

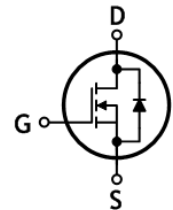
N-Channel Super Junction MOSFET

Features

- Drain-Source voltage: $V_{DS}=650V$ (@ $T_J=150^{\circ}C$)
- Low drain-source On resistance: $R_{DS(on)}=0.13\Omega$ (Typ.)
- Ultra low gate charge: $Q_g=57nC$ (Typ.)
- RoHS compliant device
- 100% avalanche tested

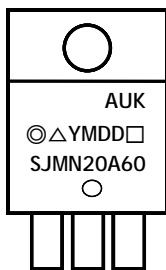
Ordering Information

Part Number	Marking	Package
SJMN20A60FD	SJMN20A60	TO-220F-3L



TO-220F-3L

Marking Information



Column 1: Manufacturer

Column 2: Production Information

e.g.) ◎△YMDD□

-. ◎: Option Code (H: Halogen Free)

-. △: Factory Management Code

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

-. □: Package Option Code

Column 3: Device Code

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

Characteristic	Symbol	Rating	Unit	
Drain-source voltage	V_{DSS}	600	V	
Gate-source voltage	V_{GSS}	±30	V	
Drain current (DC) ^(Note 1)	I_D	$T_C=25^{\circ}C$	20	A
		$T_C=100^{\circ}C$	13	A
Drain current (Pulsed) ^(Note 1)	I_{DM}	60	A	
Single pulsed avalanche energy ^(Note 2)	E_{AS}	700	mJ	
Repetitive avalanche current ^(Note 1)	I_{AR}	20	A	
Repetitive avalanche energy ^(Note 1)	E_{AR}	20.5	mJ	
Power dissipation	P_D	35	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. 3.57	°C/W
Thermal resistance, junction to ambient	$R_{th(j-a)}$	Max. 80	

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}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	600	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$I_D=250\mu\text{A}$, $V_{DS}=V_{GS}$	2	-	5	V
Drain-source cut-off current	I_{DSS}	$V_{DS}=600\text{V}$, $V_{GS}=0\text{V}$	-	-	1	μA
		$V_{DS}=480\text{V}$, $T_J=125^\circ\text{C}$	-	-	10	μA
Gate leakage current	I_{GSS}	$V_{DS}=0\text{V}$, $V_{GS}=\pm 30\text{V}$	-	-	± 100	nA
Drain-source on-resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=10\text{A}$	-	0.13	0.15	Ω
Gate resistance	R_G	$f=1\text{MHz}$, Open drain	-	1.0	-	Ω
Input capacitance	C_{iss}	$V_{DS}=25\text{V}$, $V_{GS}=0\text{V}$, $f=1\text{MHz}$	-	2100	-	pF
Output capacitance	C_{oss}		-	1600	-	
Reverse transfer capacitance	C_{rss}		-	21	-	
Turn-on delay time ^(Note 3)	$t_{d(on)}$	$V_{DD}=380\text{V}$, $I_D=10\text{A}$, $R_G=4.7\Omega$, $V_{GS}=10\text{V}$	-	25	-	ns
Rise time ^(Note 3)	t_r		-	21	-	
Turn-off delay time ^(Note 3)	$t_{d(off)}$		-	60	-	
Fall time ^(Note 3)	t_f		-	4	-	
Total gate charge ^(Note 4)	Q_g	$V_{DS}=480\text{V}$, $V_{GS}=10\text{V}$, $I_D=10\text{A}$	-	57	-	nC
Gate-source charge ^(Note 4)	Q_{gs}		-	14	-	
Gate-drain charge ^(Note 4)	Q_{gd}		-	24	-	

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	-	-	20	A
Source current (Pulsed)	I_{SM}		-	-	60	A
Forward voltage	V_{SD}	$V_{GS}=0\text{V}$, $I_S=10\text{A}$	-	-	1.4	V
Reverse recovery time ^(Note 3,4)	t_{rr}	$I_S=20\text{A}$, $V_R=50\text{V}$ $di_S/dt=100\text{A}/\mu\text{s}$	-	520	-	ns
Reverse recovery charge ^(Note 3,4)	Q_{rr}		-	5.7	-	μC

Note:

1. Calculated continuous current based on maximum allowable junction temperature
2. $L=27\text{mH}$, $I_{AS}=7\text{A}$, $V_{DD}=60\text{V}$, $R_G=25\Omega$, 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

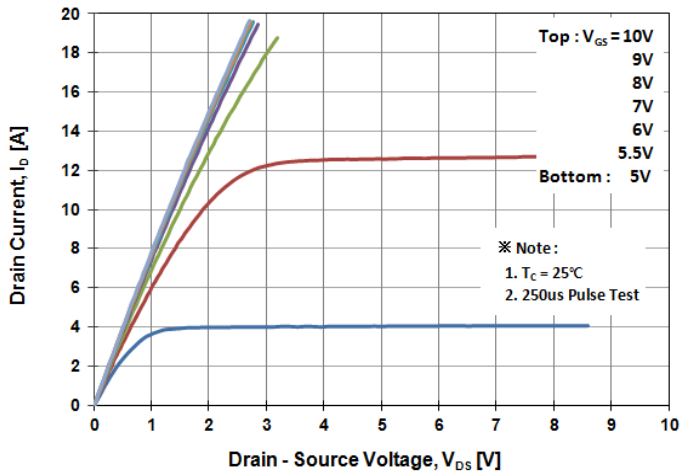


Fig. 2 Typical Transfer Characteristics

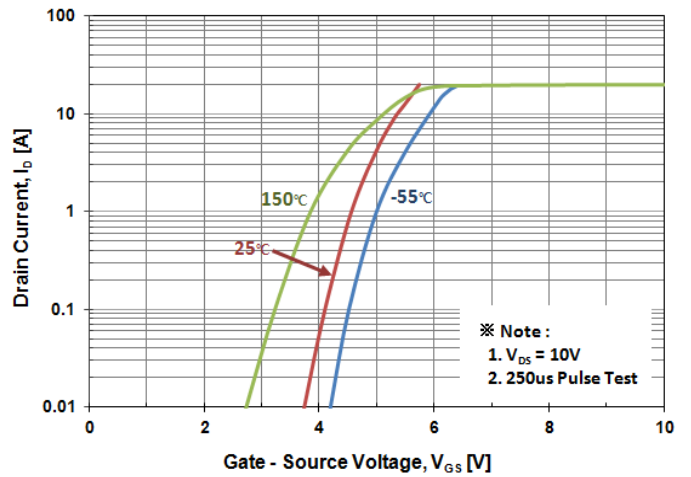


Fig.3 On-Resistance Variation with Drain Current and Gate Voltage

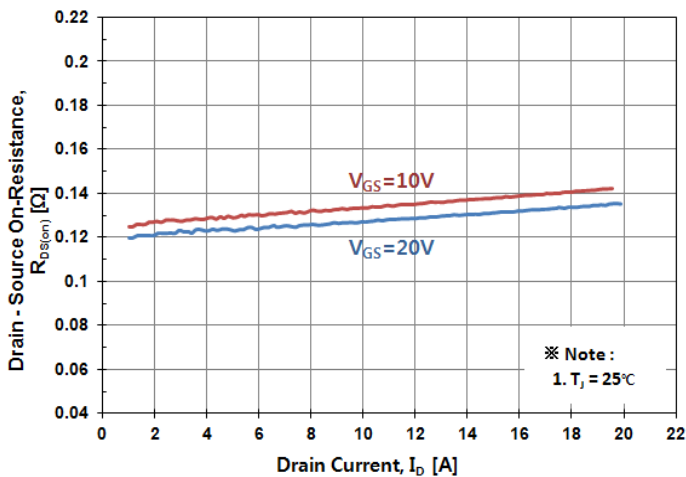


Fig. 4 Body Diode Forward Voltage Variation with Source Current

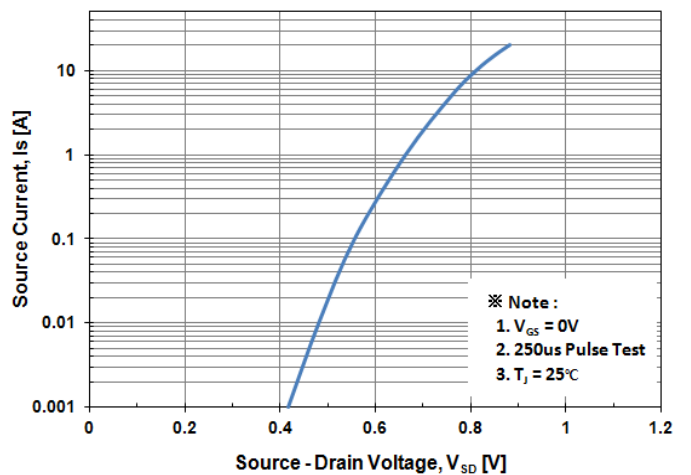


Fig. 5 Typical Capacitance Characteristics

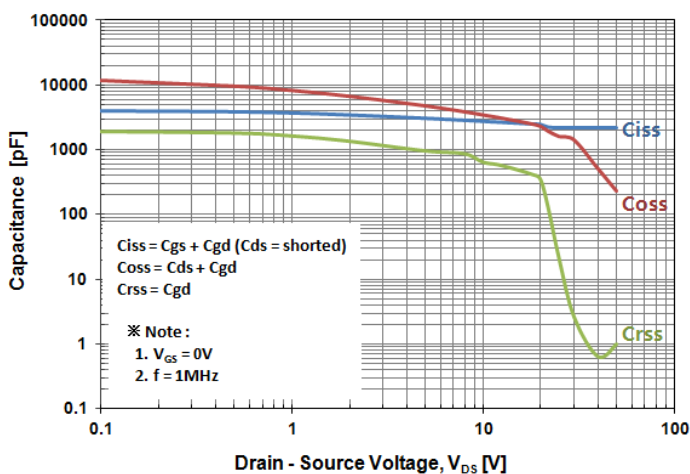


Fig. 6 Typical Total Gate Charge Characteristics

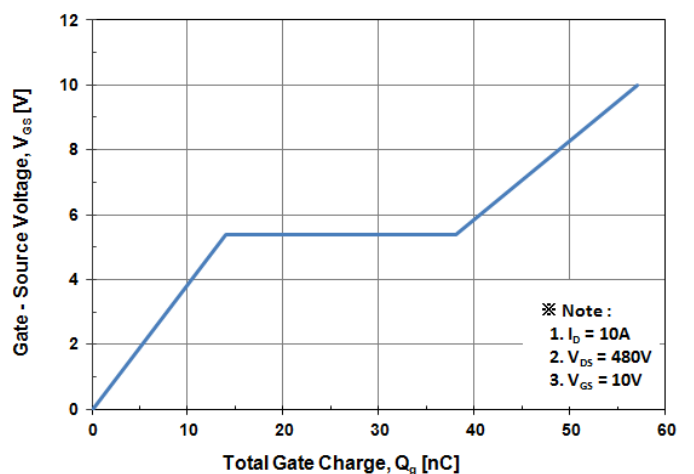


Fig. 7 Breakdown Voltage Variation vs. Temperature

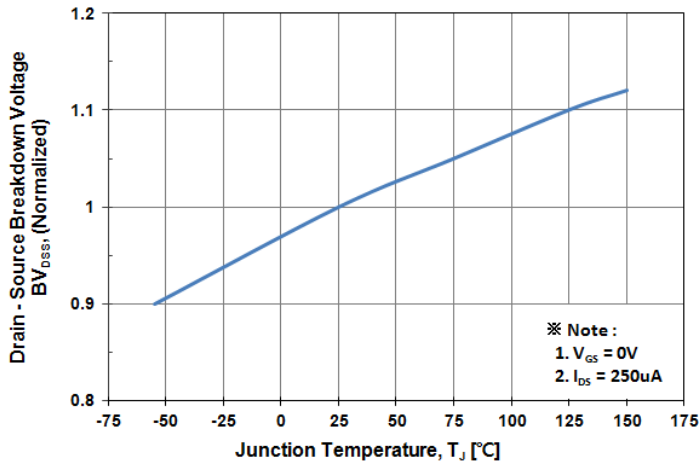


Fig. 8 On-Resistance Variation vs. Temperature

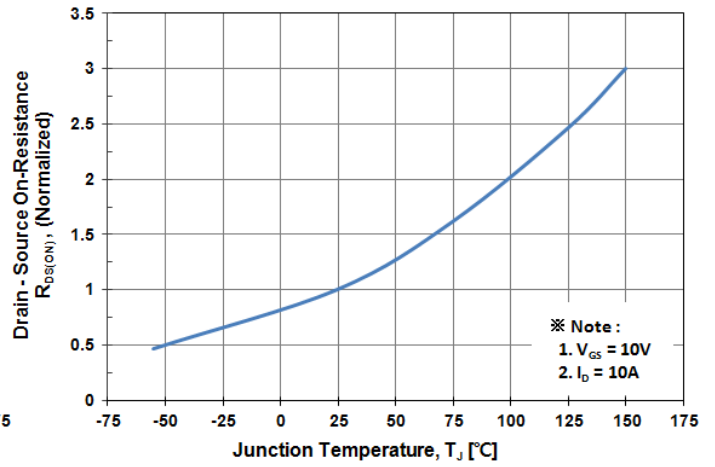


Fig. 9 Maximum Drain Current vs. Case Temperature

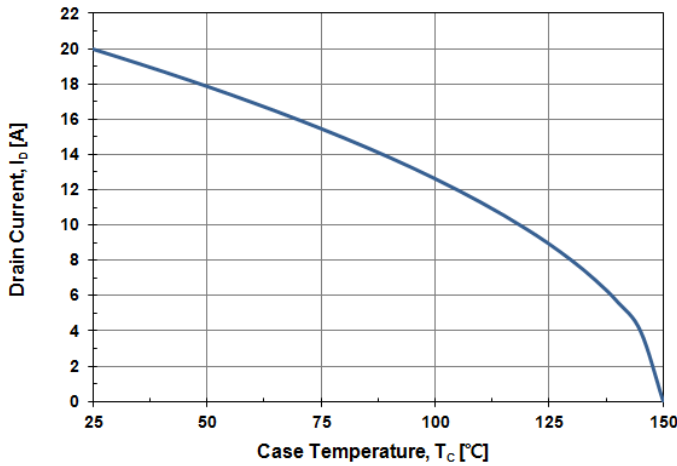


Fig. 10 Maximum Safe Operating Area

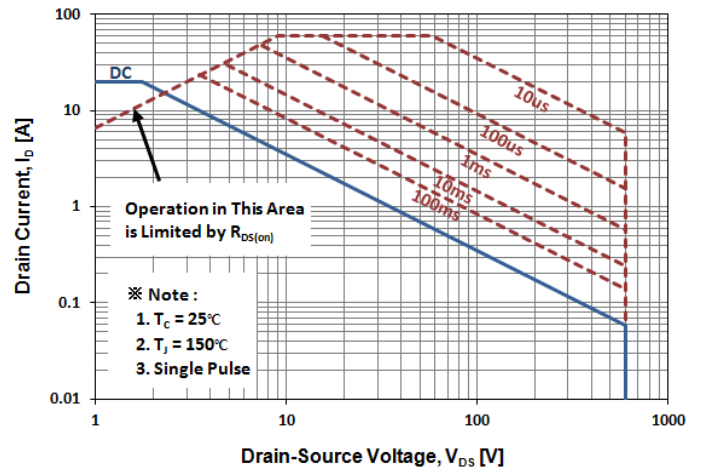


Fig. 11 Transient Thermal Impedance

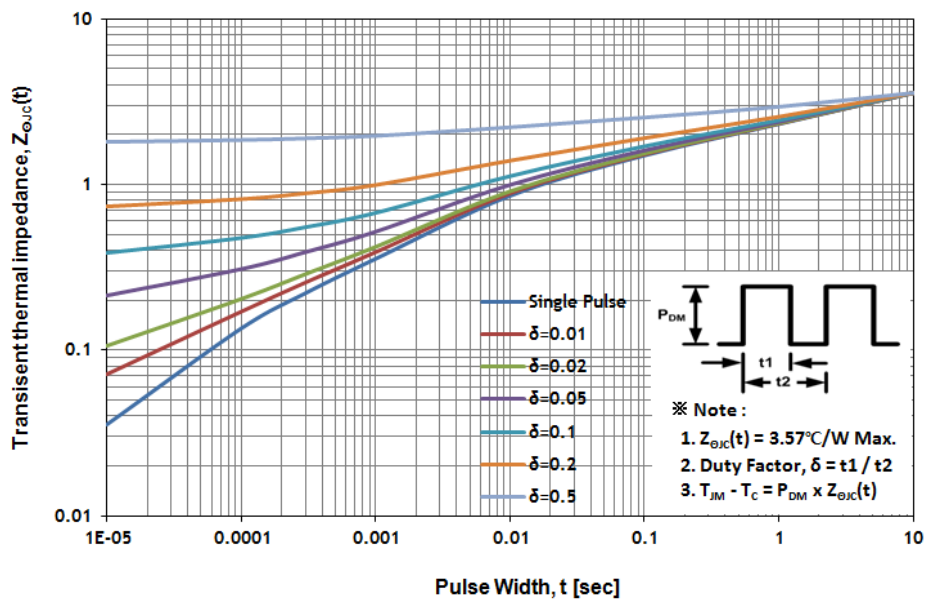


Fig. 12 Gate Charge Test Circuit & Waveform

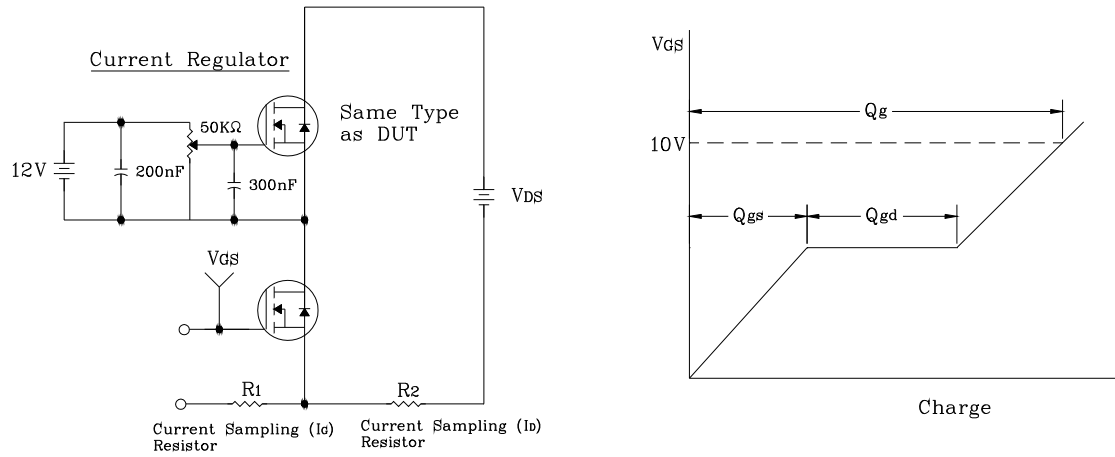


Fig. 13 Resistive Switching Test Circuit & Waveform

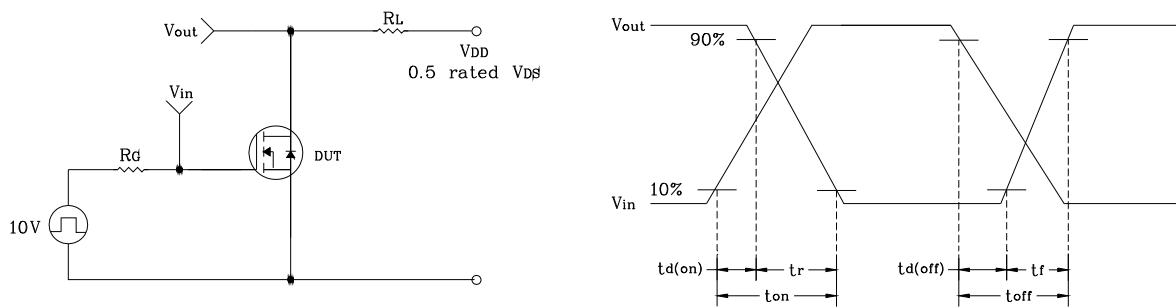


Fig. 14 E_{AS} Test Circuit & Waveform

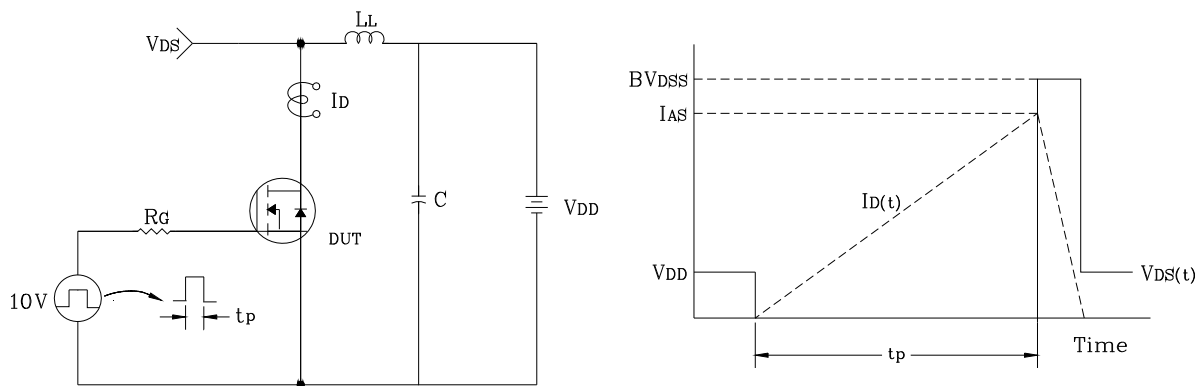
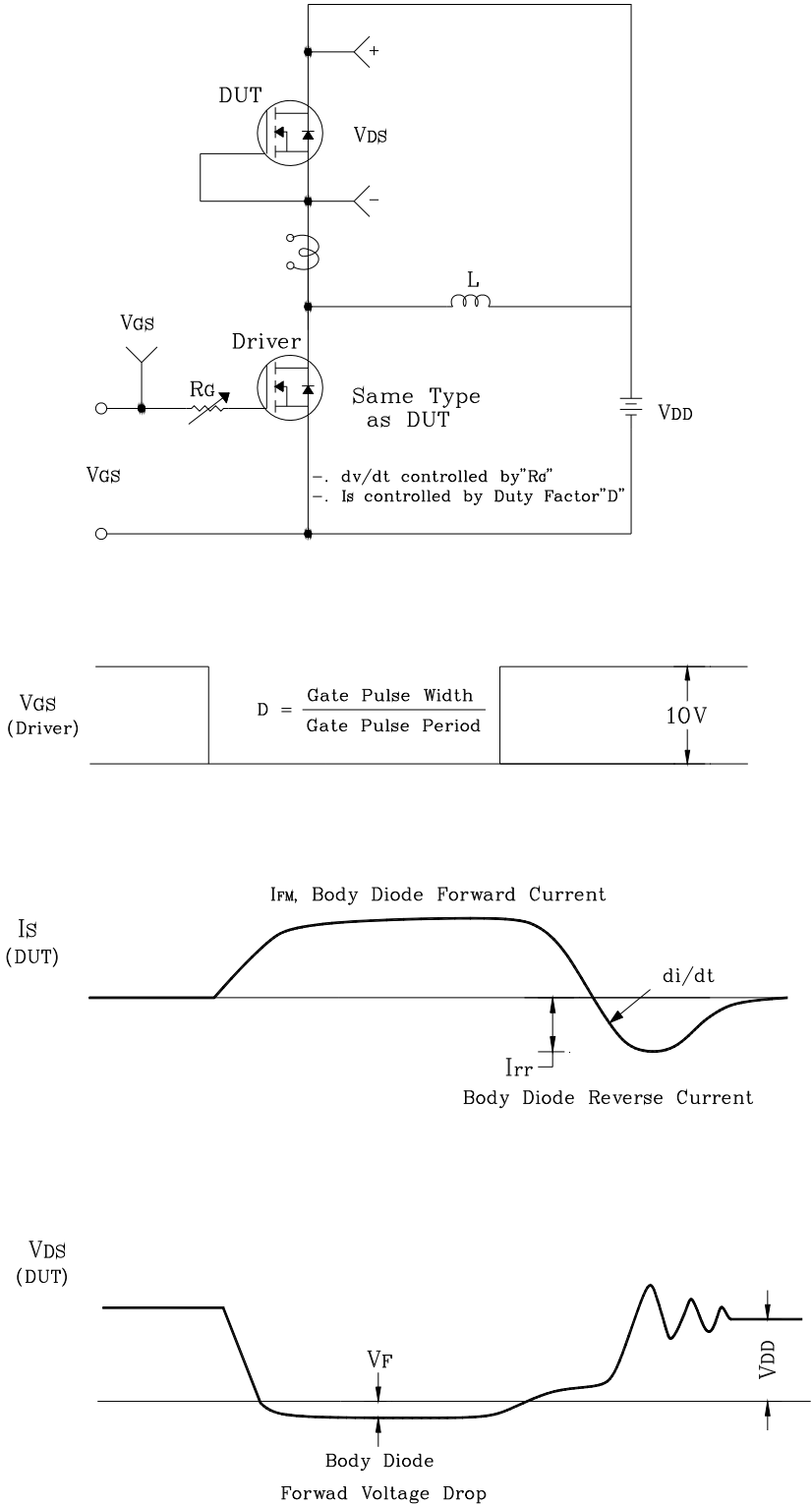
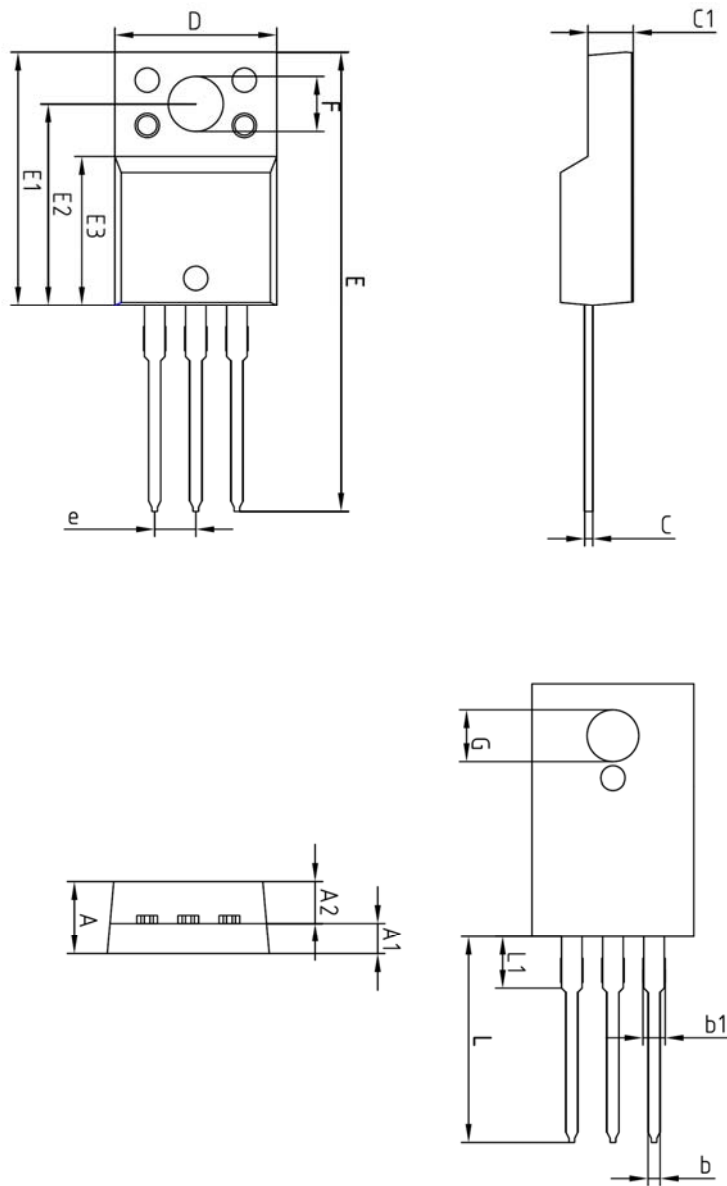


Fig. 15 Diode Reverse Recovery Time Test Circuit & Waveform



Package Outline Dimensions (Unit: mm)



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	2.34	2.54	2.74	
L	12.40	-	13.00	
L1	3.00	3.20	3.40	

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