

V_{DSS}	1200V
$R_{DS(on)}$ (Typ.)	160mΩ
I_D^{*1}	17A
P_D	100W

●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

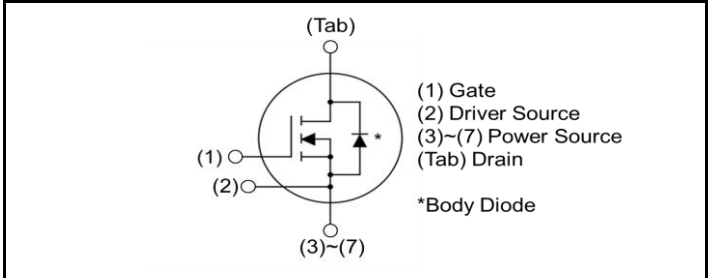
- Automobile
- Switch mode power supplies

●Outline

TO-263-7LA



●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	SCT3160KWA

●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}	17	A
	$T_c = 100^{\circ}C$	I_D^{*1}	12	A
Pulsed Drain current ($T_c = 25^{\circ}C$)	$I_{D,pulse}^{*2}$	42	A	
Gate - Source voltage (DC)	V_{GSS}	-4 to +22	V	
Gate - Source surge voltage ($t_{surge} < 300ns$)	$V_{GSS,surge}^{*4}$	-4 to +26	V	
Recommended drive voltage	$V_{GS,op}^{*5}$	0 / +18	V	
Virtual Junction temperature	T_{vj}	175	$^{\circ}C$	
Range of storage temperature	T_{stg}	-55 to +175	$^{\circ}C$	

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

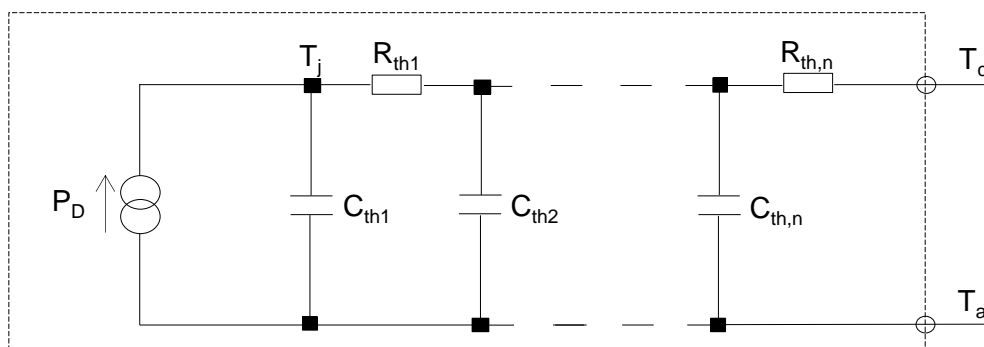
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{V}, I_D = 1\text{mA}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = -55^{\circ}\text{C}$	1200 1200	- -	- -	V
Zero Gate voltage Drain current	I_{DSS}	$V_{GS} = 0\text{V}, V_{DS} = 1200\text{V}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	- -	1 2	10 -	μA
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	$V_{GS(th)}$	$V_{DS} = 10\text{V}, I_D = 2.5\text{mA}$	2.7	-	5.6	V
Static Drain - Source on - state resistance	$R_{DS(on)}^{*6}$	$V_{GS} = 18\text{V}, I_D = 5\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	- -	160 272	208 -	$\text{m}\Omega$
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	R_{thJC}	-	1.17	1.50	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}^{*6}	$V_{DS} = 10\text{V}, I_D = 5\text{A}$	-	2.5	-	S
Input capacitance	C_{iss}	$V_{GS} = 0\text{V}$	-	398	-	pF
Output capacitance	C_{oss}	$V_{DS} = 800\text{V}$	-	41	-	
Reverse transfer capacitance	C_{rss}	$f = 1\text{MHz}$	-	18	-	
Effective output capacitance, energy related	$C_{o(er)}$	$V_{GS} = 0\text{V}$ $V_{DS} = 0\text{V to } 600\text{V}$	-	45	-	pF
Total Gate charge	Q_g^{*6}	$V_{DS} = 600\text{V}$ $I_D = 5\text{A}$	-	42	-	nC
Gate - Source charge	Q_{gs}^{*6}	$V_{GS} = 18\text{V}$	-	10	-	
Gate - Drain charge	Q_{gd}^{*6}	See Fig. 1-1.	-	22	-	
Turn - on delay time	$t_{d(on)}^{*6}$	$V_{DS} = 600\text{V}$ $I_D = 5\text{A}$	-	3	-	ns
Rise time	t_r^{*6}	$V_{GS} = 0\text{V}/+18\text{V}$	-	9	-	
Turn - off delay time	$t_{d(off)}^{*6}$	$R_G = 0\Omega, L = 750\mu\text{H}$ E_{on} includes diode	-	14	-	
Fall time	t_f^{*6}	reverse recovery $L_{\sigma} = 50\text{nH}, C_{\sigma} = 10\text{pF}$	-	9	-	
Turn - on switching loss	E_{on}^{*6}	See Fig. 2-1, 2-2, 2-3.	-	75	-	μJ
Turn - off switching loss	E_{off}^{*6}		-	7	-	

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

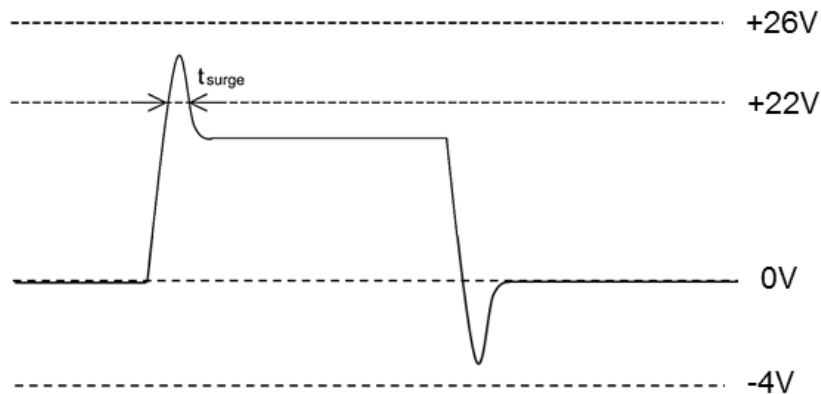
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Body diode continuous, forward current	I_S^{*1}	$T_c = 25^{\circ}\text{C}$	-	-	17	A
Body diode direct current, pulsed	$I_{SM}^{*1,3}$		-	-	42	A
Forward voltage	V_{SD}^{*6}	$V_{GS} = 0\text{V}, I_S = 5\text{A}$	-	3.2	-	V
Reverse recovery time	t_{rr}^{*6}	$I_F = 5\text{A}$ $V_R = 600\text{V}$	-	11	-	ns
Reverse recovery charge	Q_{rr}^{*6}	$di/dt = 2500\text{A}/\mu\text{s}$	-	108	-	nC
Peak reverse recovery current	I_{rrm}^{*6}	$L_{\sigma} = 50\text{nH}, C_{\sigma} = 10\text{pF}$ See Fig. 3-1, 3-2.	-	20	-	A

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

*2 Pulse width and duty cycle are limited by $T_{vj,max}$.

*3 $PW \leq 10\mu\text{s}$, Duty cycle $\leq 1\%$

*4 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.

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

*6 Pulsed

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

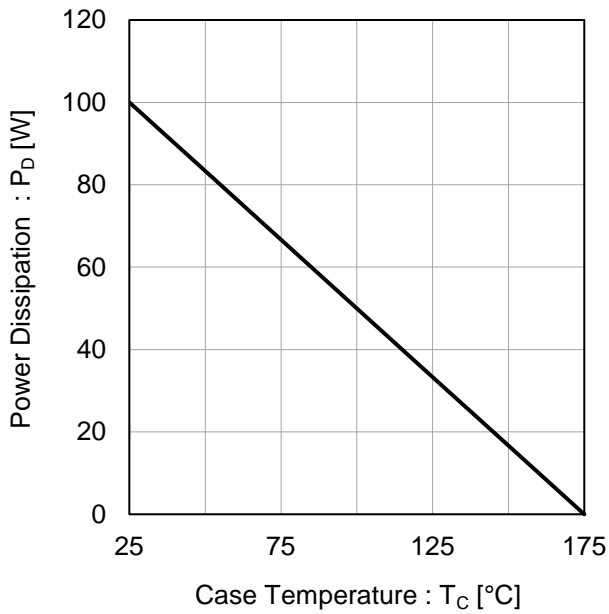


Fig.2 Maximum Safe Operating Area

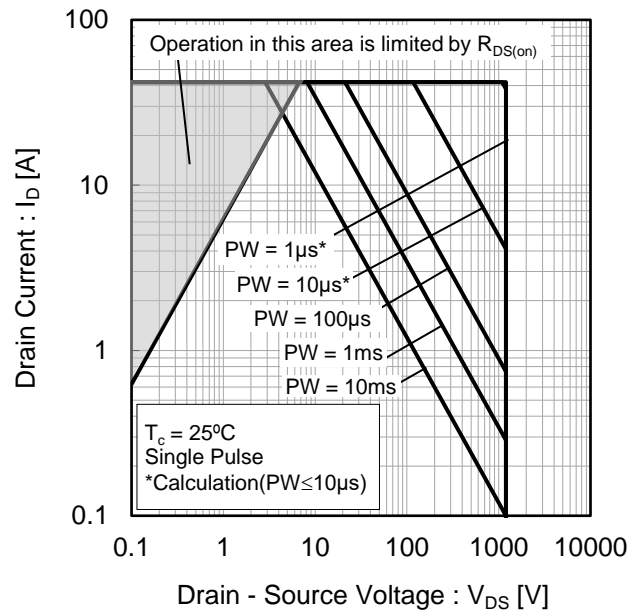
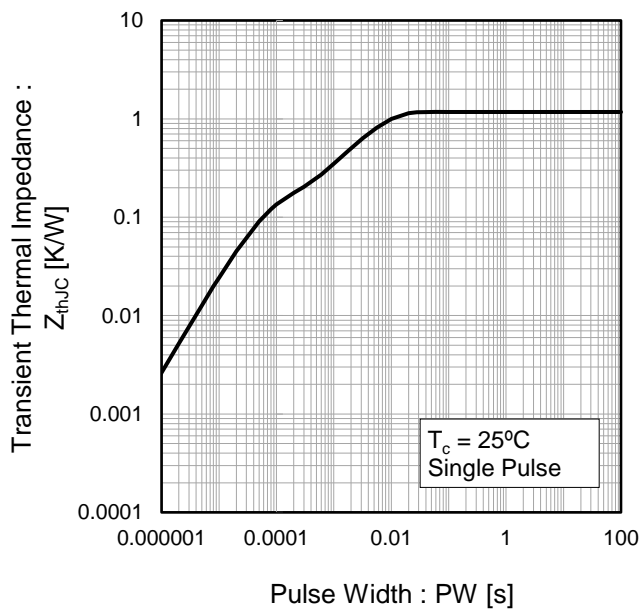


Fig.3 Typical Transient Thermal Impedance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

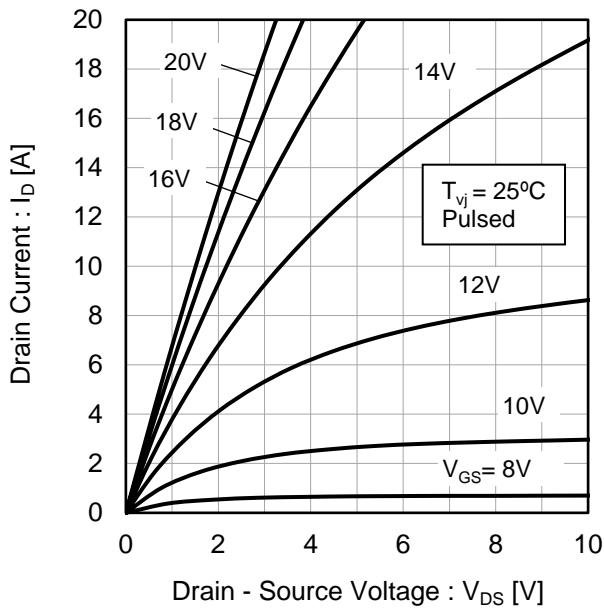


Fig.5 Typical Output Characteristics(II)

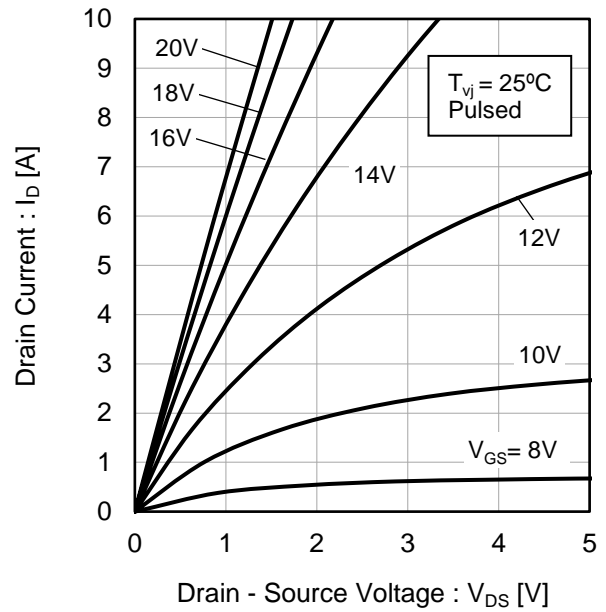
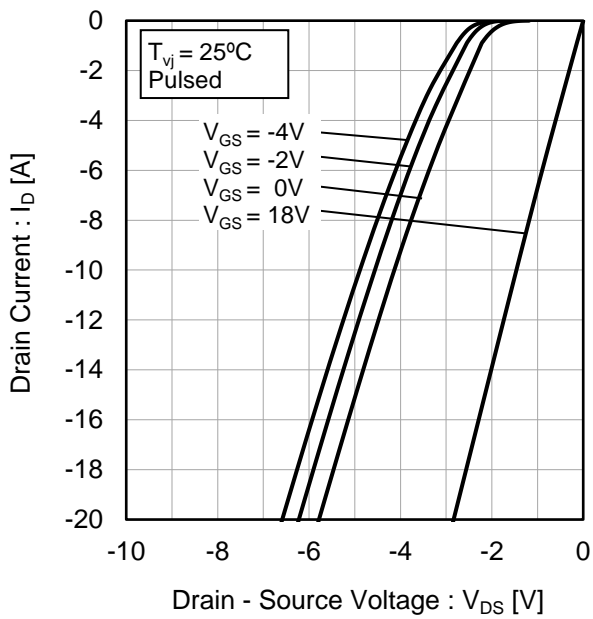


Fig.6 $T_{vj} = 25^\circ\text{C}$ 3rd Quadrant Characteristics



●Electrical characteristic curves

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

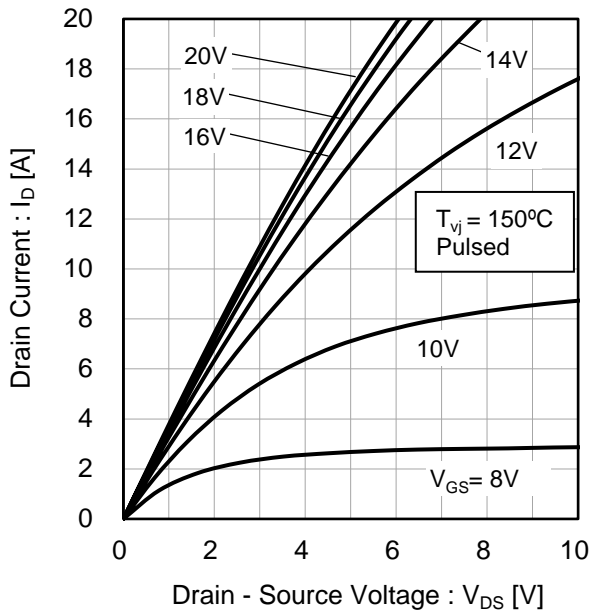


Fig.8 $T_{vj} = 150^{\circ}\text{C}$ Typical Output Characteristics(II)

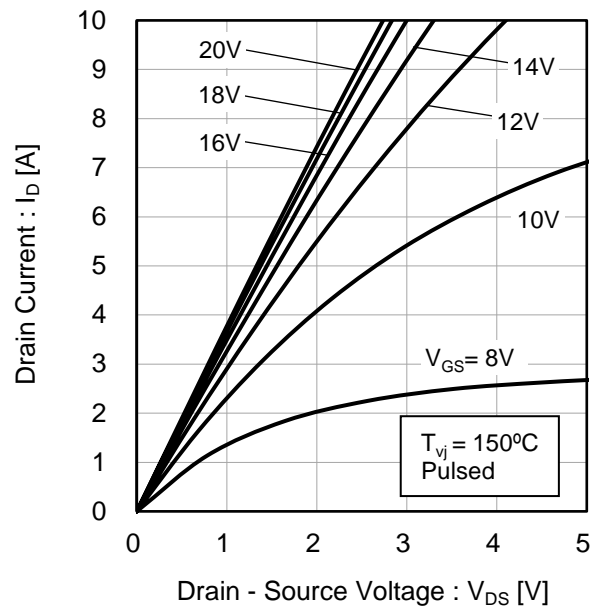


Fig.9 $T_{vj} = 150^{\circ}\text{C}$ 3rd Quadrant Characteristics

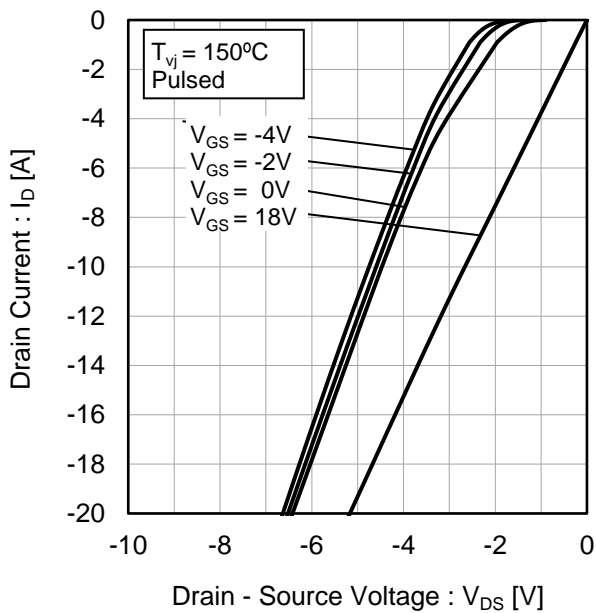
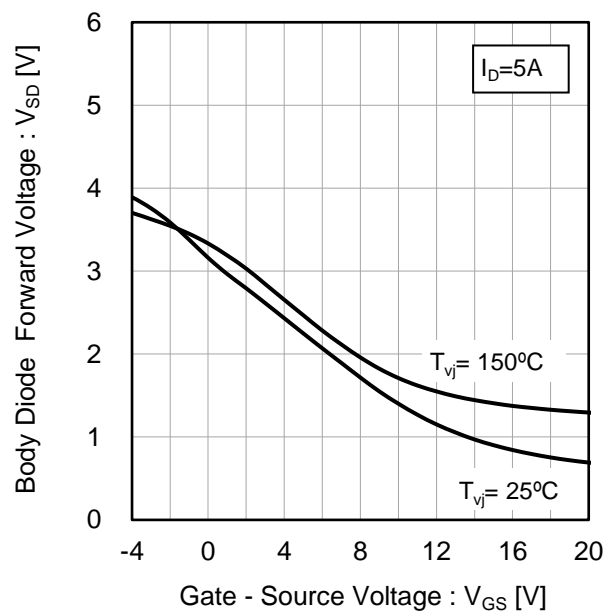


Fig.10 Body Diode Forward Voltage vs. Gate - Source Voltage



●Electrical characteristic curves

Fig.11 Typical Transfer Characteristics (I)

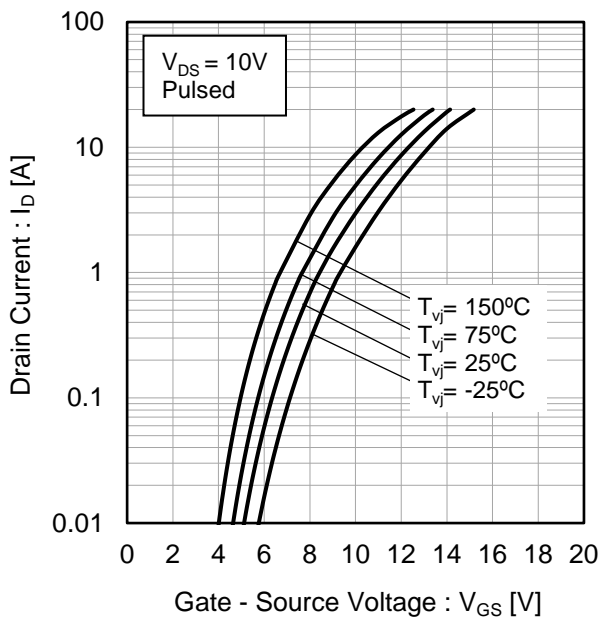


Fig.12 Typical Transfer Characteristics (II)

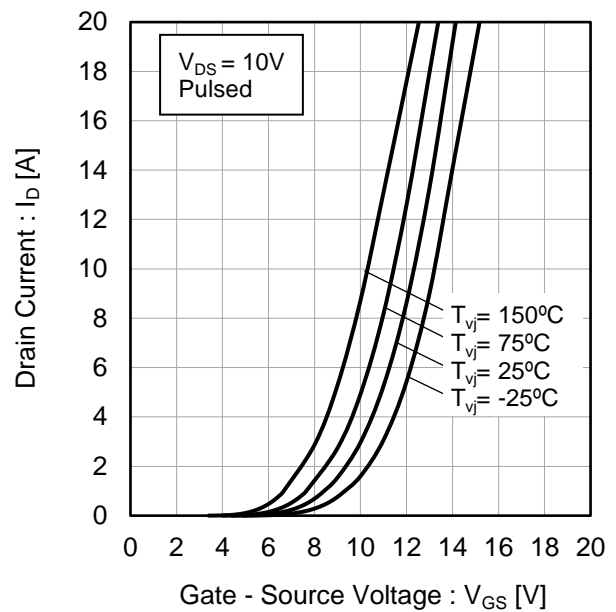


Fig.13 Gate Threshold Voltage vs. Virtual Junction Temperature

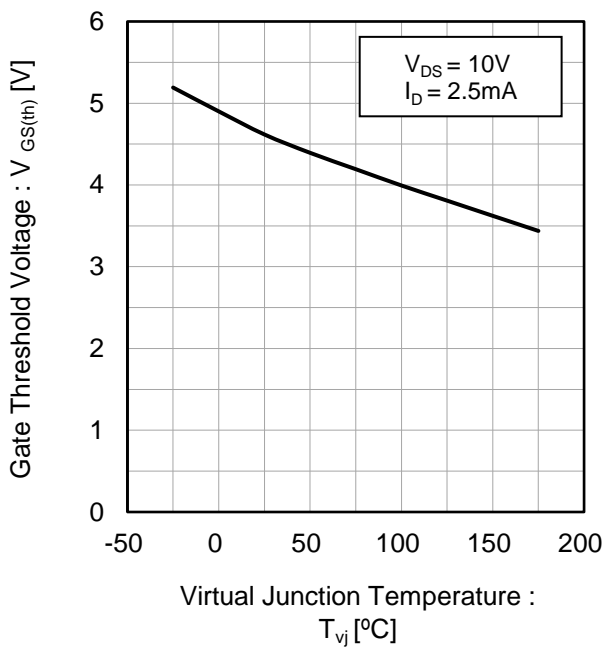
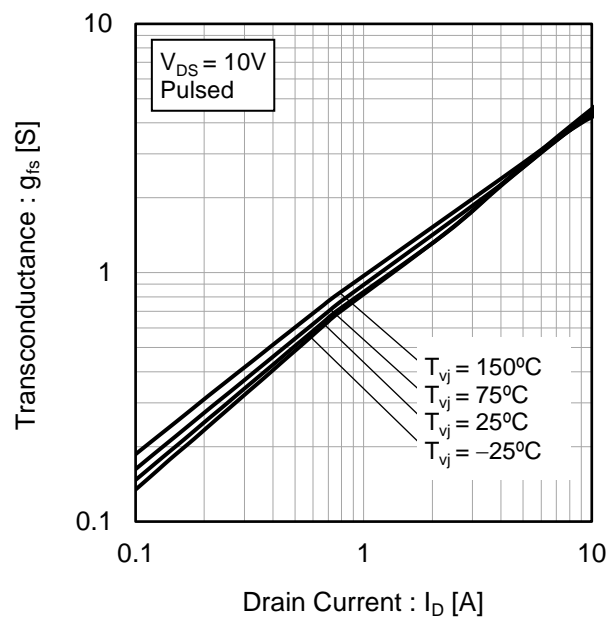


Fig.14 Transconductance vs. Drain Current



●Electrical characteristic curves

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

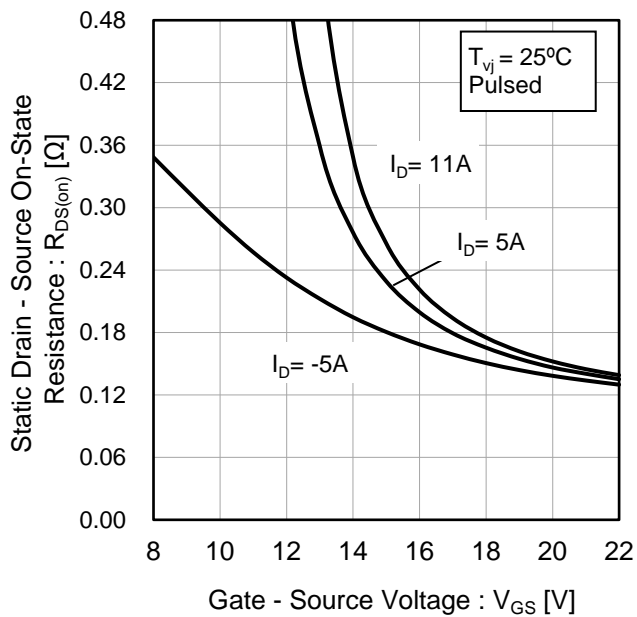


Fig.16 Static Drain - Source On - State Resistance vs. Virtual Junction Temperature

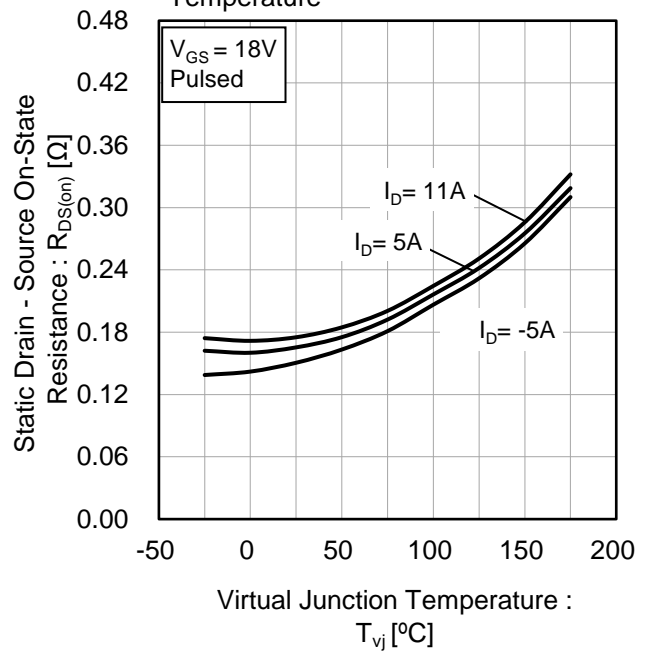


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current

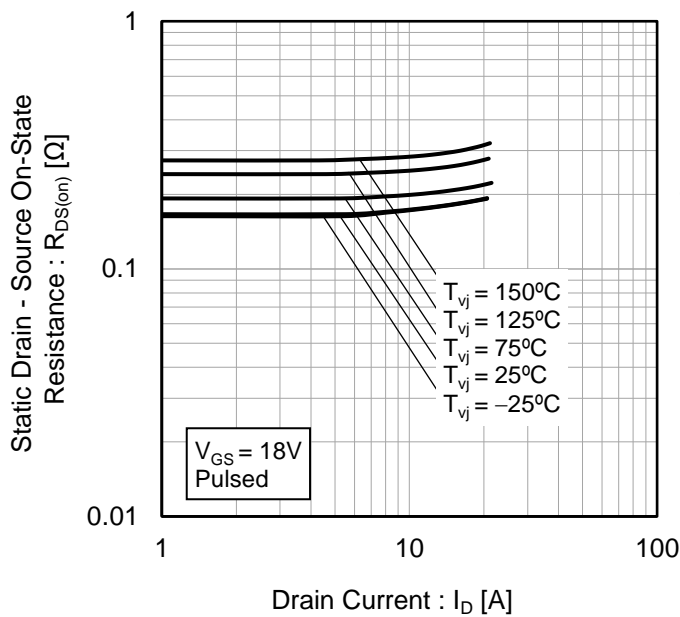
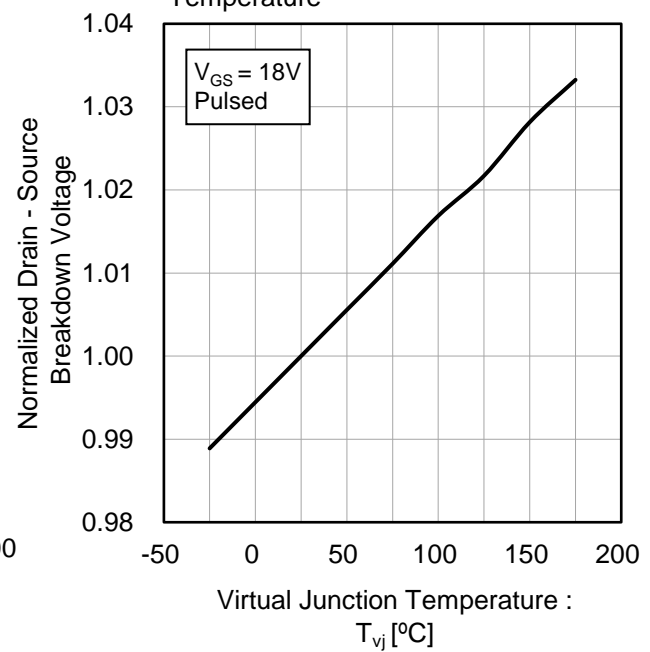


Fig.18 Normalized Drain - Source Breakdown Voltage vs. Virtual Junction Temperature



●Electrical characteristic curves

Fig.19 Typical Capacitance vs. Drain - Source Voltage

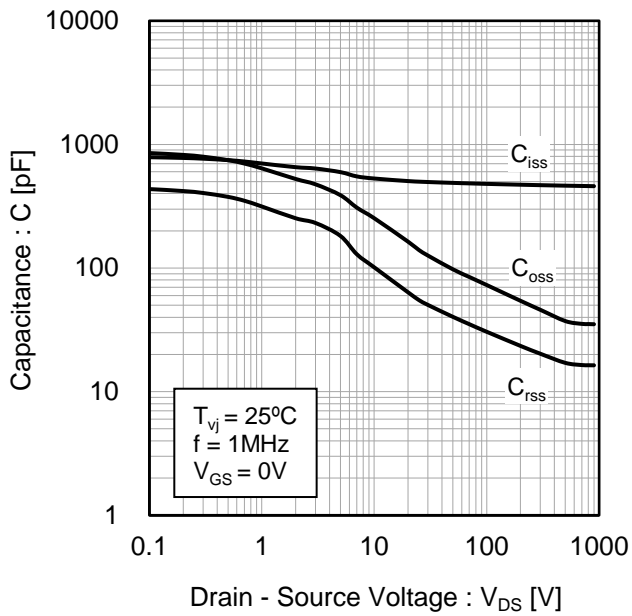


Fig.20 C_{oss} Stored Energy

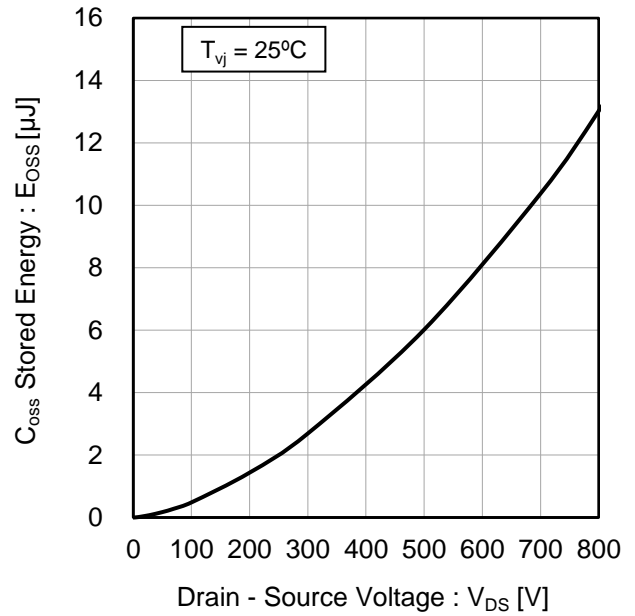
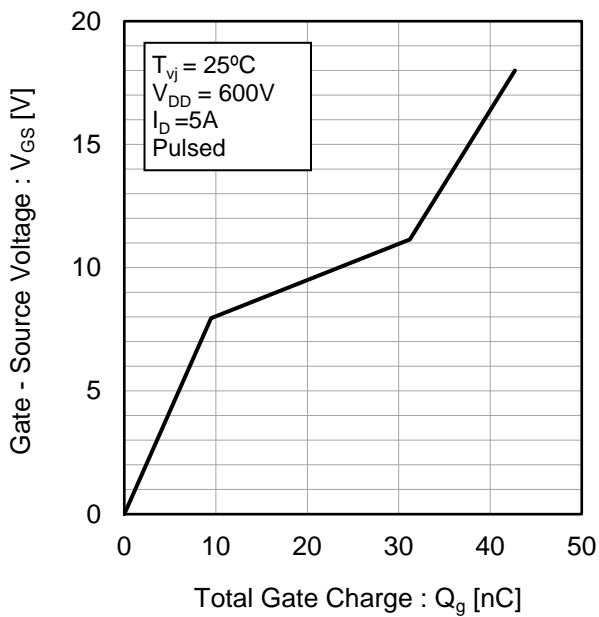
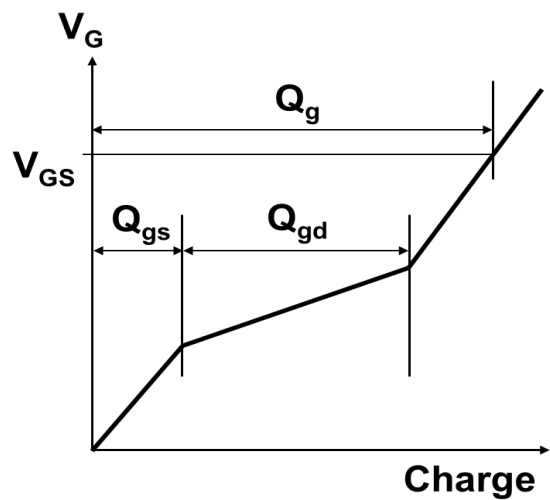


Fig.21 Dynamic Input Characteristics



*Gate Charge Waveform



●Electrical characteristic curves

Fig.22 Typical Switching Time vs. External Gate Resistance

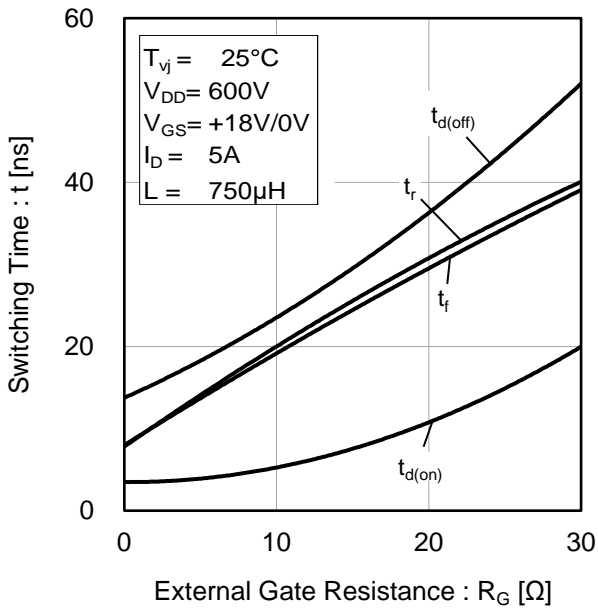


Fig.23 Typical Switching Loss vs. Drain - Source Voltage

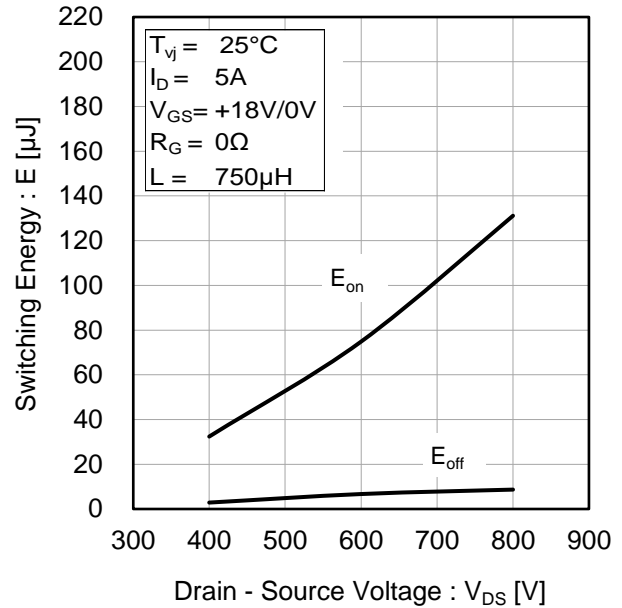


Fig.24 Typical Switching Loss vs. Drain Current

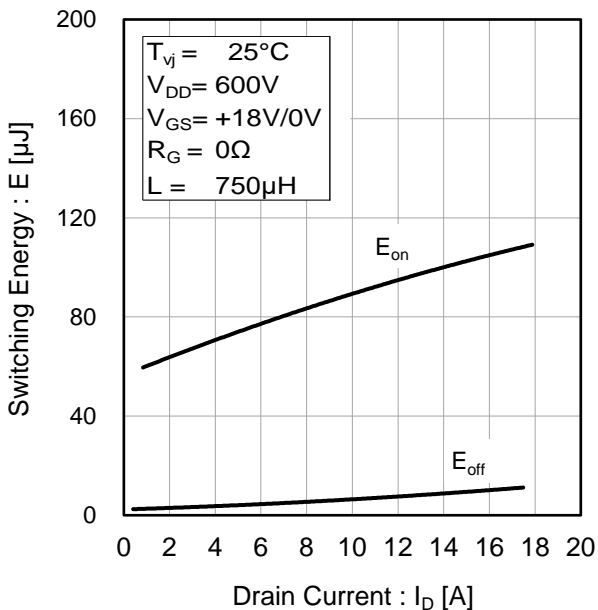
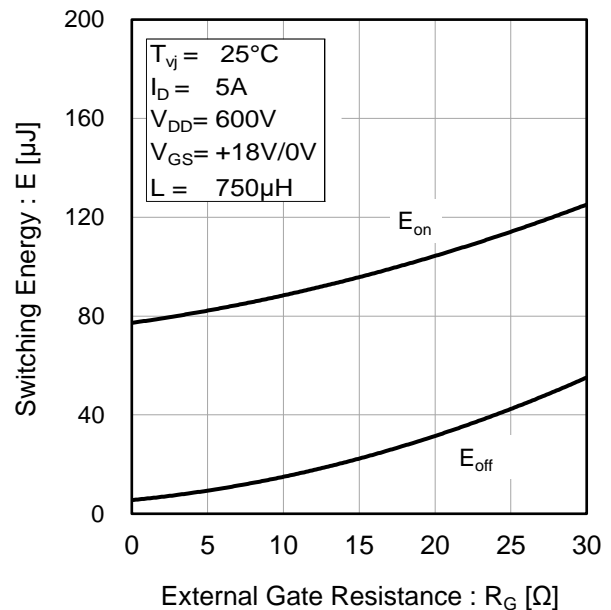


Fig.25 Typical Switching Loss vs. External Gate Resistance



● Measurement circuits and waveforms

Fig.1-1 Gate Charge Measurement Circuit

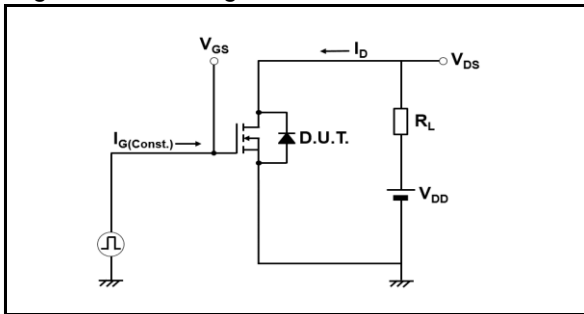


Fig.2-1 Switching Characteristics Measurement Circuit

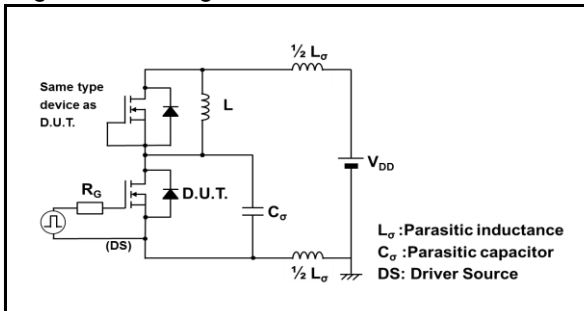


Fig.2-2 Waveforms for Switching Time

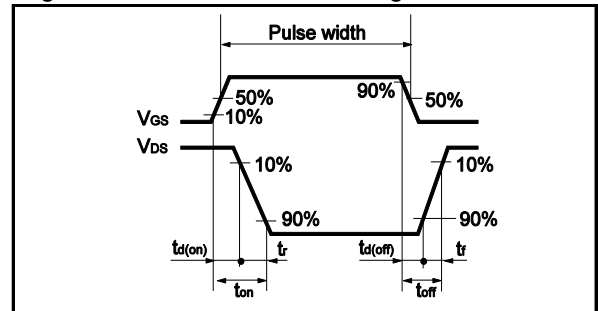


Fig.2-3 Waveforms for Switching Energy Loss

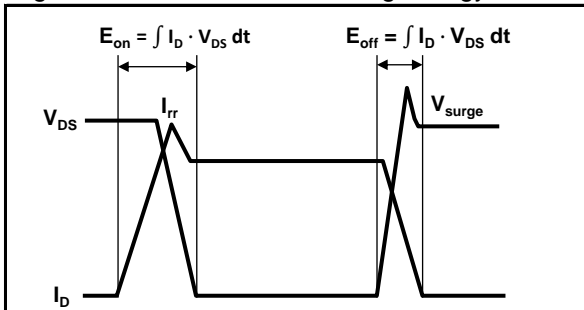


Fig.3-1 Reverse Recovery Time Measurement Circuit

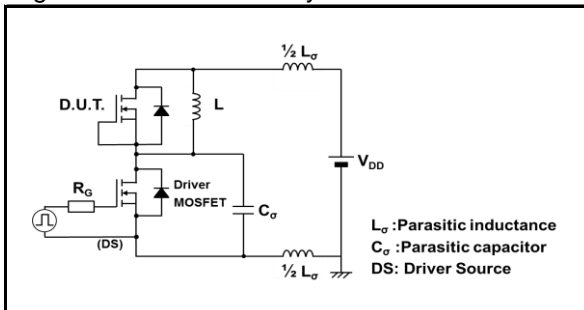
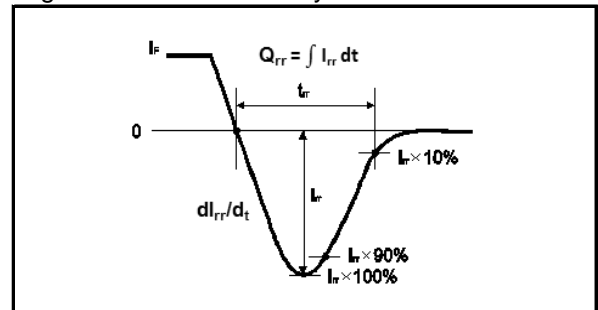
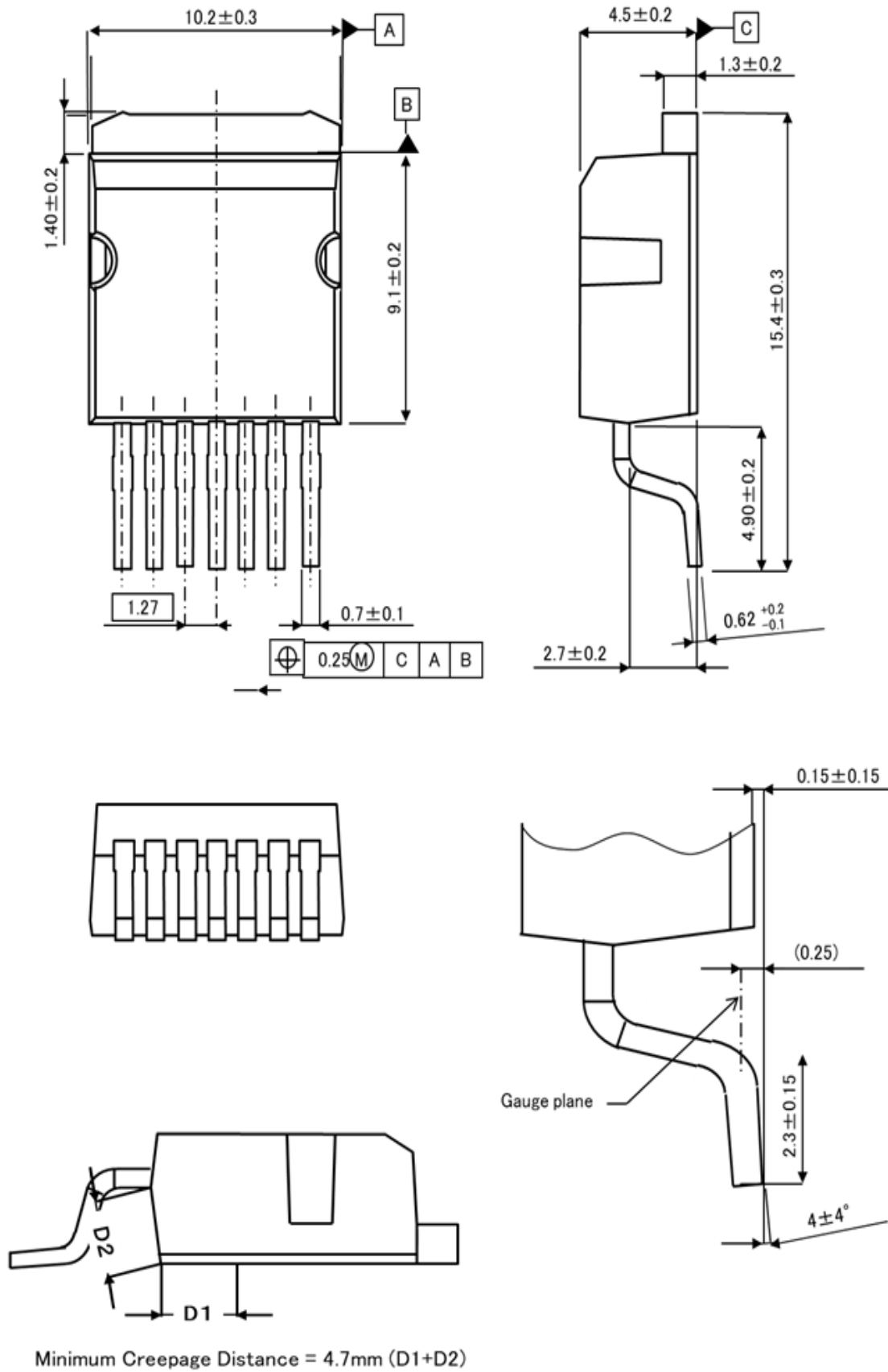


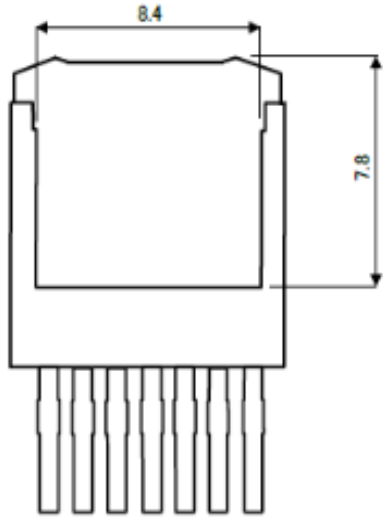
Fig.3-2 Reverse Recovery Waveform



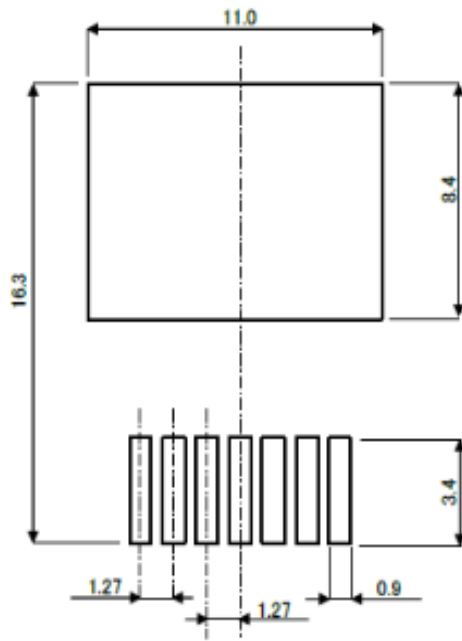
●Package Dimensions



Unit: mm

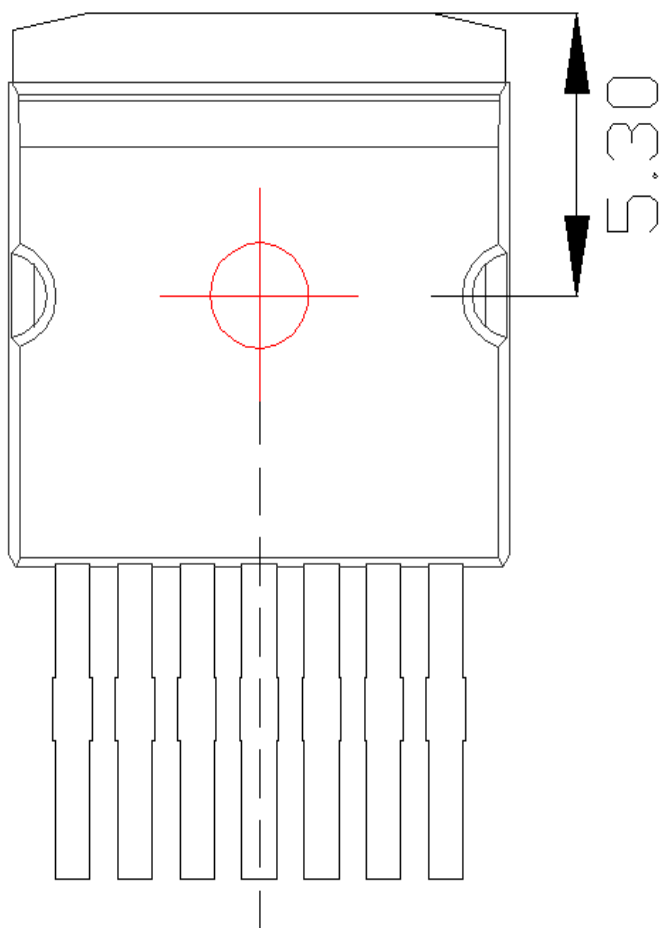
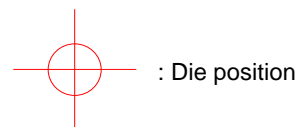


RECOMMENDED FOOTPRINT DIMENSIONS



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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