

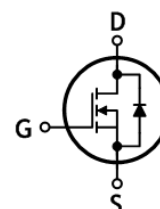
## N-Channel Super Junction MOSFET

### Features

- Drain-Source voltage:  $V_{DS}=700V$  (@ $T_J=150^{\circ}C$ )
- Low drain-source On resistance:  $R_{DS(on)}=0.6\Omega$  (Max.)
- Ultra low gate charge:  $Q_g=13.5nC$  (Typ.)
- RoHS compliant device
- 100% avalanche tested

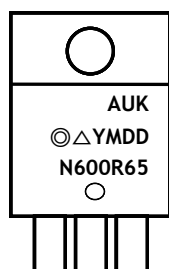
### Ordering Information

Part Number	Marking	Package
SJMN600R65F	N600R65	TO-220F-3L



TO-220F-3L

### Marking Information



Column 1: Manufacturer  
Column 2: Production Information

e.g.) ◎△YMDD

-. ◎△: Factory Management Code

-. YMDD: Date Code (Year, Month, Daily)

Column 3: Device Code

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

Characteristic	Symbol	Rating	Unit
Drain-source voltage	$V_{DS}$	650	V
Gate-source voltage	$V_{GS}$	$\pm 30$	V
Drain current (DC) (Note 1)	$I_D$	$T_C=25^{\circ}C$	7
		$T_C=100^{\circ}C$	4.4
Drain current (Pulsed) (Note 1)	$I_{DM}$	28	A
Single pulsed avalanche energy (Note 2)	$E_{AS}$	158	mJ
Repetitive avalanche current (Note 1)	$I_{AR}$	7	A
Repetitive avalanche energy (Note 1)	$E_{AR}$	3.2	mJ
Power dissipation	$P_D$	32	W
Junction temperature	$T_J$	150	$^{\circ}C$
Storage temperature range	$T_{stg}$	-55~150	$^{\circ}C$

\* Limited only maximum junction temperature

## Thermal Characteristics

Characteristic	Symbol	Rating	Unit
Thermal resistance, junction to case	$R_{th(j-c)}$	Max. 3.9	°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	$BV_{DSS}$	$I_D=250\mu\text{A}$ , $V_{GS}=0$	650	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$I_D=250\mu\text{A}$ , $V_{DS}=V_{GS}$	2	3	4	V
Drain-source cut-off current	$I_{DSS}$	$V_{DS}=650\text{V}$ , $V_{GS}=0\text{V}$	-	-	1	$\mu\text{A}$
		$V_{DS}=650\text{V}$ , $T_J=125^\circ\text{C}$	-	-	100	$\mu\text{A}$
Gate leakage current	$I_{GSS}$	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 30\text{V}$	-	-	$\pm 100$	nA
Drain-source on-resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=3.5\text{A}$	-	-	0.6	$\Omega$
Input capacitance	$C_{iss}$	$V_{DS}=25\text{V}$ , $V_{GS}=0\text{V}$ , $f=1\text{MHz}$	-	557	-	pF
Output capacitance	$C_{oss}$		-	294	-	
Reverse transfer capacitance	$C_{rss}$		-	17	-	
Turn-on delay time (Note 3)	$t_{d(on)}$	$V_{DS}=350\text{V}$ , $I_D=7\text{A}$ , $R_G=25\Omega$	-	16	-	ns
Rise time (Note 3)	$t_r$		-	13	-	
Turn-off delay time (Note 3)	$t_{d(off)}$		-	35	-	
Fall time (Note 3)	$t_f$		-	7	-	
Total gate charge (Note 4)	$Q_g$	$V_{DS}=400\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=7\text{A}$	-	13.5	-	nC
Gate-source charge (Note 4)	$Q_{gs}$		-	4.5	-	
Gate-drain charge (Note 4)	$Q_{gd}$		-	3.5	-	

## 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	-	-	7	A
Source current (Pulsed)	$I_{SM}$		-	-	28	A
Forward voltage	$V_{SD}$	$V_{GS}=0\text{V}$ , $I_S=7\text{A}$	-	-	1.2	V
Reverse recovery time (Note 3,4)	$t_{rr}$	$I_S=7\text{A}$ , $V_{GS}=0\text{V}$ , $di_S/dt=100\text{A}/\mu\text{s}$	-	278	-	ns
Reverse recovery charge (Note 3,4)	$Q_{rr}$		-	2	-	$\mu\text{C}$

Note:

1. Calculated continuous current based on maximum allowable junction temperature
2.  $L=7\text{mH}$ ,  $I_{AS}=7\text{A}$ ,  $V_{DD}=50\text{V}$ , Starting  $T_J=25^\circ\text{C}$
3. Guaranteed by design, not subject to production testing
4. Pulse test: Pulse width $\leq 300\mu\text{s}$ , Duty cycle $\leq 2\%$

## Typical Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

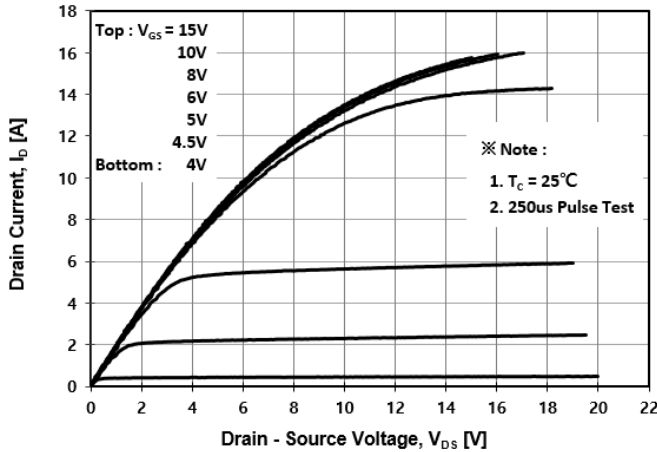


Fig. 2 Typical Transfer Characteristics

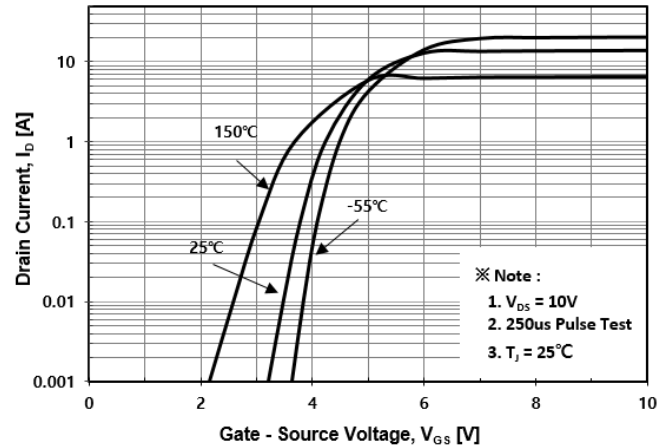


Fig.3 On-Resistance Variation with Drain Current and Gate Voltage

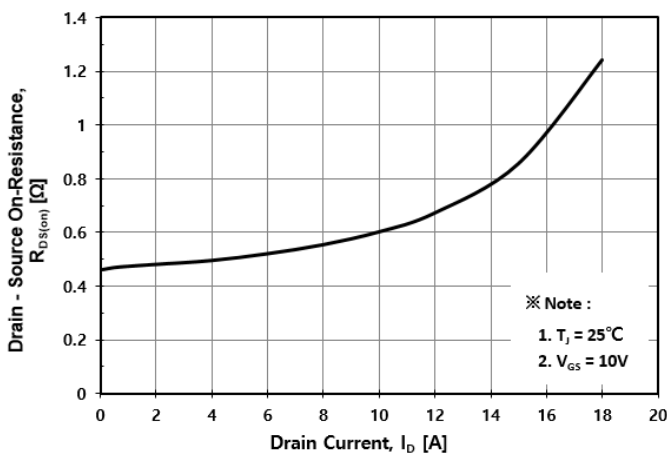


Fig. 4 Body Diode Forward Voltage Variation with Source Current

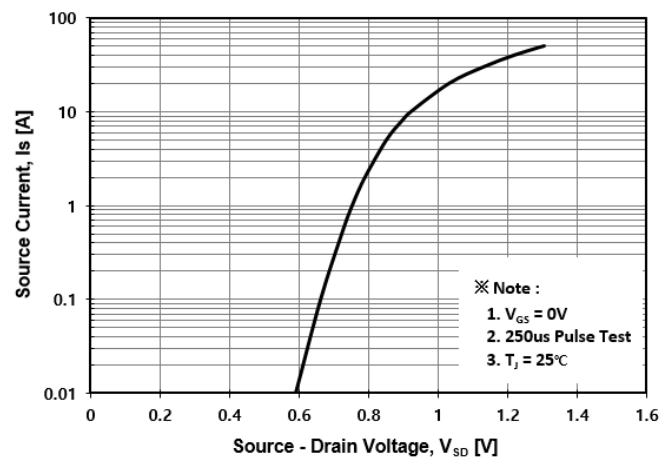


Fig. 5 Typical Capacitance Characteristics

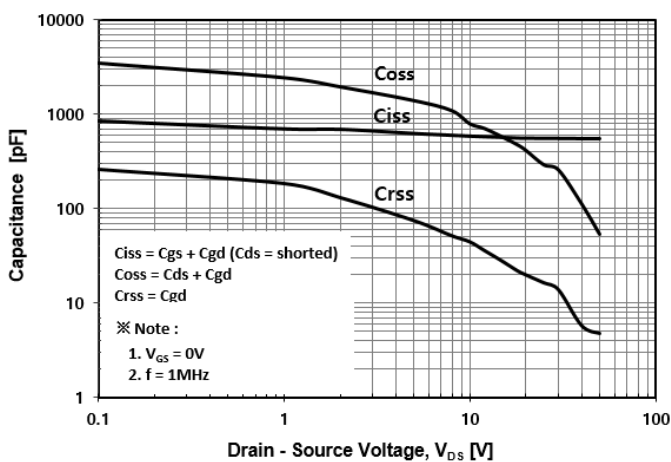


Fig. 6 Typical Total Gate Charge Characteristics

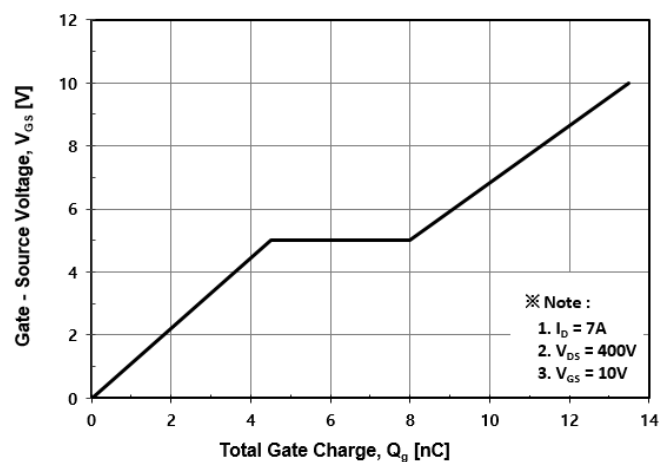


Fig. 7 Breakdown Voltage Variation vs. Temperature

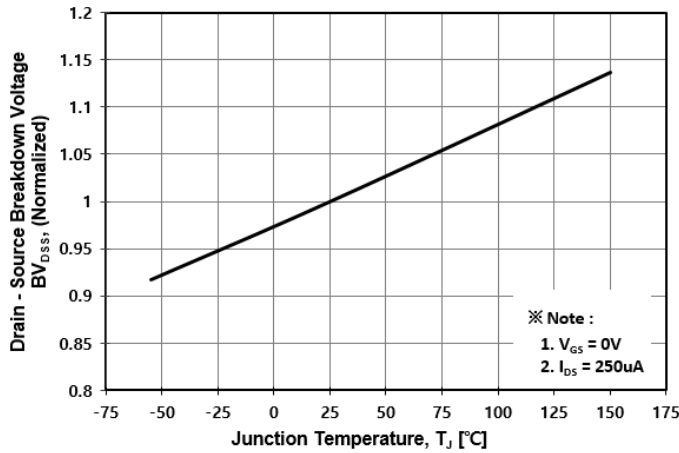


Fig. 8 On-Resistance Variation vs. Temperature

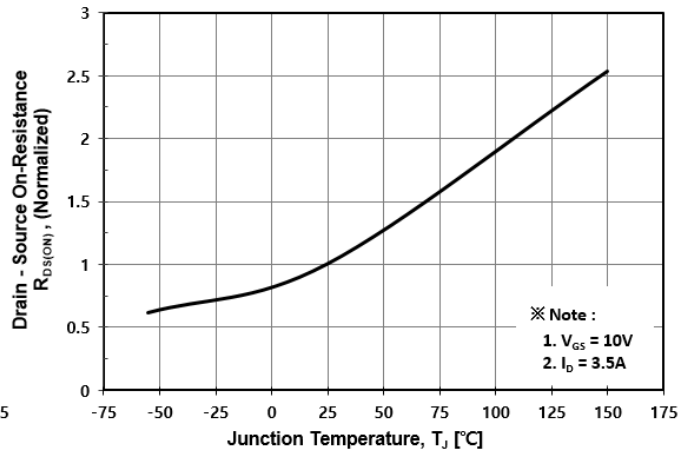


Fig. 9 Maximum Drain Current vs. Case Temperature

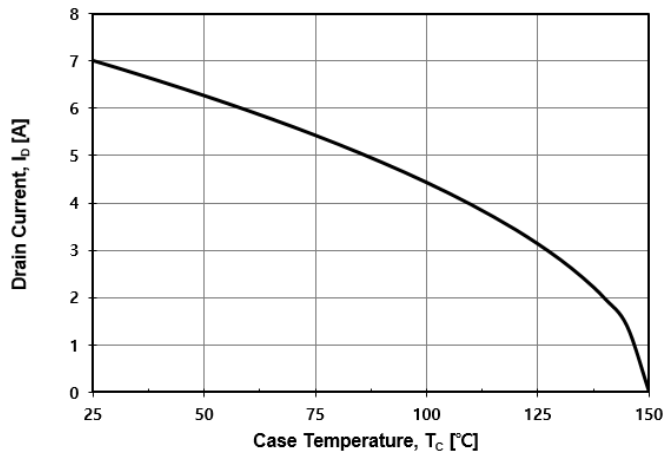


Fig. 10 Maximum Safe Operating Area

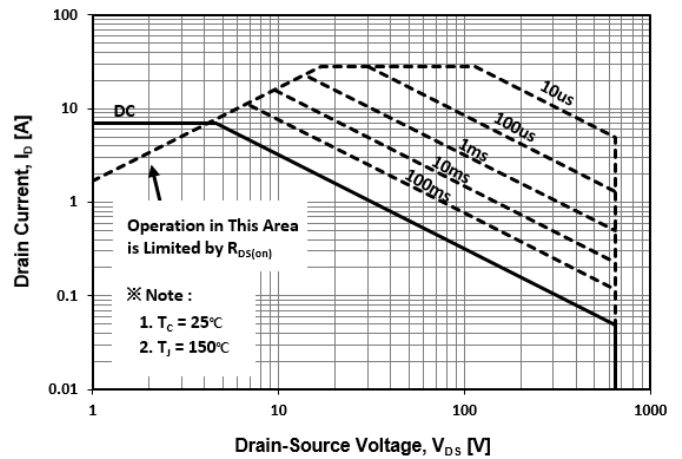
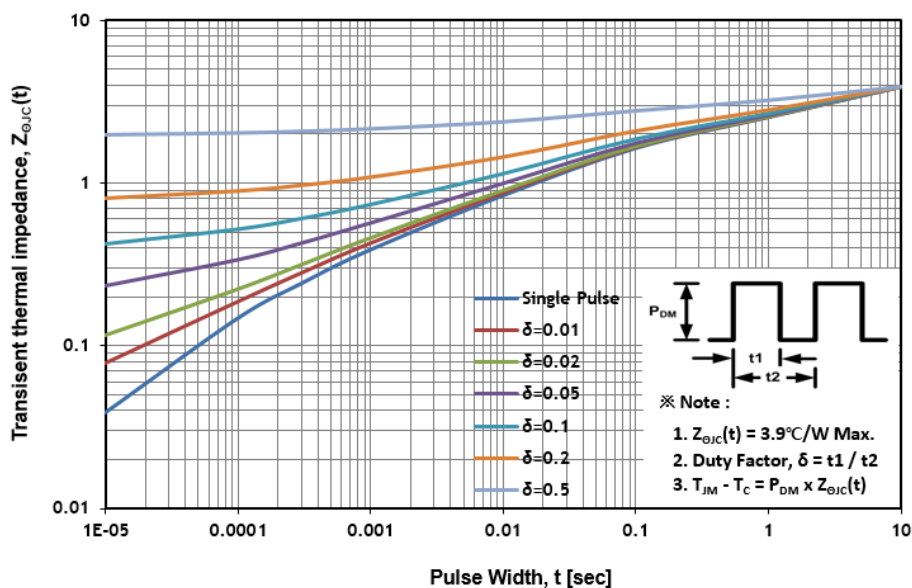
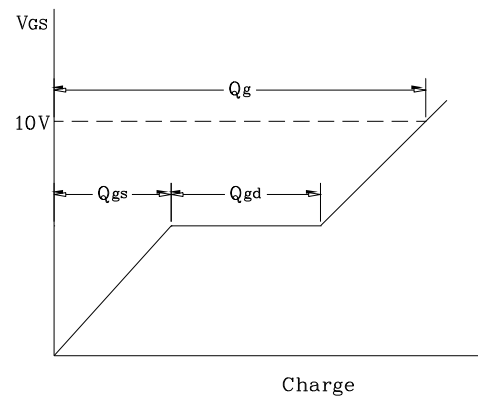
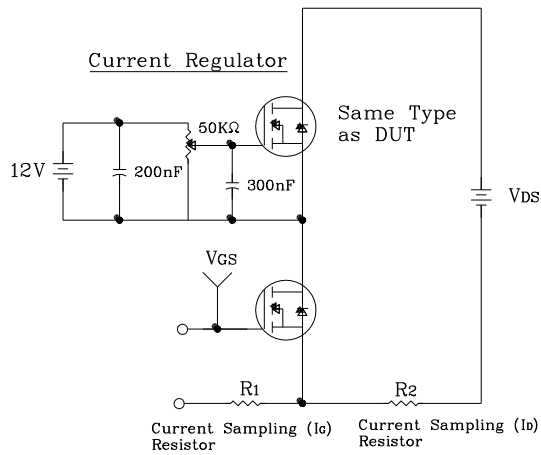


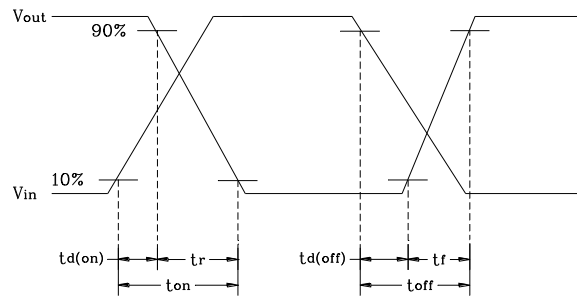
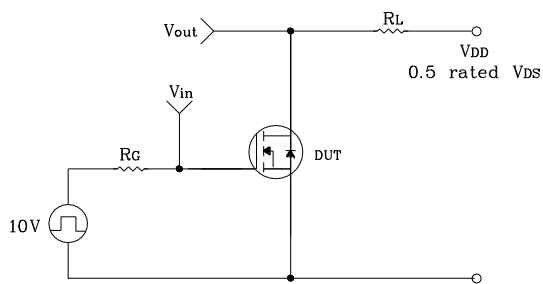
Fig. 11 Transient Thermal Impedance



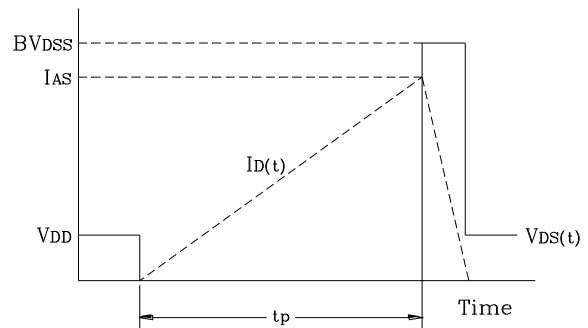
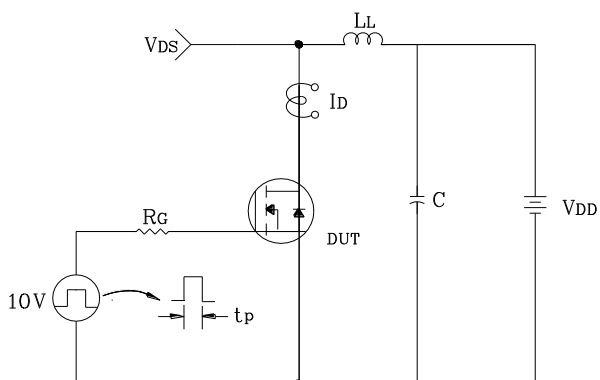
**Fig. 12 Gate Charge Test Circuit & Waveform**



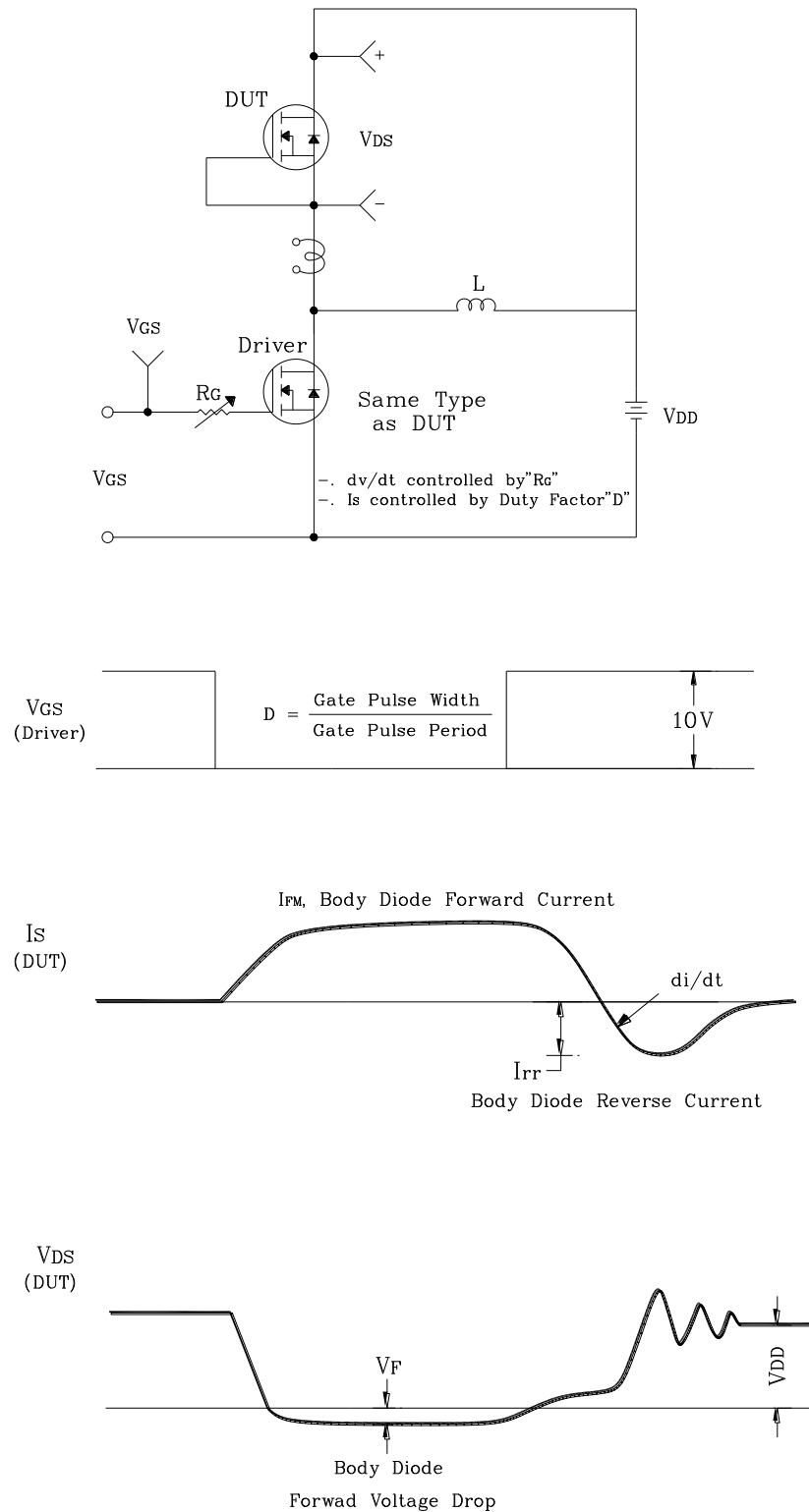
**Fig. 13 Resistive Switching Test Circuit & Waveform**



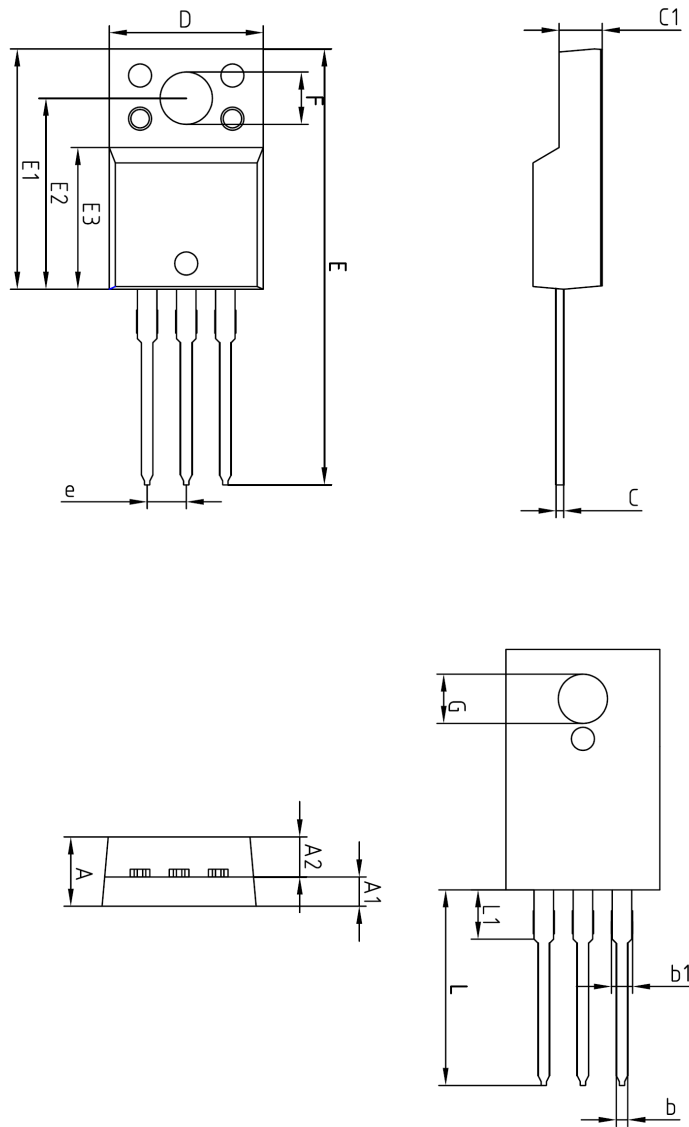
**Fig. 14 E<sub>AS</sub> Test Circuit & Waveform**



**Fig. 15 Diode Reverse Recovery Time Test Circuit & Waveform**



## Package Outline Dimensions



SYMBOL	MILLIMETERS			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	—	—	4.60	
A1	2.45	2.50	2.55	
A2	1.95	2.00	2.05	
b	0.65	0.75	0.85	
b1	1.07	1.27	1.47	
C	0.40	0.50	0.60	
C1	2.70	2.80	2.90	
D	9.90	10.00	10.10	
E	28.00	—	28.60	
E1	15.50	15.60	15.70	
E2	12.30	12.40	12.50	
E3	9.15	9.20	9.25	
F	3.30	3.40	3.50	
G	3.10	3.20	3.30	
e	2.54 BSC			
L	12.40	—	13.00	
L1	3.46 BSC			

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