

## PORTABLE EQUIPMENT APPLICATION

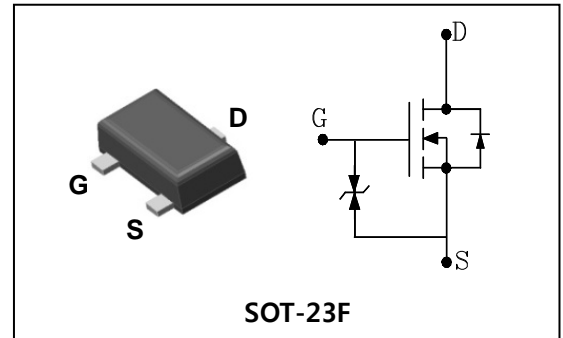
### Features

- Low Voltage :  $BV_{DSS}=20V(\text{Min.})$
- Low  $V_{GS(th)}$  :  $V_{GS(th)}=0.6\sim 1.2V$
- Small footprint due to small package
- Low  $R_{DS(on)}$  :  $R_{DS(on)}=40m\Omega(\text{Max.})$

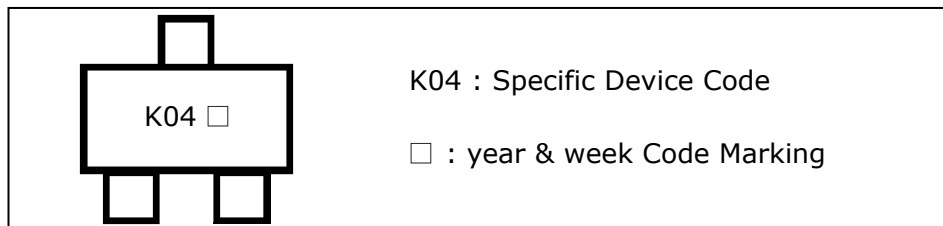
### Ordering Information

Type No.	Marking	Package Code
STK004SF	K04 □ ① ②	SOT-23F

### PIN Connection



### Marking Diagram



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

Characteristic	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	20	V
Gate-source voltage	$V_{GSS}$	$\pm 12$	V
Drain current (DC) *	$I_D$	4.2	A
Drain current (Pulsed) *	$I_{DM}$	16.8	A
Power dissipation **	$P_D$	0.35	W
Avalanche current (Single) ②	$I_{AS}$	4.2	A
Single pulsed avalanche energy ②	$E_{AS}$	27	mJ
Avalanche current (Repetitive) ①	$I_{AR}$	4.2	A
Repetitive avalanche energy ①	$E_{AR}$	2.5	mJ
Junction temperature	$T_J$	150	°C
Storage temperature range	$T_{stg}$	-55~150	

\* Limited by maximum junction temperature

\*\* Device mounted on a glass-epoxy board

Characteristic		Symbol	Typ.	Max.	Unit
Thermal resistance	Junction-ambient	$R_{th(J-A)}$	-	357	°C/W

## Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Drain-source breakdown voltage	BV <sub>DSS</sub>	I <sub>D</sub> =250uA, V <sub>GS</sub> =0	20	-	-	V	
Gate threshold voltage	V <sub>GS(th)</sub>	I <sub>D</sub> =250uA, V <sub>DS</sub> =V <sub>GS</sub>	0.6	-	1.2	V	
Drain-source cut-off current	I <sub>DSS</sub>	V <sub>DS</sub> =20V, V <sub>GS</sub> =0	-	-	1	uA	
Gate leakage current	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V	-	-	±10	uA	
Drain-source on-resistance ④	R <sub>DS(ON)</sub>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =2.1A	-	19	40	mΩ	
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =2.1A	-	27	45		
Forward transfer conductance ④	g <sub>fs</sub>	V <sub>DS</sub> =2V, I <sub>D</sub> =4.2A	-	22	-	S	
Input capacitance	C <sub>iss</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =10V, f=1MHz	-	390	590	pF	
Output capacitance	C <sub>oss</sub>		-	90	135		
Reverse transfer capacitance	C <sub>rss</sub>		-	40	60		
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> =10V, I <sub>D</sub> =4.2A R <sub>G</sub> =10Ω	-	2.0	-	ns	
Rise time	t <sub>r</sub>		-	1.9	-		
Turn-off delay time	t <sub>d(off)</sub>		③④	-	2.8		-
Fall time	t <sub>f</sub>		-	1.9	-		
Total gate charge	Q <sub>g</sub>	V <sub>DD</sub> =10V, V <sub>GS</sub> =4.5V I <sub>D</sub> =4.2A	-	4.0	6.0	nC	
Gate-source charge	Q <sub>gs</sub>		-	1.0	1.5		
Gate-drain charge	Q <sub>gd</sub>		③④	-	1.6		2.4

## Source-Drain Diode Ratings and Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

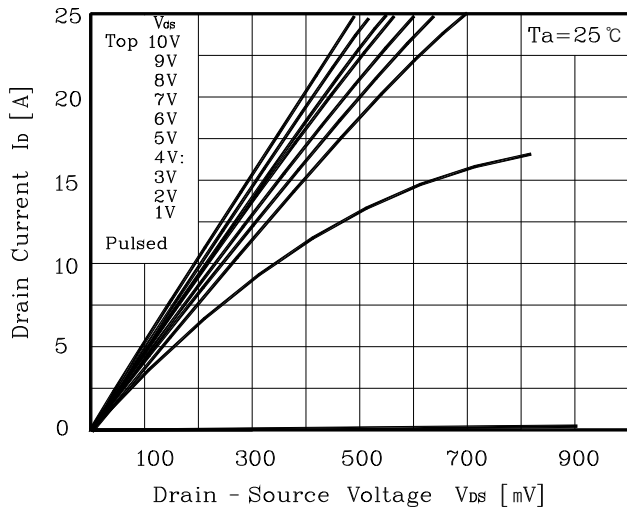
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Continuous source current	I <sub>S</sub>	Integral reverse diode in the MOSFET	-	-	0.5	A
Source current (Pulsed) ①	I <sub>SM</sub>		-	-	2.0	
Forward voltage ④	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =0.5A	-	0.7	1.2	V
Reverse recovery time	t <sub>rr</sub>	I <sub>S</sub> =0.5A, V <sub>GS</sub> =0V dI <sub>F</sub> /dt=10A/us	-	57	-	ns
Reverse recovery charge	Q <sub>rr</sub>		-	240	-	uC

Note ;

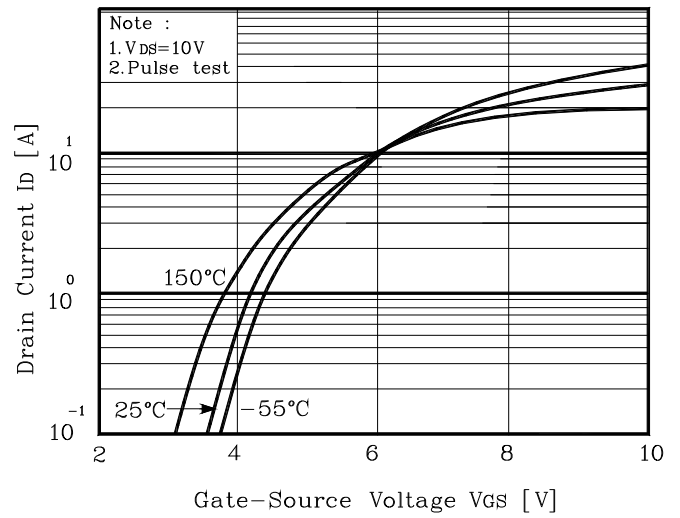
- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ② L=2.0mH, I<sub>AS</sub>=4.2A, V<sub>DD</sub>=10V, R<sub>G</sub>=25Ω
- ③ Pulse Test : Pulse width≤300us, Duty cycle≤2%
- ④ Essentially independent of operating temperature

## N-CH Electrical Characteristic Curves

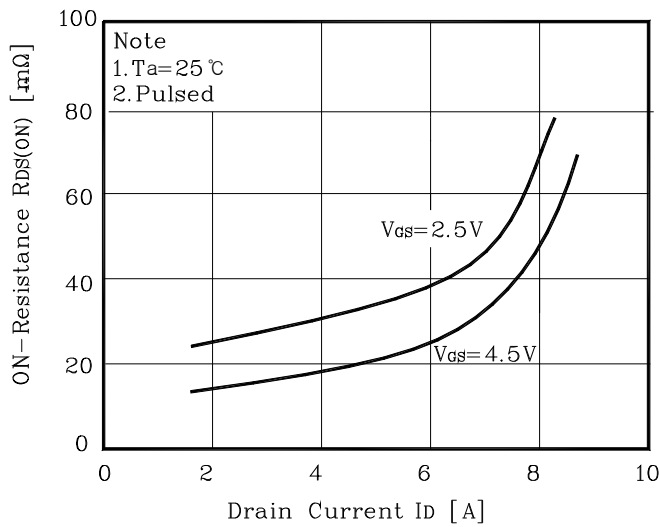
**Fig. 1  $I_D - V_{DS}$**



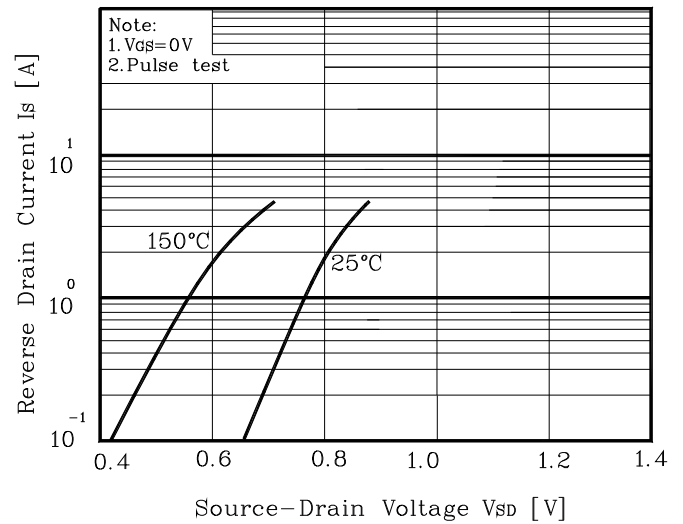
**Fig. 2  $I_D - V_{GS}$**



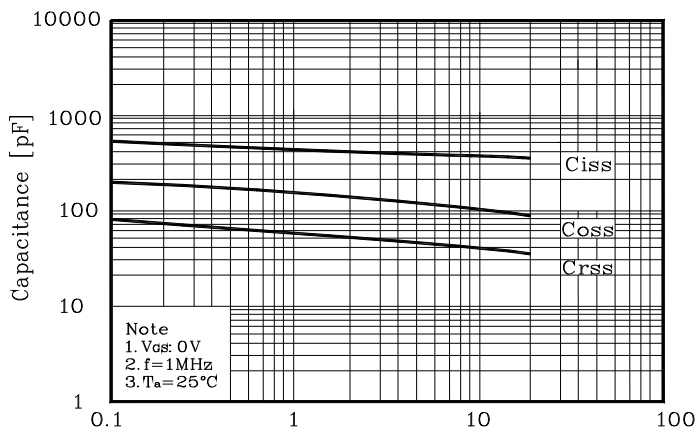
**Fig. 3  $R_{DS(on)} - I_D$**



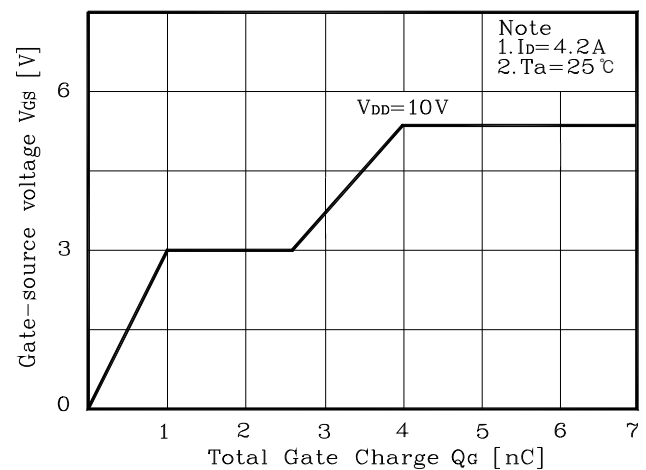
**Fig. 4  $I_S - V_{SD}$**



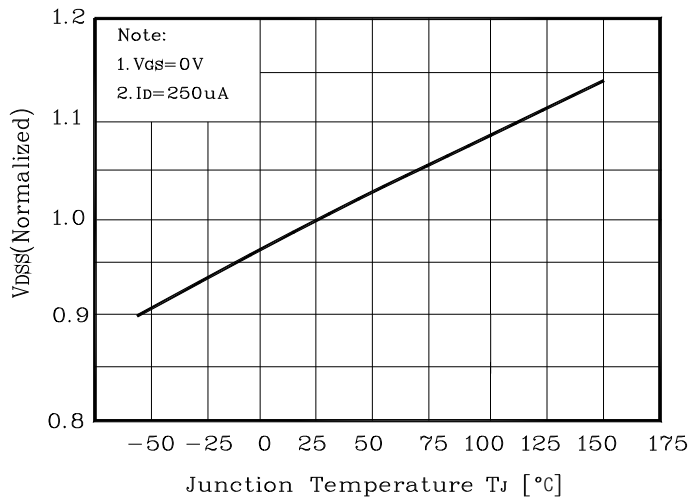
**Fig. 5 Capacitance -  $V_{DS}$**



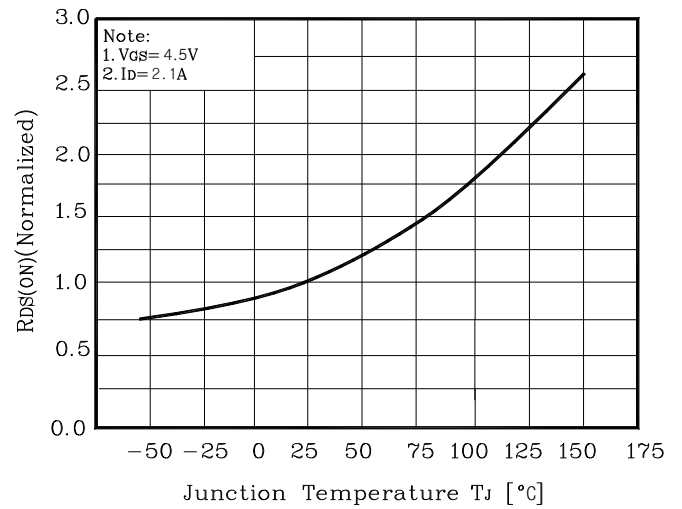
**Fig. 6  $V_{GS} - Q_G$**



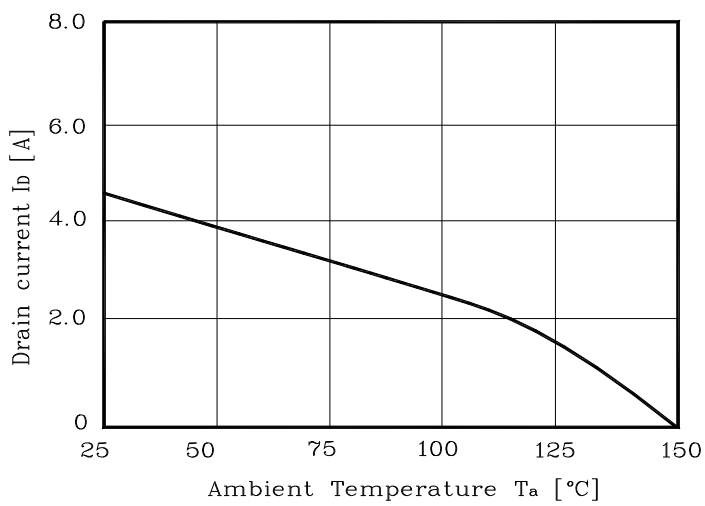
**Fig. 7  $V_{DSS} - T_J$**



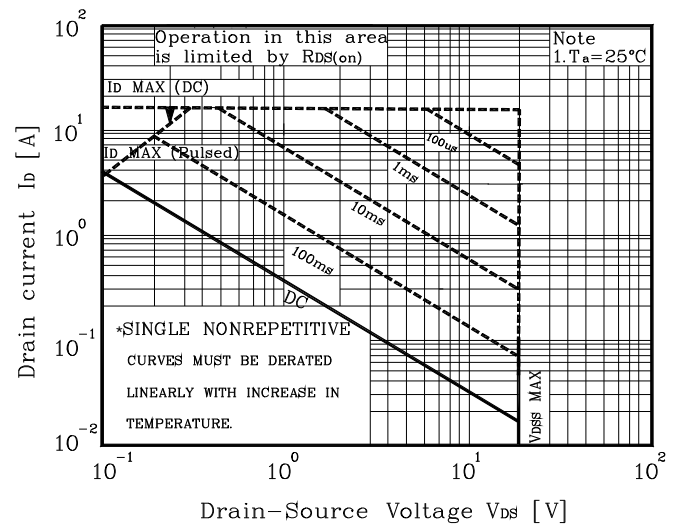
**Fig. 8  $R_{DS(on)} - T_J$**



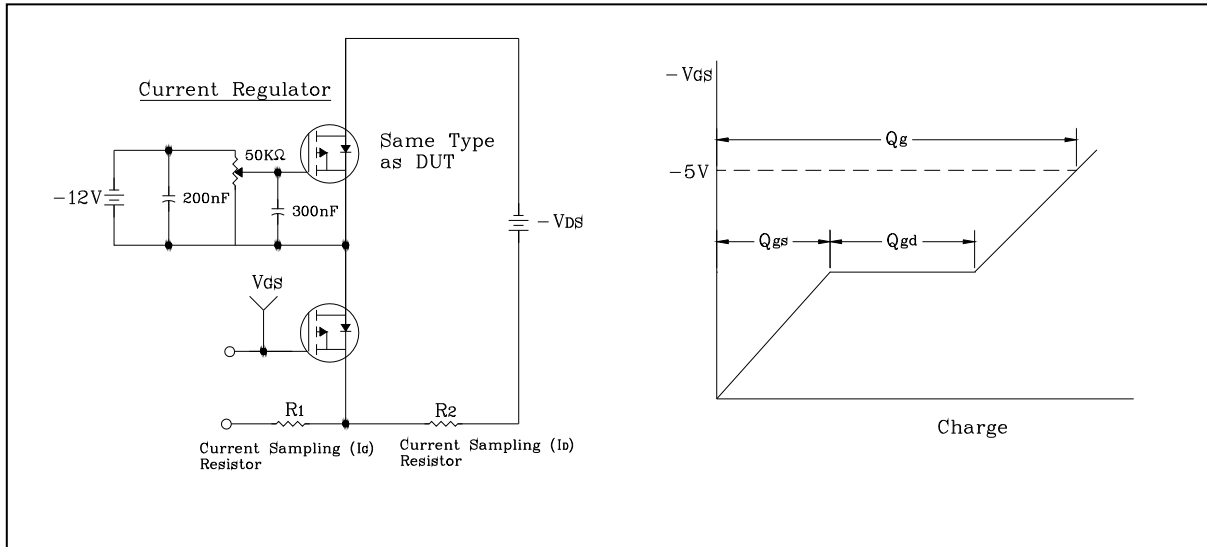
**Fig. 9  $I_D - T_a$**



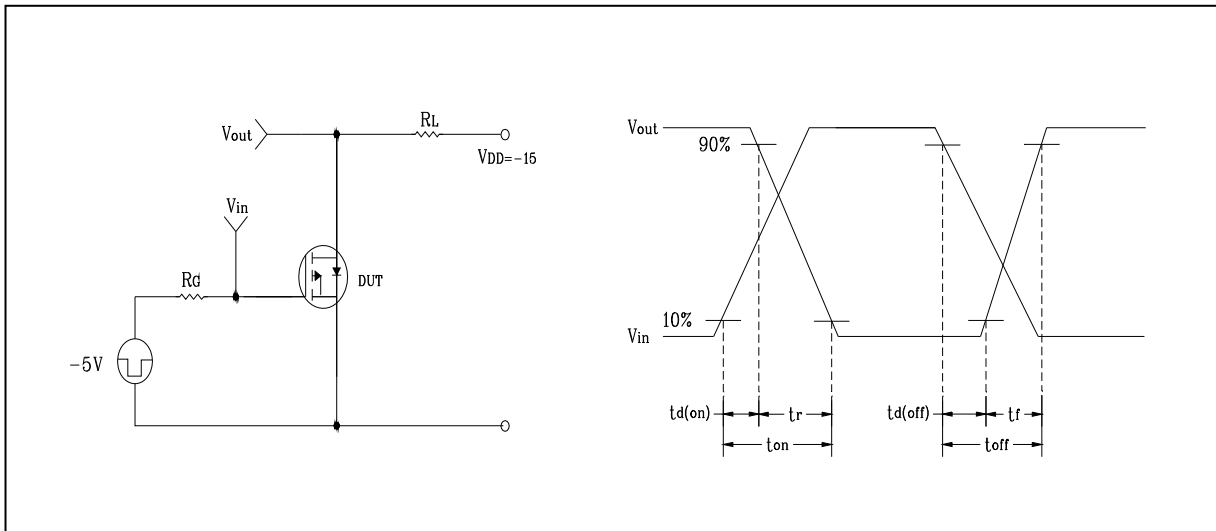
**Fig. 10 Safe Operating Area**



**Fig. 11 Gate Charge Test Circuit & Waveform**



**Fig. 12 Resistive Switching Test Circuit & Waveform**



**Fig. 13 EAS Test Circuit & Waveform**

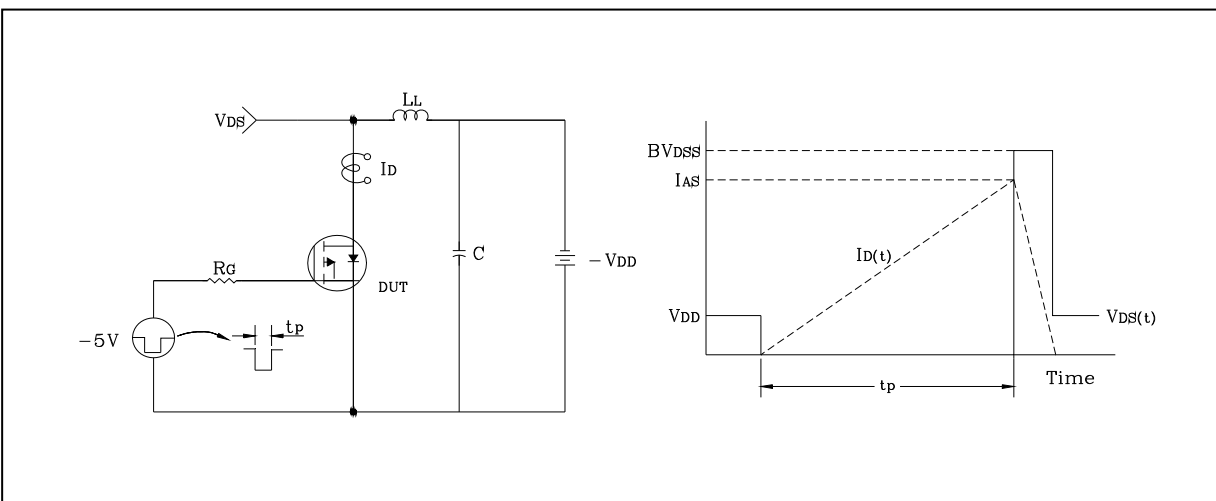
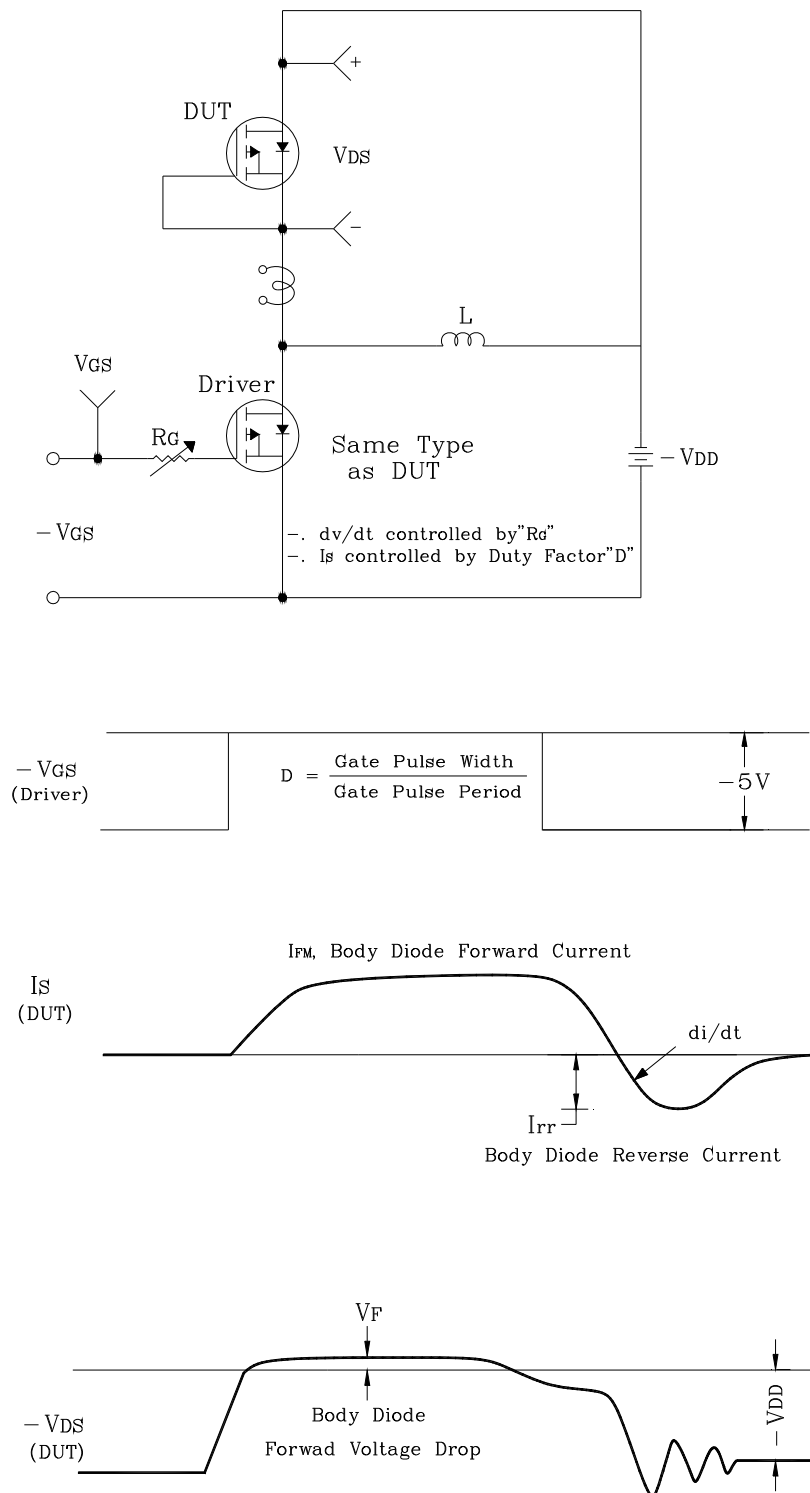
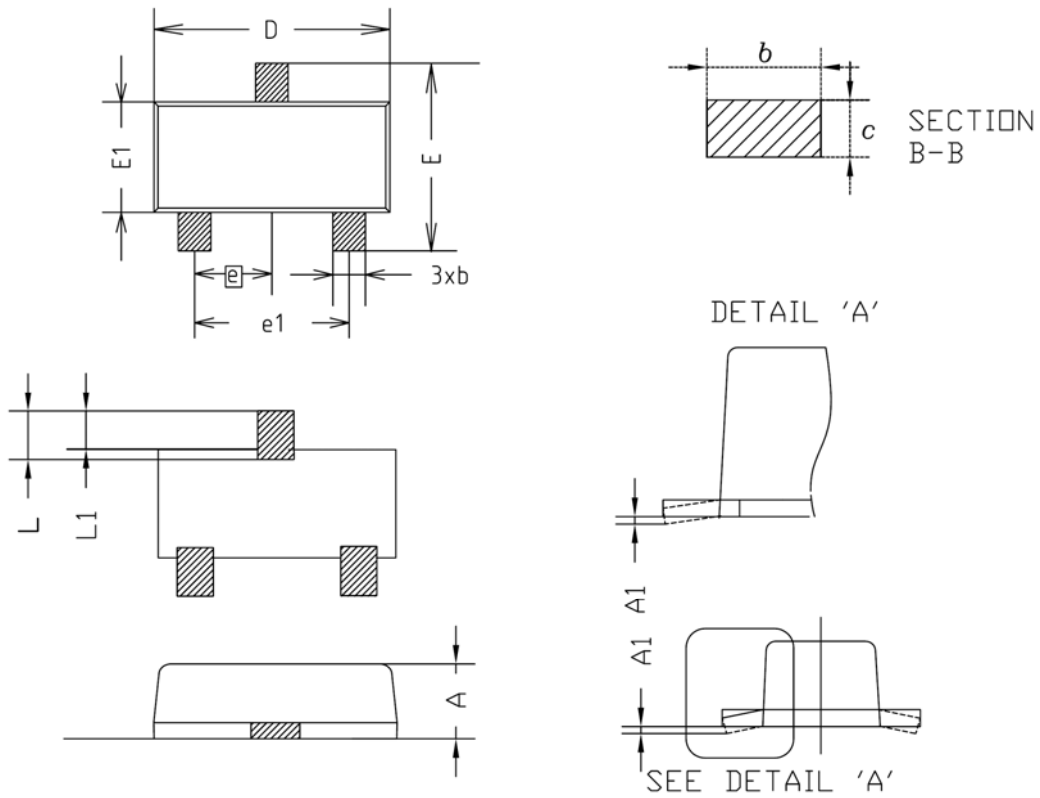


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform



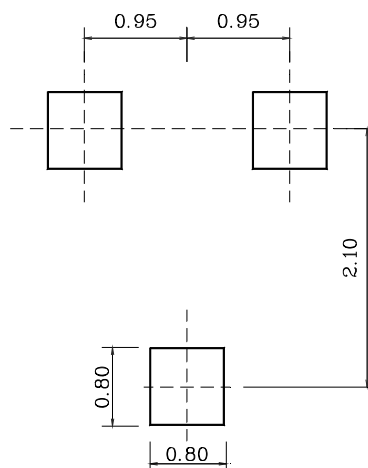
## Outline Dimension

unit: mm



SYMBOL	MILLIMETER(mm)			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	0.80	0.90	1.00	
A1	0.00	-	0.10	
b	0.35	0.40	0.45	
c	0.10	0.15	0.20	
D	2.80	2.90	3.00	
E	2.30	2.40	2.50	
E1	1.50	1.60	1.70	
e	0.95BSC			
e1	1.80	1.90	2.00	
L	0.48	0.58	0.68	
L1	0.30	-	0.50	

### ※ Recommended Land Pattern [unit: mm]



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