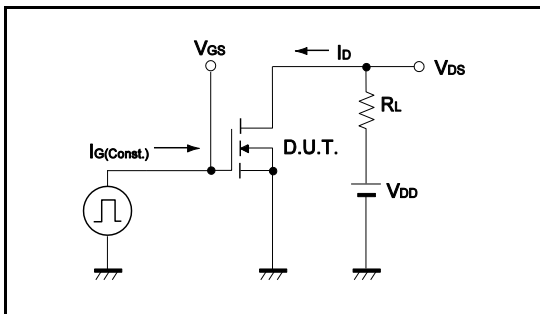


Fig.2-2 Gate Charge Waveform

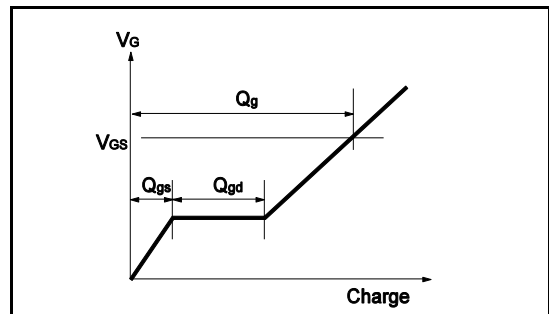


Fig.3-1 Switching Energy Measurement Circuit

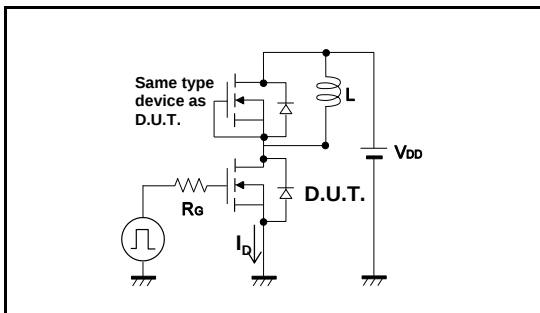


Fig.3-2 Switching Waveforms

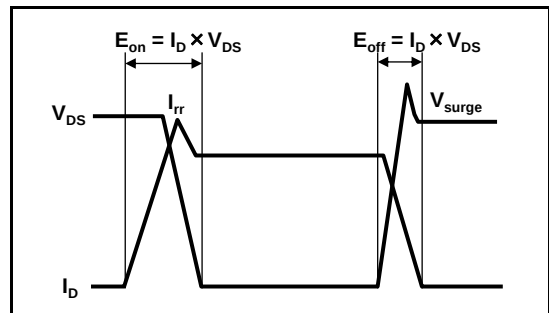


Fig.4-1 Reverse Recovery Time Measurement Circuit

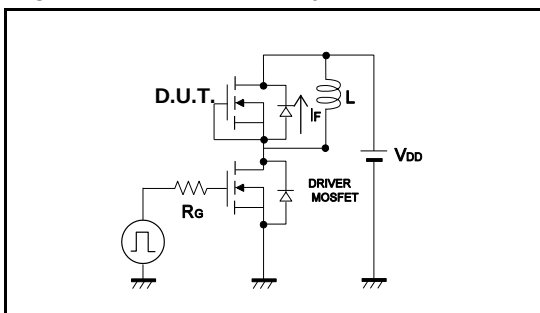
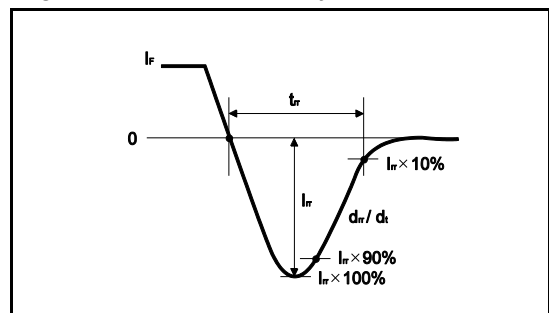
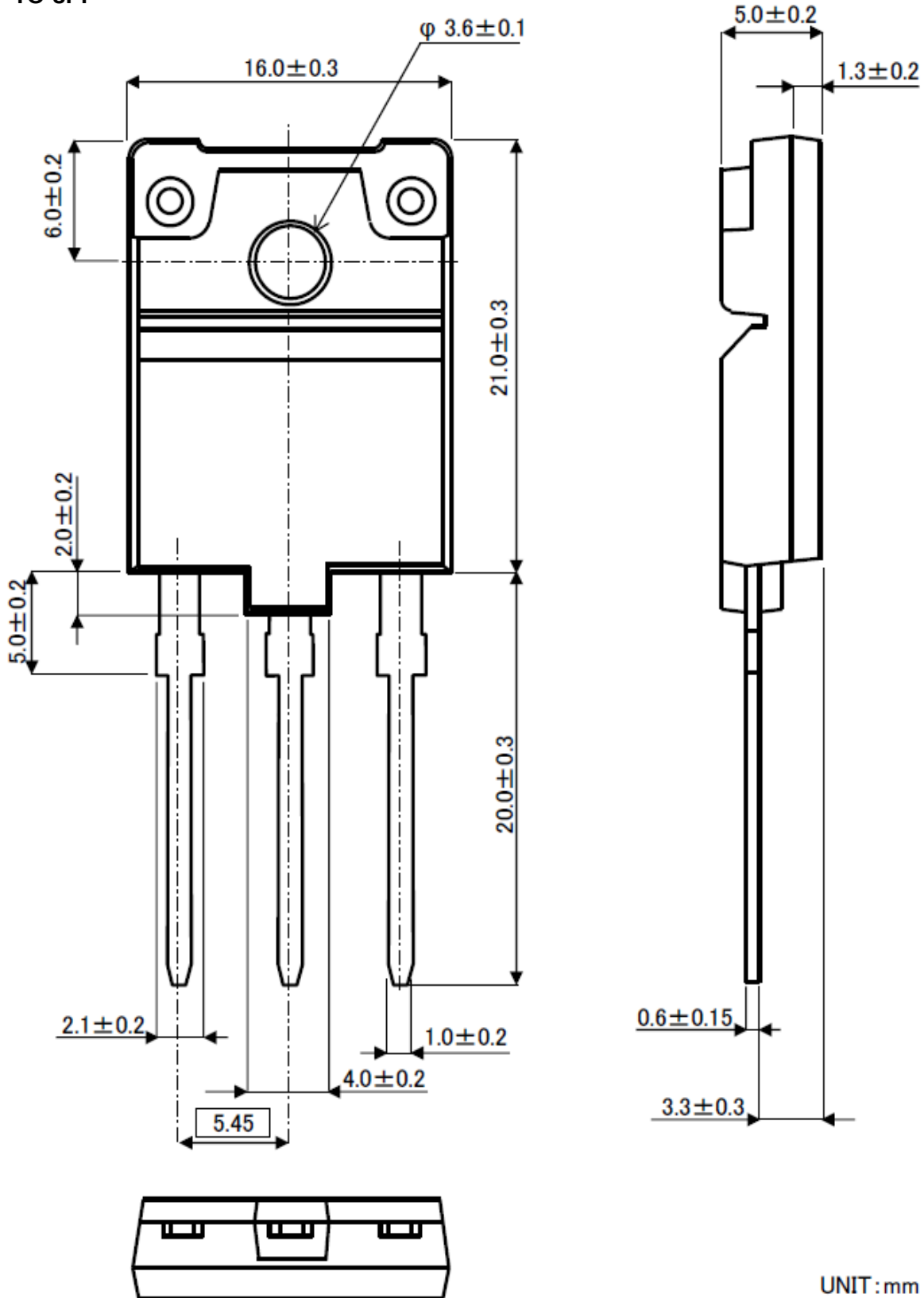


Fig.4-2 Reverse Recovery Waveform



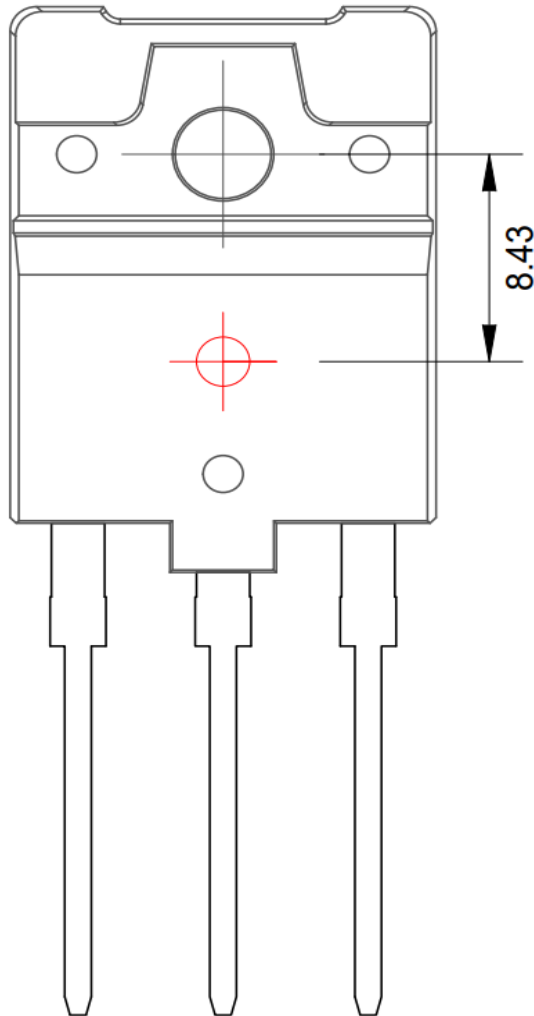
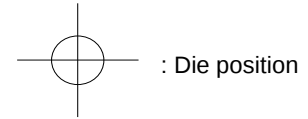
●Package Dimensions

TO-3PF



UNIT : mm

●Die Bonding Layout



- Front view of the packaging.
- Dimensions are design values.
- If the heat sink is to be installed, it should be in contact with the die bonding point.

Unit: mm