

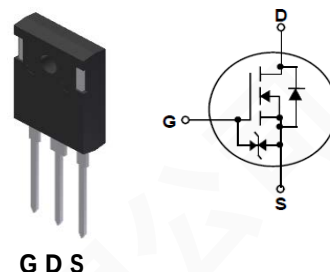
SWITCHING REGULATOR APPLICATION

Features

- 600V Super-junction MOSFET
- Ultra fast body diode and Built-in ESD diode
- Low drain-source On-resistance: $R_{DS(on)}=0.099\Omega$ (Max.)
- 100% avalanche tested
- RoHS compliant device and Halogen-free device

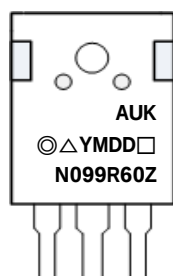
Ordering Information

Part Number	Marking	Package
SJMN099R60ZSW	N099R60Z	TO-247



TO-247

Marking Information



Column 1: Manufacturer

Column 2: Production Information

e.g.) ◎△YMDD□

- ◎: Management Code
- △: Factory Management Code
- YMDD: Date Code (Year, Monthly, Daily)
- □: Factory Management Code

Column 3: Device Code

Absolute maximum ratings ($T_c=25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol		Rating	Unit
Drain-source voltage	V_{DSS}		600	V
Gate-source voltage	V_{GSS}		±20	V
Drain current (DC) ^(Note 1)	I_D	$T_c=25^{\circ}\text{C}$	30.7	A
		$T_c=100^{\circ}\text{C}$	19.4	A
Drain current (Pulsed) ^(Note 1)	I_{DM}		92	A
Single pulsed avalanche energy ^(Note 2)	E_{AS}		588	mJ
Repetitive avalanche current ^(Note 1)	I_{AR}		3.5	A
Gate source ESD (HBM, C=100pF, R=1.5kΩ)	$V_{ESD(G-S)}$		2000	V
Power dissipation	P_D		205	W
Diode dv/dt ruggedness ^(Note 3)	dv/dt		15	V/ns
MOSFET dv/dt ruggedness ^(Note 4)	dv/dt		50	V/ns
Junction temperature	T_J		150	°C
Storage temperature range	T_{stg}		-55~150	°C

Thermal Characteristics

Characteristic	Symbol	Rating	Unit
Thermal resistance, junction to case	$R_{th(j-c)}$	Max. 0.61	°C/W
Thermal resistance, junction to ambient	$R_{th(j-a)}$	Max. 62.5	

Electrical Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV_{DSS}	$I_D=1\text{mA}$, $V_{GS}=0\text{V}$	600	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$I_D=1.29\text{mA}$, $V_{DS}=V_{GS}$	2.5	-	5	V
Drain-source cut-off current	I_{DSS}	$V_{DS}=600\text{V}$, $V_{GS}=0\text{V}$	-	-	5	uA
Gate leakage current	I_{GSS}	$V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$	-	-	± 1	uA
Drain-source on-resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=13.2\text{A}$	-	0.086	0.099	Ω
Input capacitance	C_{iss}	$V_{DS}=400\text{V}$, $V_{GS}=0\text{V}$, $f=1.0\text{MHz}$	-	3300	-	pF
Output capacitance	C_{oss}		-	70	-	
Reverse transfer capacitance	C_{rss}		-	3.3	-	
Turn-on delay time (Note 5)	$t_{d(on)}$	$V_{DD}=300\text{V}$, $I_D=16.7\text{A}$, $R_G=25\Omega$, $V_{GS}=10\text{V}$	-	63	-	ns
Rise time (Note 5)	t_r		-	32	-	
Turn-off delay time (Note 5)	$t_{d(off)}$		-	281	-	
Fall time (Note 5)	t_f		-	20	-	
Total gate charge (Note 6)	Q_g	$V_{DS}=480\text{V}$, $V_{GS}=10\text{V}$, $I_D=16.7\text{A}$	-	74	-	nC
Gate-source charge (Note 6)	Q_{gs}		-	14	-	
Gate-drain charge (Note 6)	Q_{gd}		-	22	-	
Gate plateau voltage (Note 6)	$V_{plateau}$		-	TBD	-	V

Source-Drain Diode Ratings and Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Source current (DC)	I_S	Integral reverse diode in the MOSFET	-	-	30.7	A
Source current (Pulsed)	I_{SM}		-	-	92	A
Forward voltage	V_{SD}	$V_{GS}=0\text{V}$, $I_S=16.7\text{A}$	-	-	1.3	V
Reverse recovery time (Note 5, 6)	t_{rr}	$I_S=16.7\text{A}$, $V_{GS}=0\text{V}$ $di_S/dt=100\text{A/us}$	-	160	-	ns
Reverse recovery charge (Note 5, 6)	Q_{rr}		-	1.09	-	uC

Note:

1. Calculated continuous current based on maximum allowable junction temperature
2. $I_{AS}=3.5\text{A}$, $V_{DD}=100\text{V}$, Starting $T_J=25^{\circ}\text{C}$
3. $I_S \leq 16.74\text{A}$, $V_{DS} \leq 400\text{V}$, $di_S/dt \leq 100\text{A/us}$, $T_J=25^{\circ}\text{C}$
4. $V_{DS} \leq 0 \dots 400\text{V}$
5. Guaranteed by design, not subject to production testing
6. Pulse test: Pulse width $\leq 300\text{us}$, Duty cycle $\leq 2\%$

Typical Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

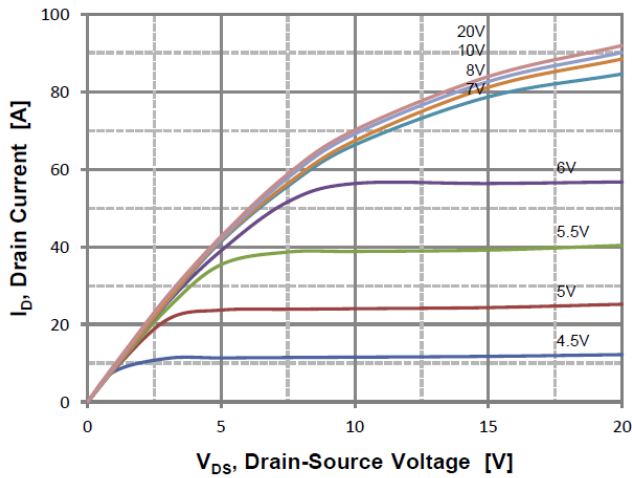


Fig. 2 Typical Transfer Characteristics

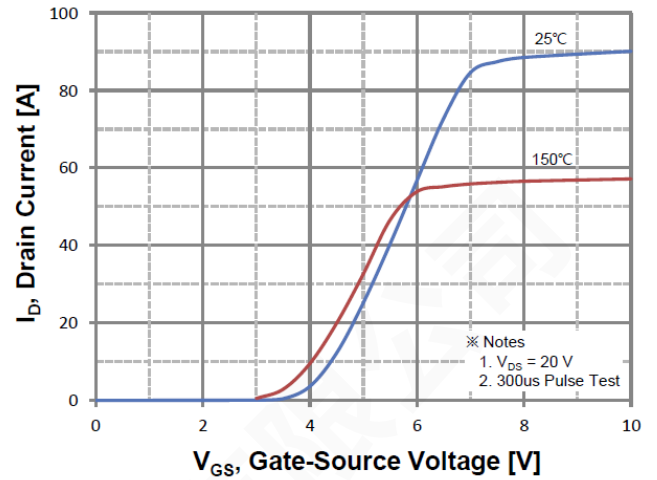


Fig.3 On-Resistance Variation with Drain Current and Gate Voltage

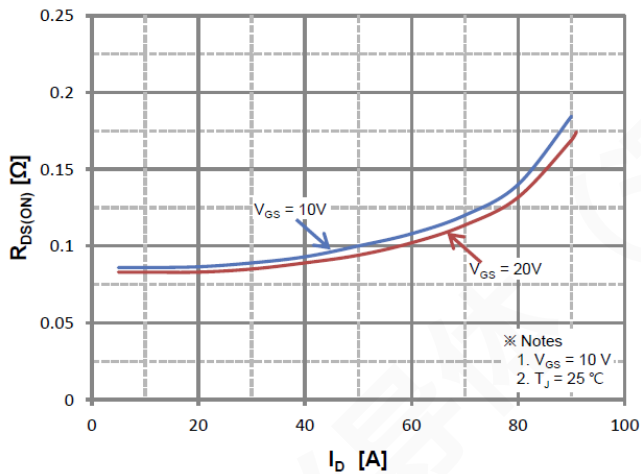


Fig. 4 Body Diode Forward Voltage Variation with Source Current

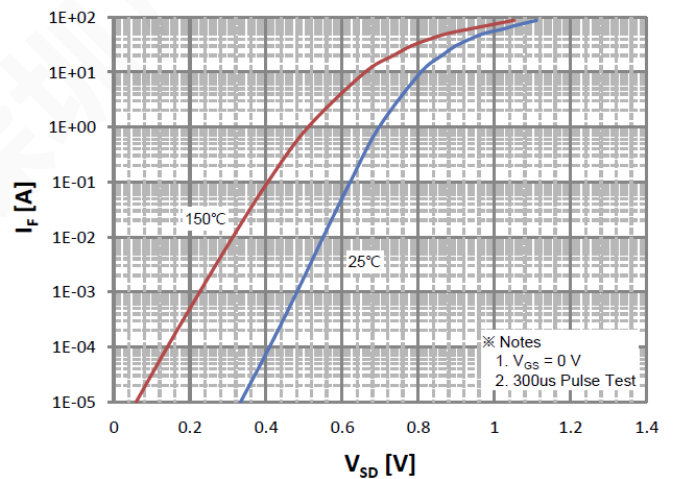


Fig. 5 Typical Capacitance Characteristics

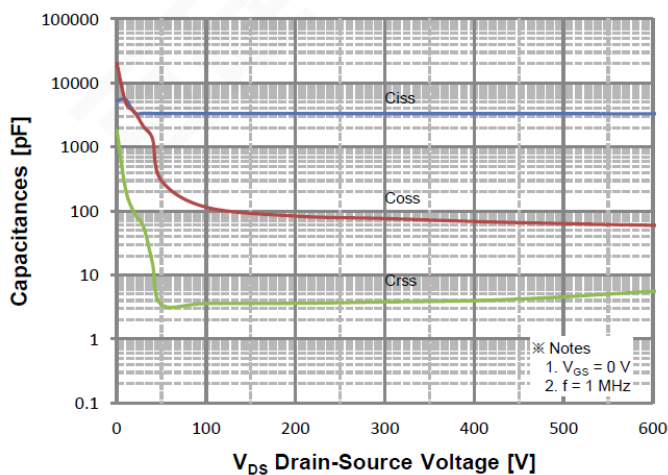
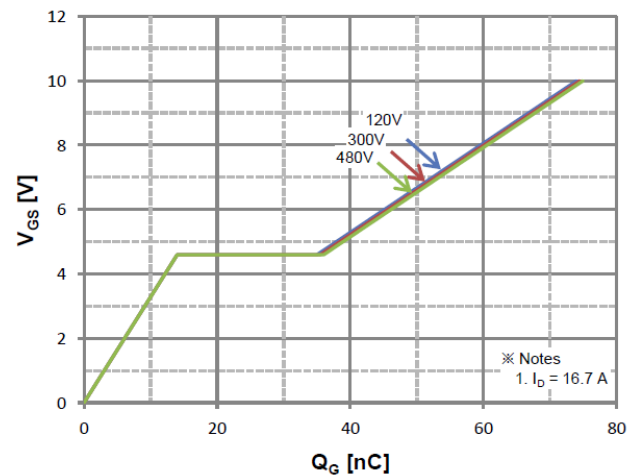


Fig. 6 Typical Total Gate Charge Characteristics



Typical Electrical Characteristics Curves

Fig. 7 Breakdown Voltage Variation vs. Temperature

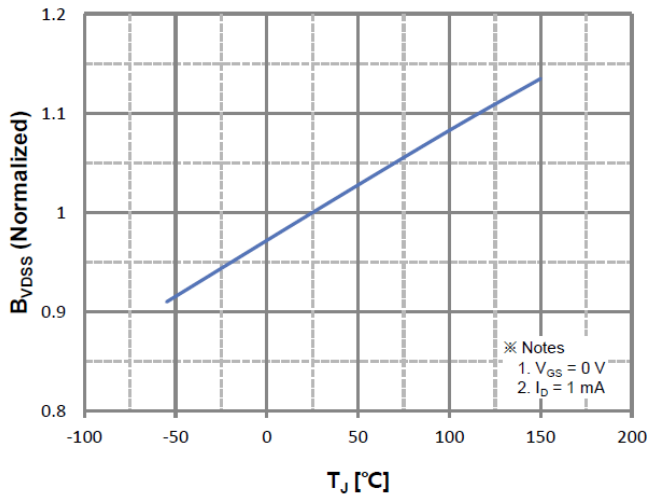


Fig. 8 On-Resistance Variation vs. Temperature

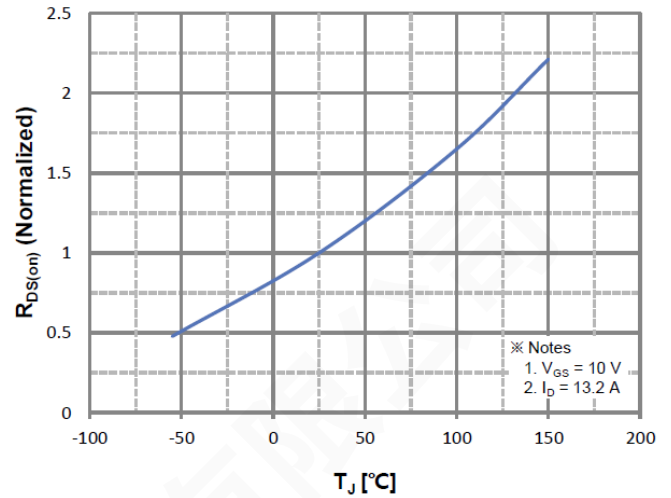


Fig. 9 Maximum Safe Operating Area

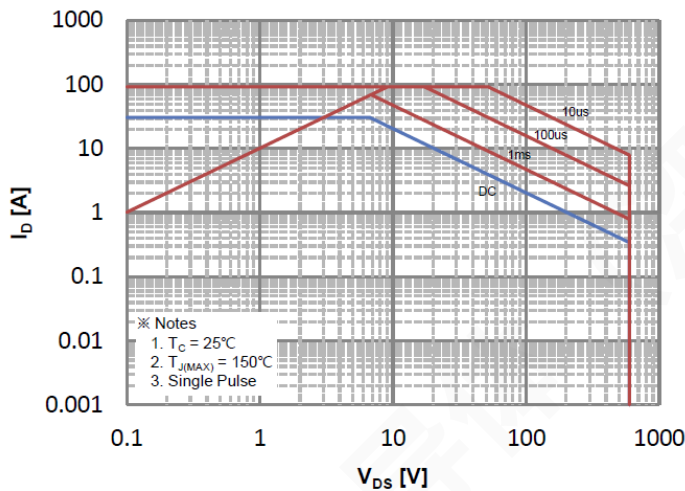


Fig. 10 Maximum Drain Current vs. Case Temperature

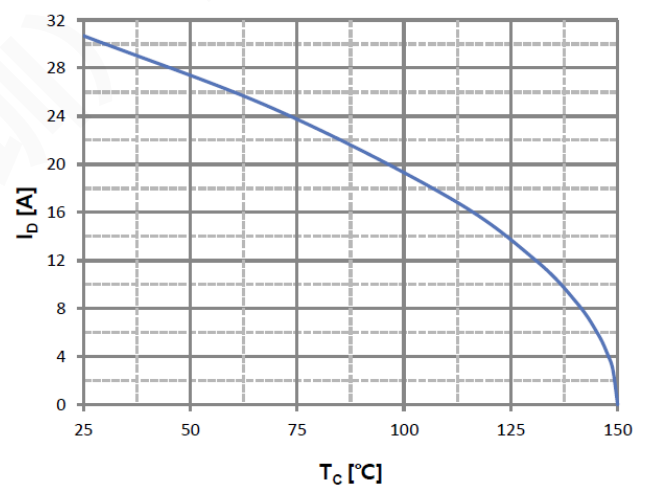


Fig. 11 Transient Thermal Impedance

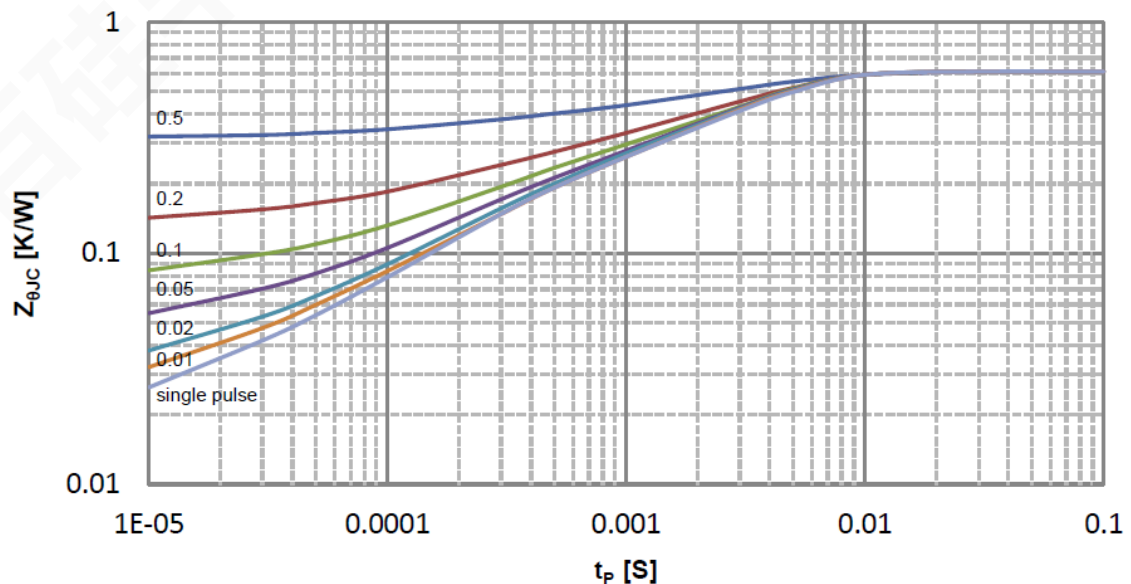
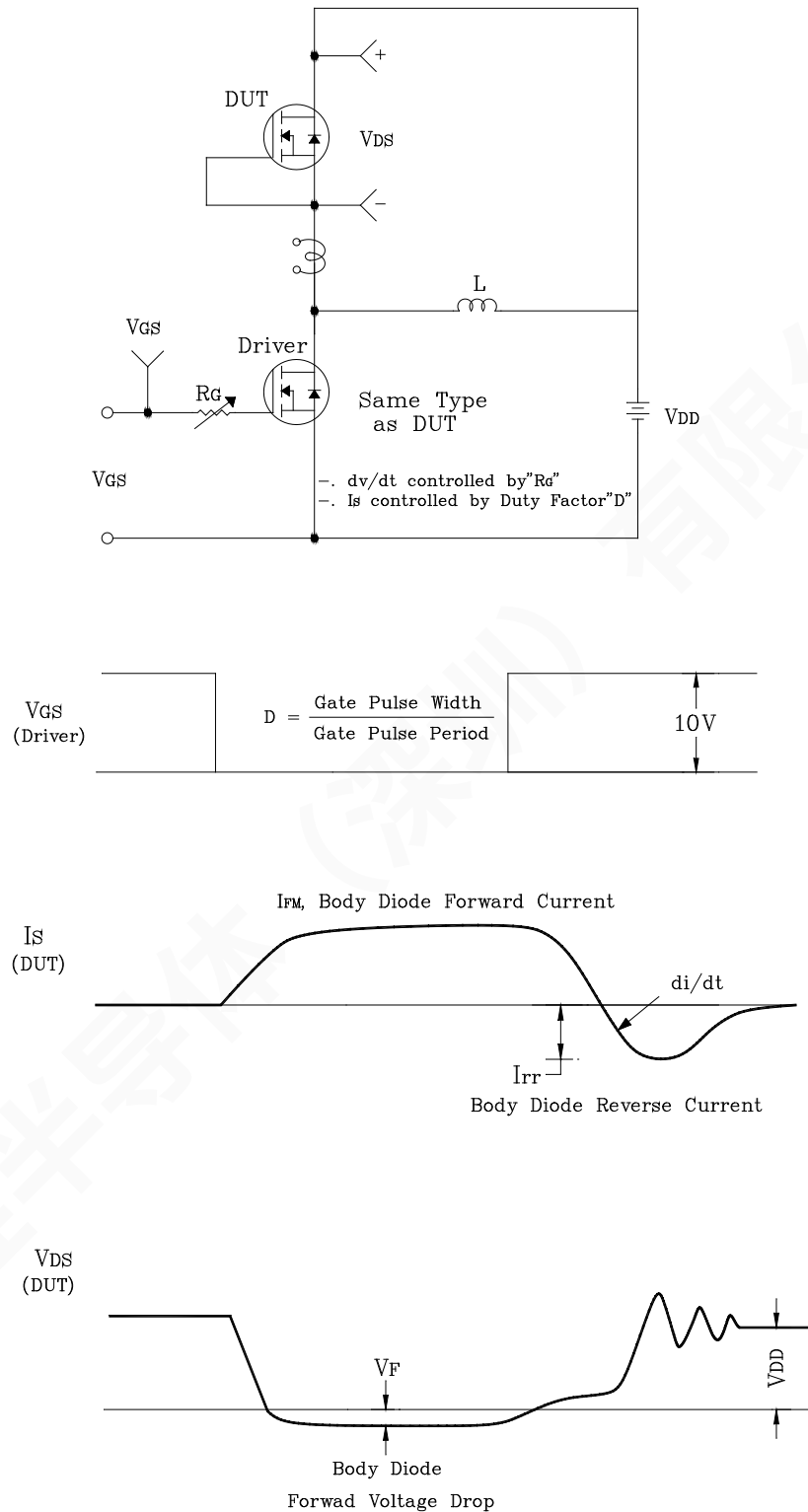
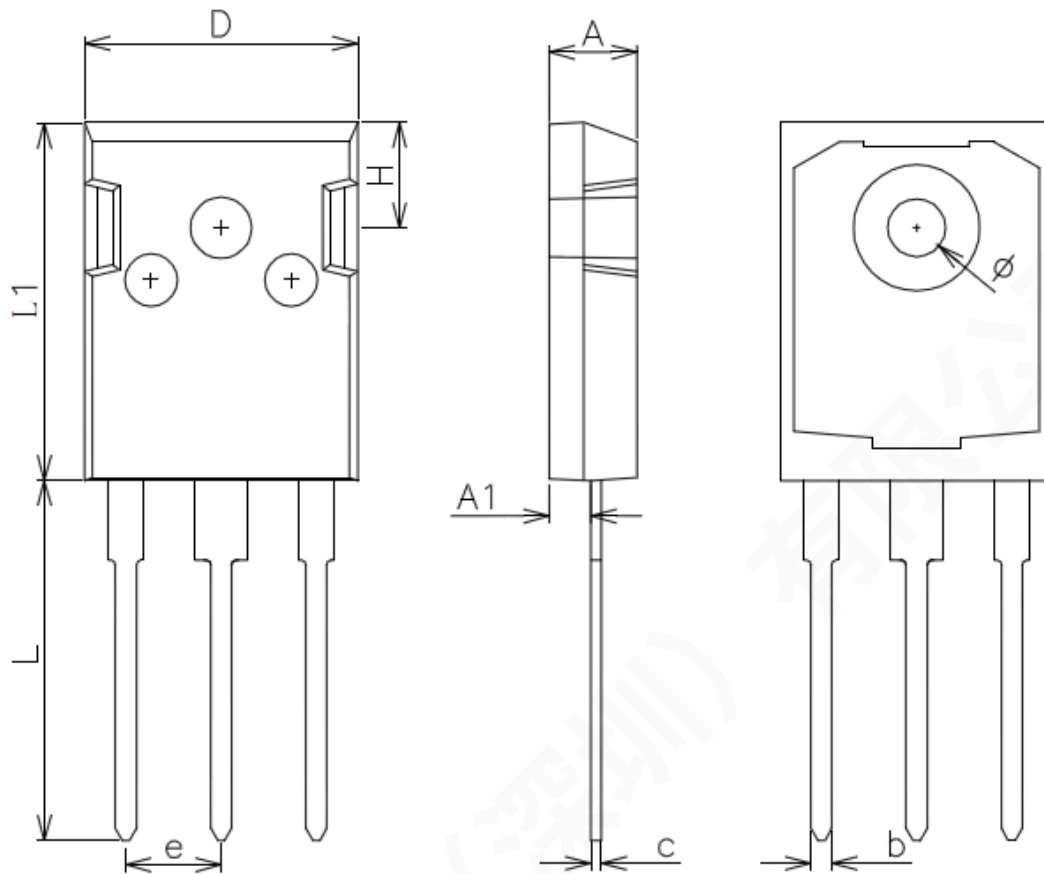


Fig. 15 Diode Reverse Recovery Time Test Circuit & Waveform



Package Outline Dimensions (Unit: mm)



SYMBOL	MILLIMETERS		
	MIN	Nominal	MAX
A	4.80	5.00	5.20
A1	2.41 REF		
b	1.00	1.20	1.40
c	0.40	0.60	0.80
D	15.60	15.80	16.00
e	5.45 REF		
H	6.15 REF		
L	19.35	19.95	20.55
L1	20.80	21.00	21.20
Ø	3.20	3.50	3.80

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