

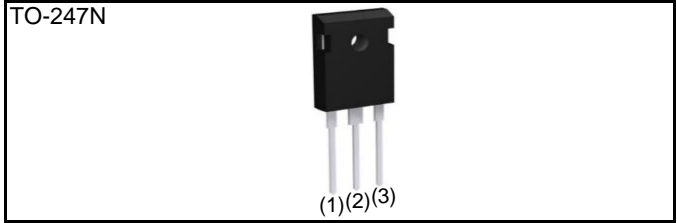


**THE DATASHEET OF
SCT3040KLHRC11**

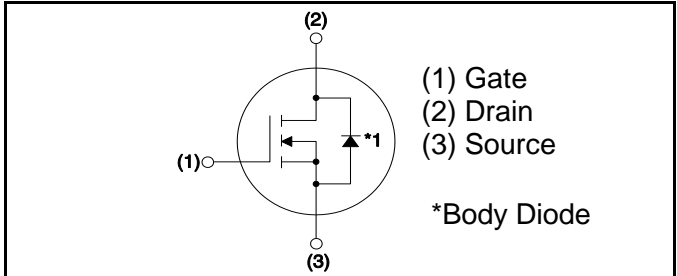


V_{DSS}	1200V
$R_{DS(on)}$ (Typ.)	40m Ω
I_D^{*1}	55A
P_D	262W

●Outline



●Inner circuit



●Features

- 1) Qualified to AEC-Q101
- 2) Low on-resistance
- 3) Fast switching speed
- 4) Fast reverse recovery
- 5) Easy to parallel
- 6) Simple to drive
- 7) Pb-free lead plating ; RoHS compliant

●Application

- Automobile
- Switch mode power supplies

●Packaging specifications

Type	Packing	Tube
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	30
	Taping code	C11
	Marking	SCT3040KL

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

Parameter	Symbol	Value	Unit	
Drain - Source Voltage	V_{DSS}	1200	V	
Continuous Drain current	$T_c = 25^{\circ}\text{C}$	I_D^{*1}	55	A
	$T_c = 100^{\circ}\text{C}$	I_D^{*1}	39	A
Pulsed Drain current ($T_c = 25^{\circ}\text{C}$)	$I_{D,pulse}^{*2}$	137	A	
Gate - Source voltage (DC)	V_{GSS}	-4 to +22	V	
Gate - Source surge voltage ($t_{surge} < 300\text{nsec}$)	$V_{GSS,surge}^{*3}$	-4 to +26	V	
Recommended drive voltage	$V_{GS,op}^{*4}$	0 / +18	V	
Virtual Junction temperature	T_{vj}	175	$^{\circ}\text{C}$	
Range of storage temperature	T_{stg}	-55 to +175	$^{\circ}\text{C}$	

●Electrical characteristics (T_{vj} = 25°C unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	V _{(BR)DSS}	V _{GS} = 0V, I _D = 1mA T _{vj} = 25°C T _{vj} = -55°C	1200 1200	- -	- -	V
Zero Gate voltage Drain current	I _{DSS}	V _{GS} = 0V, V _{DS} = 1200V T _{vj} = 25°C T _{vj} = 150°C	- -	1 2	10 -	μA
Gate - Source leakage current	I _{GSS+}	V _{GS} = +22V, 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} = 10V, I _D = 10mA	2.7	-	5.6	V
Static Drain - Source on - state resistance	R _{DS(on)} ^{*5}	V _{GS} = 18V, I _D = 20A T _{vj} = 25°C T _{vj} = 150°C	- -	40 68	52 -	mΩ
Gate input resistance	R _G	f = 1MHz, open drain	-	7	-	Ω

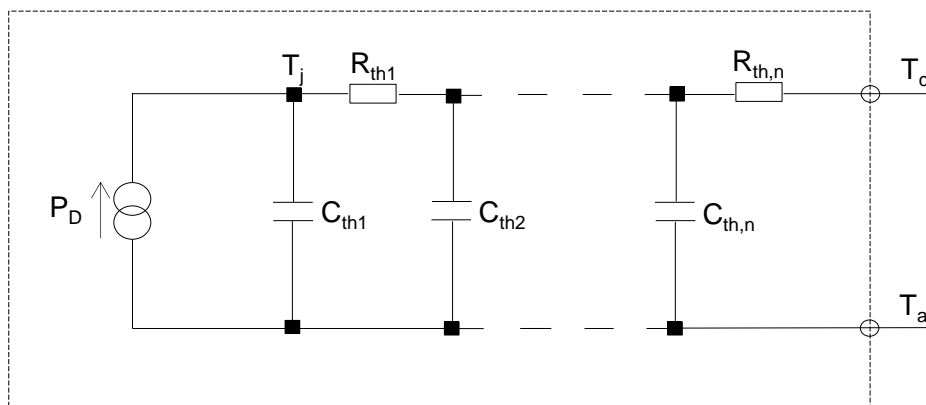
●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case	R _{thJC}	-	0.44	0.57	K/W

●Typical Transient Thermal Characteristics

Symbol	Value	Unit
R _{th1}	2.56E-02	K/W
R _{th2}	1.95E-01	
R _{th3}	2.20E-01	

Symbol	Value	Unit
C _{th1}	1.39E-03	Ws/K
C _{th2}	1.00E-02	
C _{th3}	3.57E-02	



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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Transconductance	g_{fs}^{*5}	$V_{DS} = 10\text{V}, I_D = 20\text{A}$	-	8.3	-	S
Input capacitance	C_{iss}	$V_{GS} = 0\text{V}$	-	1337	-	pF
Output capacitance	C_{oss}	$V_{DS} = 800\text{V}$	-	76	-	
Reverse transfer capacitance	C_{rss}	$f = 1\text{MHz}$	-	27	-	
Effective output capacitance, energy related	$C_{o(er)}$	$V_{GS} = 0\text{V}$ $V_{DS} = 0\text{V to } 600\text{V}$	-	122	-	pF
Total Gate charge	Q_g^{*5}	$V_{DS} = 600\text{V}$ $I_D = 20\text{A}$	-	107	-	nC
Gate - Source charge	Q_{gs}^{*5}	$V_{GS} = 18\text{V}$	-	17	-	
Gate - Drain charge	Q_{gd}^{*5}	See Fig. 1-1.	-	56	-	
Turn - on delay time	$t_{d(on)}^{*5}$	$V_{DS} = 400\text{V}$ $I_D = 18\text{A}$	-	21	-	ns
Rise time	t_r^{*5}	$V_{GS} = 0\text{V}/+18\text{V}$	-	39	-	
Turn - off delay time	$t_{d(off)}^{*5}$	$R_G = 0\Omega$ $R_L = 22\Omega$	-	49	-	
Fall time	t_f^{*5}	See Fig. 1-1, 1-2.	-	24	-	
Turn - on switching loss	E_{on}^{*5}	$V_{DS} = 600\text{V}$ $V_{GS}=0\text{V}/18\text{V}, I_D = 20\text{A}$ $R_G = 0\Omega, L = 250\mu\text{H}$	-	283	-	μJ
Turn - off switching loss	E_{off}^{*5}	E_{on} includes diode reverse recovery $L_{\sigma} = 50\text{nH}, C_{\sigma} = 200\text{pF}$ See Fig. 2-1, 2-2.	-	118	-	

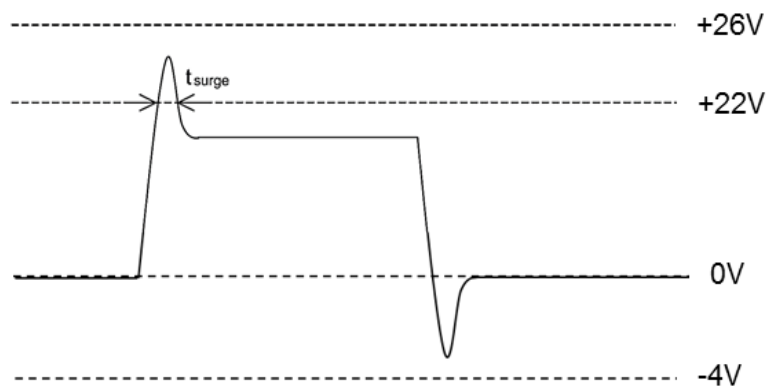
● **Body diode electrical characteristics** (Source-Drain) ($T_{vj} = 25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Body diode continuous, forward current	I_S^{*1}	$T_c = 25^{\circ}\text{C}$	-	-	55	A
Body diode direct current, pulsed	I_{SM}^{*2}		-	-	137	A
Forward voltage	V_{SD}^{*5}	$V_{GS} = 0\text{V}, I_S = 20\text{A}$	-	3.2	-	V
Reverse recovery time	t_{rr}^{*5}	$I_F = 20\text{A}$ $V_R = 600\text{V}$ $di/dt = 1100\text{A}/\mu\text{s}$ $L_{\sigma} = 50\text{nH}, C_{\sigma} = 200\text{pF}$ See Fig. 3-1, 3-2.	-	25	-	ns
Reverse recovery charge	Q_{rr}^{*5}		-	115	-	nC
Peak reverse recovery current	I_{rrm}^{*5}		-	9	-	A

*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 Please be advised not to use SiC-MOSFETs with V_{GS} below 13V as doing so may cause thermal runaway.

*5 Pulsed

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

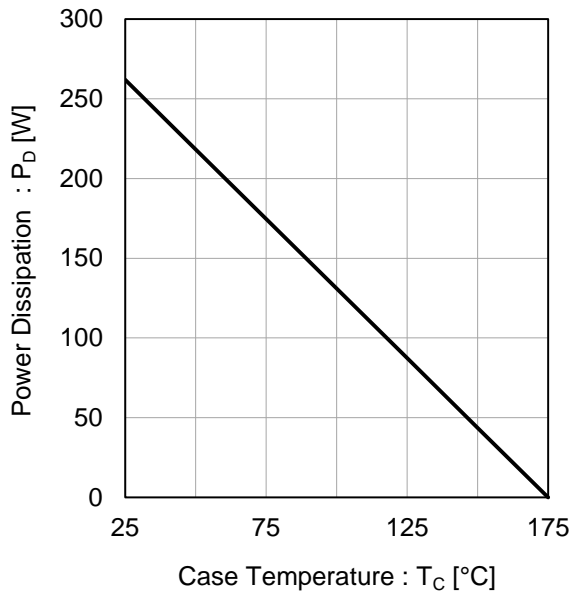


Fig.2 Maximum Safe Operating Area

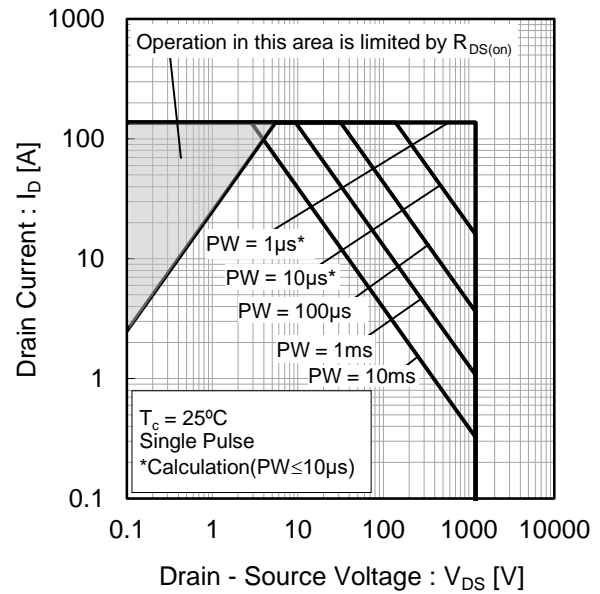
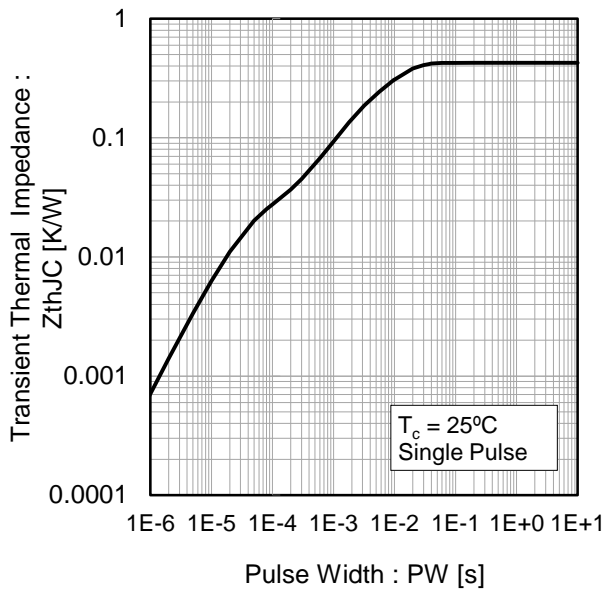


Fig.3 Typical Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

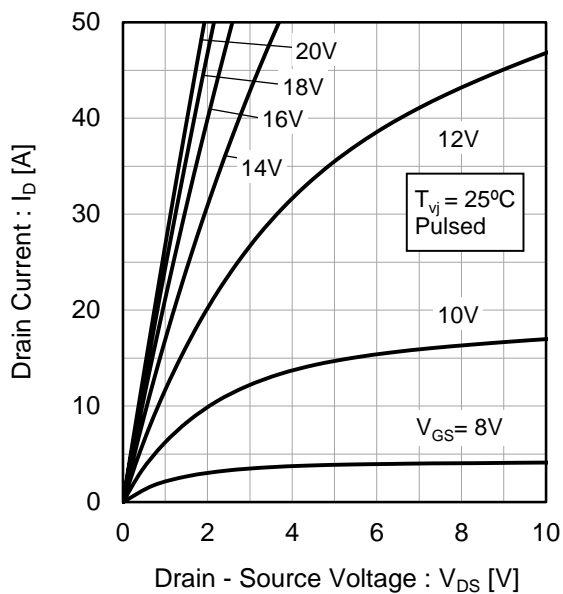


Fig.5 Typical Output Characteristics(II)

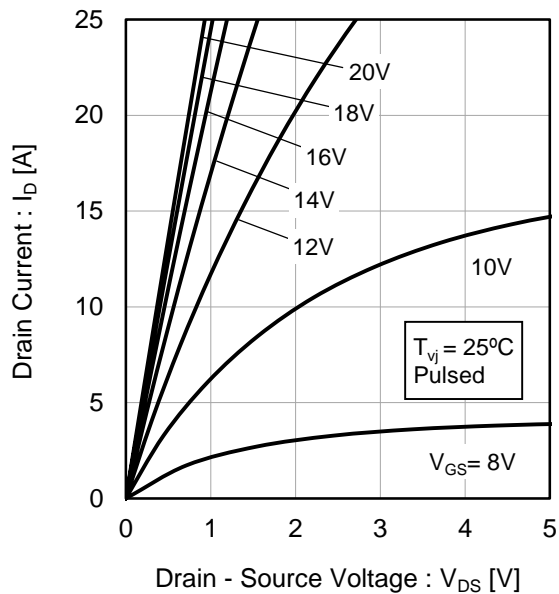
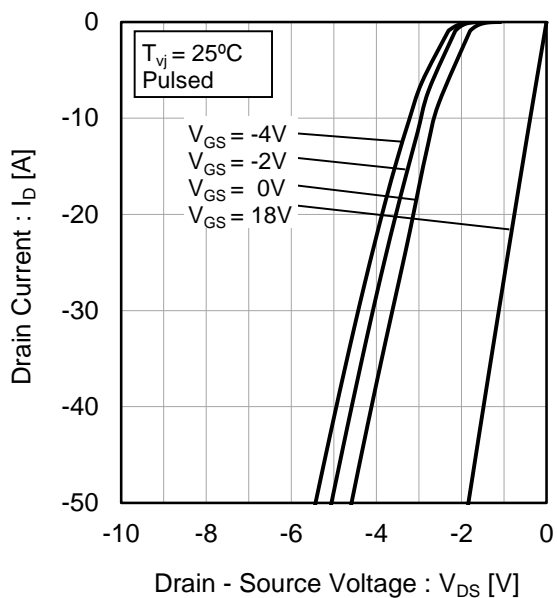


Fig.6 $T_{vj} = 25^\circ C$ 3rd Quadrant Characteristics



●Electrical characteristic curves

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

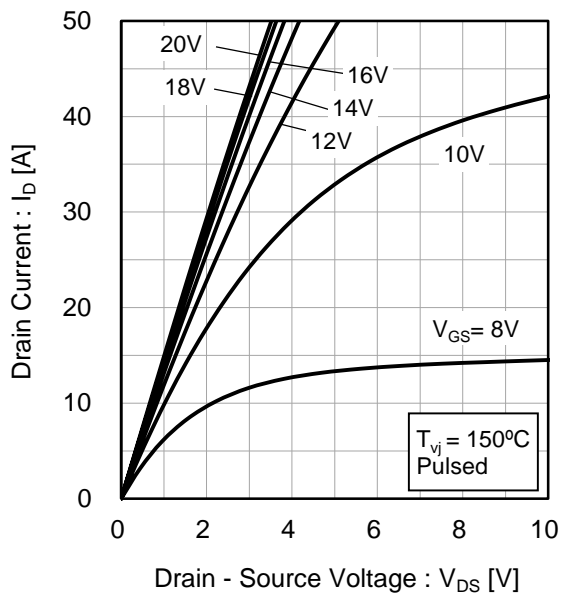


Fig.8 $T_{vj} = 150^{\circ}\text{C}$ Typical Output Characteristics(II)

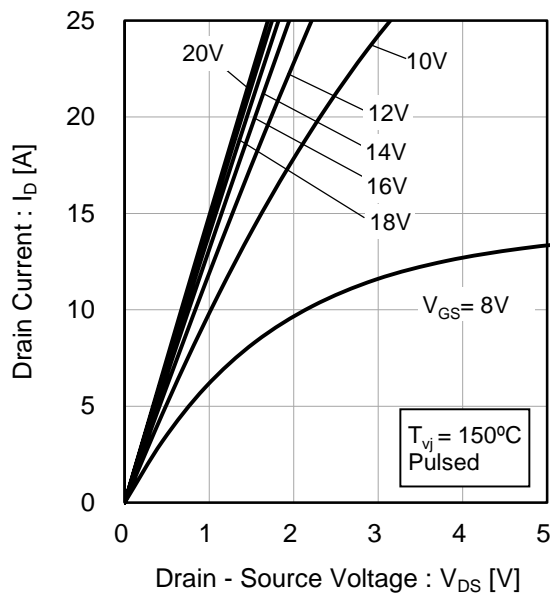


Fig.9 $T_{vj} = 150^{\circ}\text{C}$ 3rd Quadrant Characteristics

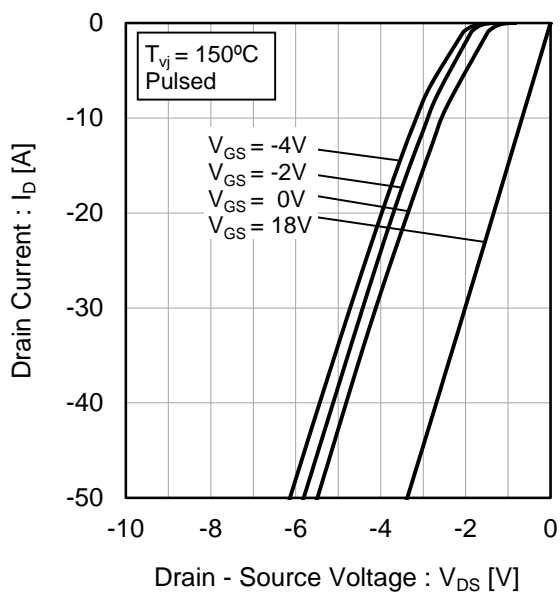
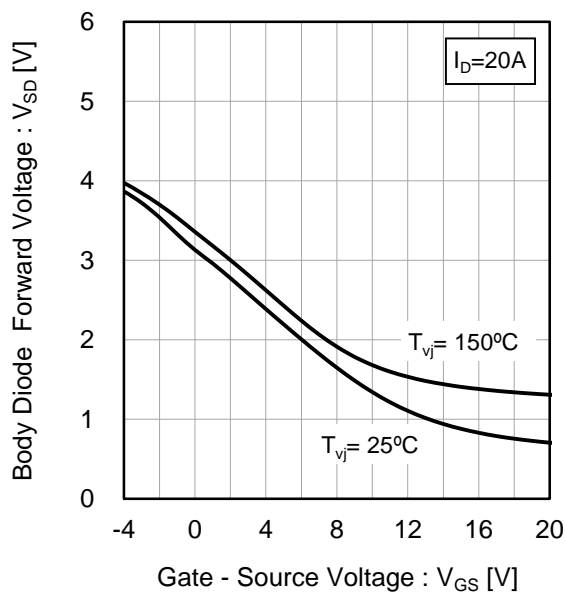


Fig.10 Body Diode Forward Voltage vs. Gate - Source Voltage



●Electrical characteristic curves

Fig.11 Typical Transfer Characteristics (I)

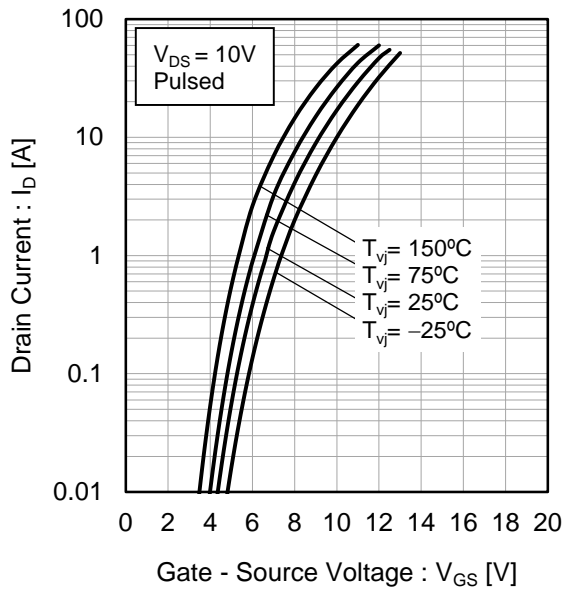


Fig.12 Typical Transfer Characteristics (II)

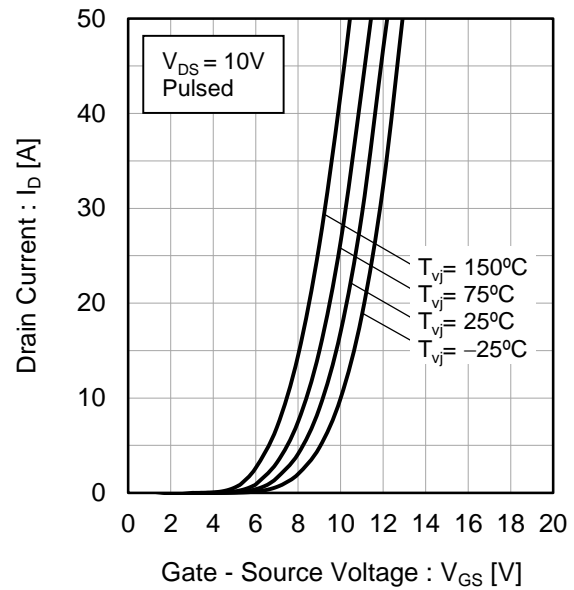


Fig.13 Gate Threshold Voltage vs. Junction Temperature

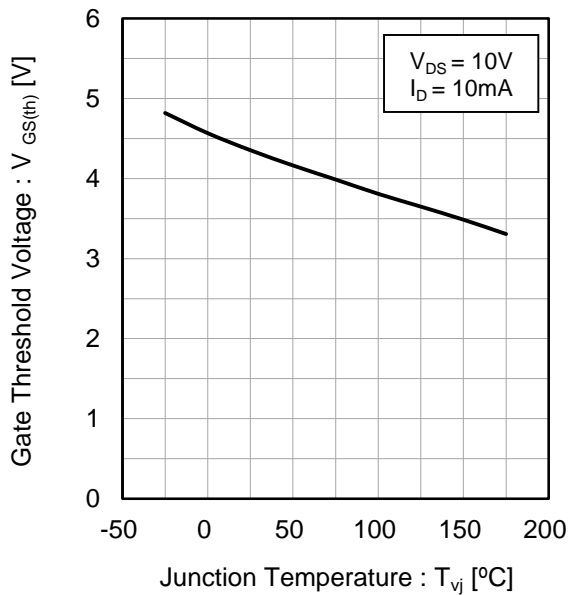
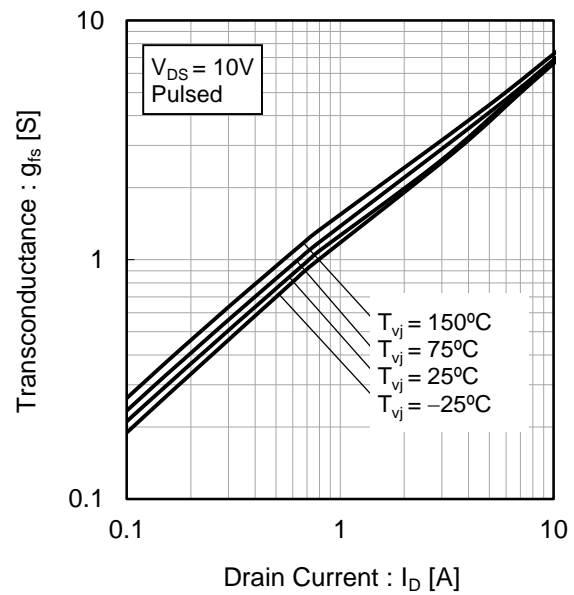


Fig.14 Transconductance vs. Drain Current



●Electrical characteristic curves

Fig.15 Static Drain - Source On - State Resistance vs. Gate - Source Voltage

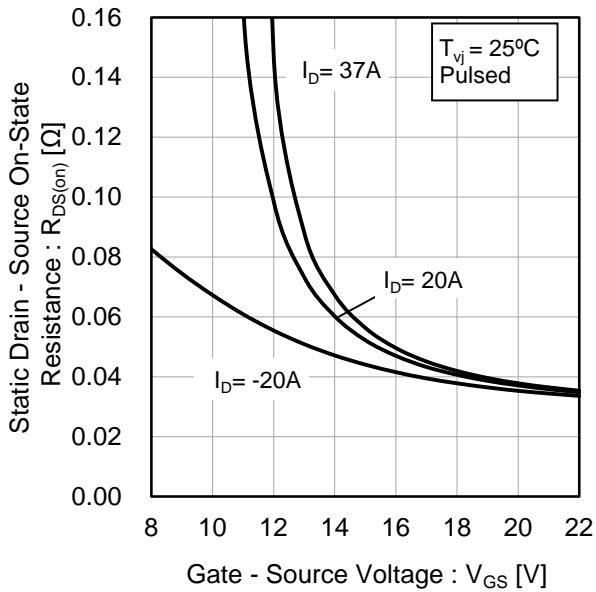


Fig.16 Static Drain - Source On - State Resistance vs. Junction Temperature

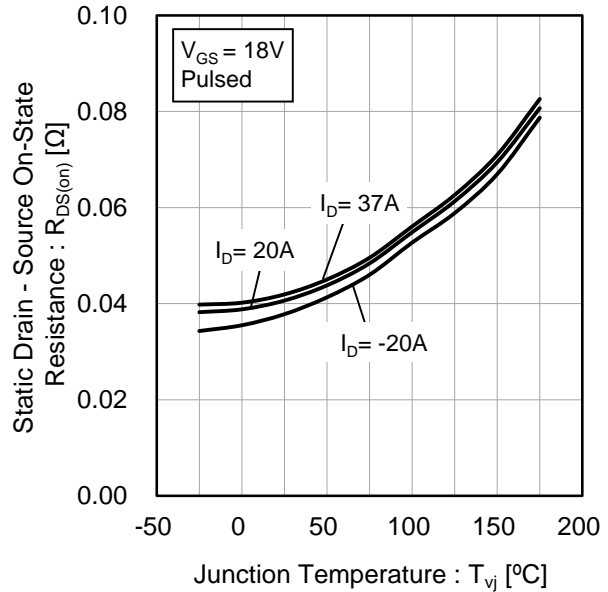


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current

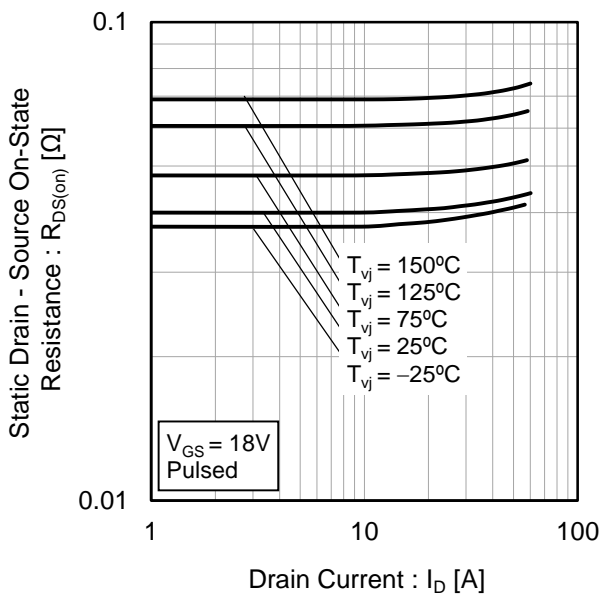
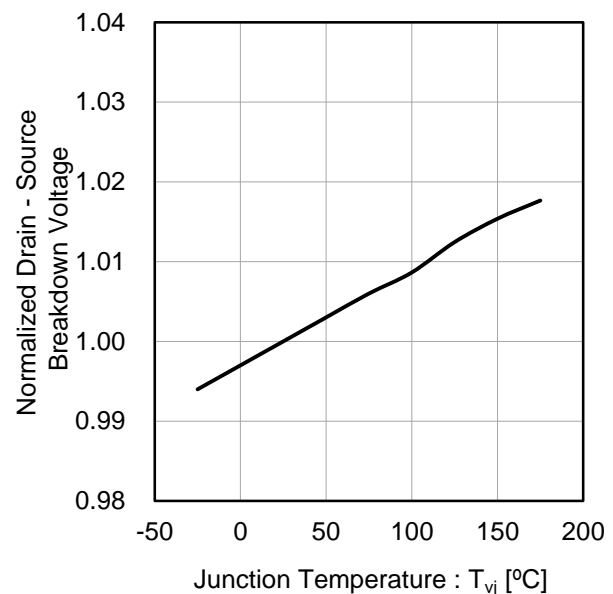


Fig.18 Normalized Drain - Source Breakdown Voltage vs. Junction Temperature



●Electrical characteristic curves

Fig.19 Typical Capacitance vs. Drain - Source Voltage

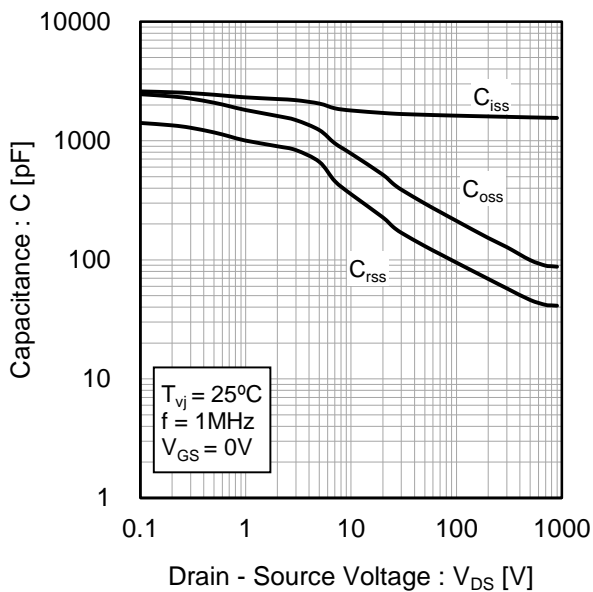


Fig.20 C_{oss} Stored Energy

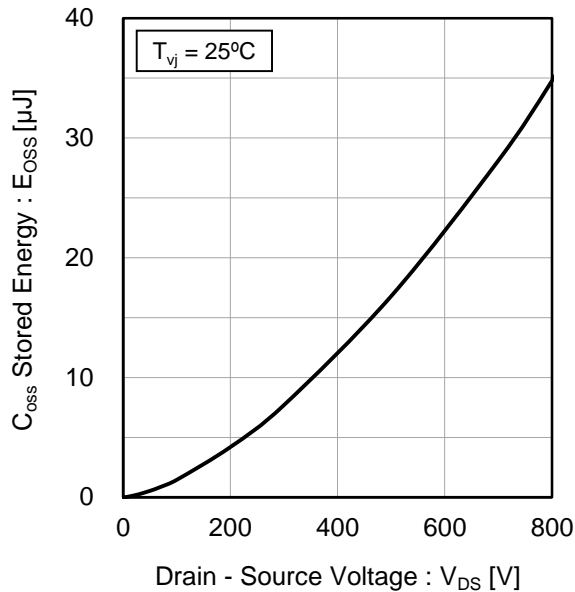
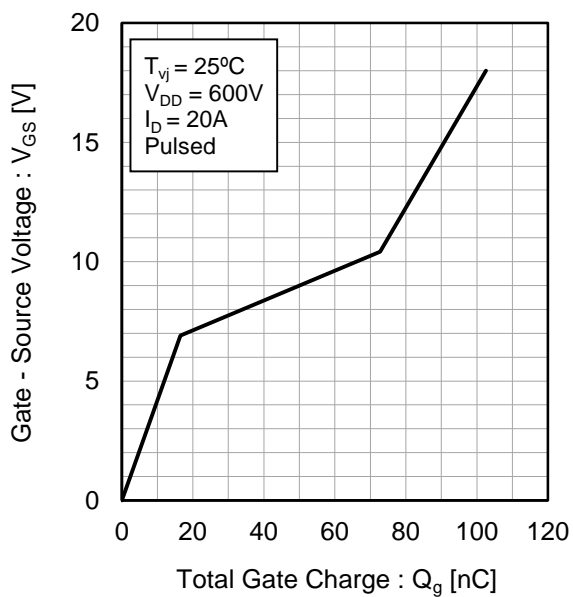
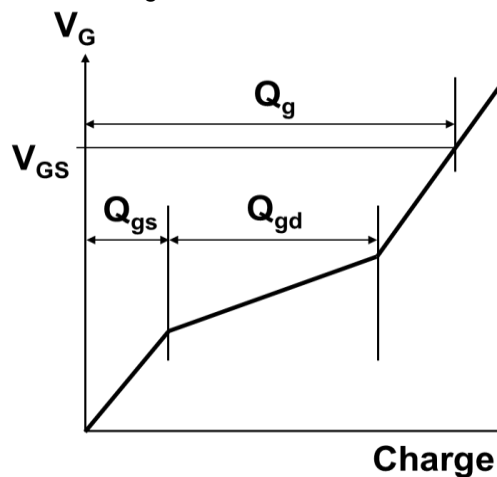


Fig.21 Dynamic Input Characteristics



*Gate Charge Waveform



●Electrical characteristic curves

Fig.19 Typical Switching Time vs. Drain Current

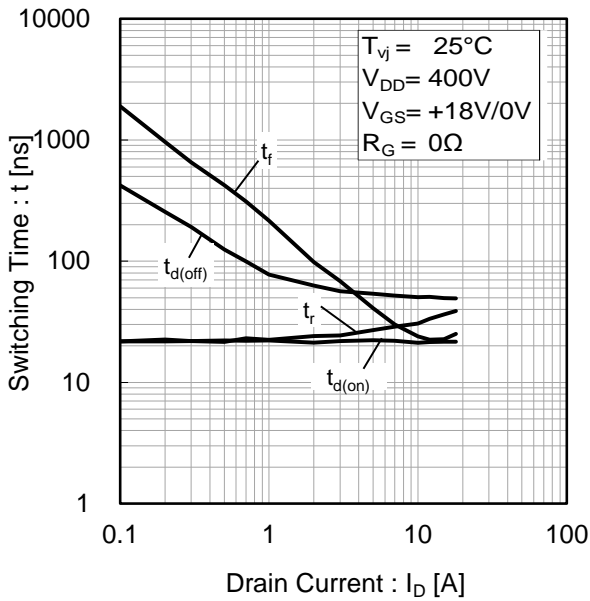


Fig.20 Typical Switching Loss vs. Drain - Source Voltage

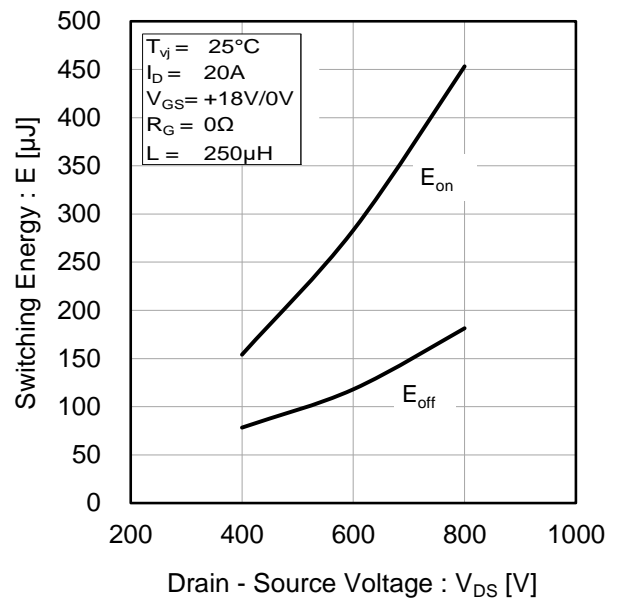


Fig.21 Typical Switching Loss vs. Drain Current

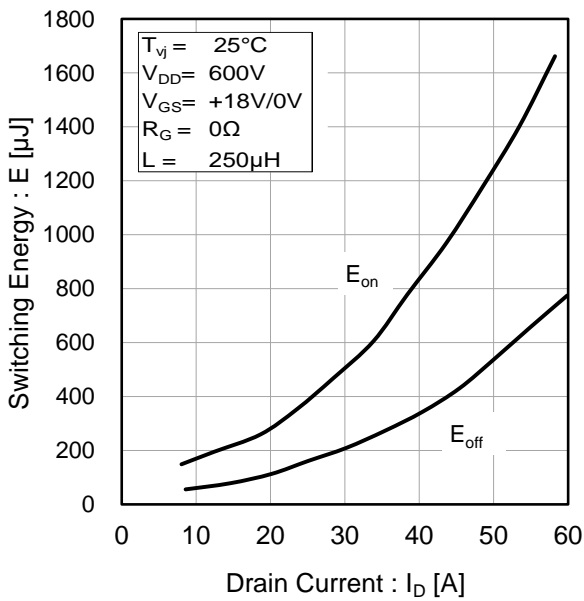
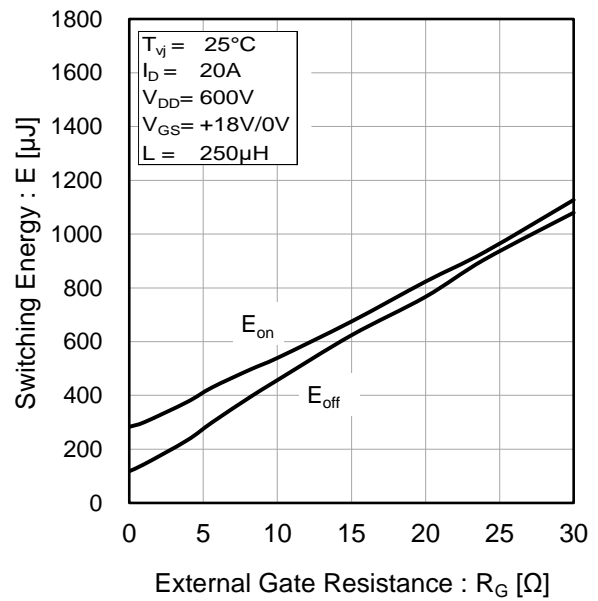


Fig.22 Typical Switching Loss vs. External Gate Resistance



● Measurement circuits and waveforms

Fig.1-1 Gate Charge and Switching Time Measurement Circuit

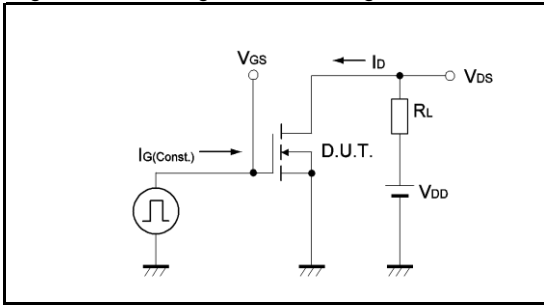


Fig.1-2 Waveforms for Switching Time

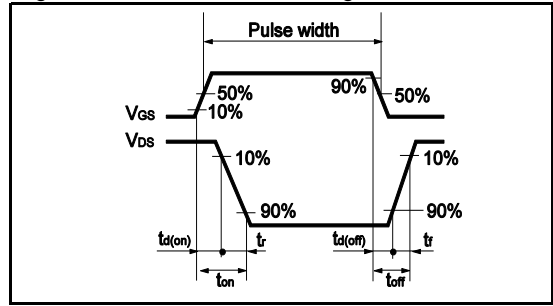


Fig.2-1 Switching Energy Measurement Circuit

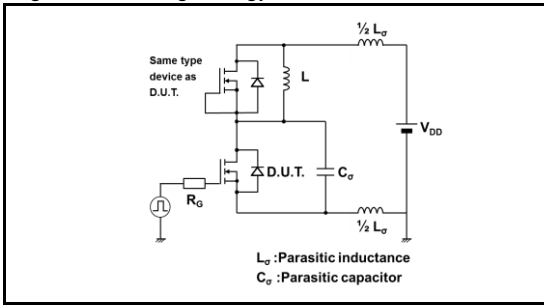


Fig.2-2 Waveforms for Switching Energy Loss

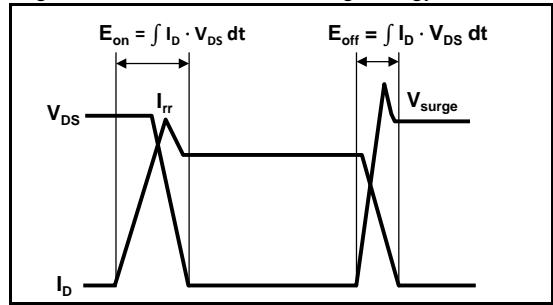


Fig.3-1 Reverse Recovery Time Measurement Circuit

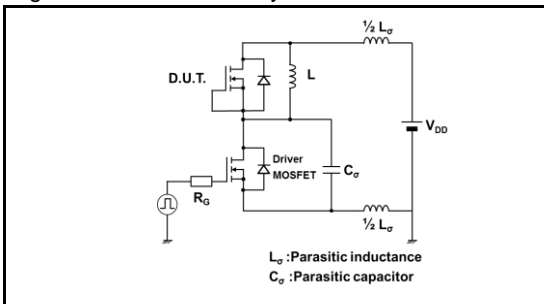
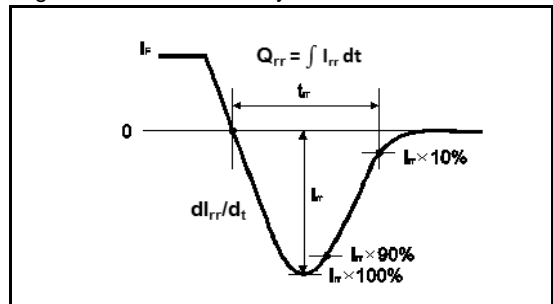
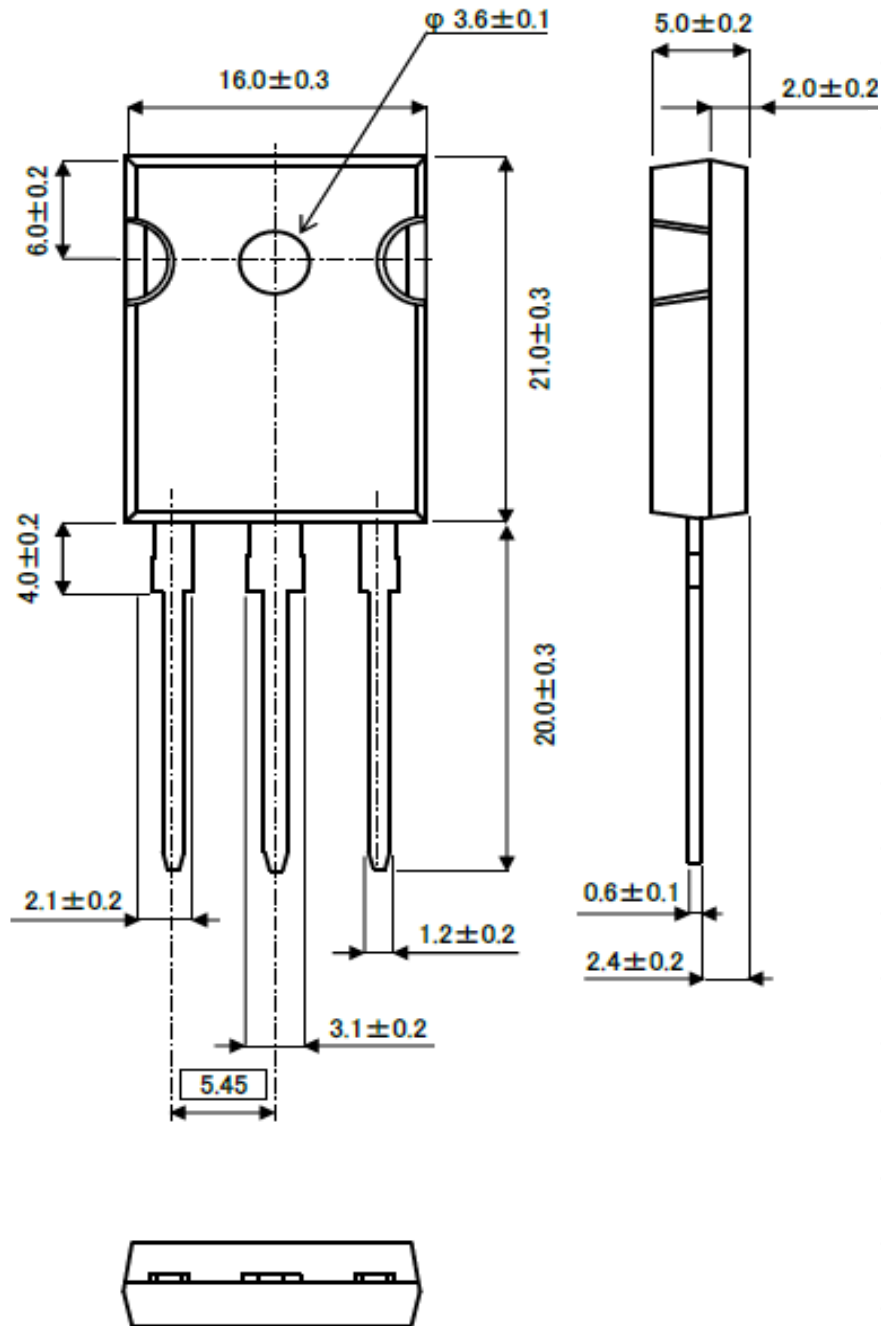


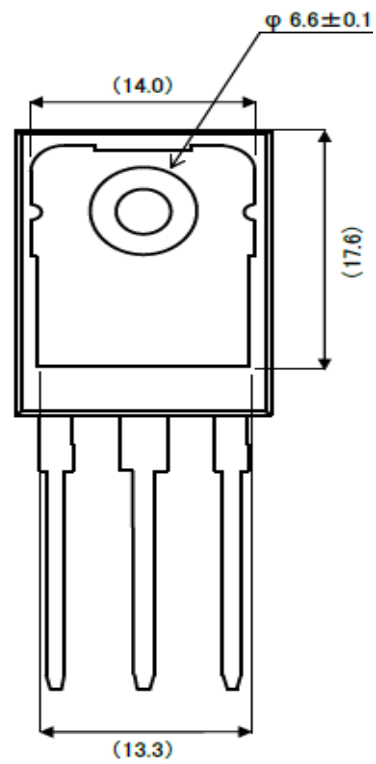
Fig.3-2 Reverse Recovery Waveform



●Package Dimensions

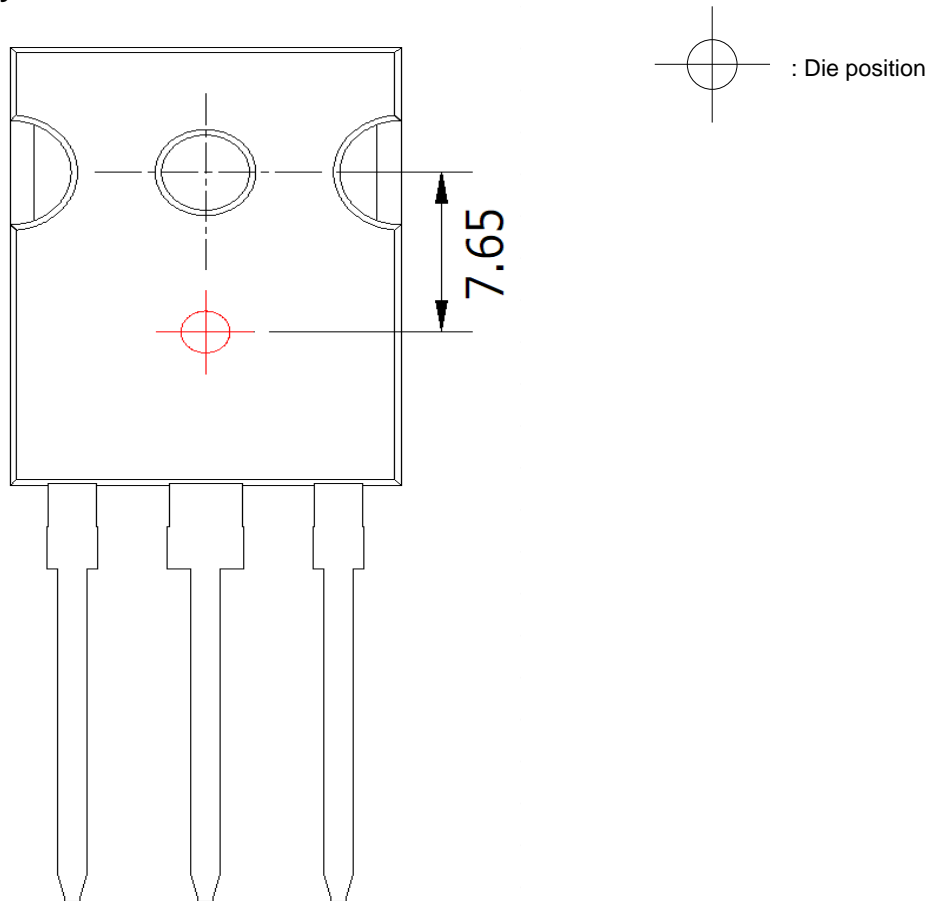


Unit: mm



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

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