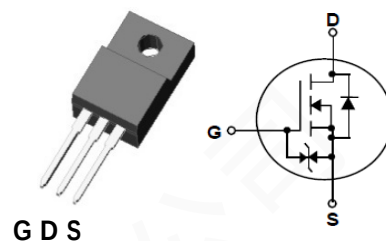


SWITCHING REGULATOR APPLICATION

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

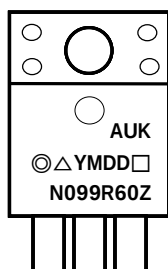


Ordering Information

Part Number	Marking	Package
SJMN099R60ZSF	N099R60Z	TO-220F-3L

TO-220F-3L

Marking Information



Column 1: Manufacturer Logo

Column 2: Production Information

- ◎: Management Code

- △: Machine Code

- YMDD: Date Code Marking (Year, Month, Day)

- □: 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		45	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. 2.78	°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 5, 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 5, 6)	Q_{gs}		-	14	-	
Gate-drain charge (Note 5, 6)	Q_{gd}		-	22	-	

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. $I_S \leq 16.7\text{A}$, $V_{DS} \leq 400\text{V}$, $dI_S/dt \leq 100\text{A/us}$, $T_J=25^{\circ}\text{C}$
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

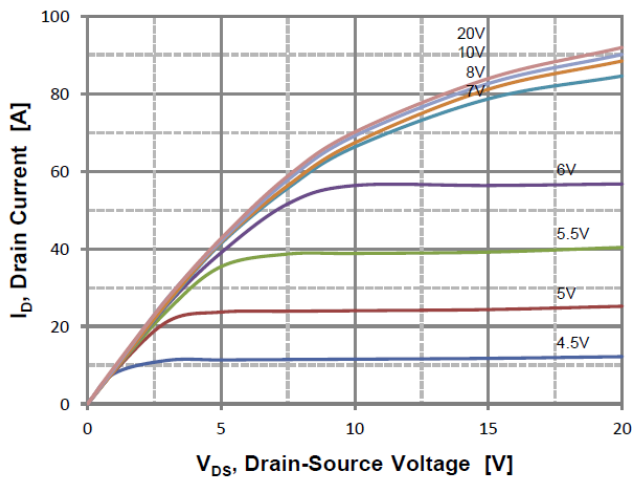


Fig. 2 Typical Transfer Characteristics

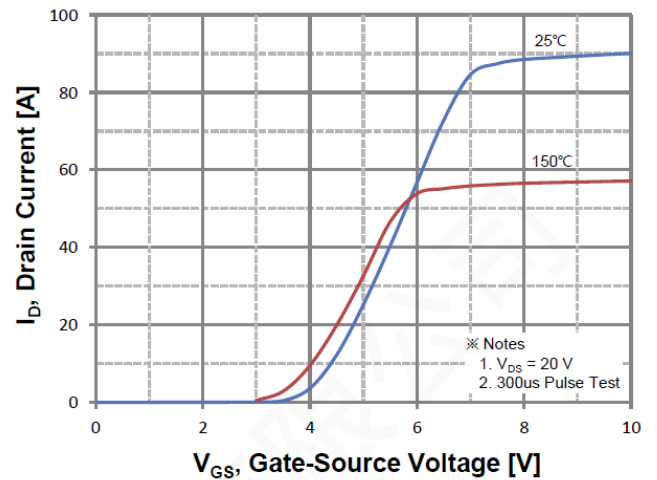


Fig. 3 On-Resistance Variation with Drain Current and Gate Voltage

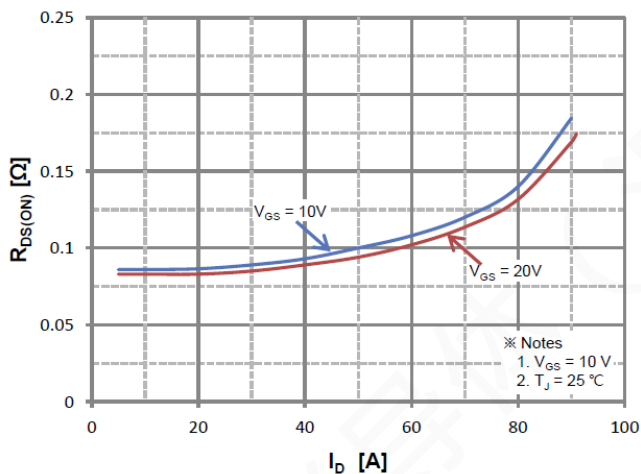


Fig. 4 Body Diode Forward Voltage Variation with Source Current

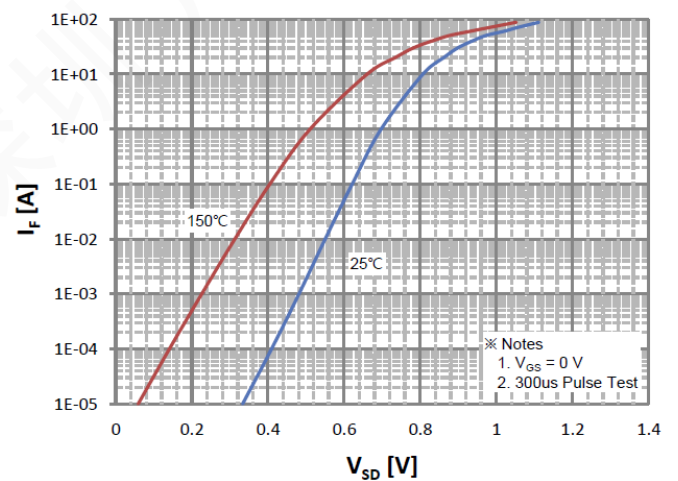


Fig. 5 Typical Capacitance Characteristics

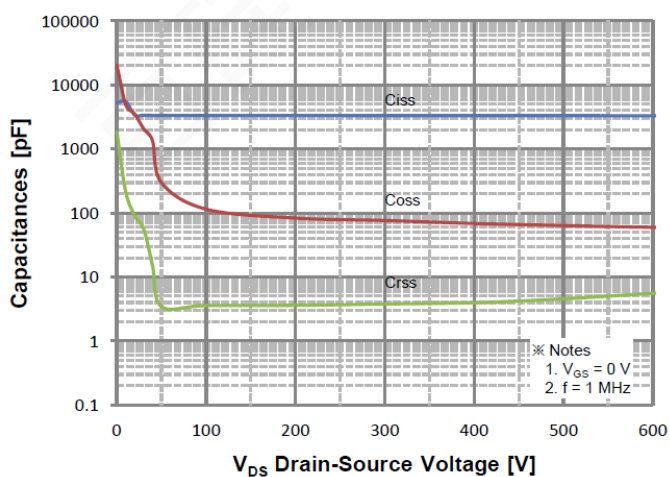


Fig. 6 Typical Total Gate Charge Characteristics

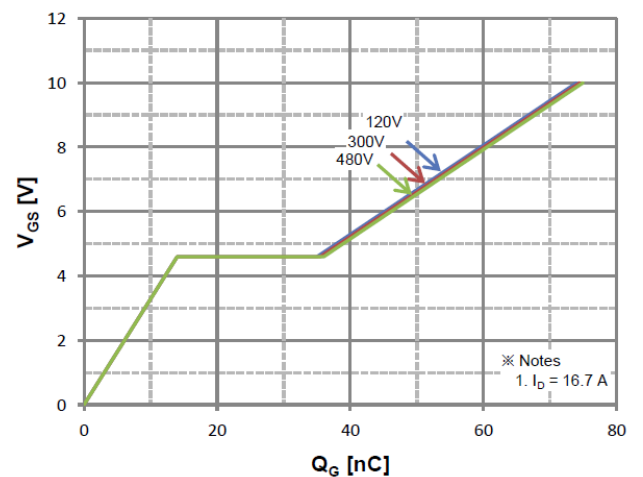


Fig. 12 Gate Charge Test Circuit & Waveform

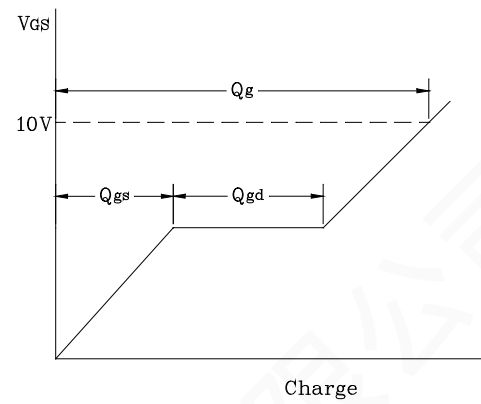
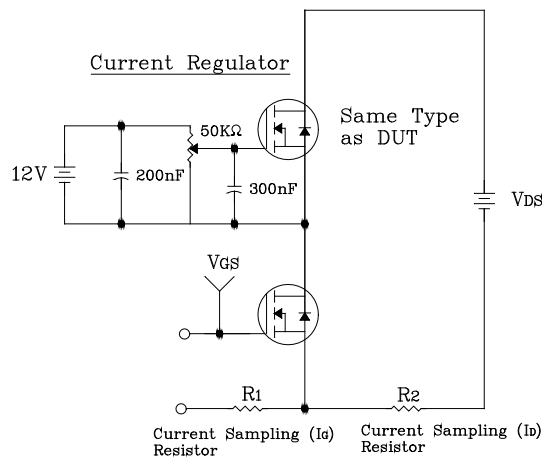


Fig. 13 Resistive Switching Test Circuit & Waveform

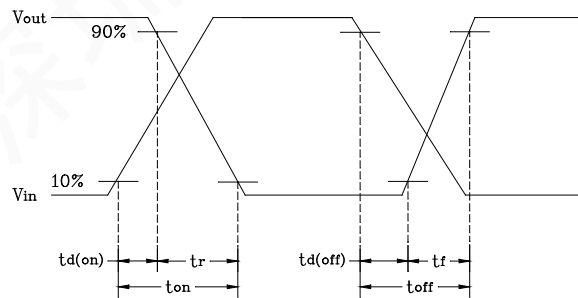
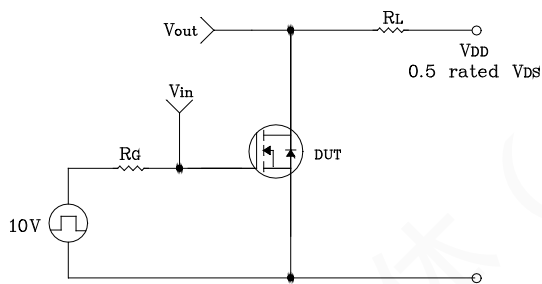


Fig. 14 E_{AS} Test Circuit & Waveform

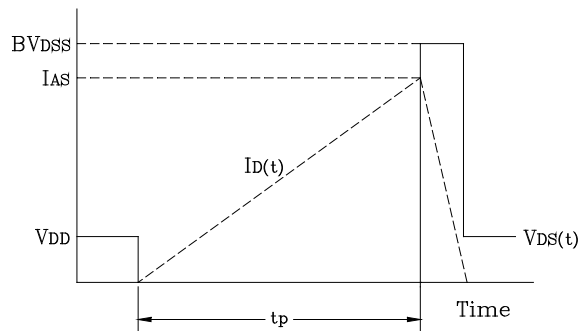
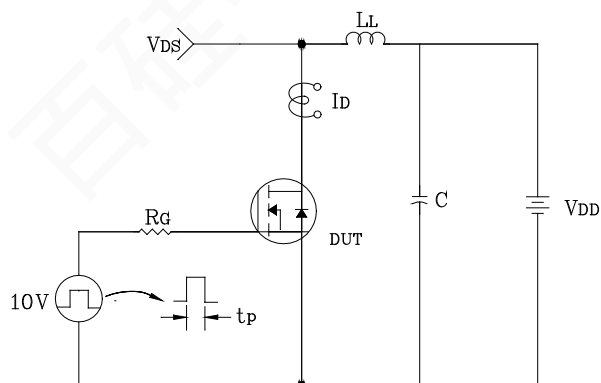
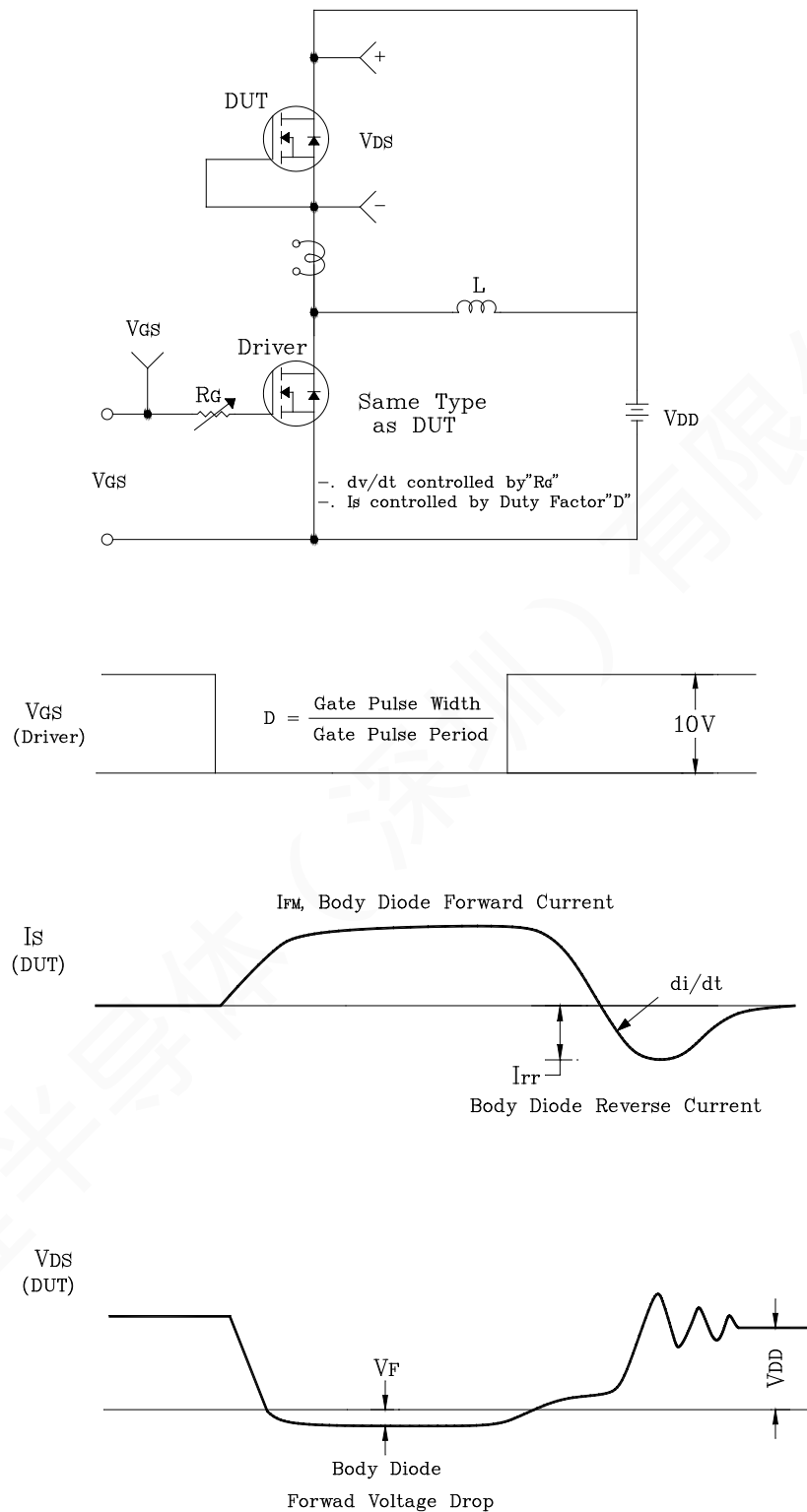
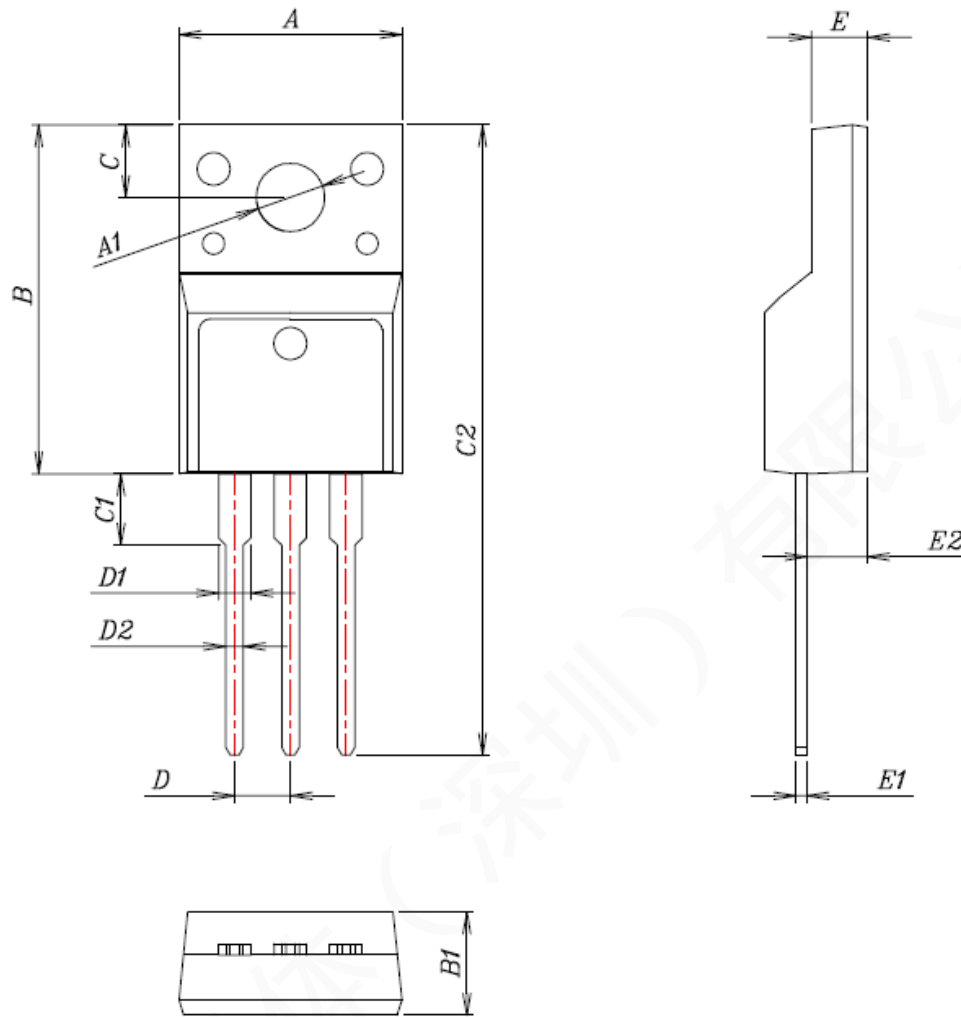


Fig. 15 Diode Reverse Recovery Time Test Circuit & Waveform



Package Outline Dimensions



SYMBOL	MILLIMETERS
A	10.16±0.30
A1	3.12±0.20
B	15.90±0.50
B1	4.70±0.30
C	3.30±0.25
C1	3.25±0.30
C2	28.70±0.50
D	Typical 2.54
D1	1.47(MAX)
D2	0.80±0.20
E	2.55±0.25
E1	0.50±0.20
E2	2.75±0.30

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