

V_{DSS}	650V
$R_{DS(on)}$ (Typ.)	120mΩ
I_D^{*1}	21A
P_D	100W

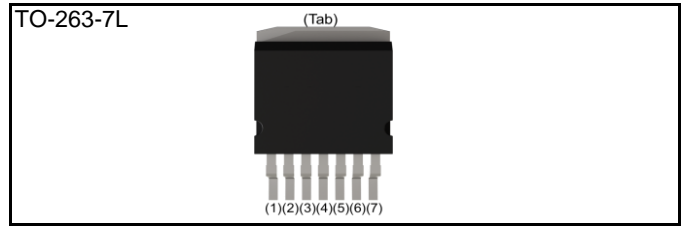
●Features

- 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

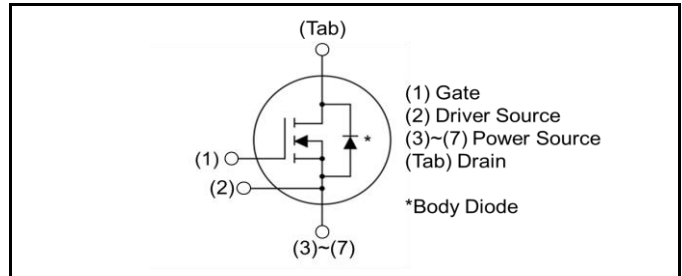
●Application

- 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	SCT3120AW7

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

Parameter	Symbol	Value	Unit	
Drain - Source Voltage	V_{DSS}	650	V	
Continuous Drain current	$T_c = 25^\circ\text{C}$	I_D^{*1}	21	A
	$T_c = 100^\circ\text{C}$	I_D^{*1}	15	A
Pulsed Drain current ($T_c = 25^\circ\text{C}$)	$I_{D,pulse}^{*2}$	52	A	
Gate - Source voltage (DC)	V_{GSS}	-4 to +22	V	
Gate - Source surge voltage ($t_{surge} < 300\text{ns}$)	$V_{GSS,surge}^{*3}$	-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 ($T_{vj} = 25^{\circ}\text{C}$ unless otherwise specified)

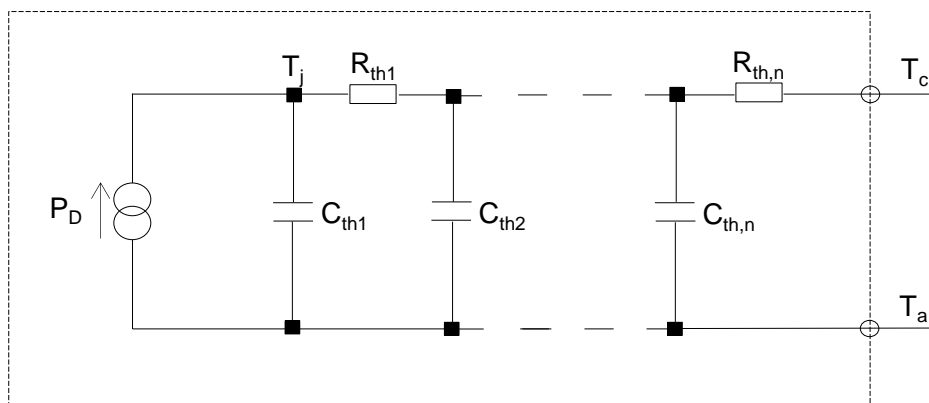
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{V}, I_D = 1\text{mA}$				V
		$T_{vj} = 25^{\circ}\text{C}$	650	-	-	
		$T_{vj} = -55^{\circ}\text{C}$	650	-	-	
Zero Gate voltage Drain current	I_{DSS}	$V_{GS} = 0\text{V}, V_{DS} = 650\text{V}$				μA
		$T_{vj} = 25^{\circ}\text{C}$	-	1	10	
		$T_{vj} = 150^{\circ}\text{C}$	-	2	-	
Gate - Source leakage current	I_{GSS+}	$V_{GS} = +22\text{V}, V_{DS} = 0\text{V}$	-	-	100	nA
Gate - Source leakage current	I_{GSS-}	$V_{GS} = -4\text{V}, V_{DS} = 0\text{V}$	-	-	-100	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = 10\text{V}, I_D = 3.33\text{mA}$	2.7	-	5.6	V
Static Drain - Source on - state resistance	$R_{DS(on)}^{*5}$	$V_{GS} = 18\text{V}, I_D = 6.7\text{A}$				m Ω
		$T_{vj} = 25^{\circ}\text{C}$	-	120	156	
		$T_{vj} = 150^{\circ}\text{C}$	-	172	-	
Gate input resistance	R_G	$f = 1\text{MHz}, \text{open drain}$	-	18	-	Ω

●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case ^{*6}	R_{thJC}	-	1.17	1.5	K/W

●Typical Transient Thermal Characteristics

Symbol	Value	Unit	Symbol	Value	Unit
R_{th1}	1.95×10^{-1}	K/W	C_{th1}	1.38×10^{-3}	Ws/K
R_{th2}	3.47×10^{-1}		C_{th2}	1.40×10^{-2}	
R_{th3}	5.60×10^{-1}		C_{th3}	8.68×10^{-3}	



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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Transconductance	g_{fs}^{*5}	$V_{DS} = 10\text{V}, I_D = 6.7\text{A}$	-	2.7	-	S
Input capacitance	C_{iss}	$V_{GS} = 0\text{V}$	-	460	-	pF
Output capacitance	C_{oss}	$V_{DS} = 500\text{V}$	-	35	-	
Reverse transfer capacitance	C_{rss}	$f = 1\text{MHz}$	-	16	-	
Effective output capacitance, energy related	$C_{o(er)}$	$V_{GS} = 0\text{V}$ $V_{DS} = 0\text{V to } 300\text{V}$	-	70	-	pF
Total Gate charge	Q_g^{*5}	$V_{DS} = 300\text{V}$ $I_D = 6.7\text{A}$	-	38	-	nC
Gate - Source charge	Q_{gs}^{*5}	$V_{GS} = 18\text{V}$	-	10	-	
Gate - Drain charge	Q_{gd}^{*5}	See Fig. 1-1.	-	18	-	
Turn - on delay time	$t_{d(on)}^{*5}$	$V_{DS} = 400\text{V}$ $I_D = 5.0\text{A}$	-	6	-	ns
Rise time	t_r^{*5}	$V_{GS} = 0\text{V}/+18\text{V}$	-	14	-	
Turn - off delay time	$t_{d(off)}^{*5}$	$R_G = 0\Omega, L = 750\mu\text{H}$ $L_{\sigma} = 50\text{nH}, C_{\sigma} = 10\text{pF}$	-	19	-	
Fall time	t_f^{*5}	See Fig. 2-1, 2-2, 2-3.	-	11	-	
Turn - on switching loss	E_{on}^{*5}	E_{on} includes diode reverse recovery.	-	49	-	μJ
Turn - off switching loss	E_{off}^{*5}		-	4	-	

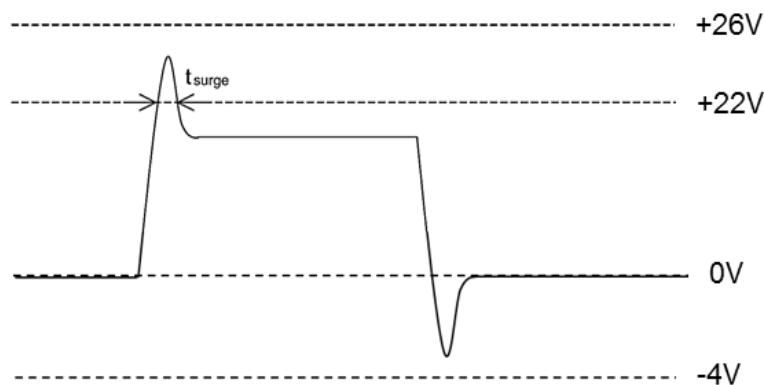
● **Body diode electrical characteristics** (Source-Drain) ($T_{vj} = 25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Body diode continuous, forward current	I_S^{*1}	$T_c = 25^{\circ}\text{C}$	-	-	21	A
Body diode direct current, pulsed	I_{SM}^{*2}		-	-	52	A
Forward voltage	V_{SD}^{*5}	$V_{GS} = 0\text{V}, I_S = 6.7\text{A}$	-	3.2	-	V
Reverse recovery time	t_{rr}^{*5}	$I_F = 5.0\text{A}$ $V_R = 400\text{V}$ $di/dt = 2500\text{A}/\mu\text{s}$ $L_{\sigma} = 50\text{nH}, C_{\sigma} = 10\text{pF}$ See Fig. 3-1, 3-2.	-	11	-	ns
Reverse recovery charge	Q_{rr}^{*5}		-	133	-	nC
Peak reverse recovery current	I_{rrm}^{*5}		-	11	-	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

*6 The case is bottom of leadframe underneath the chip. Practical value of $R_{th(j-c)}$ is influenced by design of the user. Described value is only valid at the specific conditions such as JESD51-14.

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

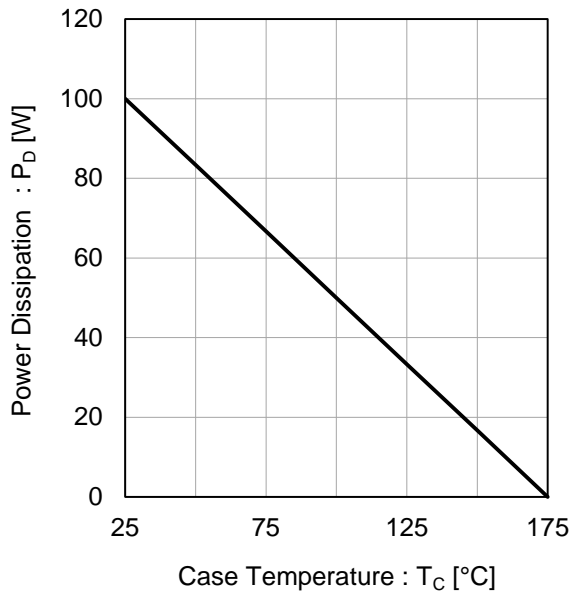


Fig.2 Maximum Safe Operating Area

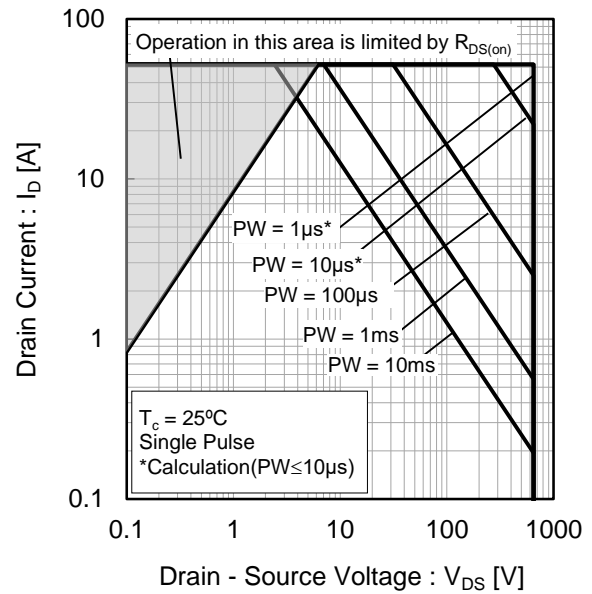
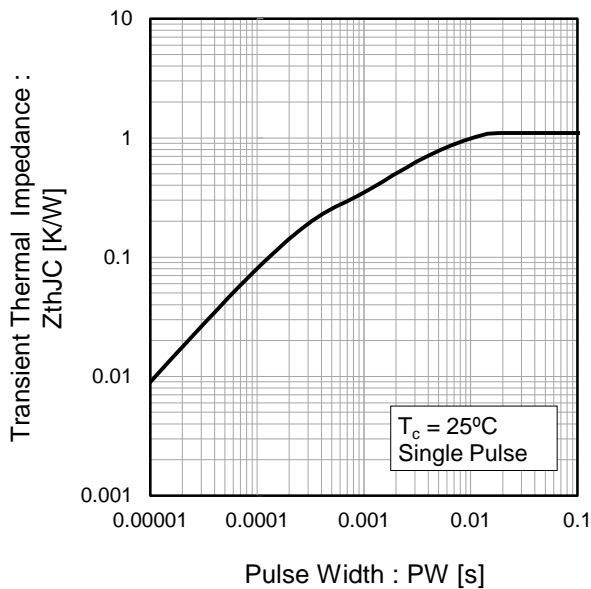


Fig.3 Typical Transient Thermal Impedance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

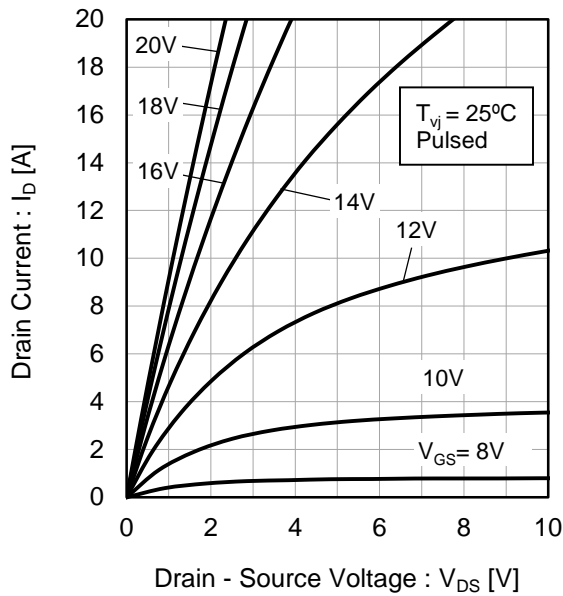


Fig.5 Typical Output Characteristics(II)

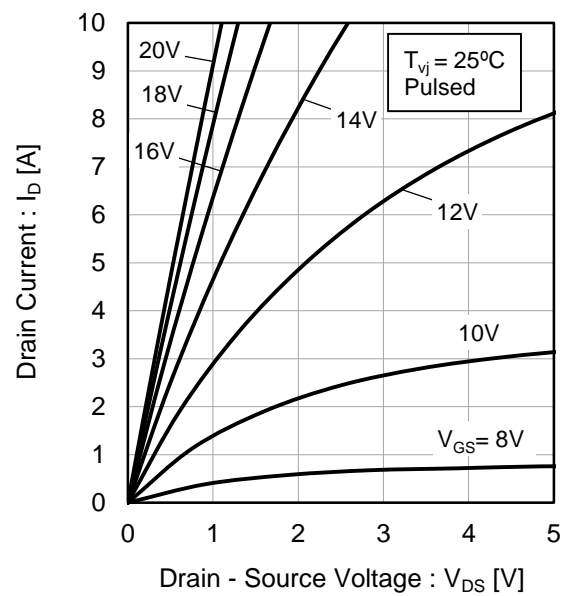
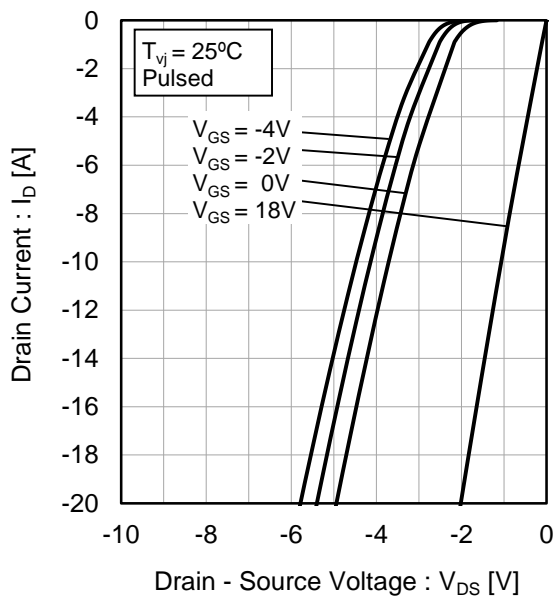


Fig.6 $T_{vj} = 25^\circ\text{C}$ 3rd Quadrant Characteristics



●Electrical characteristic curves

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

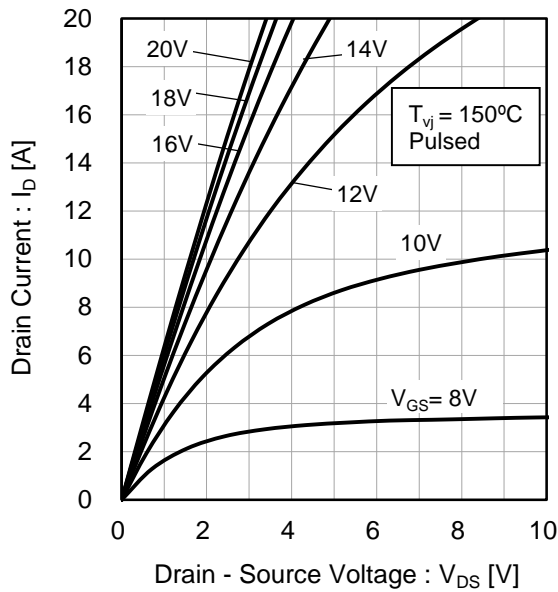


Fig.8 $T_{vj} = 150^{\circ}\text{C}$ Typical Output Characteristics(II)

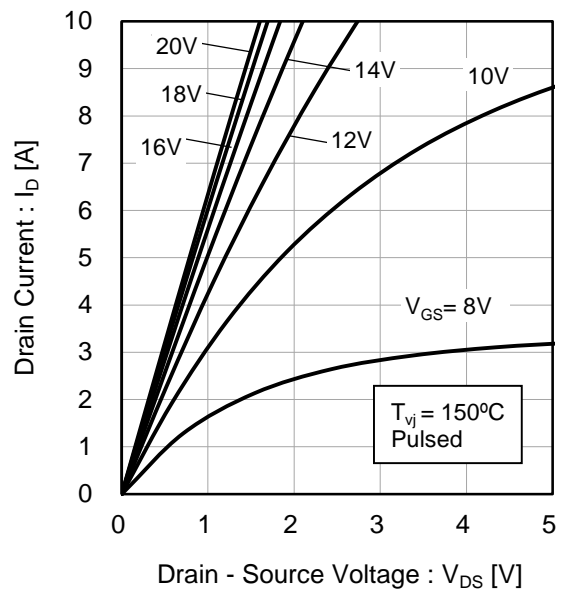


Fig.9 $T_{vj} = 150^{\circ}\text{C}$ 3rd Quadrant Characteristics

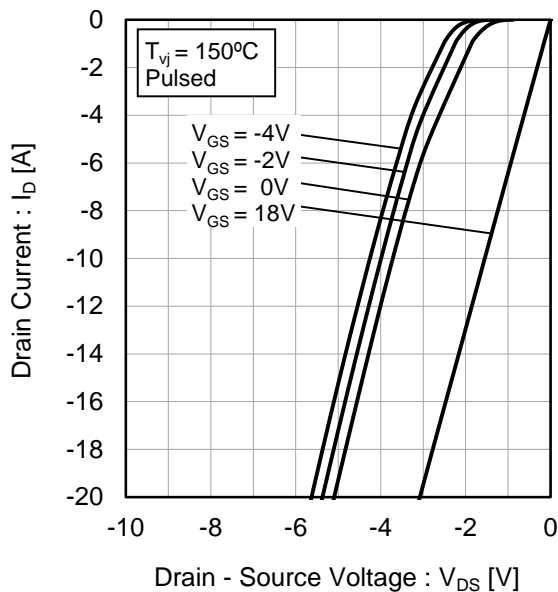
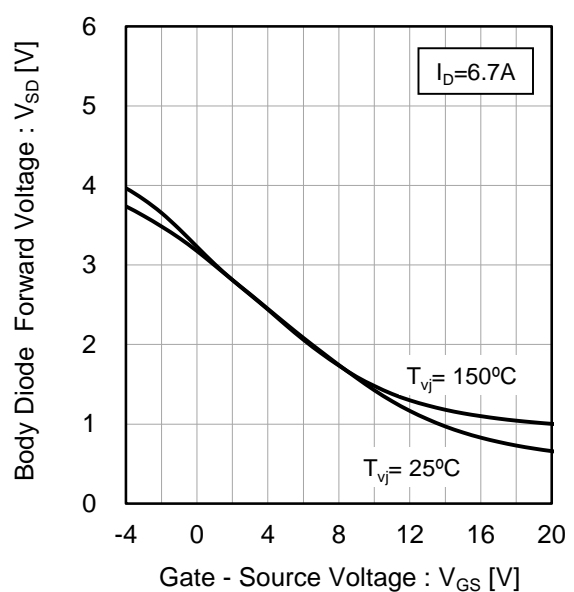


Fig.10 Body Diode Forward Voltage vs. Gate - Source Voltage



●Electrical characteristic curves

Fig.11 Typical Transfer Characteristics (I)

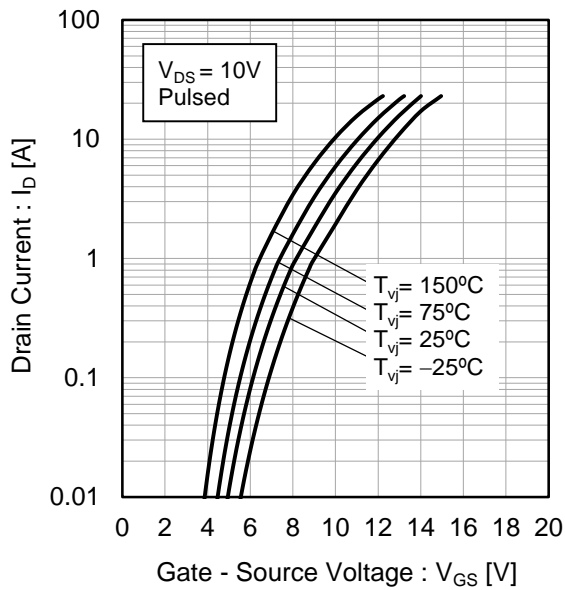


Fig.12 Typical Transfer Characteristics (II)

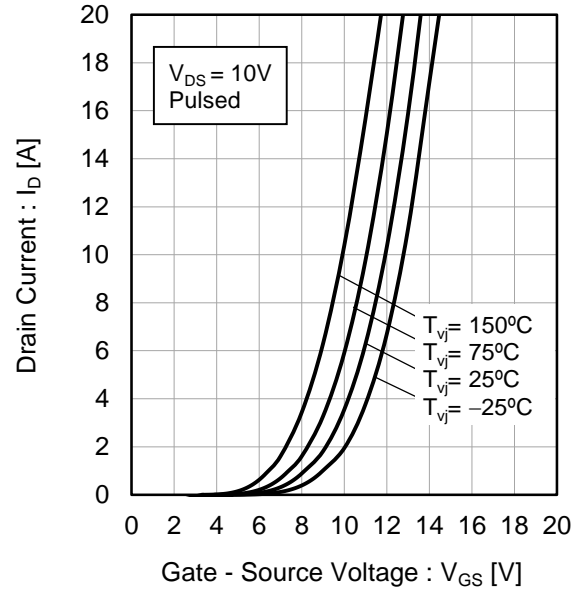


Fig.13 Gate Threshold Voltage vs. Virtual Junction Temperature

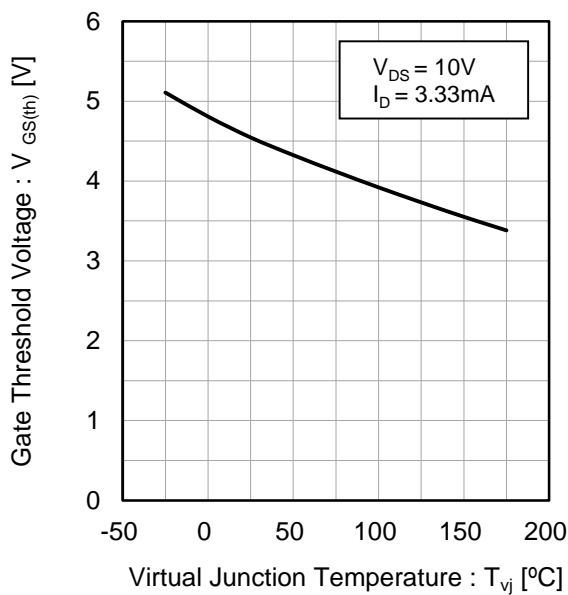
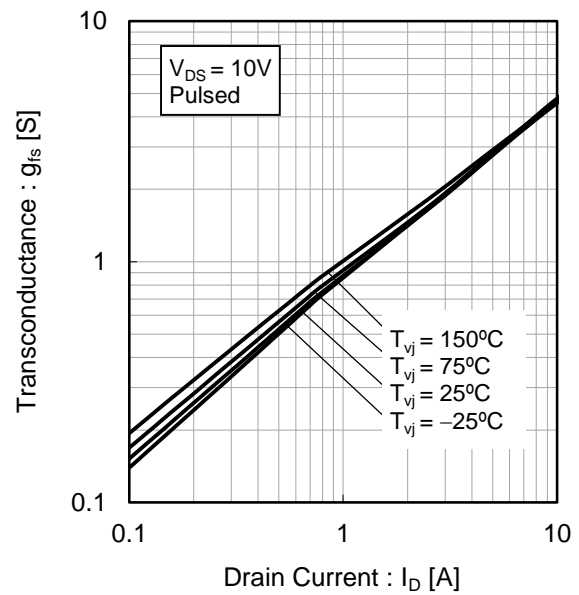


Fig.14 Transconductance vs. Drain Current



●Electrical characteristic curves

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

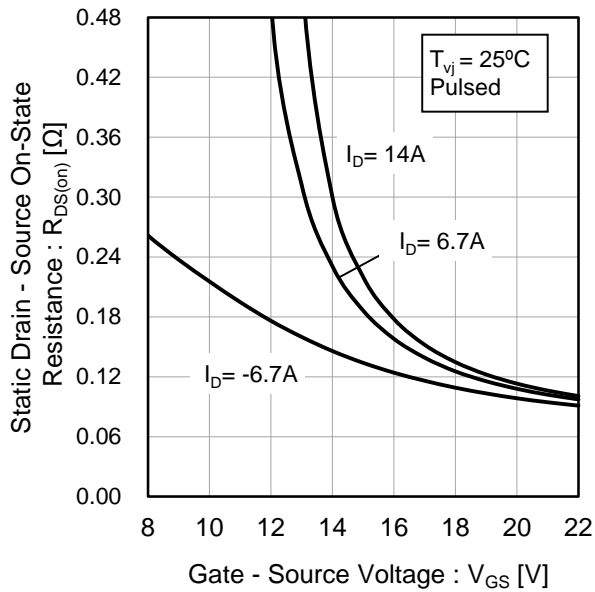


Fig.16 Static Drain - Source On - State Resistance vs. Virtual Junction Temperature

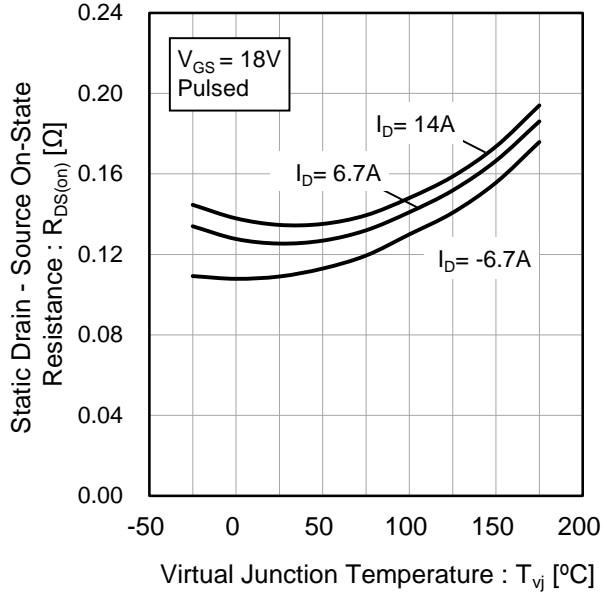


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current

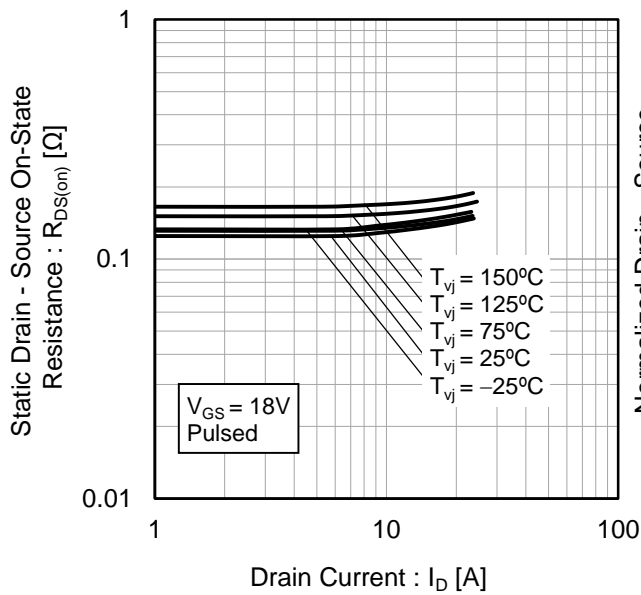
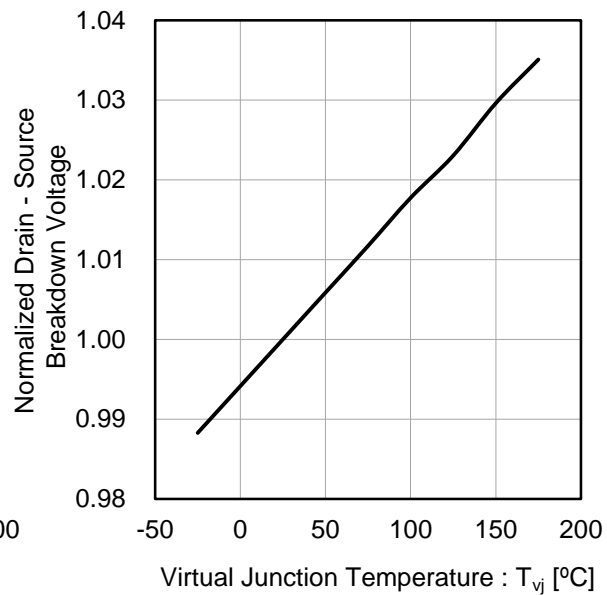


Fig.18 Normalized Drain - Source Breakdown Voltage vs. Virtual Junction Temperature



●Electrical characteristic curves

Fig.19 Typical Capacitance vs. Drain - Source Voltage

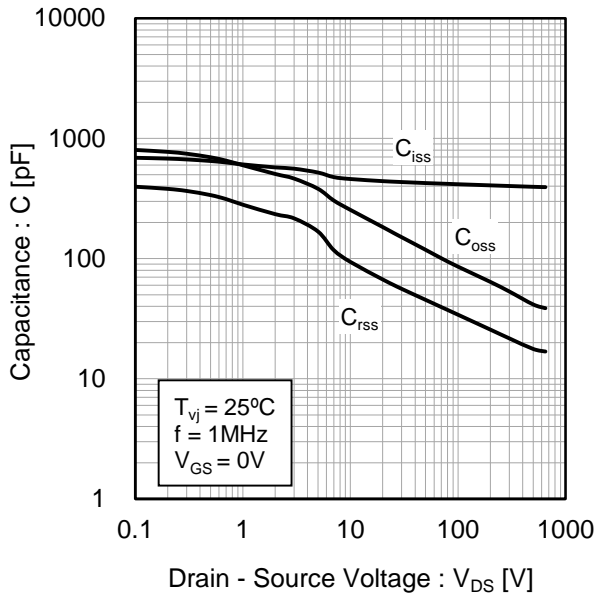


Fig.20 C_{oss} Stored Energy

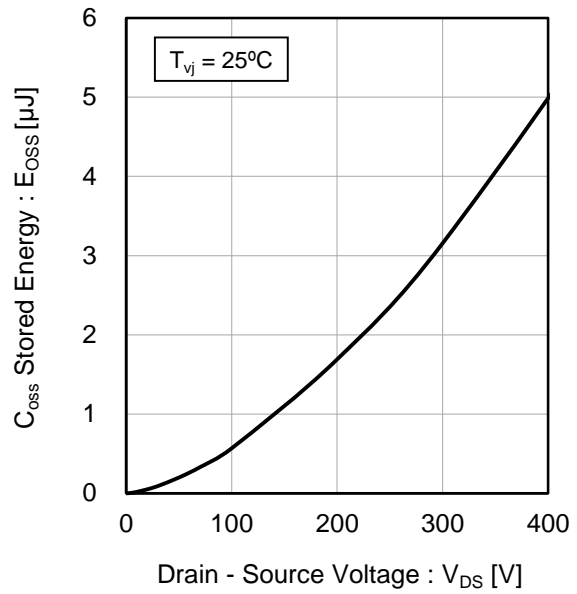
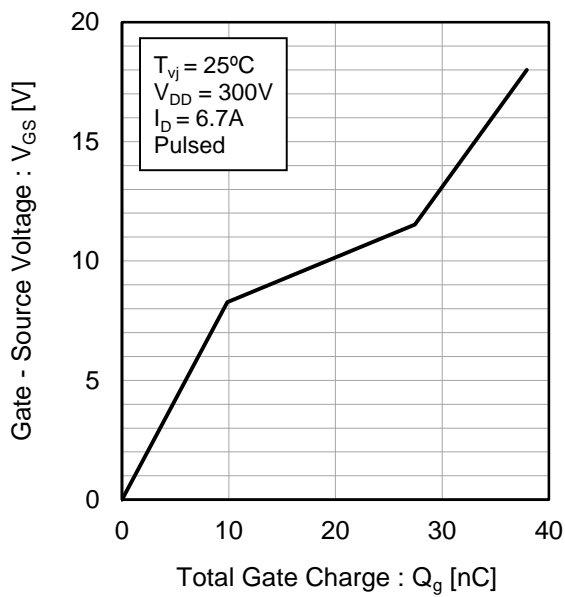
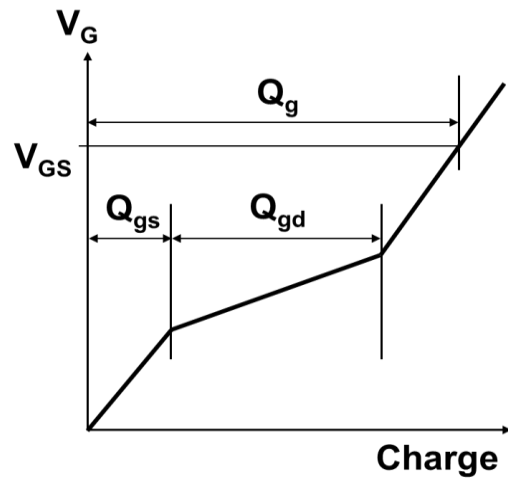


Fig.21 Dynamic Input Characteristics



*Gate Charge Waveform



●Electrical characteristic curves

Fig.22 Typical Switching Time vs. External Gate Resistance

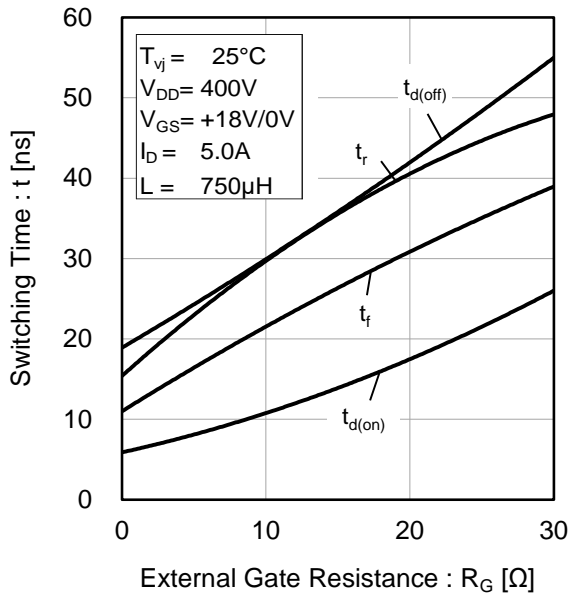


Fig.23 Typical Switching Loss vs. Drain - Source Voltage

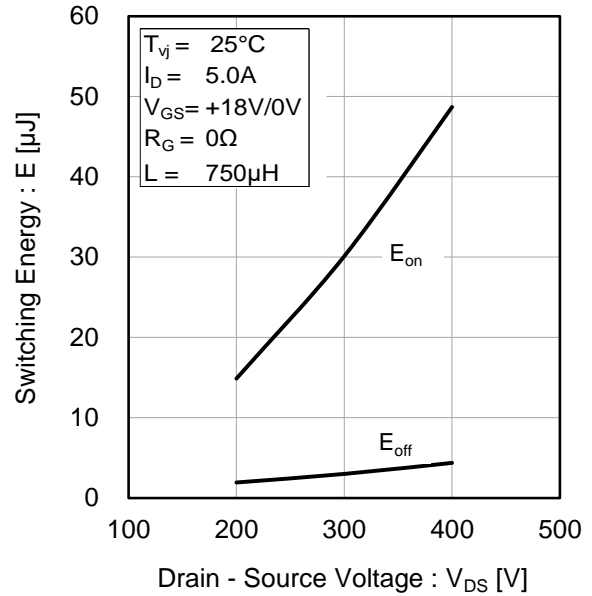


Fig.24 Typical Switching Loss vs. Drain Current

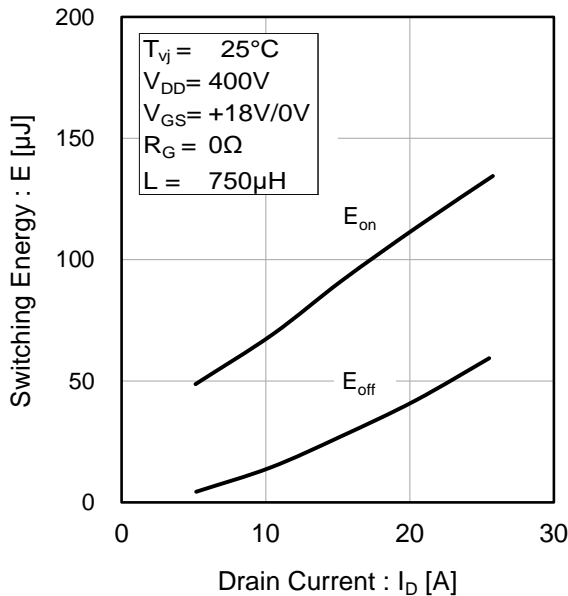
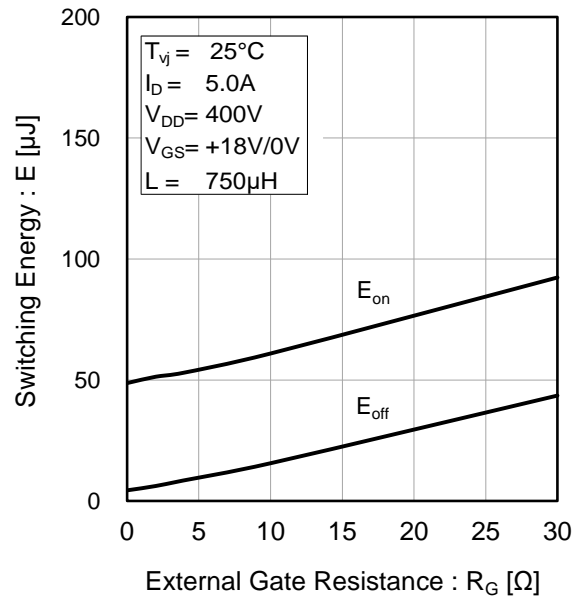


Fig.25 Typical Switching Loss vs. External Gate Resistance



● Measurement circuits and waveforms

Fig.1-1 Gate Charge Measurement Circuit

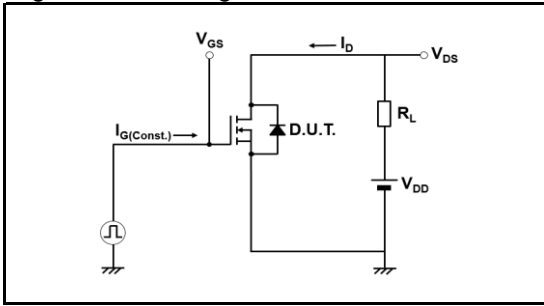


Fig.2-1 Switching Characteristics Measurement Circuit

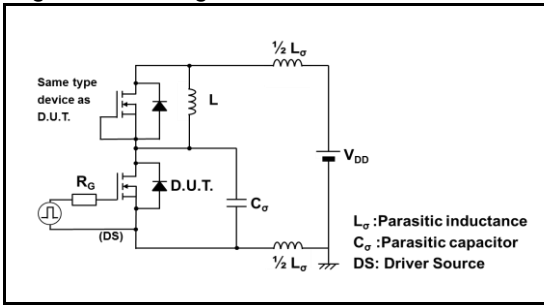


Fig.2-2 Waveforms for Switching Time

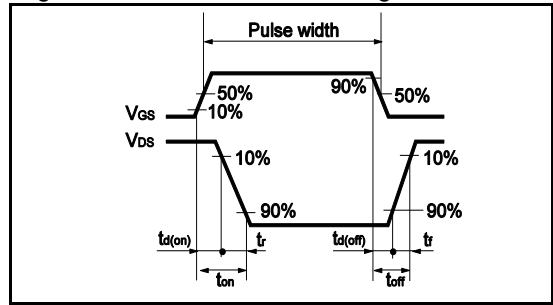


Fig.2-3 Waveforms for Switching Energy Loss

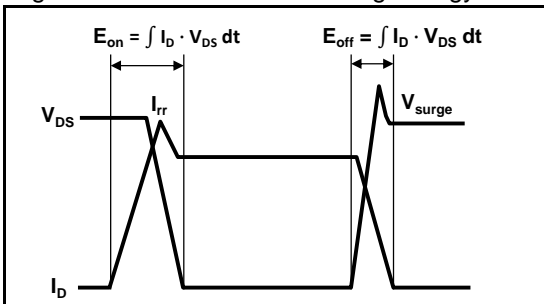


Fig.3-1 Reverse Recovery Time Measurement Circuit

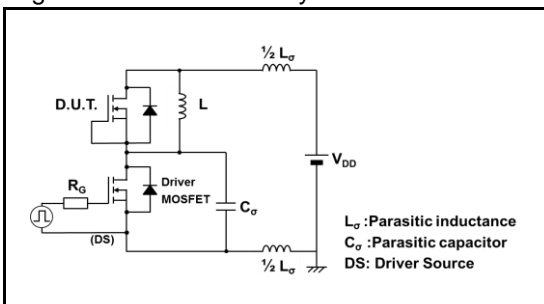
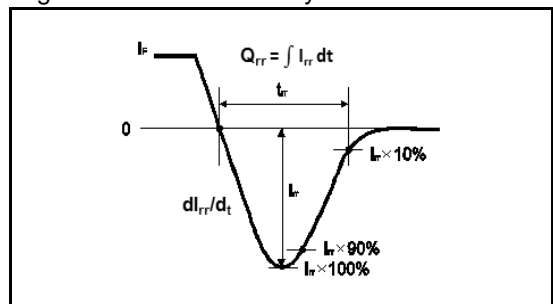
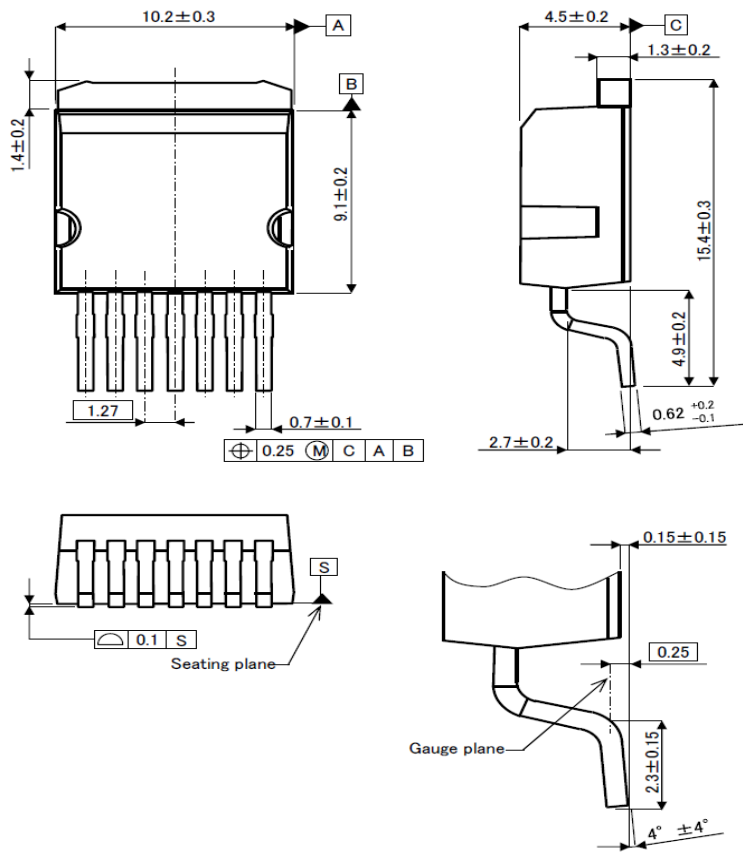


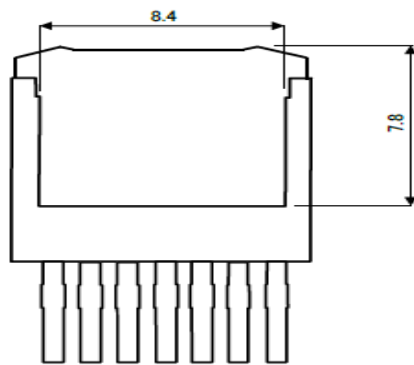
Fig.3-2 Reverse Recovery Waveform



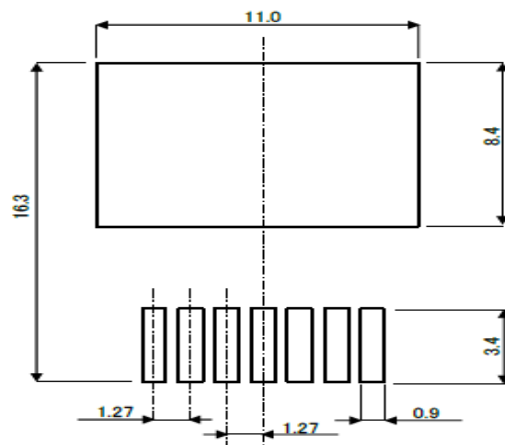
●Package Dimensions



Unit: mm

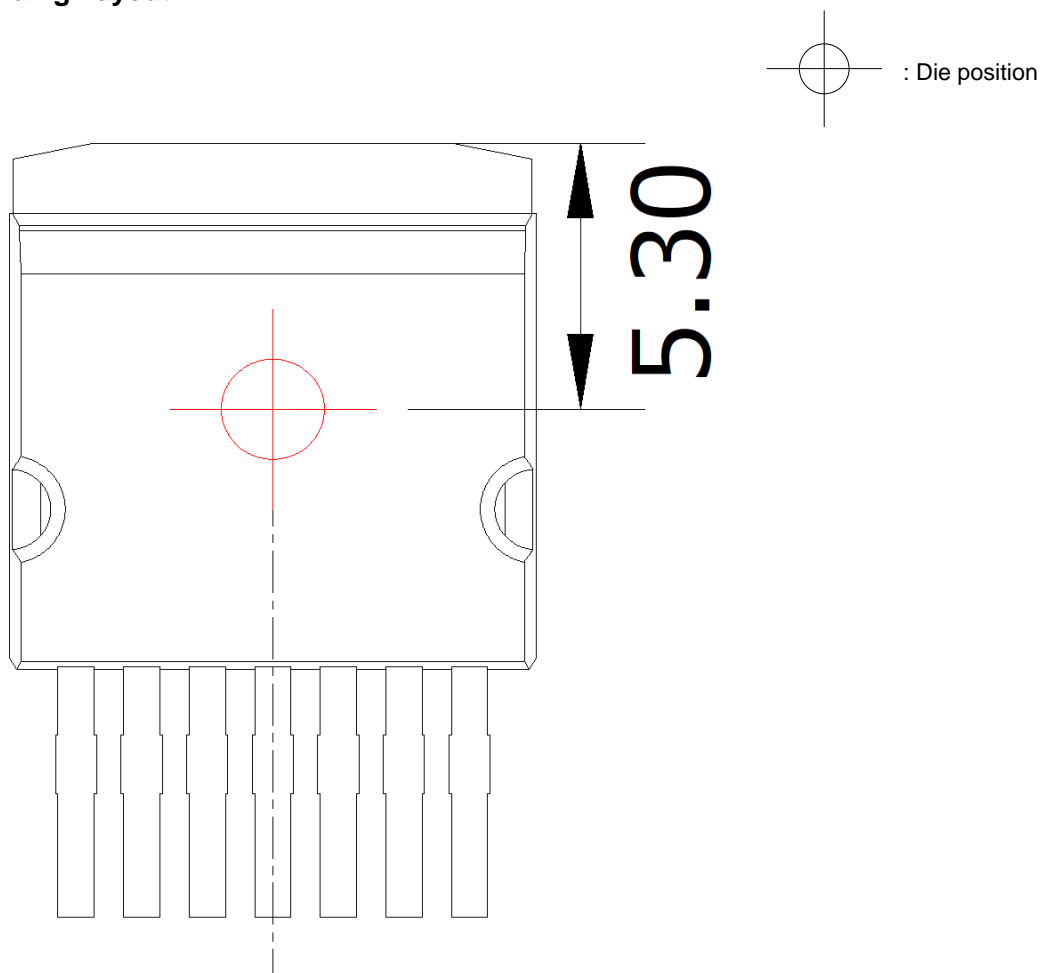


RECOMMENDED FOOTPRINT DIMENSIONS



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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