

$V_{DSS}$	1200V
$R_{DS(on)}$ (Typ.)	40mΩ
$I_D^{*1}$	56A
$P_D$	267W

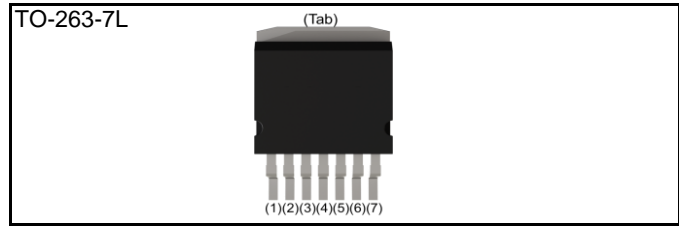
### ●Features

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

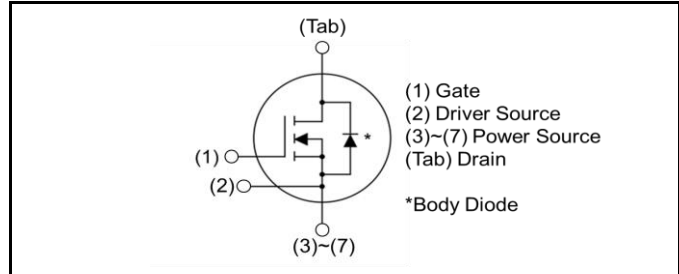
### ●Application

- Solar inverters
- DC/DC converters
- Switch mode power supplies
- Induction heating
- Motor drives

### ●Outline



### ●Inner circuit



Please note Driver Source and Power Source are not exchangeable. Their exchange might lead to malfunction.

### ●Packaging specifications

Type	Packing	Embossed tape
	Reel size (mm)	330
	Tape width (mm)	24
	Basic ordering unit (pcs)	1000
	Taping code	TL
	Marking	SCT3040KW7

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

Parameter	Symbol	Value	Unit	
Drain - Source Voltage	$V_{DSS}$	1200	V	
Continuous Drain current	$T_c = 25^{\circ}C$	$I_D^{*1}$	56	A
	$T_c = 100^{\circ}C$	$I_D^{*1}$	39	A
Pulsed Drain current ( $T_c = 25^{\circ}C$ )	$I_{D,pulse}^{*2}$	140	A	
Gate - Source voltage (DC)	$V_{GSS}$	-4 to +22	V	
Gate - Source surge voltage ( $t_{surge} < 300ns$ )	$V_{GSS,surge}^{*3}$	-4 to +26	V	
Recommended drive voltage	$V_{GS,op}^{*4}$	0 / +18	V	
Virtual Junction temperature	$T_{vj}$	175	$^{\circ}C$	
Range of storage temperature	$T_{stg}$	-55 to +175	$^{\circ}C$	

●Electrical characteristics (T<sub>vj</sub> = 25°C unless otherwise specified)

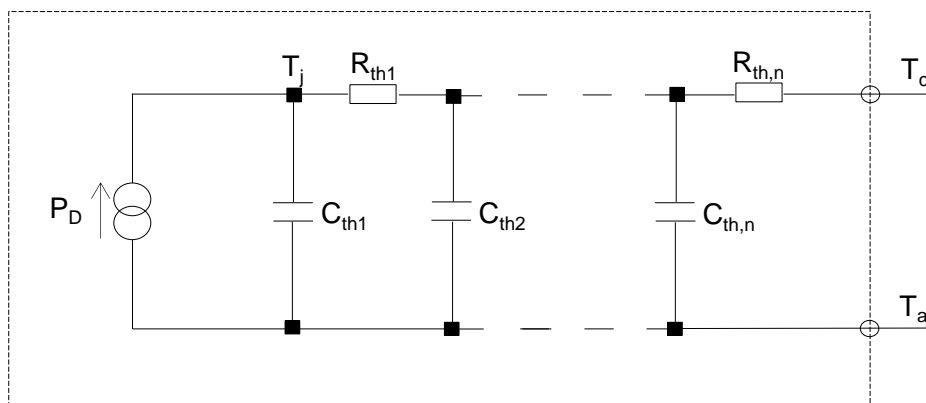
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = 1mA T <sub>vj</sub> = 25°C T <sub>vj</sub> = -55°C	1200 1200	- -	- -	V
Zero Gate voltage Drain current	I <sub>DSS</sub>	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 1200V T <sub>vj</sub> = 25°C T <sub>vj</sub> = 150°C	- -	1 2	10 -	μA
Gate - Source leakage current	I <sub>GSS+</sub>	V <sub>GS</sub> = +22V, V <sub>DS</sub> = 0V	-	-	100	nA
Gate - Source leakage current	I <sub>GSS-</sub>	V <sub>GS</sub> = -4V, V <sub>DS</sub> = 0V	-	-	-100	nA
Gate threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = 10V, I <sub>D</sub> = 10mA	2.7	-	5.6	V
Static Drain - Source on - state resistance	R <sub>DS(on)</sub> <sup>*5</sup>	V <sub>GS</sub> = 18V, I <sub>D</sub> = 20A T <sub>vj</sub> = 25°C T <sub>vj</sub> = 150°C	- -	40 68	52 -	mΩ
Gate input resistance	R <sub>G</sub>	f = 1MHz, open drain	-	7	-	Ω

●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case	R <sub>thJC</sub>	-	0.44	0.56	K/W

●Typical Transient Thermal Characteristics

Symbol	Value	Unit	Symbol	Value	Unit
R <sub>th1</sub>	4.06×10 <sup>-2</sup>	K/W	C <sub>th1</sub>	7.06×10 <sup>-3</sup>	Ws/K
R <sub>th2</sub>	6.86×10 <sup>-2</sup>		C <sub>th2</sub>	2.59×10 <sup>-2</sup>	
R <sub>th3</sub>	3.31×10 <sup>-1</sup>		C <sub>th3</sub>	2.77×10 <sup>-2</sup>	



● **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	$t_{d(on)}^{*5}$	$V_{DS} = 600\text{V}$ $I_D = 20\text{A}$	-	6	-	ns
Rise time	$t_r^{*5}$	$V_{GS} = 0\text{V}/+18\text{V}$	-	19	-	
Turn - off delay time	$t_{d(off)}^{*5}$	$R_G = 0\Omega, L = 750\mu\text{H}$ $L_{\sigma} = 50\text{nH}, C_{\sigma} = 10\text{pF}$	-	29	-	
Fall time	$t_f^{*5}$	See Fig. 2-1, 2-2, 2-3.	-	19	-	
Turn - on switching loss	$E_{on}^{*5}$	$E_{on}$ includes diode reverse recovery.	-	286	-	$\mu\text{J}$
Turn - off switching loss	$E_{off}^{*5}$		-	69	-	

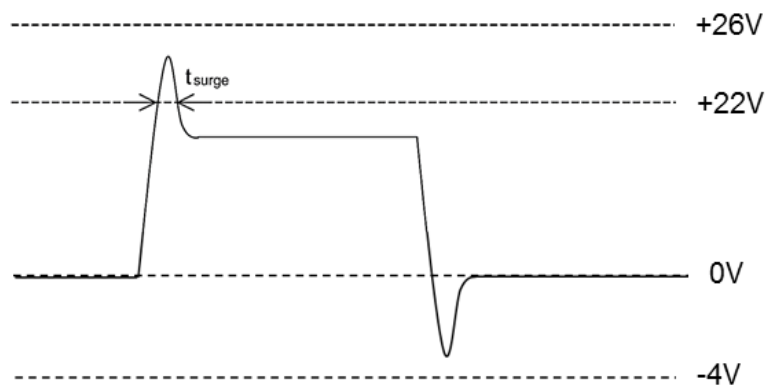
● **Body diode electrical characteristics** (Source-Drain) ( $T_{vj} = 25^{\circ}\text{C}$  unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Body diode continuous, forward current	$I_S$ *1	$T_c = 25^{\circ}\text{C}$	-	-	56	A
Body diode direct current, pulsed	$I_{SM}$ *2		-	-	140	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	$I_F = 20\text{A}$ $V_R = 600\text{V}$ $di/dt = 2500\text{A}/\mu\text{s}$ $L_{\sigma} = 50\text{nH}, C_{\sigma} = 10\text{pF}$ See Fig. 3-1, 3-2.	-	25	-	ns
Reverse recovery charge	$Q_{rr}$ *5		-	535	-	nC
Peak reverse recovery current	$I_{rrm}$ *5		-	35	-	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



Please note especially when using driver source that  $V_{GSS\_surge}$  must be in the range of absolute maximum rating.

\*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

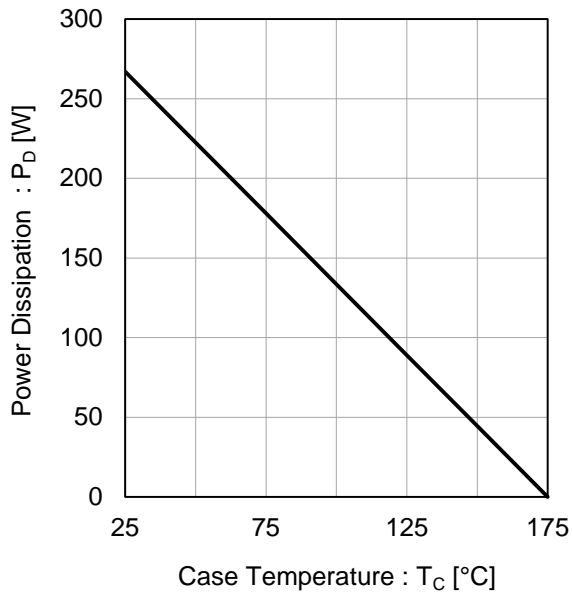


Fig.2 Maximum Safe Operating Area

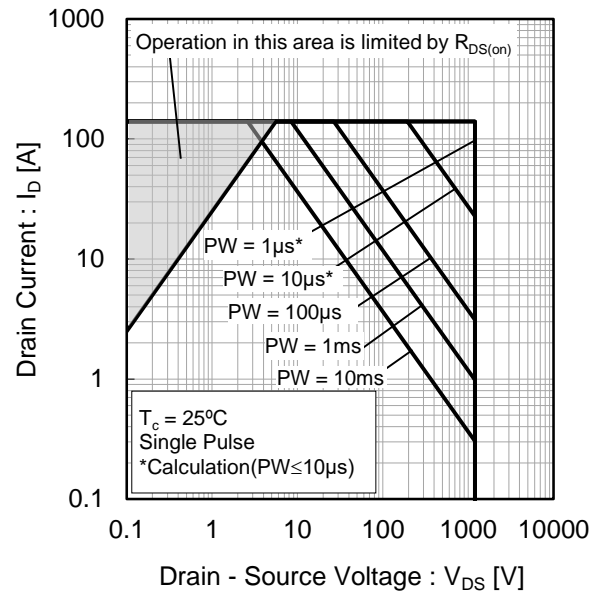
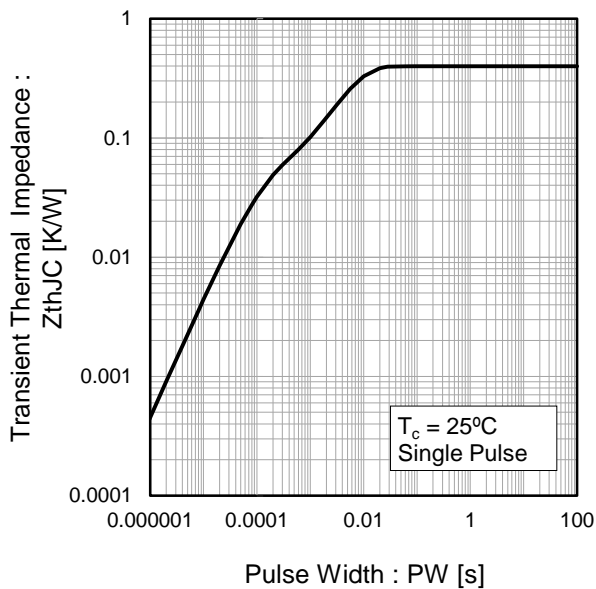


Fig.3 Typical Transient Thermal Impedance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

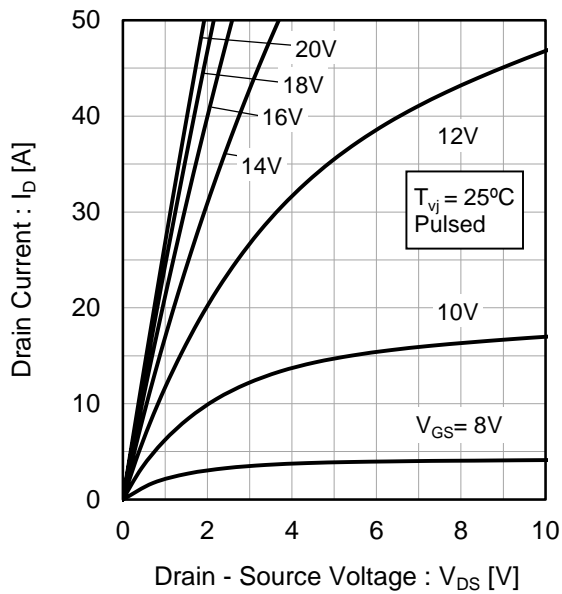


Fig.5 Typical Output Characteristics(II)

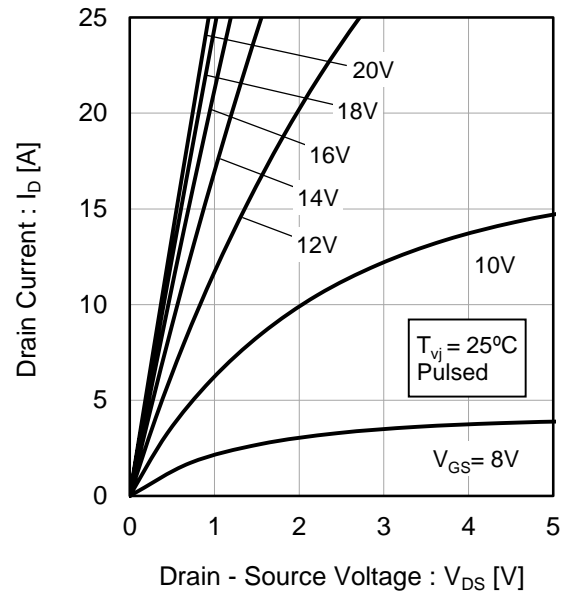
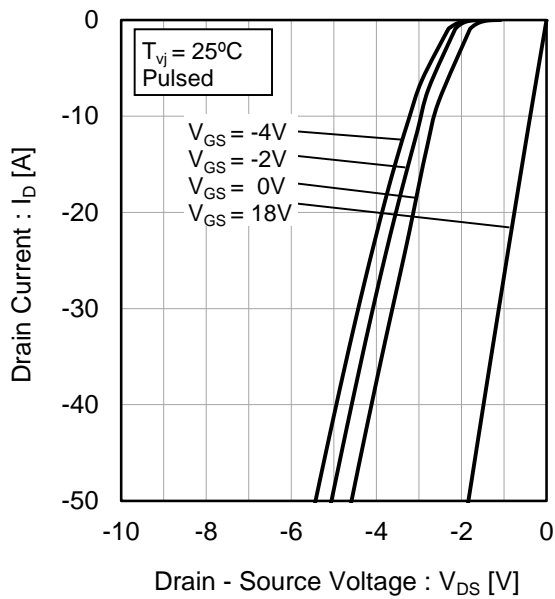


Fig.6  $T_{vj} = 25^\circ C$  3rd Quadrant Characteristics



●Electrical characteristic curves

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

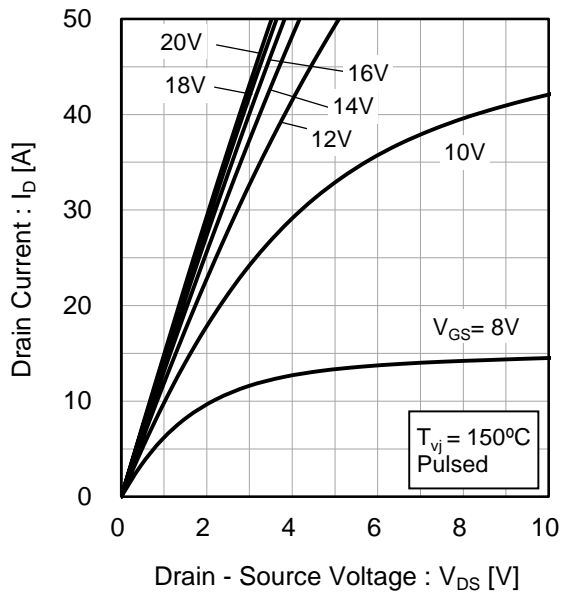


Fig.8  $T_{vj} = 150^{\circ}\text{C}$  Typical Output Characteristics(II)

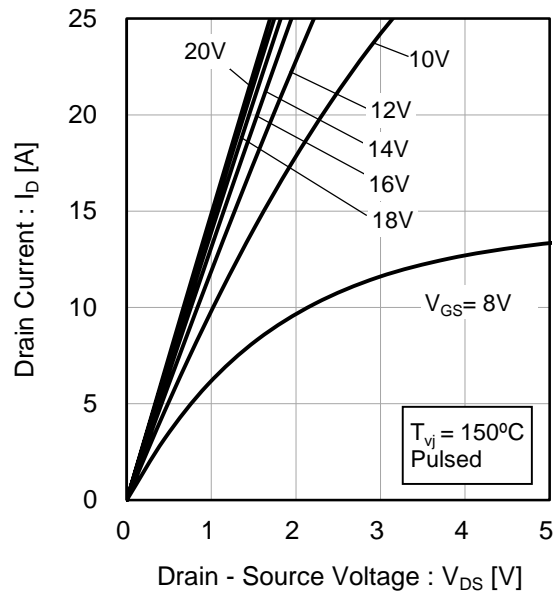


Fig.9  $T_{vj} = 150^{\circ}\text{C}$  3rd Quadrant Characteristics

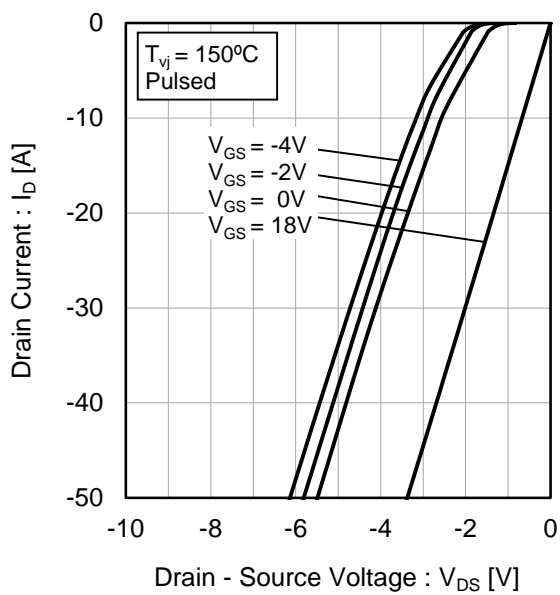
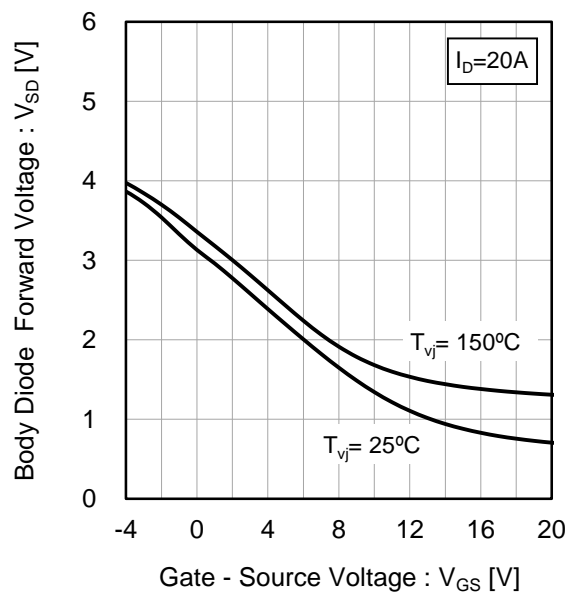


Fig.10 Body Diode Forward Voltage vs. Gate - Source Voltage



●Electrical characteristic curves

Fig.11 Typical Transfer Characteristics (I)

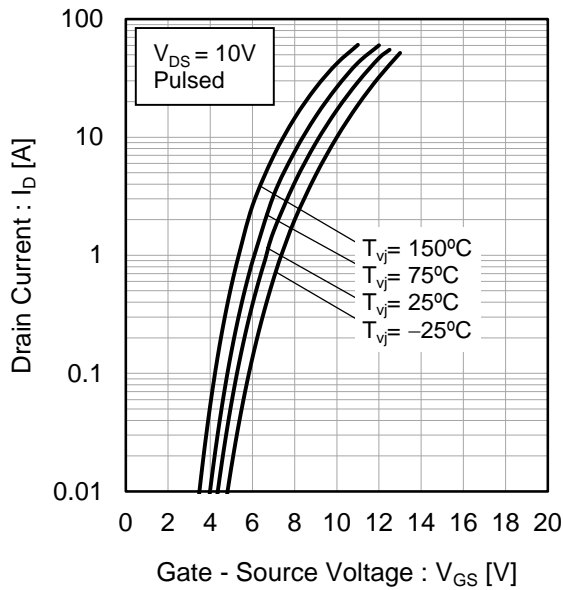


Fig.12 Typical Transfer Characteristics (II)

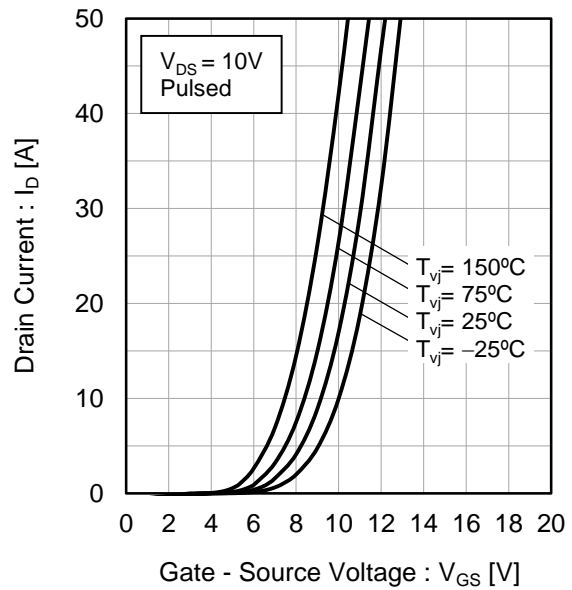


Fig.13 Gate Threshold Voltage vs. Virtual Junction Temperature

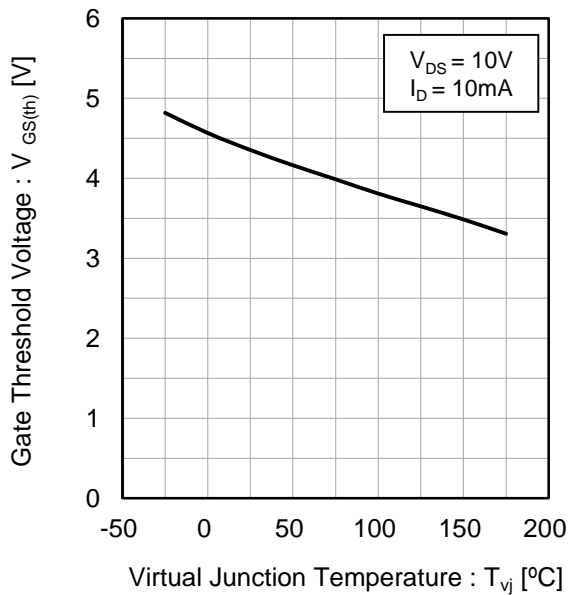
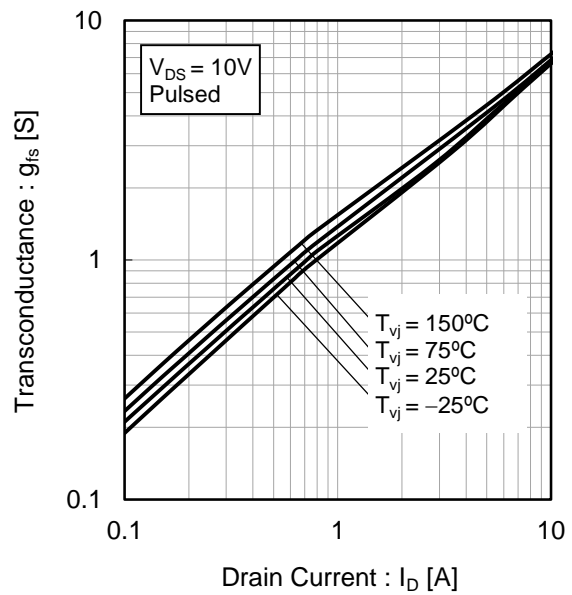


Fig.14 Transconductance vs. Drain Current





●Electrical characteristic curves

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

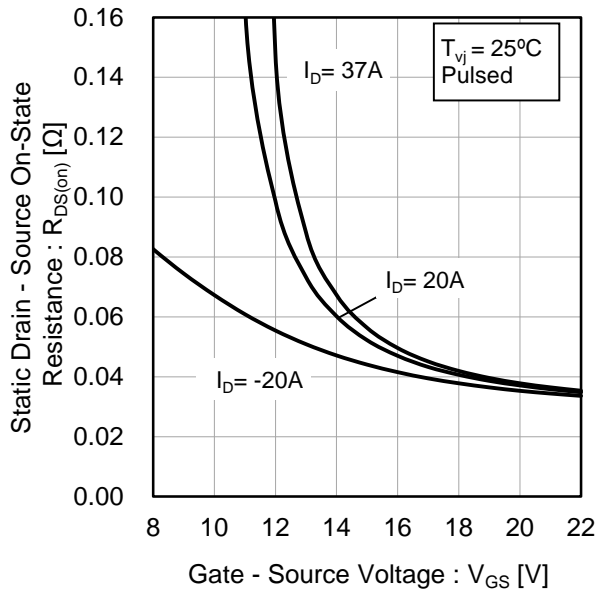


Fig.16 Static Drain - Source On - State Resistance vs. Virtual Junction Temperature

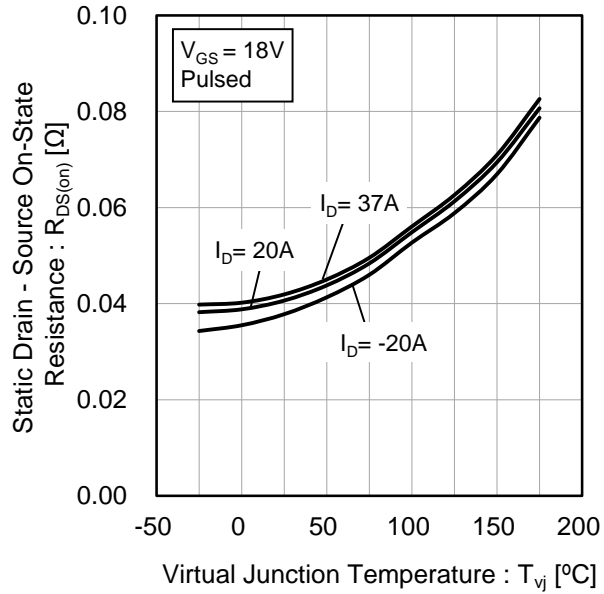


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current

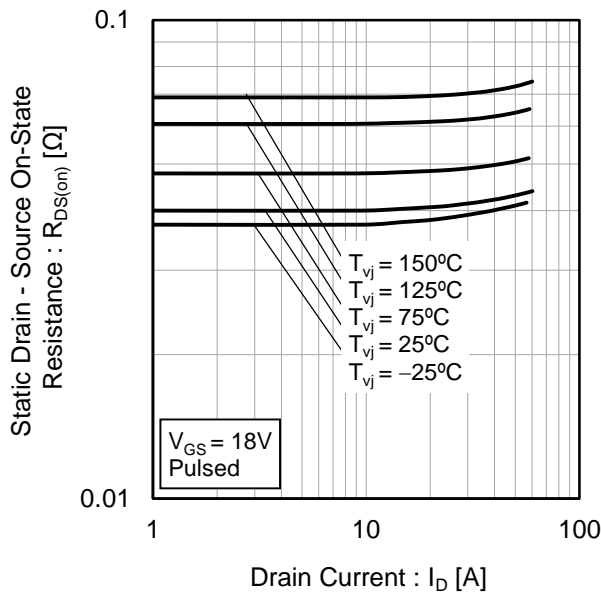
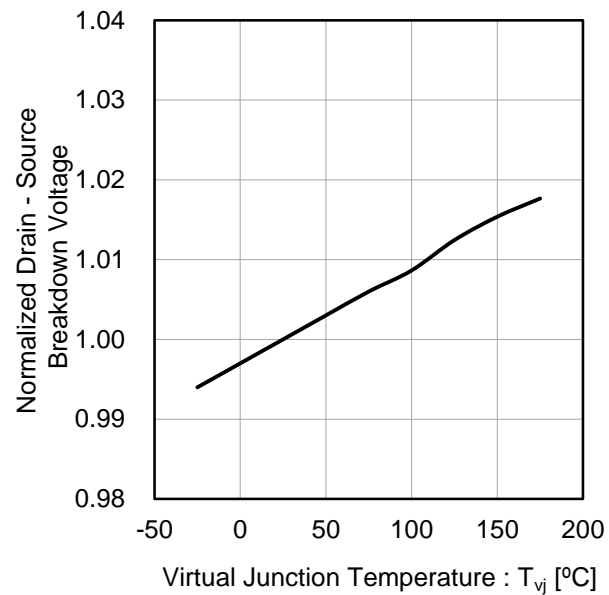


Fig.18 Normalized Drain - Source Breakdown Voltage vs. Virtual Junction Temperature



●Electrical characteristic curves

Fig.19 Typical Capacitance vs. Drain - Source Voltage

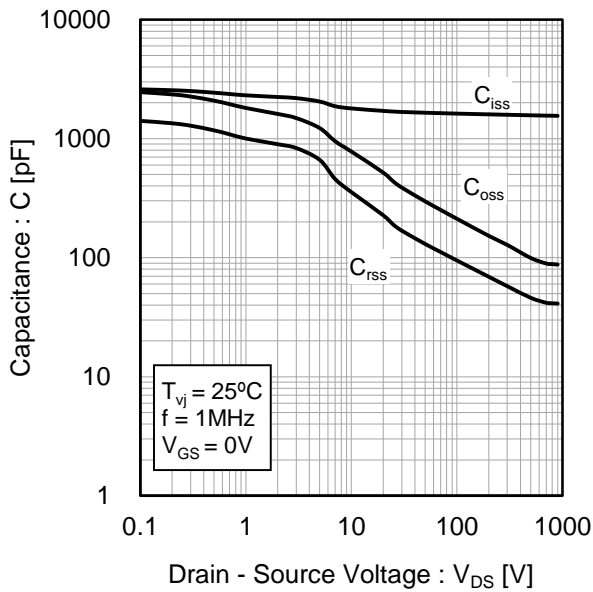


Fig.20  $C_{oss}$  Stored Energy

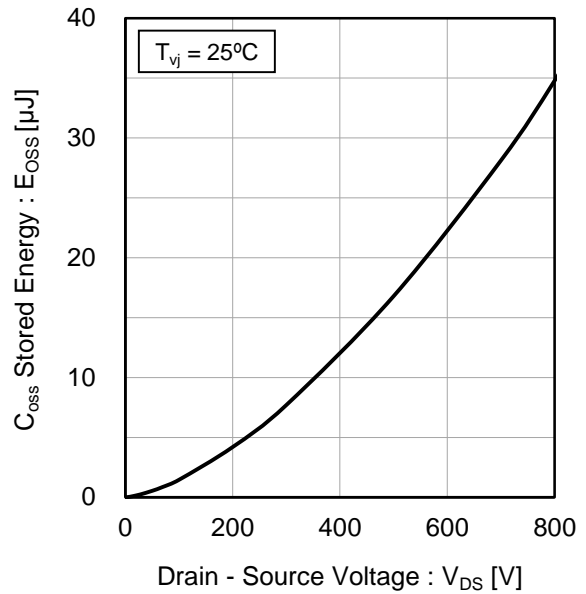
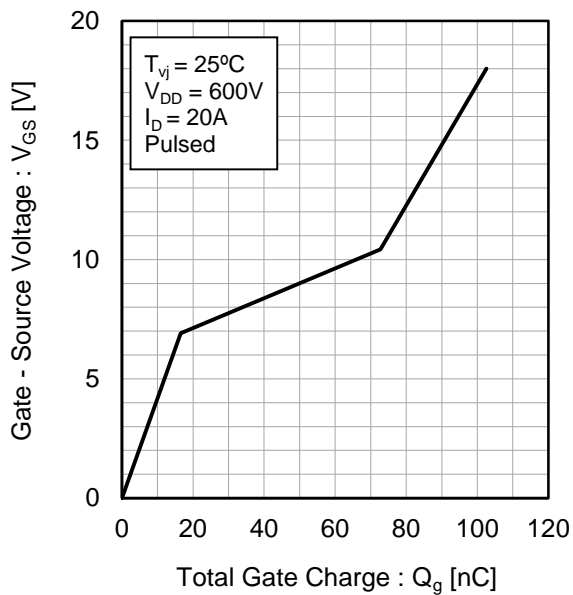
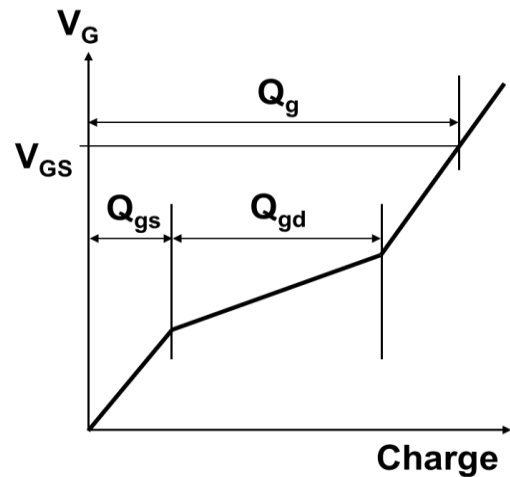


Fig.21 Dynamic Input Characteristics



\*Gate Charge Waveform



●Electrical characteristic curves

Fig.22 Typical Switching Time vs. External Gate Resistance

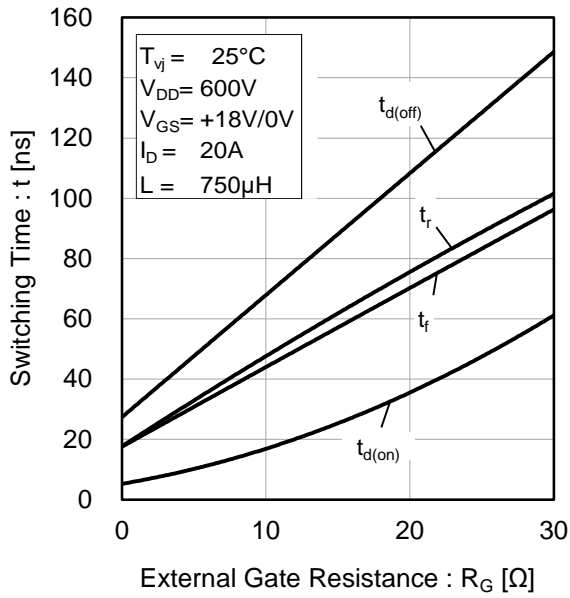


Fig.23 Typical Switching Loss vs. Drain - Source Voltage

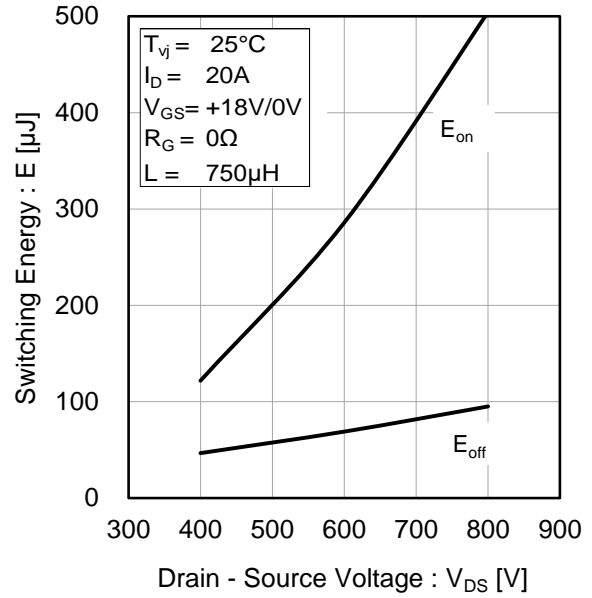


Fig.24 Typical Switching Loss vs. Drain Current

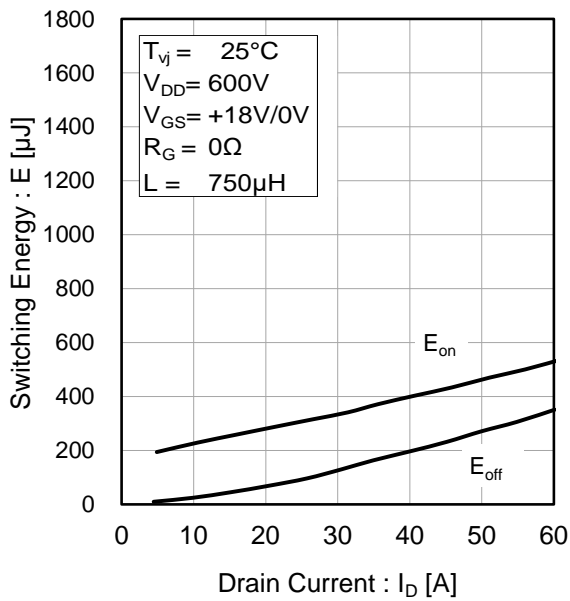
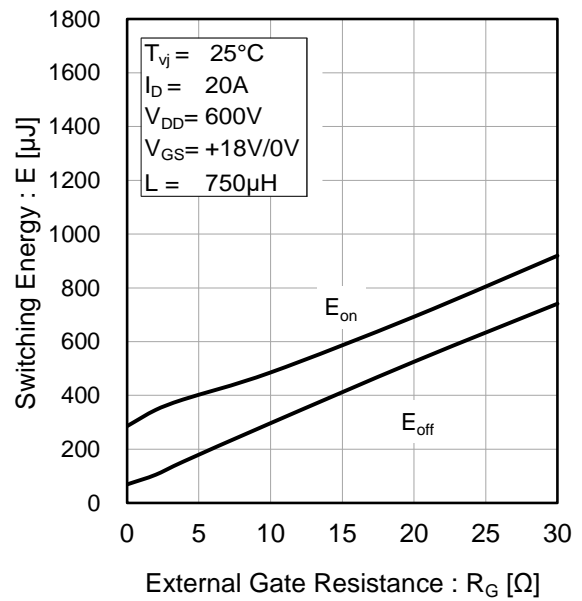


Fig.25 Typical Switching Loss vs. External Gate Resistance



● Measurement circuits and waveforms

Fig.1-1 Gate Charge Measurement Circuit

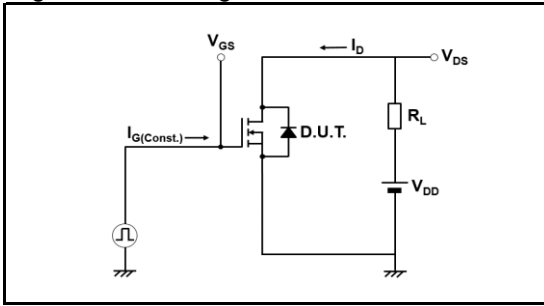


Fig.2-1 Switching Characteristics Measurement Circuit

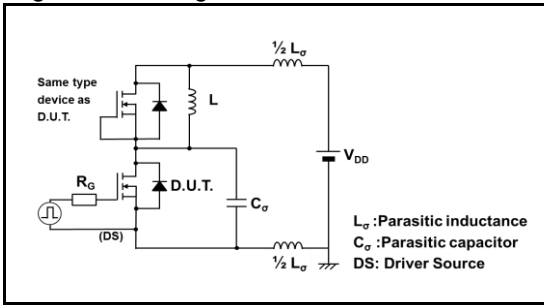


Fig.2-2 Waveforms for Switching Time

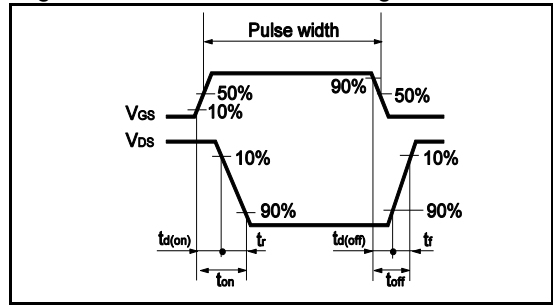


Fig.2-3 Waveforms for Switching Energy Loss

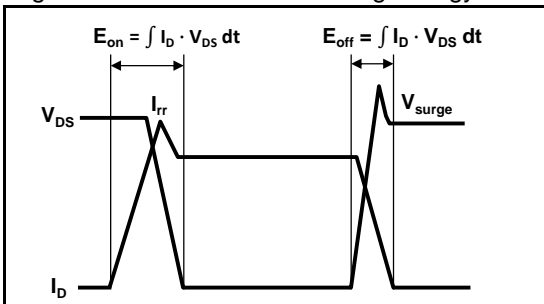


Fig.3-1 Reverse Recovery Time Measurement Circuit

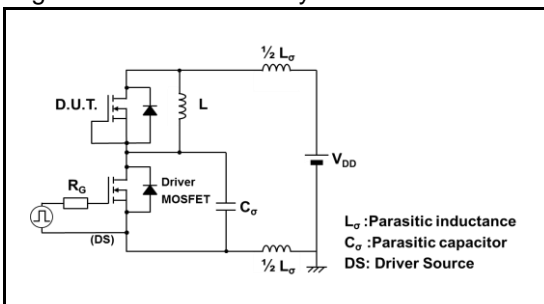
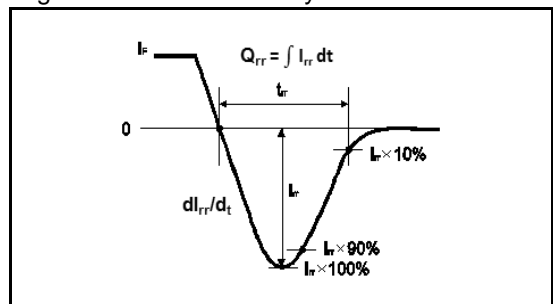
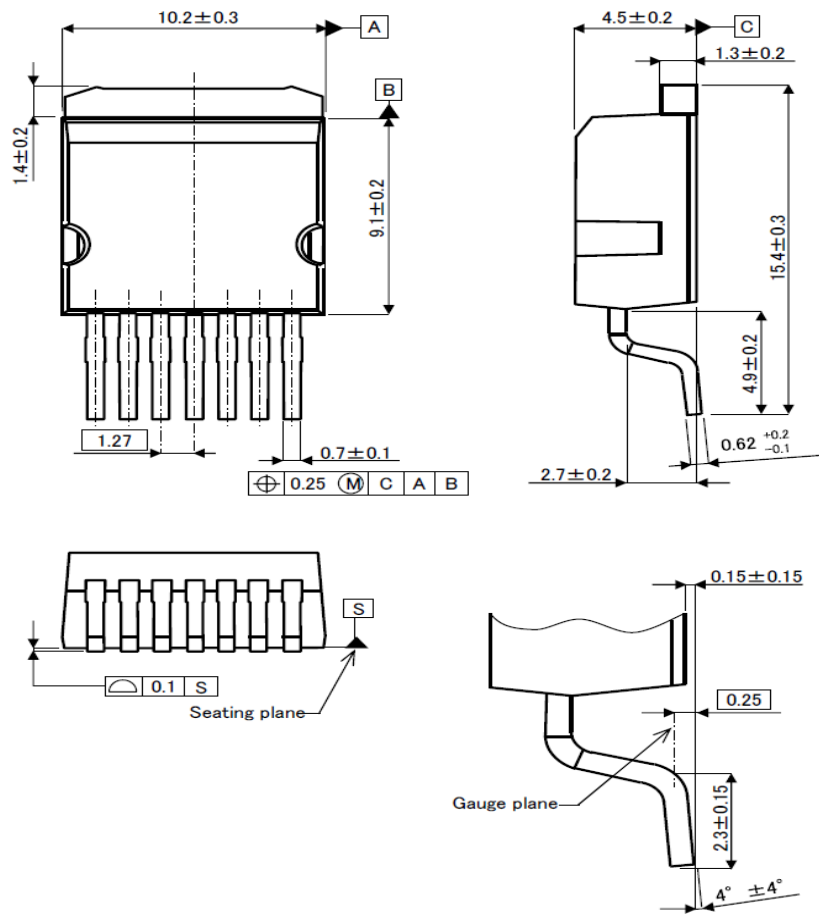


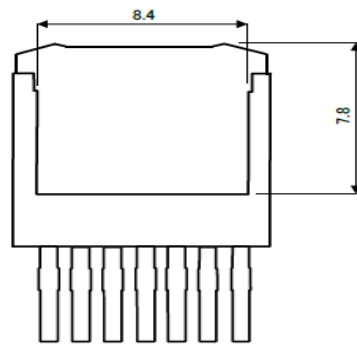
Fig.3-2 Reverse Recovery Waveform



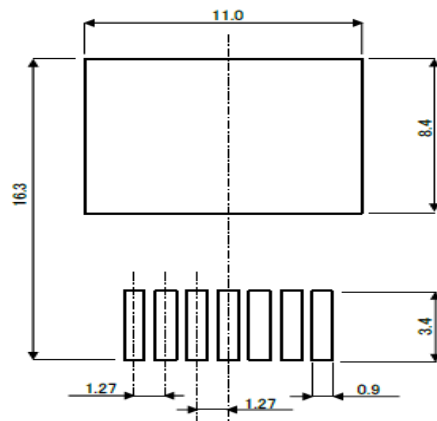
●Package Dimensions



Unit: mm

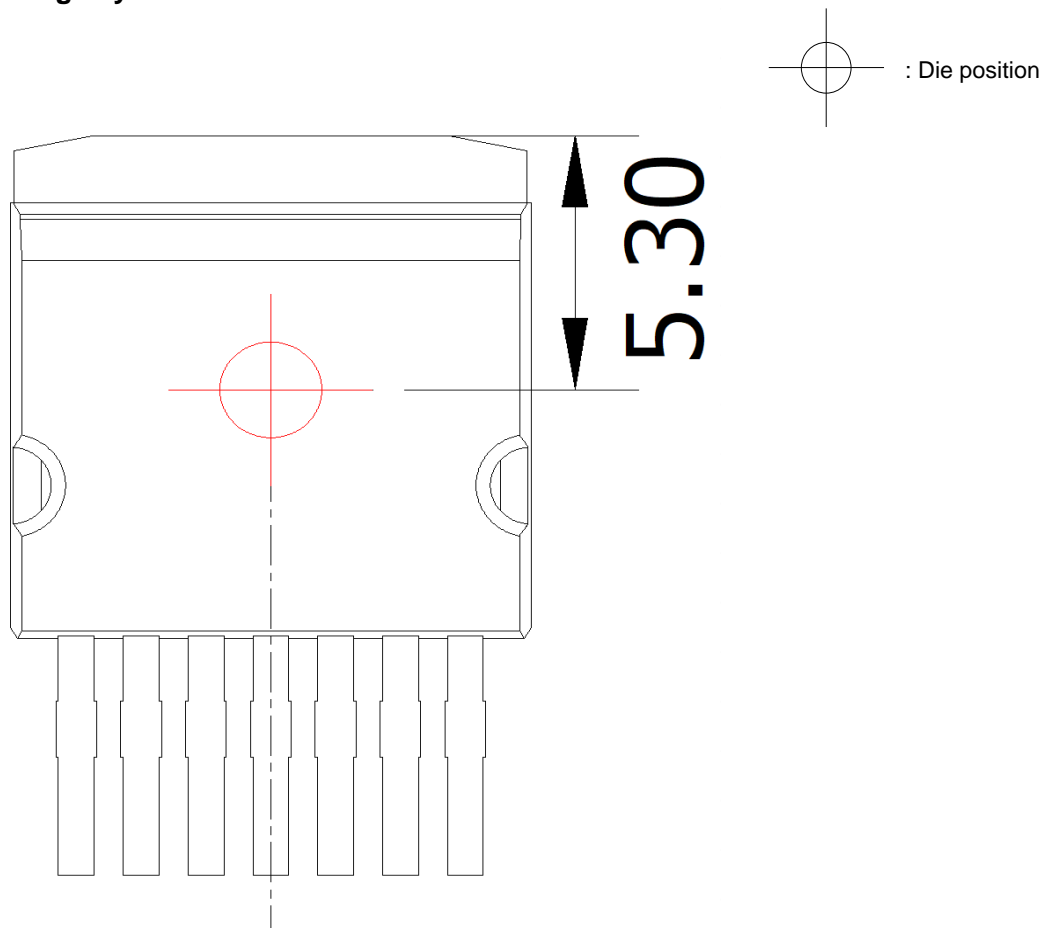


## RECOMMENDED FOOTPRINT DIMENSIONS



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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