

DC-DC CONVERTER APPLICATION HIGH VOLTAGE SWITCHING APPLICATIONS

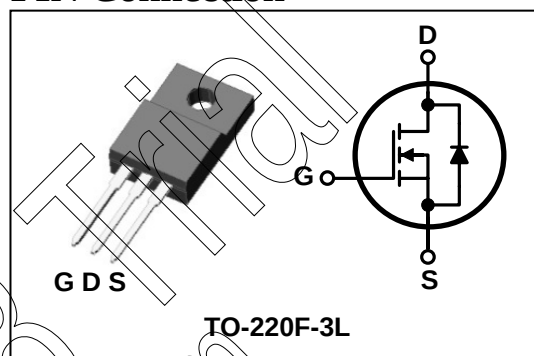
Features

- High Voltage: $BV_{DSS}=250V$ (Min.)
- Low C_{rss} : $C_{rss}=49pF$ (Typ.)
- Low gate charge : $Q_g=22nC$ (Typ.)
- Low $R_{DS(on)}$: $R_{DS(on)}=0.27\Omega$ (Max.)

Ordering Information

Type NO.	Marking	Package Code
SMK1625F SMK1625		TO-220F-3L

PIN Connection



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

Characteristic Symbol		Rating	Unit
Drain-source voltage	V_{DSS}	250	V
Gate-source voltage	V_{GSS}	±30	V
Drain current (DC) *	I_D	($T_C=25^{\circ}C$)	A
		($T_C=100^{\circ}C$)	A
Drain current (Pulsed) *	I_{DM}	64	A
Drain power dissipation	P_D	35	W
Avalanche current (Single) ②	I_{AS} 16		A
Single pulsed avalanche energy ②	E_{AS} 480		mJ
Avalanche current (Repetitive) ①	I_{AR} 16		A
Repetitive avalanche energy ①	E_{AR} 13.9		mJ
Junction temperature	T_J	150	°C
Storage temperature range	T_{stg}	-55~150	

* Limited by maximum junction temperature

Characteristic Symbol			Typ.	Max	Unit
Thermal resistance	Junction-case R	$\theta_{th(J-C)}$ -		3.57	$^{\circ}C/W$
	Junction-ambient	$R_{th(J-A)}$	-	62.5	

Electrical Characteristics (T_C=25°C unless otherwise noted)

Characteristic Symbol		Test Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV _{DSS}	I _D =250μA, V _{GS} =0	250 -		-	V
Gate threshold voltage	V _{GS(th)}	I _D =250μA, V _{DS} =V _{GS}	2.0 -		4.0	V
Drain-source cut-off current	I _{DSS} V	V _{DS} =250V, V _{GS} =0V -		-	1	μA
Gate leakage current	I _{GSS}	V _{DS} =0V, V _{GS} =±30V	- -		±100	nA
Drain-source on-resistance ④	R _{DS(ON)} V	V _{GS} =10V, I _D =8.0A -		0.22	0.27	Ω
Forward transfer conductance ④	g _{fs} V	V _{DS} =10V, I _D =8.0A -		10.5	-	S
Input capacitance	C _{iss} -	V _{GS} =0V, V _{DS} =25V, f=1MHz		968	1275	pF
Output capacitance	C _{oss}			204	278	
Reverse transfer capacitance	C _{rss}		- 49		64	
Turn-on delay time	t _{d(on)} -	V _{DD} =125V, I _D =16A R _G =25Ω ③④		15	-	ns
Rise time	t _r -			130	-	
Turn-off delay time	t _{d(off)} -			135	-	
Fall time	t _f			105	-	
Total gate charge	Q _g -	V _{DS} =200V, V _{GS} =10V I _D =16A ③④		22	28	nC
Gate-source charge	Q _{gs} -			7.1	-	
Gate-drain charge	Q _{gd}		- 5.	9	-	

Source-Drain Diode Ratings and Characteristics (T_C=25°C unless otherwise noted)

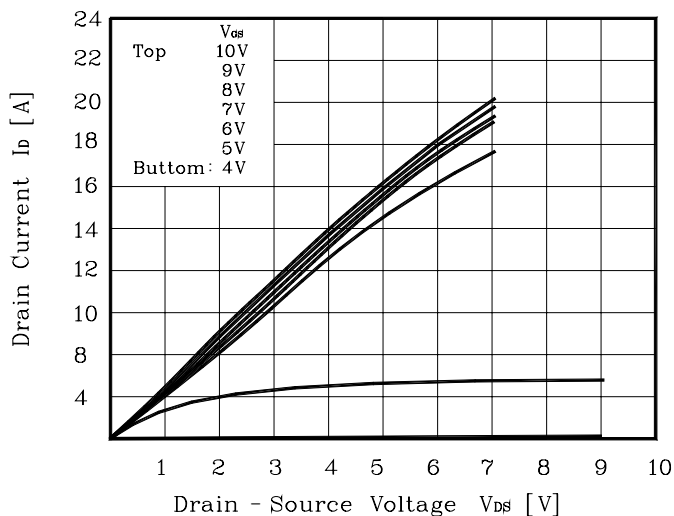
Characteristic Symbol		Test Condition	Min	Typ	Max	Unit
Source current	I _S	Integral reverse diode in the MOSFET	-	-	16	A
Source current(Plused) ①	I _{SM}		- -		64	
Forward voltage ④	V _{SD} V	V _{GS} =0V, I _S =16A -		-	1.4	V
Reverse recovery time	t _{rr} -	I _S =16A, V _{GS} =0, di _S /dt=100A/us		208	-	ns
Reverse recovery charge	Q _{rr}		- 1.	63	-	uC

Note ;

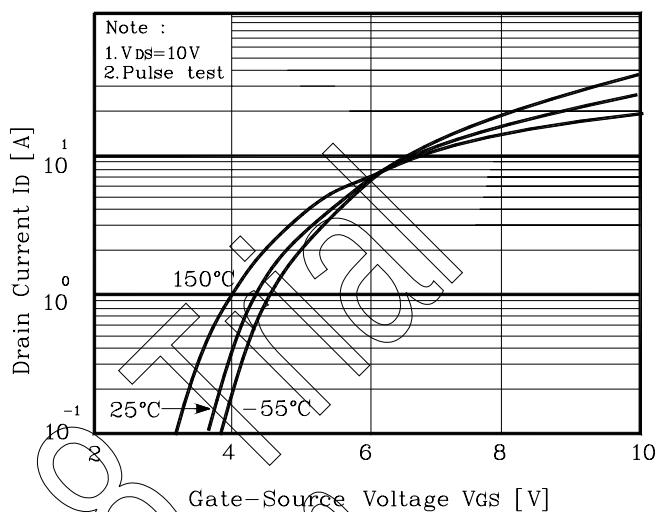
- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ② L=3.0mH, I_{AS}=16A, V_{DD}=50V, R_G=27Ω
- ③ Pulse Test : Pulse Width < 30 0us, Duty cycle ≤ 2%
- ④ Essentially independent of operating temperature

Electrical Characteristic Curves

Fi g. 1 $I_D - V_{DS}$



Fi g. 2 $I_D - V_{GS}$



Fi g. 3 $R_{DS(on)} - I_D$

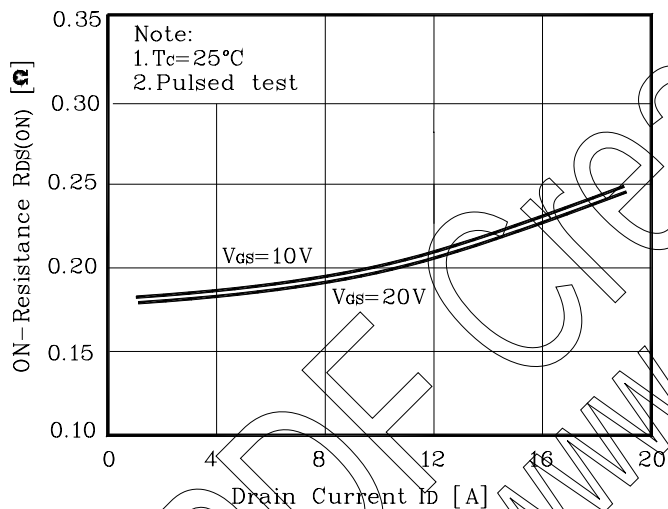


Fig-4 $I_S - V_{SD}$

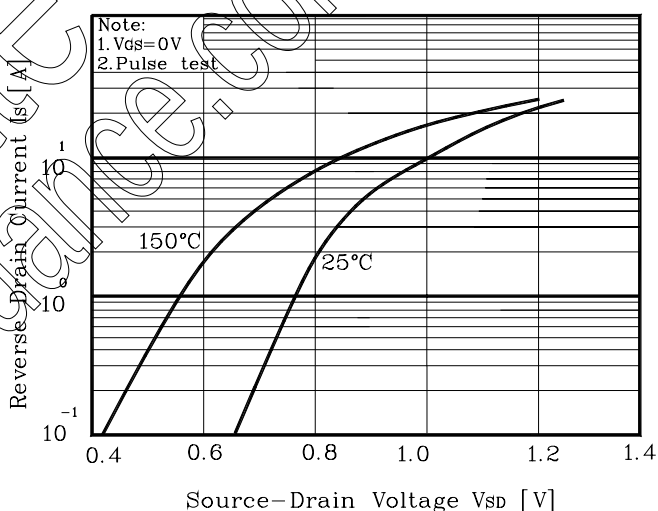


Fig. 5 Capacitance - V_{DS}

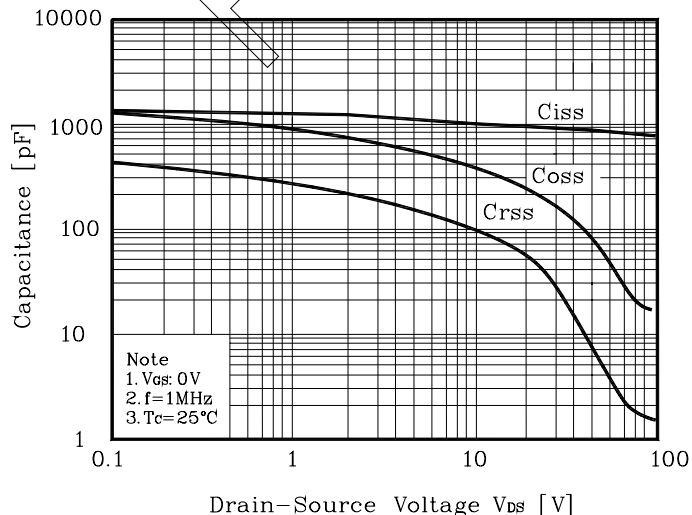


Fig. 6 $V_{GS} - Q_G$

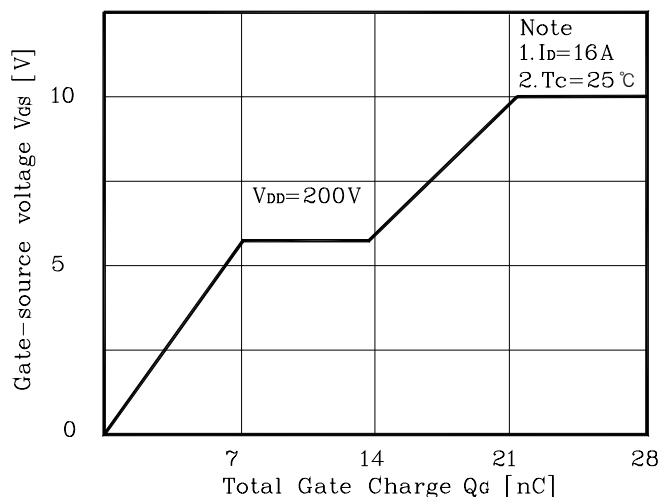


Fig. 7 $V_{DSS} - T_J$

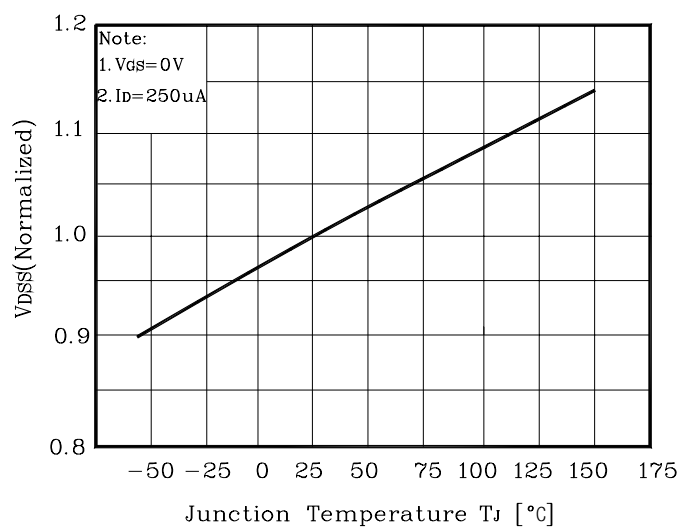


Fig. 8 $R_{DS(on)}$ - T_J

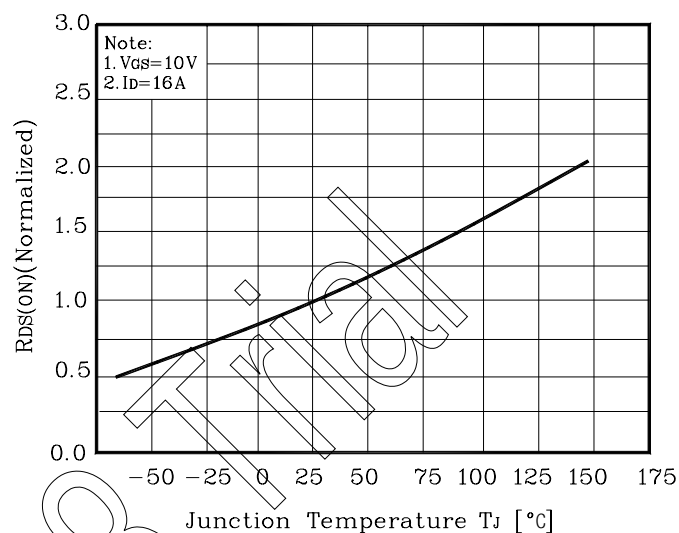


Fig. 9 $I_D - T_C$

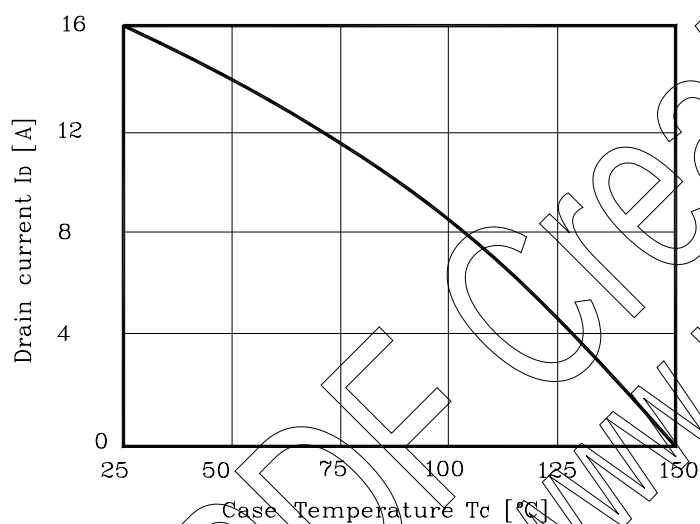


Fig. 10 Safe Operating Area

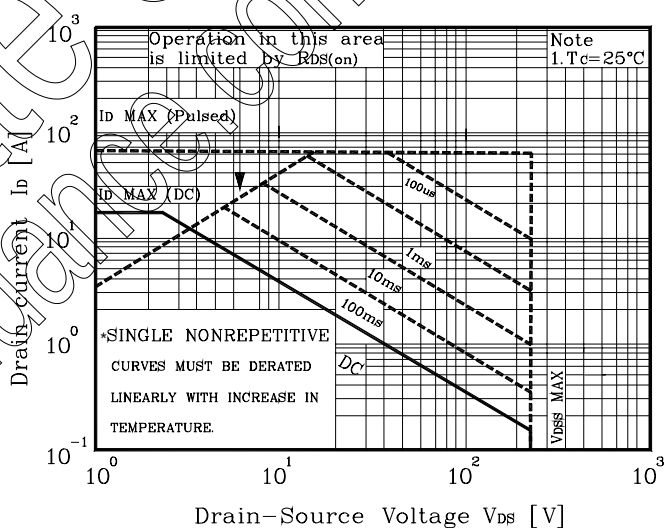


Fig. 11 Gate Charge Test Circuit & Waveform

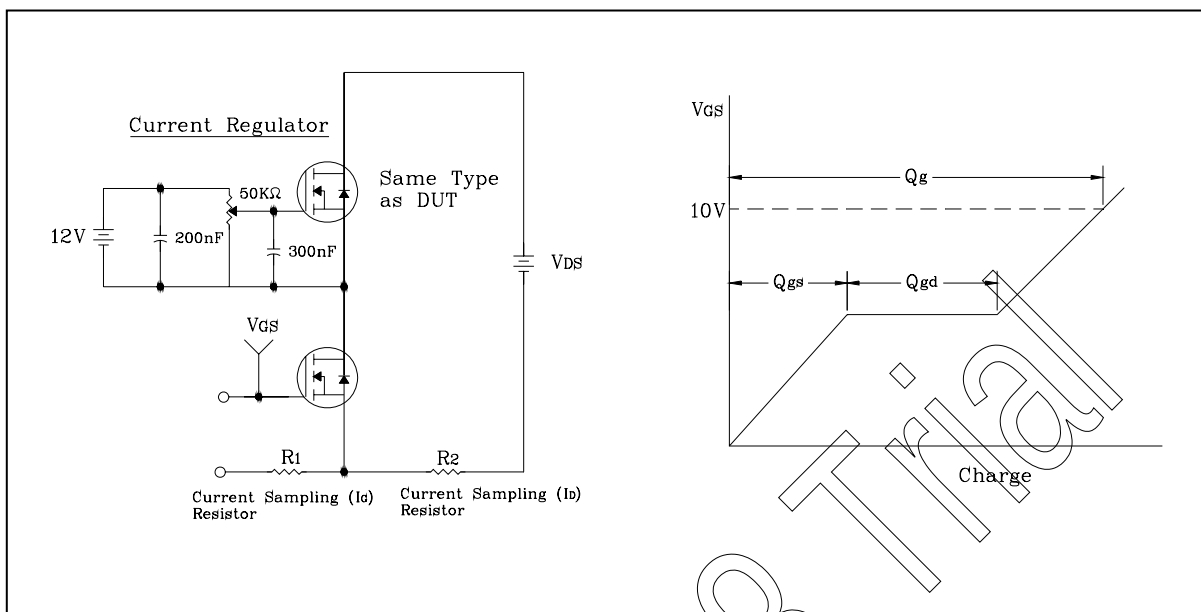


Fig. 12 Resistive Switching Test Circuit & Waveform

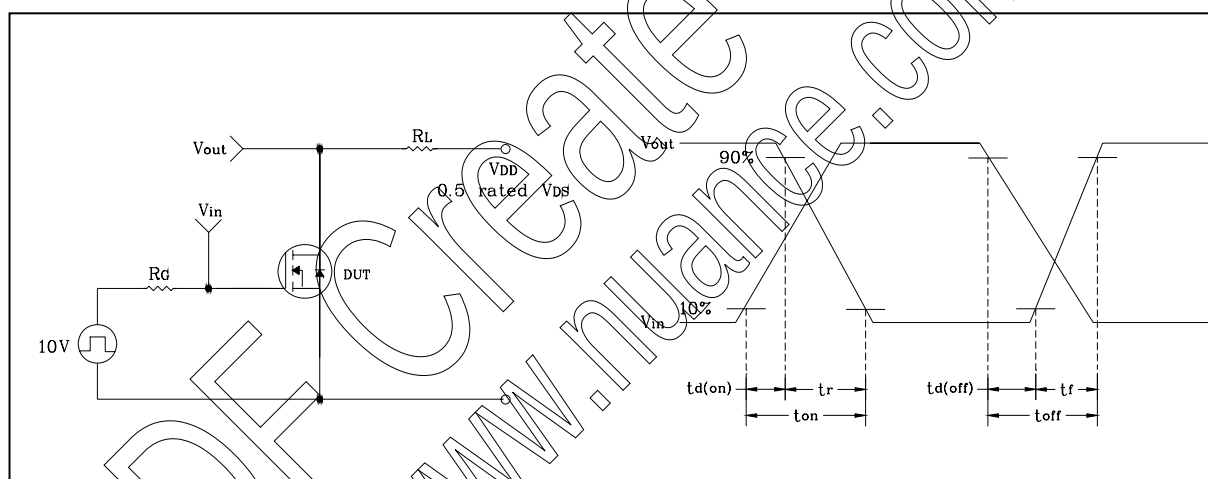


Fig. 13 E_{AS} Test Circuit & Waveform

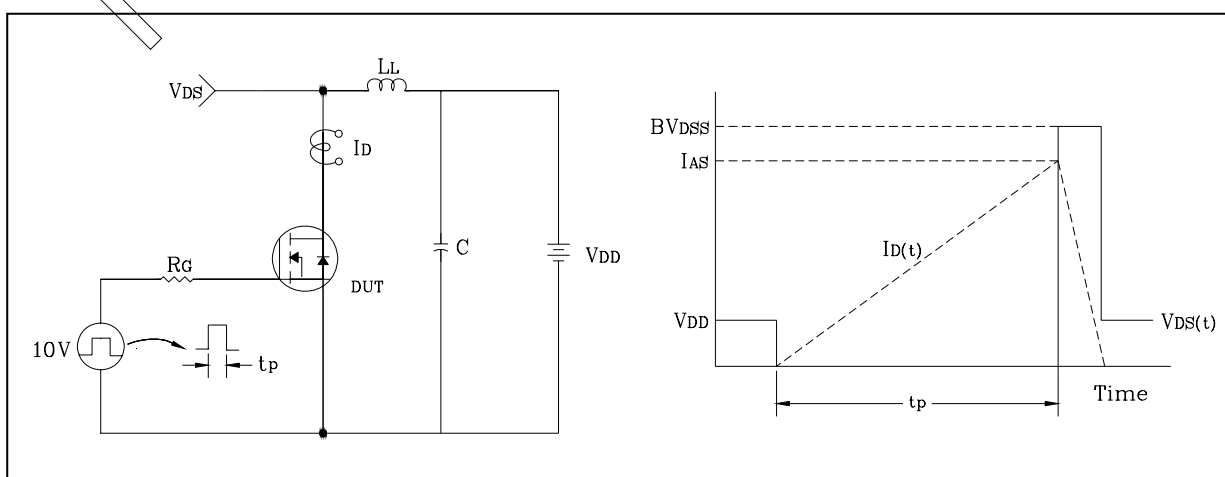
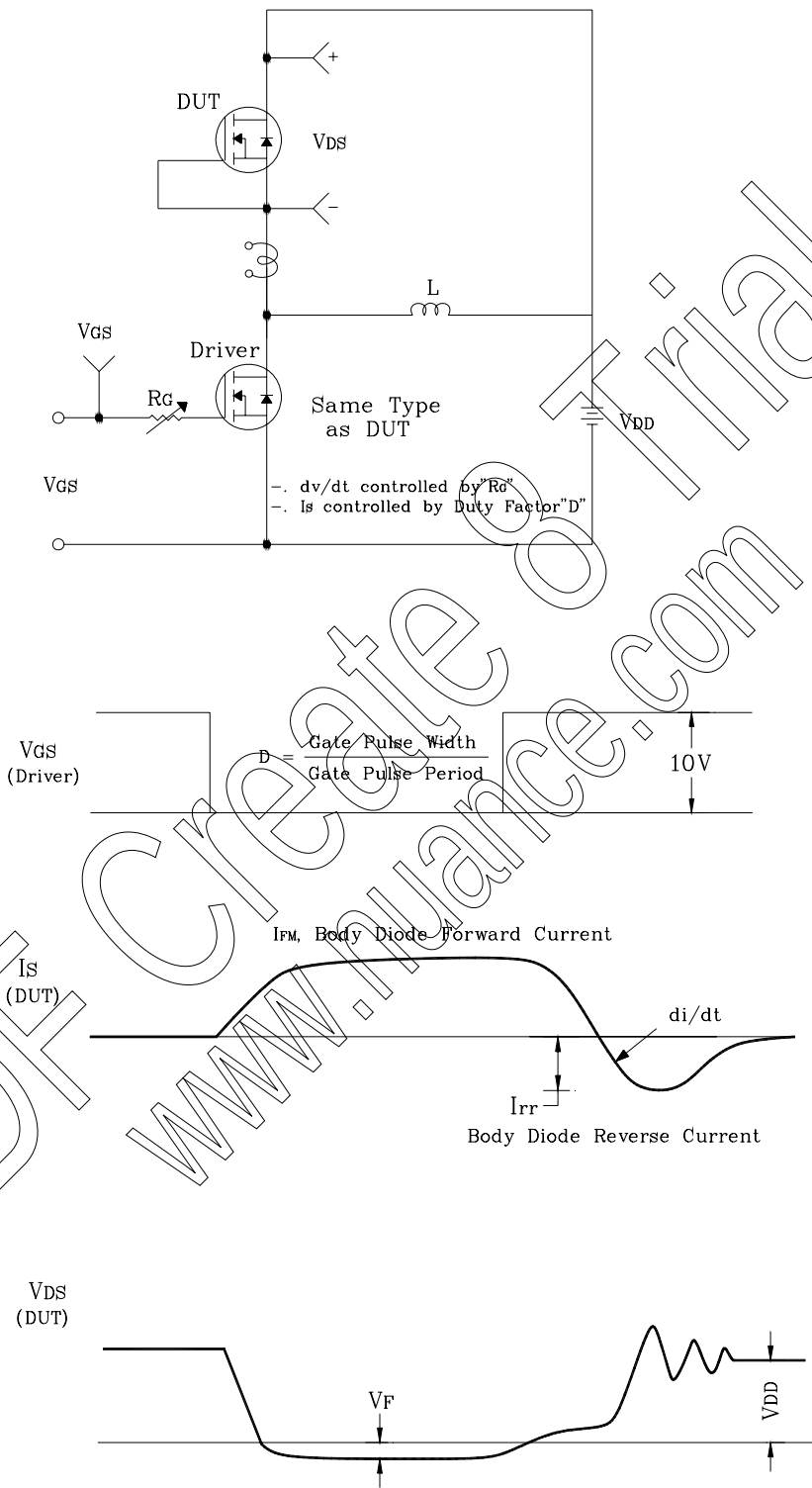
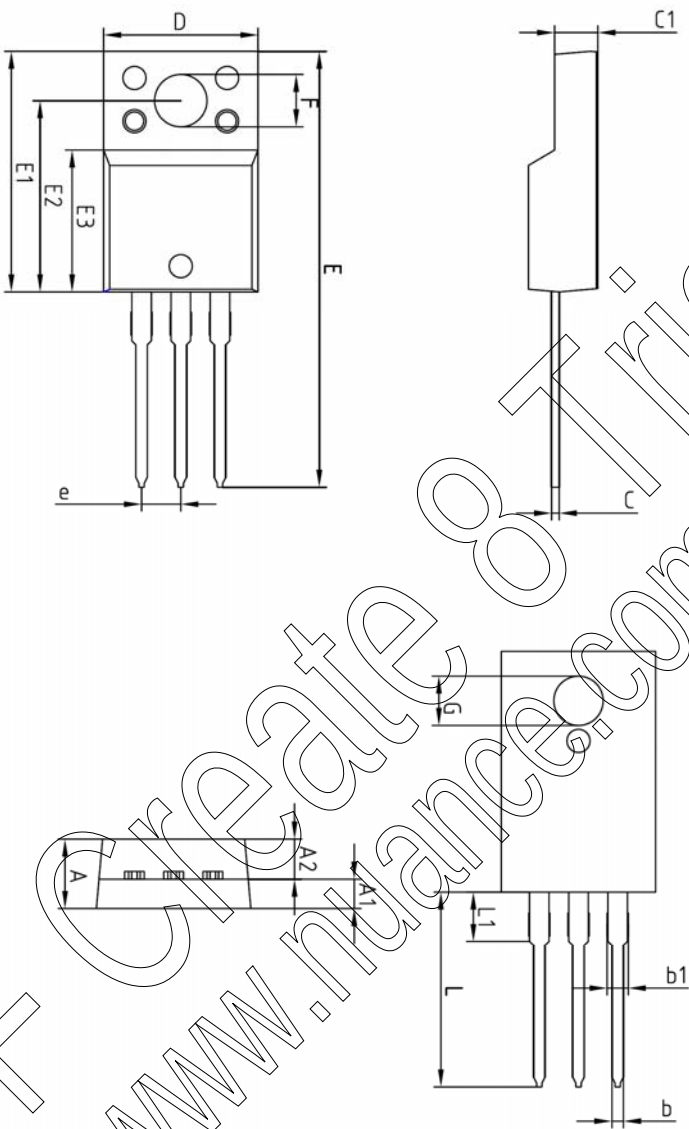


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform



Outline Dimension



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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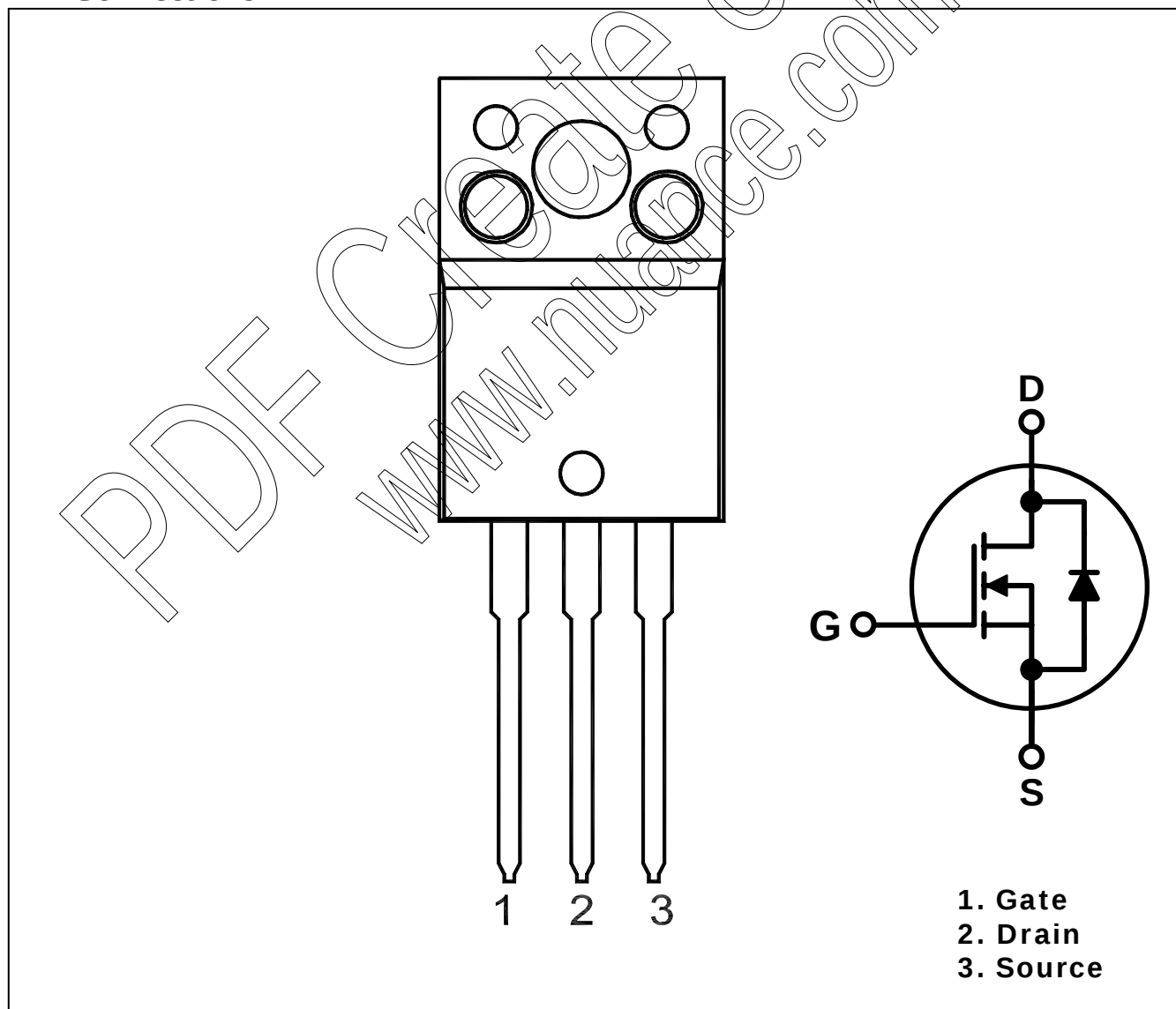
SWITCHING REGULATOR APPLICATIONS

Features

- High Voltage: $BV_{DSS}=600V(\text{Min.})$
- Low C_{rss} : $C_{rss}=13.8pF(\text{Typ.})$
- Low gate charge : $Q_g=41nC(\text{Typ.})$
- Low $R_{DS(on)}$: $R_{DS(on)}=0.65\Omega(\text{Max.})$

Ordering Information

Type NO.	Marking	Package Code
SMK1260F SMK1260		TO-220F-3L

PIN Connections

Absolute maximum ratings

(Tc=25°C)

Characteristic Symbol		Rating	Unit	
Drain-source voltage	V_{DSS}	600	V	
Gate-source voltage	V_{GSS}	±30	V	
Drain current (DC)*	I_D	(Tc=25℃)	12	A
		(Tc=100℃)	7.1	A
Drain current (Pulsed)*	I_{DM}	48	A	
Drain power dissipation	P_D	45	W	
Avalanche current (Single) ②	I_{AS}	12	A	
Single pulsed avalanche energy ②	E_{AS}	700	mJ	
Avalanche current (Repetitive) ①	I_{AR}	12	A	
Repetitive avalanche energy ①	E_{AR}	11.6	mJ	
Junction temperature	T_J	150	℃	
Storage temperature range	T_{stg}	-55~150		

* Limited by maximum junction temperature

Characteristic Symbol		Typ.	Max	Unit
Thermal resistance	Junction-case	$R_{th(J-C)}$	2.7	°C/W
	Junction-ambient	$R_{th(J-a)}$	62.5	

Electrical Characteristics

(Tc=25°C)

Characteristic Symbol		Test Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV_{DSS}	$I_D=250\mu A, V_{GS}=0$	600	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$I_D=250\mu A, V_{DS}=V_{GS}$	2.0	-	4.0	V
Drain-source cut-off current	I_{DSS}	$V_{DS}=600V, V_{GS}=0V$	-	-	1	μA
Gate leakage current	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 30V$	- -		± 100	nA
Drain-source on-resistance ④	$R_{DS(ON)}$	$V_{GS}=10V, I_D=6.0A$	-	0.55	0.65	Ω
Forward transfer conductance ④	g_{fs}	$V_{DS}=10V, I_D=6.0A$	-	10	-	S
Input capacitance	C_{iss}	$V_{GS}=0V, V_{DS}=25V$ $f=1MHz$	-	2213	2951	pF
Output capacitance	C_{oss}		-	170	226	
Reverse transfer capacitance	C_{rss}		- 13.	8	18.4	
Turn-on delay time	$t_{d(on)}$ -	$V_{DD}=300V, I_D=12A$ $R_G=25\Omega$ ③④	-	30	-	ns
Rise time	t_r		-	85	-	
Turn-off delay time	$t_{d(off)}$		-	140	-	
Fall time	t_f		-	90	-	
Total gate charge	Q_g -	$V_{DS}=480V, V_{GS}=10V$ $I_D=12A$ ③④	-	41	63	nC
Gate-source charge	Q_{gs}		-	13	-	
Gate-drain charge	Q_{gd}		-	10.5	-	

Source-Drain Diode Ratings and Characteristics

(Tc=25°C)

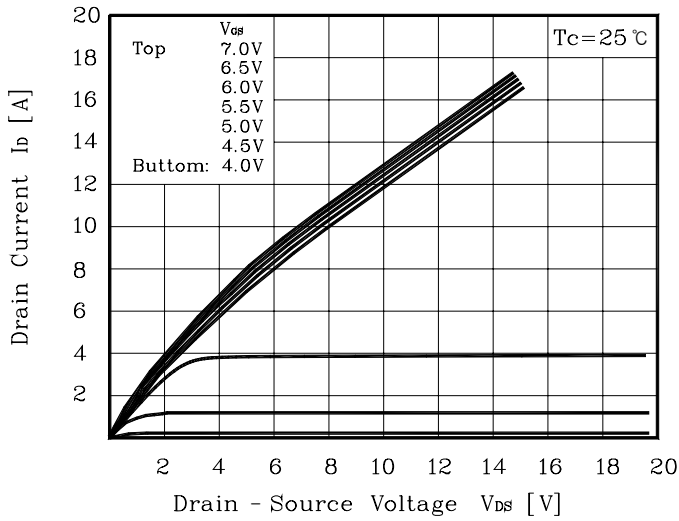
Characteristic Symbol		Test Condition	Min	Typ	Max	Unit
Source current (DC)	I_S	Integral reverse diode in the MOSFET	-	-	12	A
Source current (Pulsed) ①	I_{SM}		- -		48	
Forward voltage ④	V_{SD} V	$V_{GS}=0V, I_S=12A$ -		-	1.4	V
Reverse recovery time	t_{rr} -	$I_S=12A, V_{GS}=0,$ $di_S/dt=100A/\mu s$		500	-	ns
Reverse recovery charge	Q_{rr}		- 4.	3	-	μC

Note ;

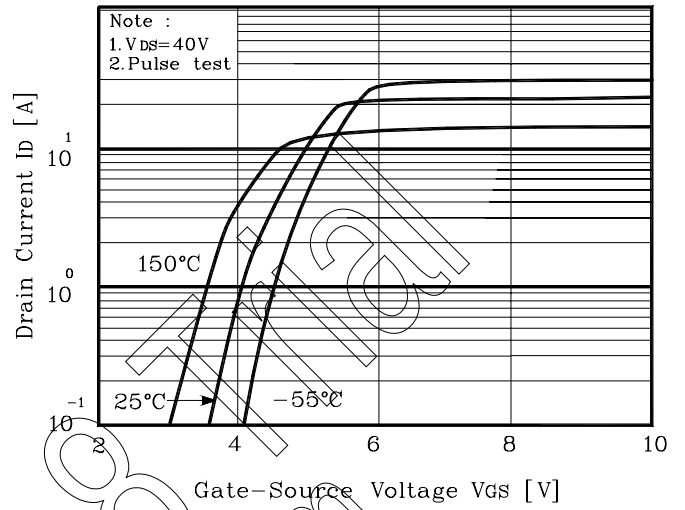
- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ② L=20mH, $I_{AS}=8A$, $V_{DD}=50V$, $R_G=25\Omega$, Starting $T_J = 25^\circ C$
- ③ Pulse Test : Pulse Width < 30 μs , Duty cycle $\leq 2\%$
- ④ Essentially independent of operating temperature

Electrical Characteristic Curves

Fi g. 1 $I_D - V_{DS}$



Fi g. 2 $I_D - V_{GS}$



Fi g. 3 $R_{DS(on)} - I_D$

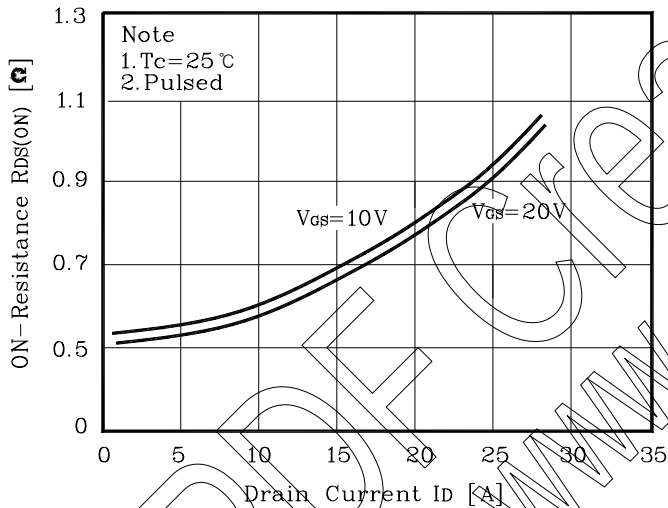
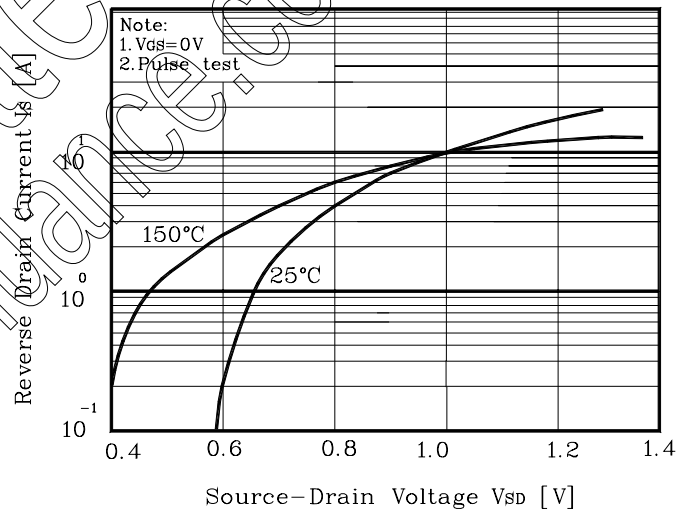
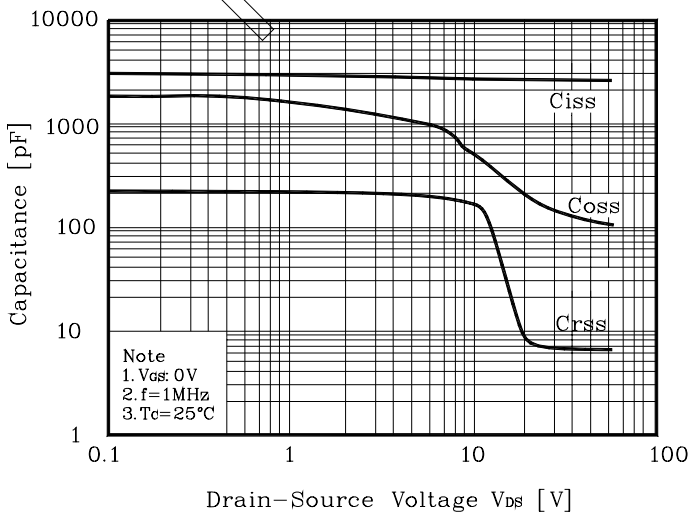


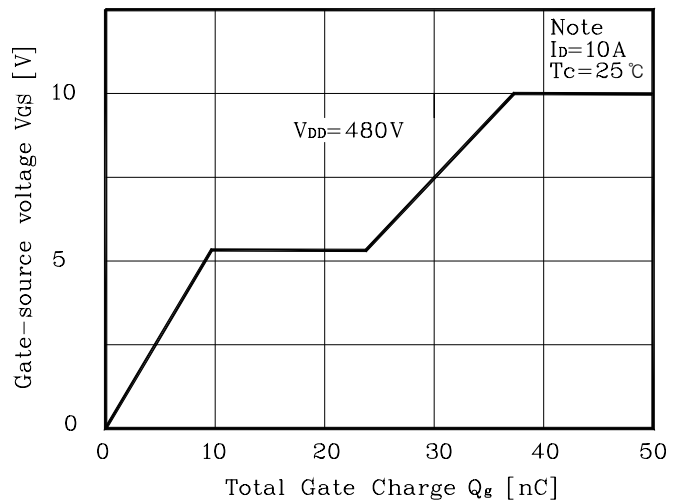
Fig. 4 $I_S - V_{SD}$



Fi g. 5 Capacitance - V_{DS}



Fi g.6 $V_{GS} - Q_g$



Electrical Characteristic Curves

Fig. 7 $V_{DSS} - T_J$

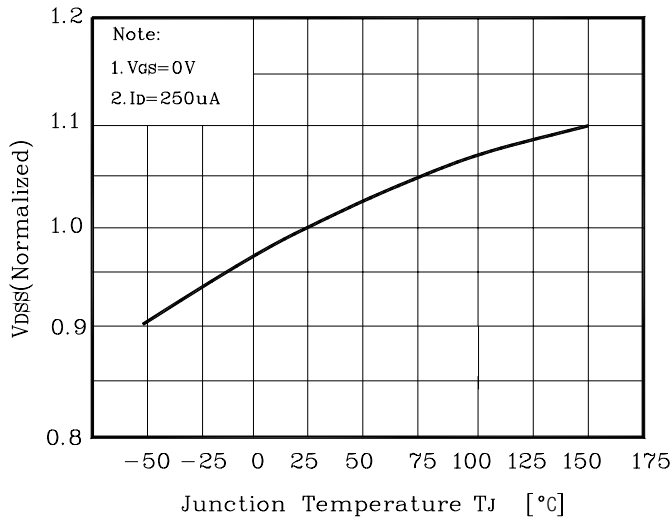


Fig.8 $R_{DS(on)} - T_J$

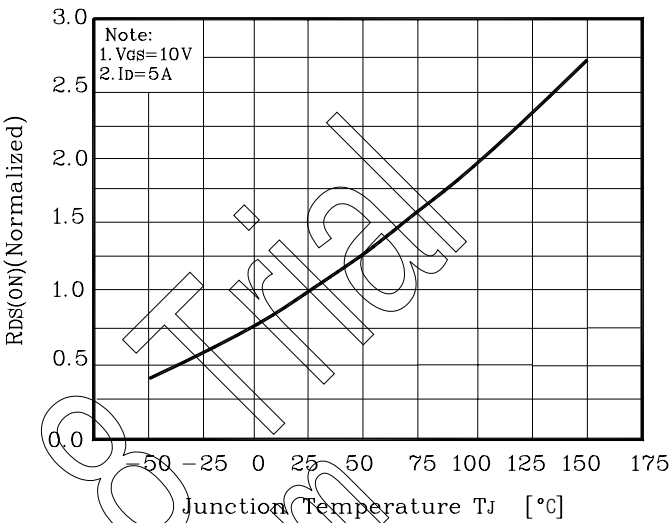


Fig. 9 $I_D - T_C$

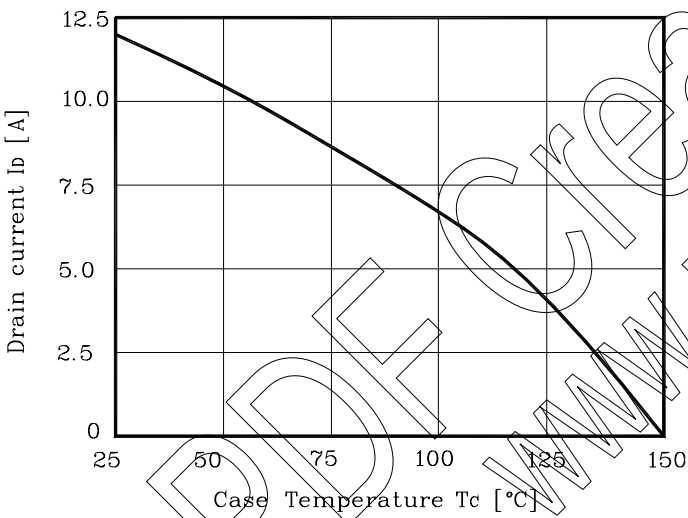


Fig. 10 Safe Operating Area

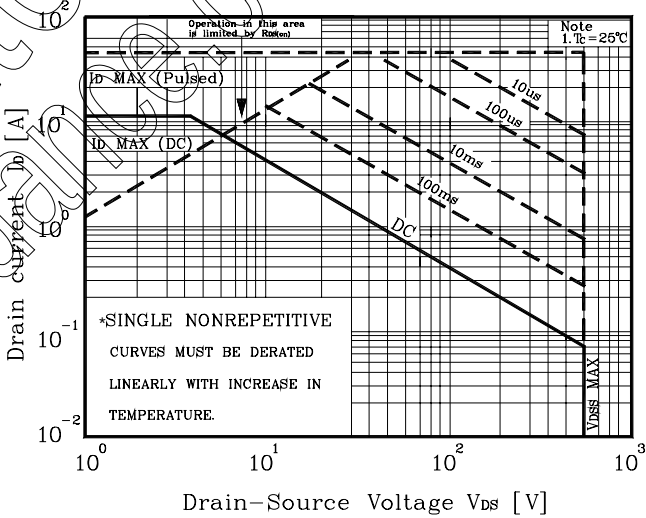


Fig. 10 Gate Charge Test Circuit & Waveform

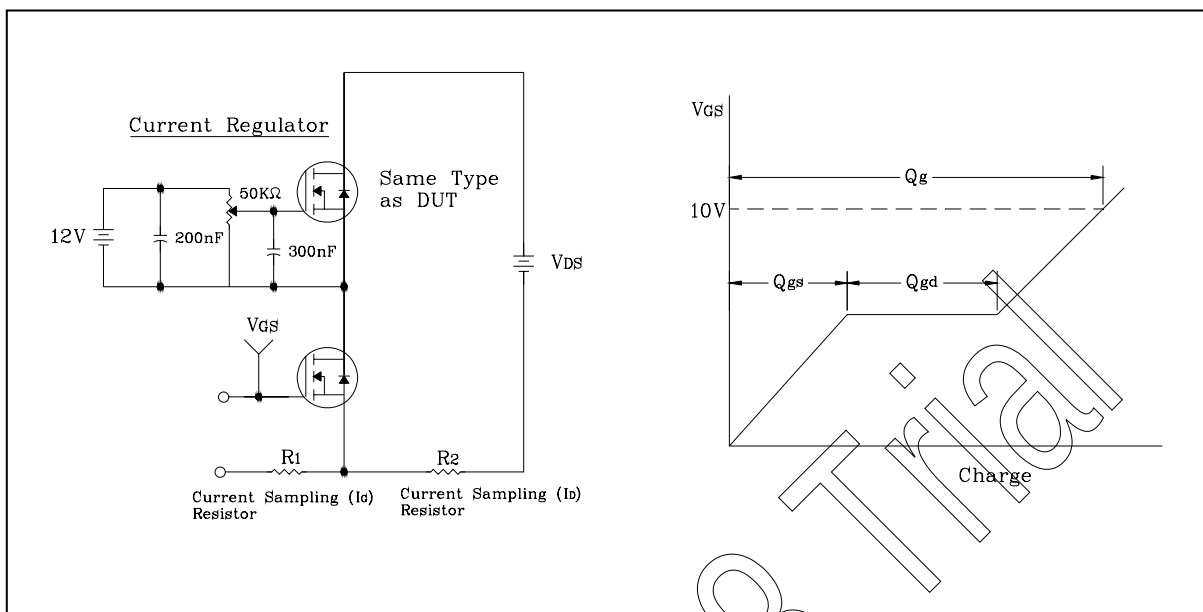


Fig. 11 Resistive Switching Test Circuit & Waveform

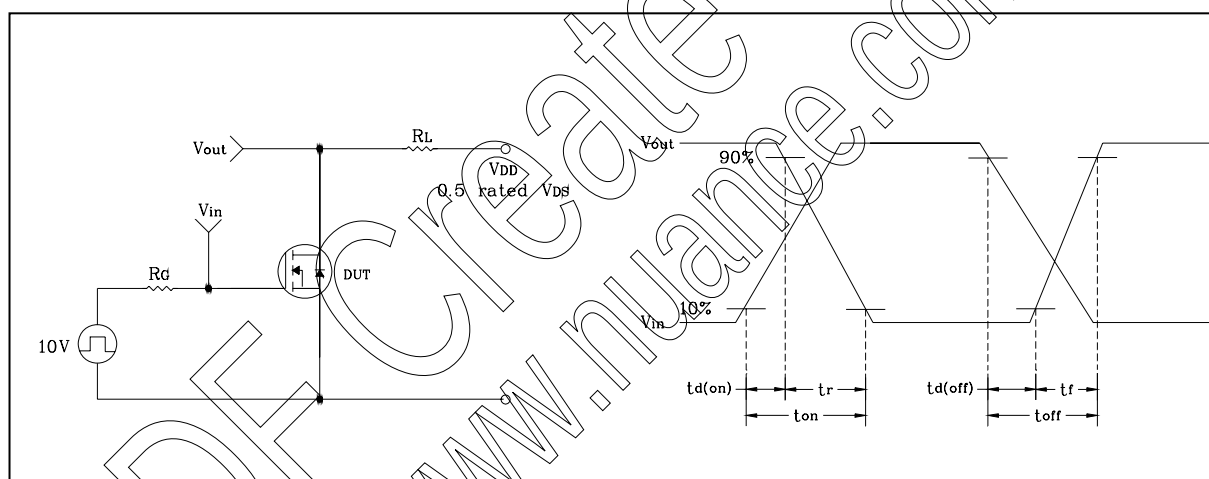


Fig. 12 E_{AS} Test Circuit & Waveform

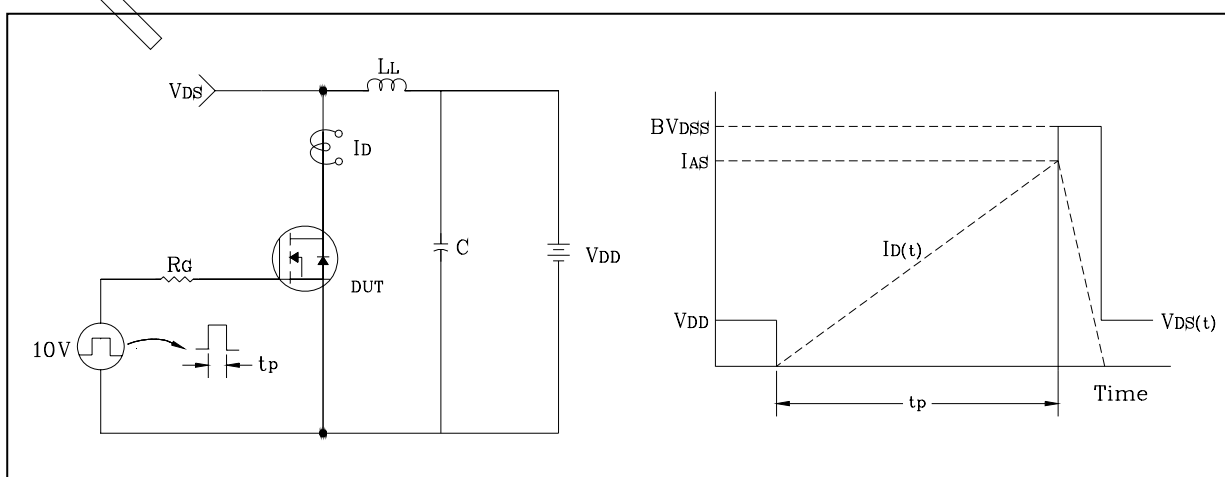
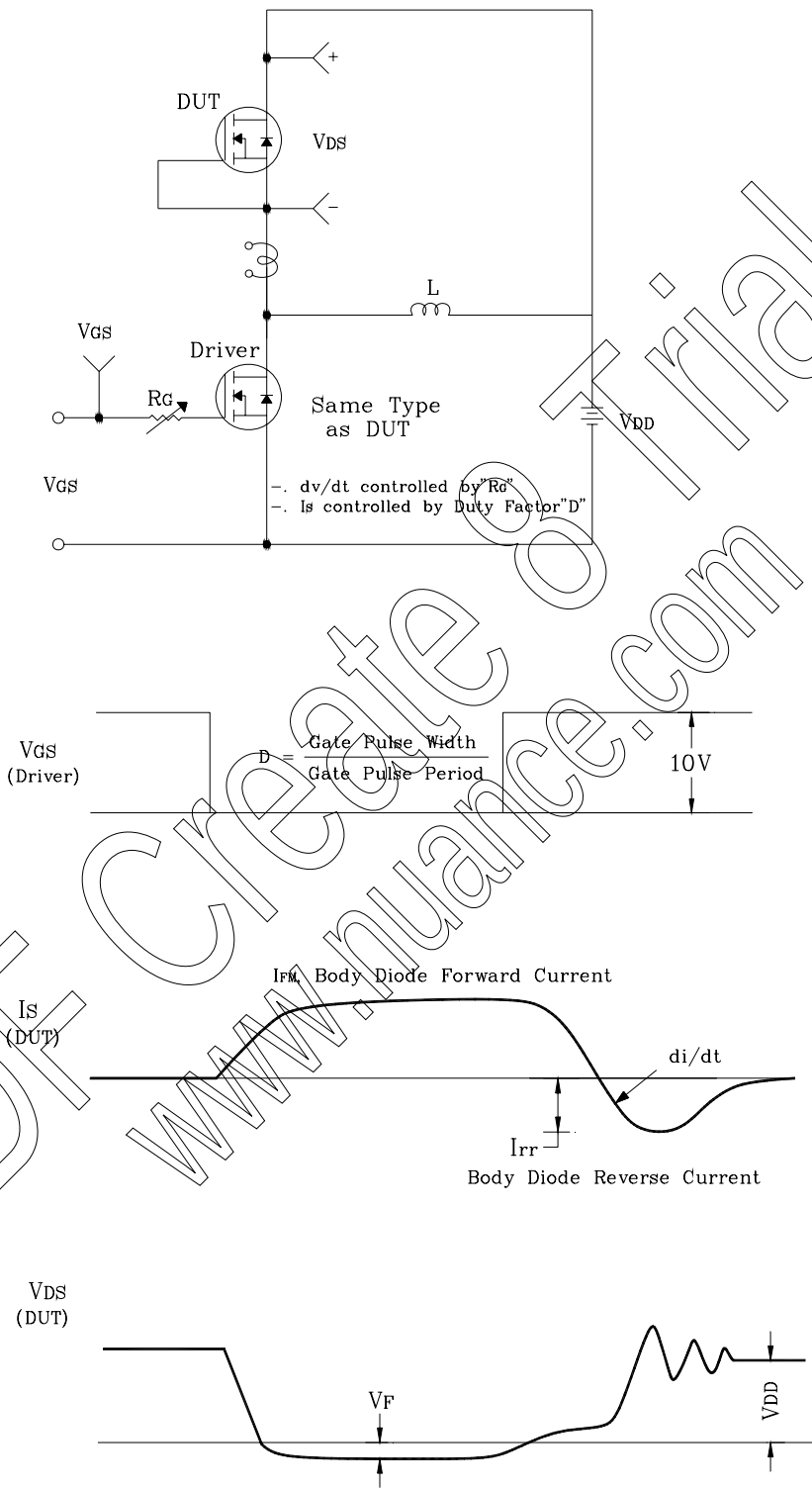
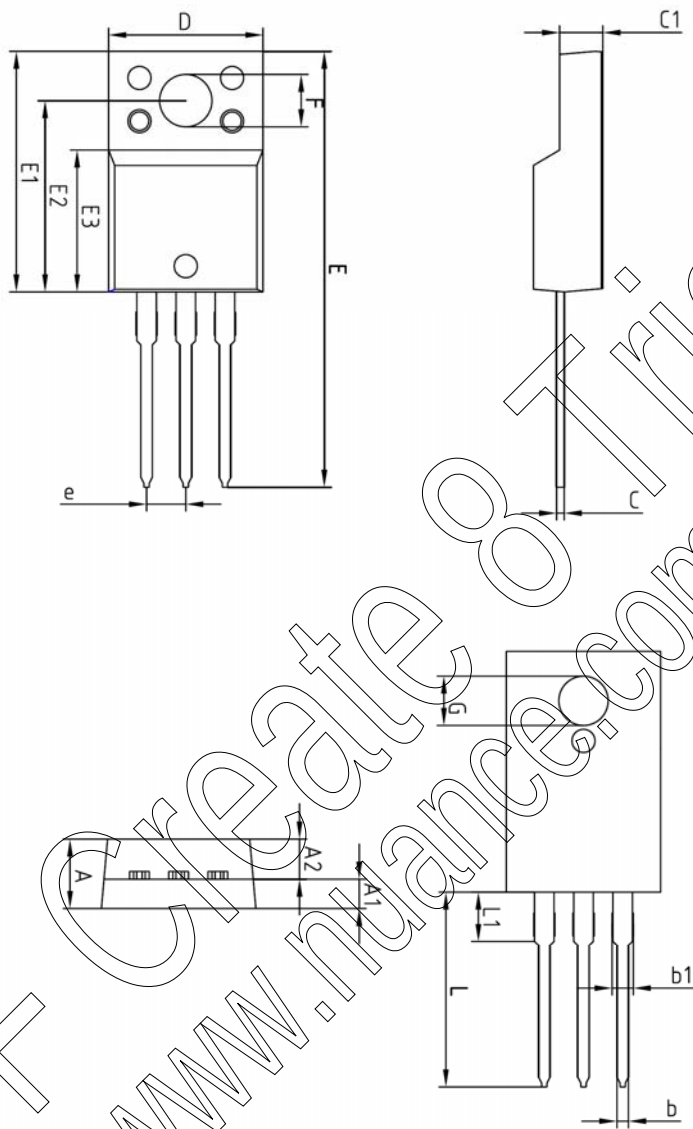


Fig. 13 Diode Reverse Recovery Time Test Circuit & Waveform





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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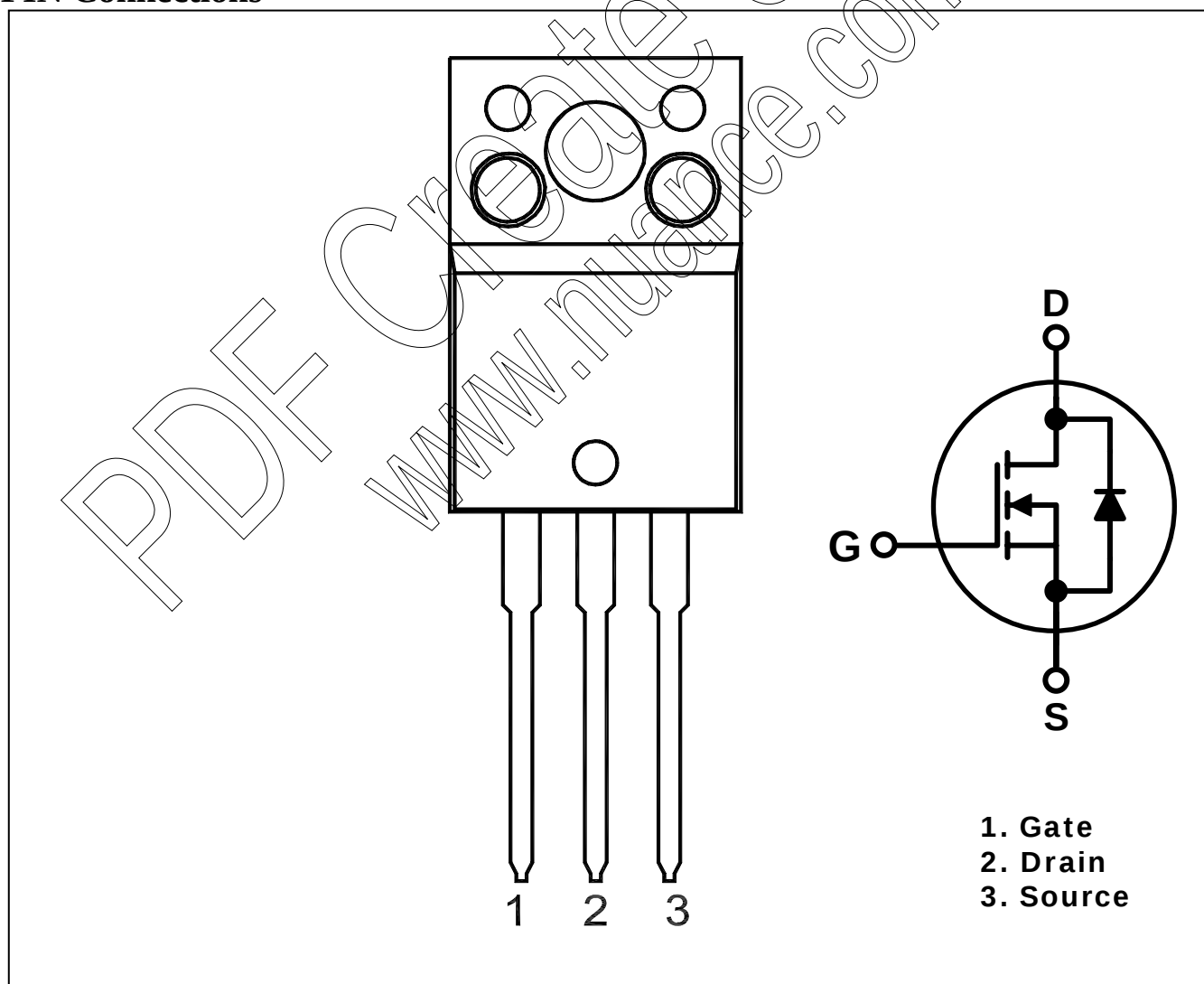
SWITCHING REGULATOR APPLICATIONS

Features

- High Voltage: $BV_{DSS}=650V(\text{Min.})$
- Low C_{rss} : $C_{rss}=14.6pF(\text{Typ.})$
- Low gate charge : $Q_g=41nC(\text{Typ.})$
- Low $R_{DS(on)}$: $R_{DS(on)}=0.8\Omega(\text{Max.})$

Ordering Information

Type NO.	Marking	Package Code
SMK1265F SMK1265		TO-220F-3L

PIN Connections

Absolute maximum ratings

(Tc=25°C)

Characteristic Symbol			Rating	Unit
Drain-source voltage	V _{DSS} 650			V
Gate-source voltage	V _{GSS}		±30	V
Drain current (DC)*	I _D	(Tc=25℃)	12	A
		(Tc=100℃)	4.5	A
Drain current (Pulsed)*	I _{DM}		48	A
Drain power dissipation	P _D		45	W
Avalanche current (Single) ②	I _{AS}		12	A
Single pulsed avalanche energy ②	E _{AS}		273	mJ
Avalanche current (Repetitive) ①	I _{AR}		12	A
Repetitive avalanche energy ①	E _{AR}		7.6	mJ
Junction temperature	T _J		150	℃
Storage temperature range	T _{stg} -55~150			

* Limited by maximum junction temperature

Characteristic Symbol		Typ.	Max	Unit
Thermal resistance	Junction-case	$R_{th(J-C)}$	2.7	°C/W
	Junction-ambient	$R_{th(J-a)}$	62.5	

Electrical Characteristics

(Tc=25°C)

Characteristic Symbol		Test Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV_{DSS}	$I_D=250\mu A, V_{GS}=0$	650	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$I_D=250\mu A, V_{DS}=V_{GS}$	2.0	-	4.0	V
Drain-source cut-off current	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$	-	-	1	μA
Gate leakage current	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 30V$	- -		± 100	nA
Drain-source on-resistance ④	$R_{DS(ON)}$	$V_{GS}=10V, I_D=6.0A$	-	0.68	0.80	Ω
Forward transfer conductance ④	g_{fs}	$V_{DS}=10V, I_D=6.0A$	-	10	-	S
Input capacitance	C_{iss}	$V_{GS}=0V, V_{DS}=25V$ $f=1MHz$	-	2162	2882	pF
Output capacitance	C_{oss}		-	183	244	
Reverse transfer capacitance	C_{rss}		- 14.	6	19.4	
Turn-on delay time	$t_{d(on)}$ -	$V_{DD}=300V, I_D=12A$ $R_G=25\Omega$ ③ ④	-	30	-	ns
Rise time	t_r		-	85	-	
Turn-off delay time	$t_{d(off)}$		-	140	-	
Fall time	t_f		-	90	-	
Total gate charge	Q_g -	$V_{DS}=480V, V_{GS}=10V$ $I_D=12A$ ③ ④	-	41	63	nC
Gate-source charge	Q_{gs}		-	13	-	
Gate-drain charge	Q_{gd}		-	10.5	-	

Source-Drain Diode Ratings and Characteristics

(Tc=25°C)

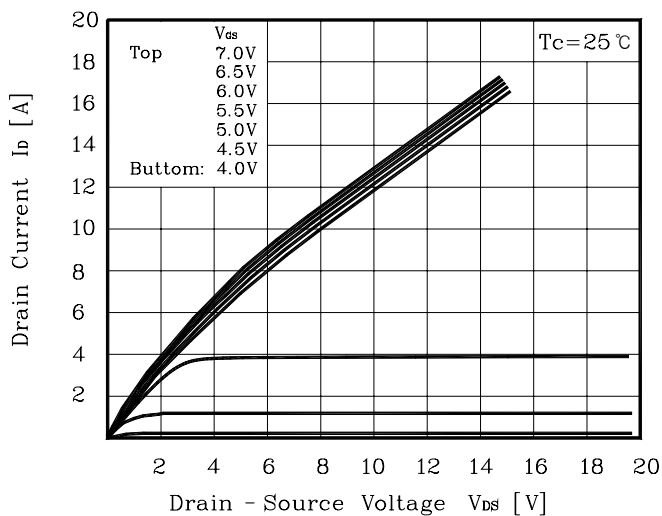
Characteristic Symbol		Test Condition	Min	Typ	Max	Unit
Source current (DC)	I_S	Integral reverse diode in the MOSFET	-	-	12	A
Source current (Pulsed) ①	I_{SM}		- -		48	
Forward voltage ④	V_{SD} V	$V_{GS}=0V, I_S=12A$ -		-	1.4	V
Reverse recovery time	t_{rr} -	$I_S=12A, V_{GS}=0,$ $di_S/dt=100A/\mu s$		510	-	ns
Reverse recovery charge	Q_{rr}		- 4.	3	-	μC

Note ;

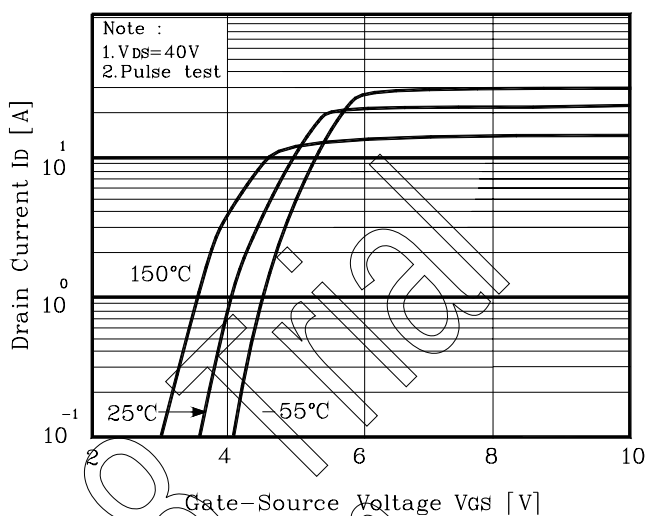
- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ② $L=3.5mH, I_{AS}=12A, V_{DD}=50V, R_G=25\Omega$, Starting $T_J = 25^\circ C$
- ③ Pulse Test : Pulse Width < 30 μs , Duty cycle $\leq 2\%$
- ④ Essentially independent of operating temperature

Electrical Characteristic Curves

Fi g. 1 $I_D - V_{DS}$



Fi g. 2 $I_D - V_{GS}$



Fi g. 3 $R_{DS(on)} - I_D$

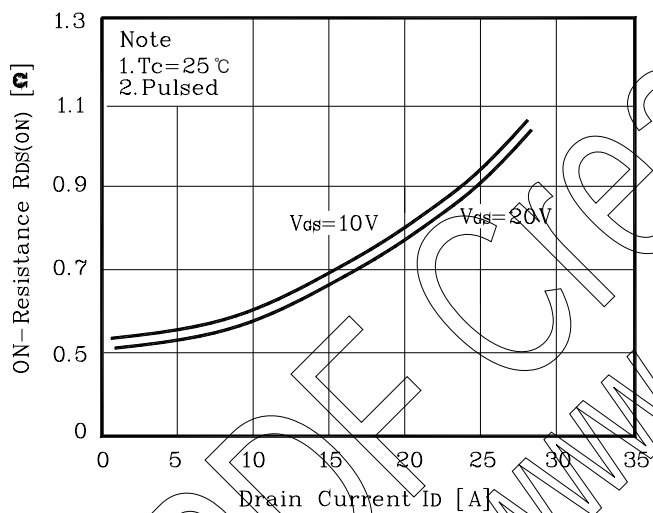
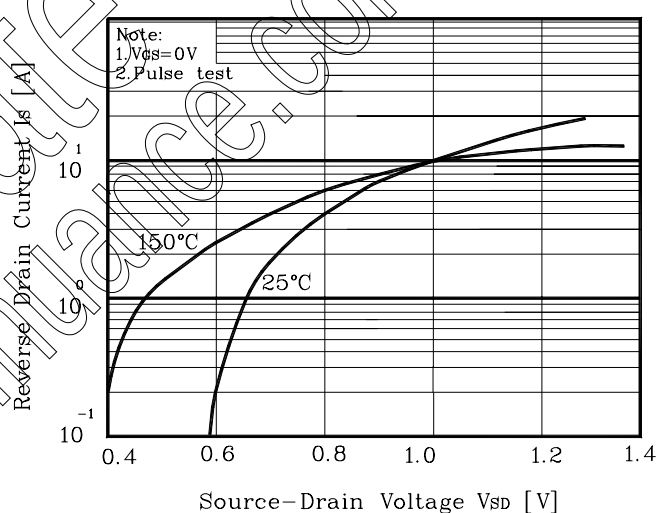
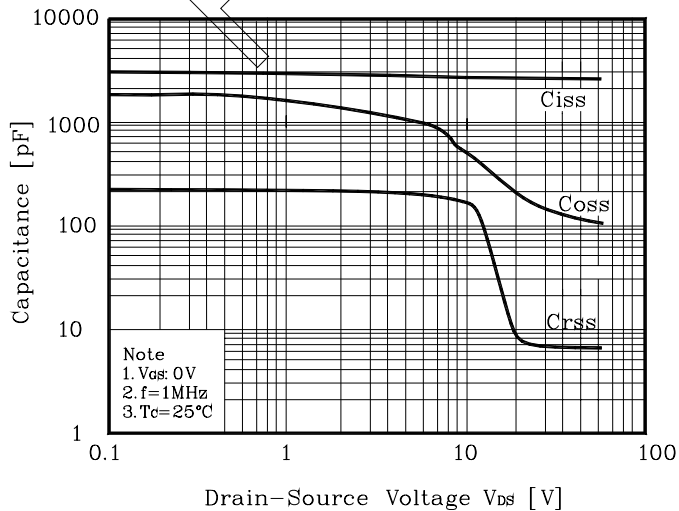


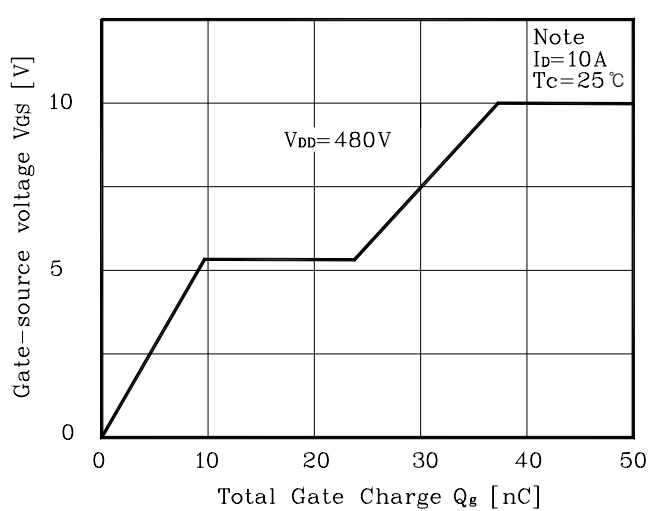
Fig. 4 $I_S - V_{SD}$



Fi g. 5 Capacitance - V_{DS}



Fi g. 6 $V_{GS} - Q_G$



Electrical Characteristic Curves

Fig. 7 $V_{DS} - T_J$

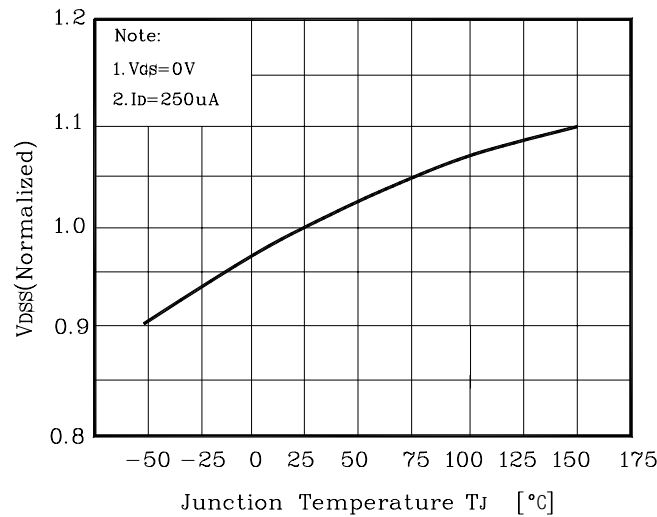


Fig.8 $R_{DS(on)} - T_J$

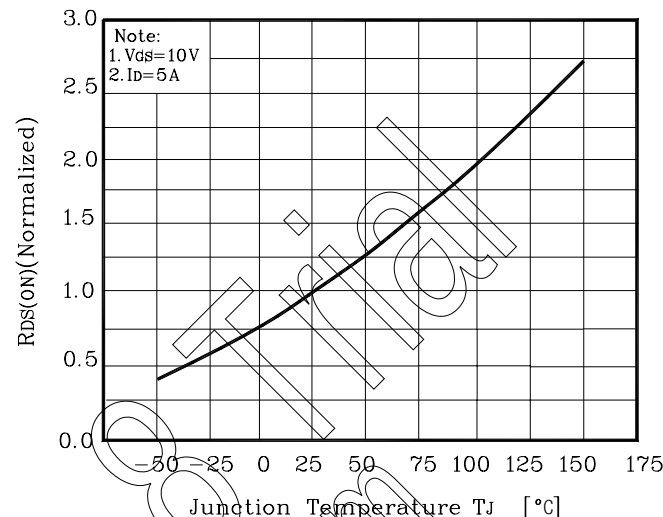


Fig. 9 $I_D - T_C$

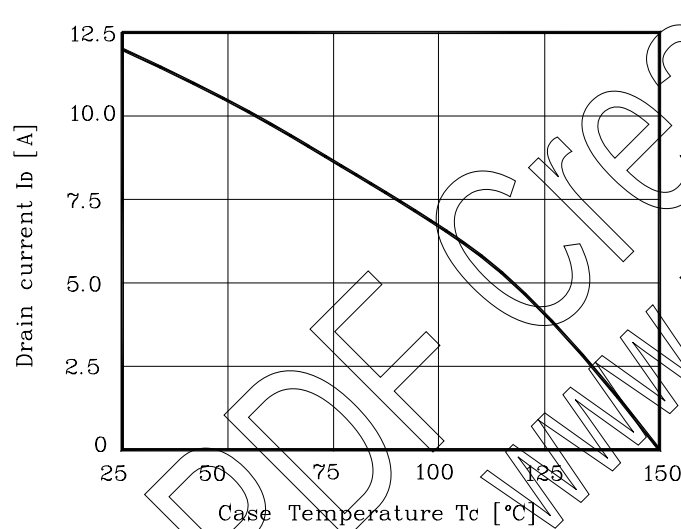


Fig. 10 Safe Operating Area

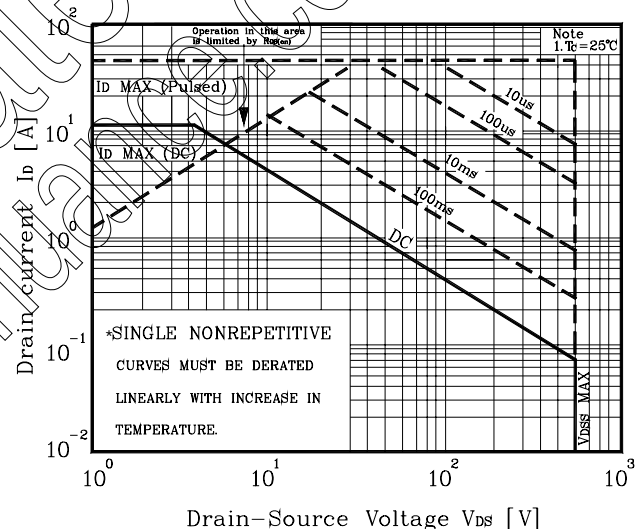


Fig. 11 Gate Charge Test Circuit & Waveform

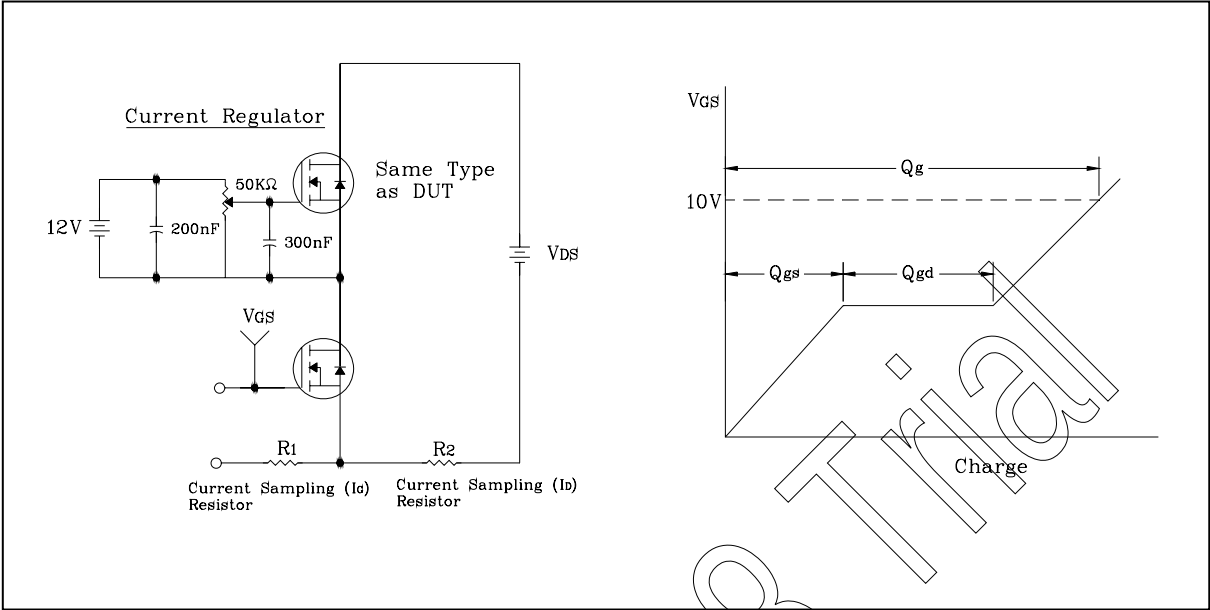


Fig. 12 Resistive Switching Test Circuit & Waveform

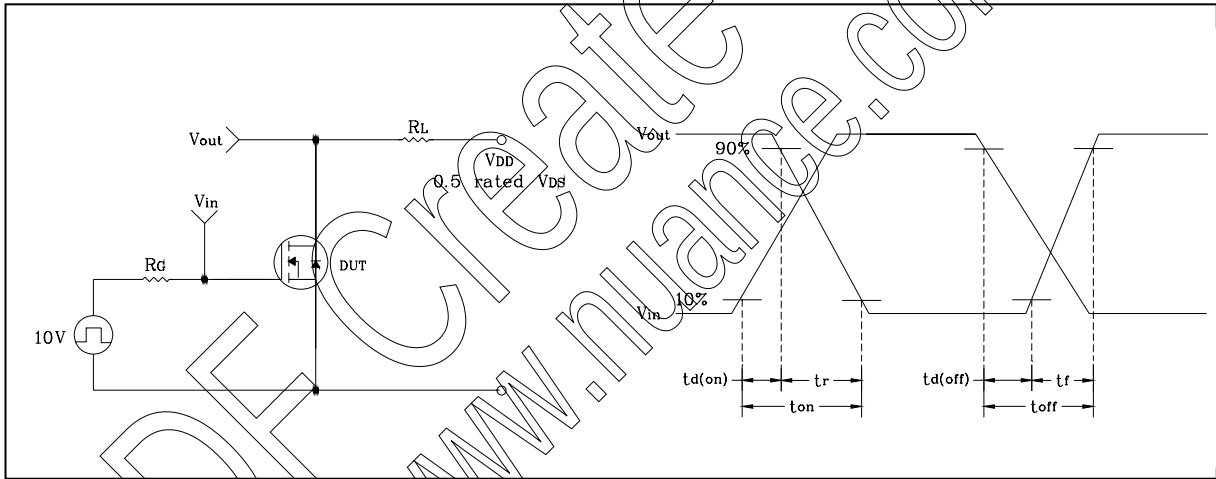


Fig. 13 E_{AS} Test Circuit & Waveform

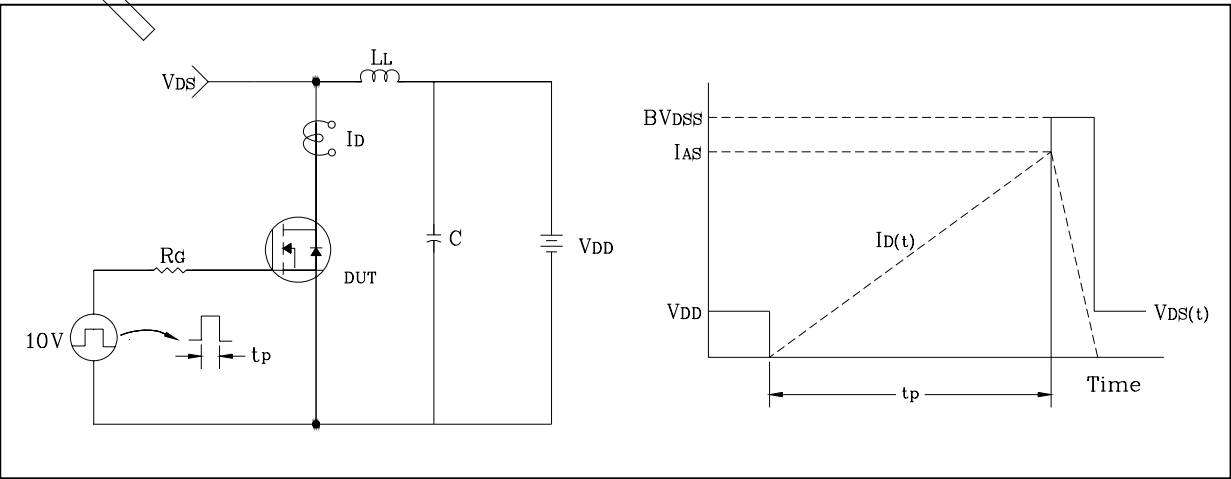
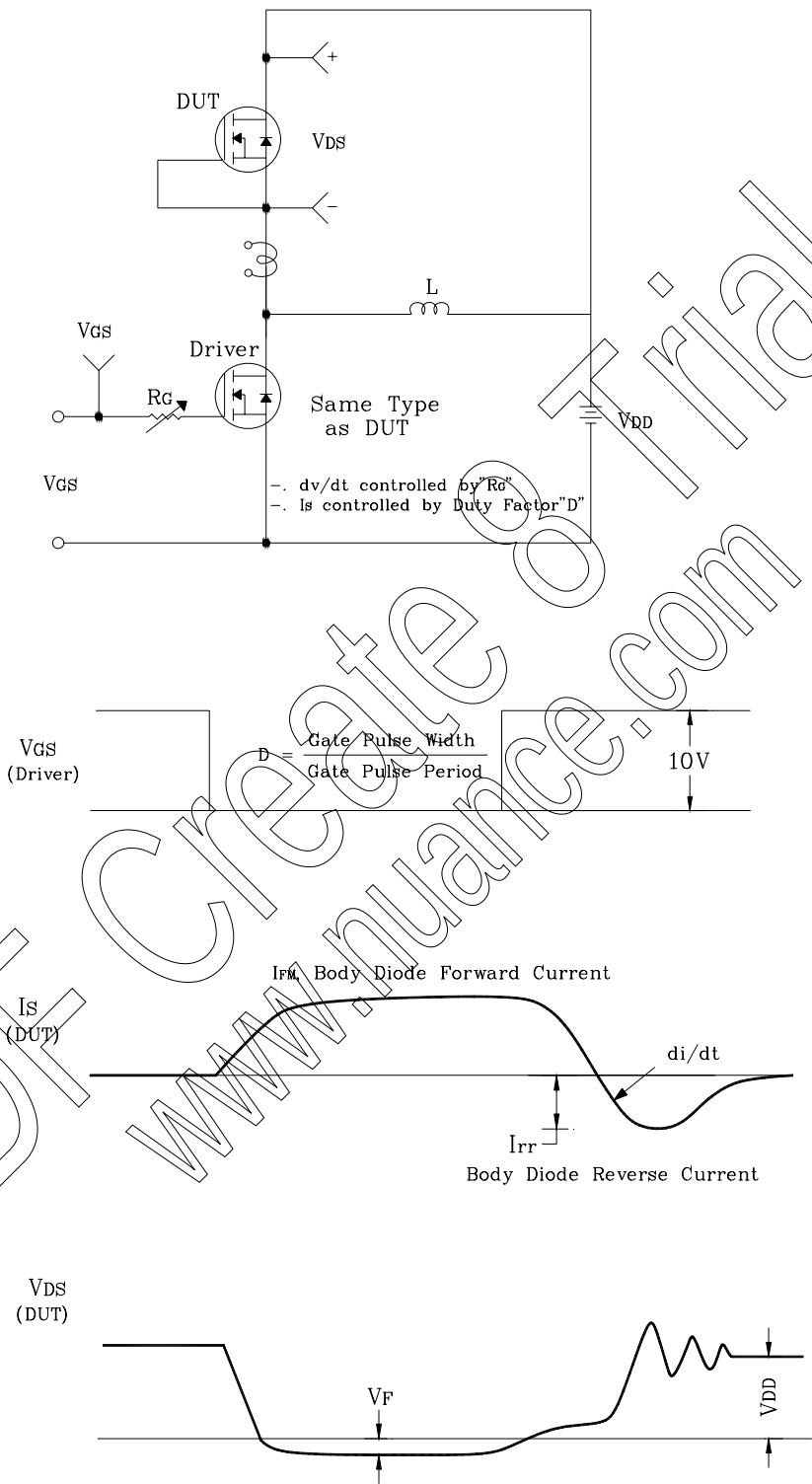
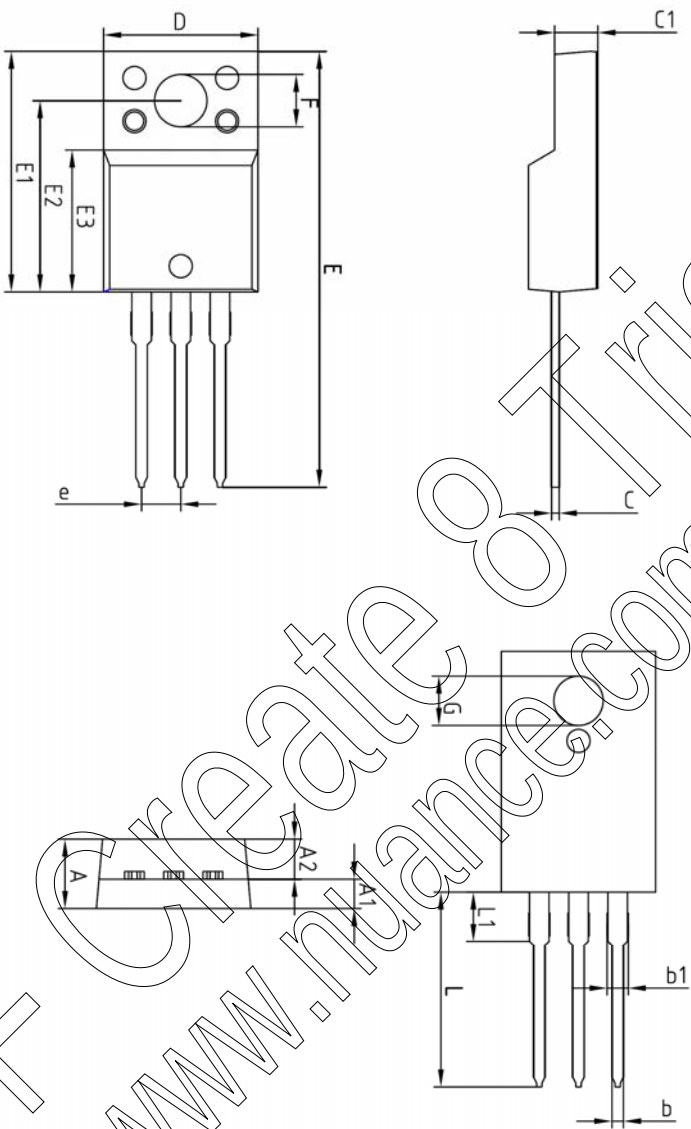


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform



Outline Dimension



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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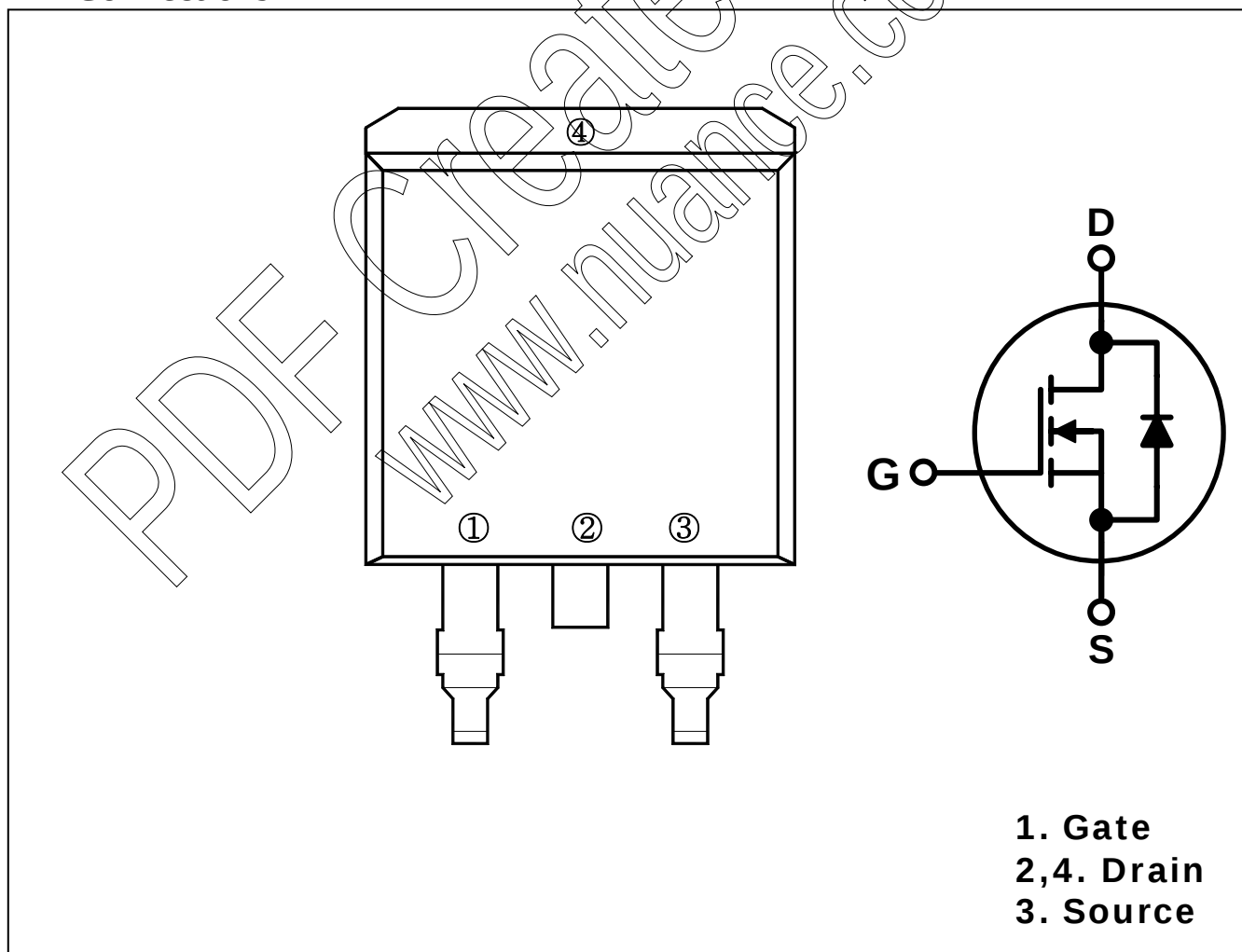
SWITCHING REGULATOR APPLICATIONS

Features

- High Voltage: $BV_{DSS}=300V(\text{Min.})$
- Low C_{rss} : $C_{rss}=19pF(\text{Typ.})$
- Low gate charge : $Q_g=24nc(\text{Typ.})$
- Low $R_{DS(on)}$: $R_{DS(on)}=0.29\Omega(\text{Max.})$

Ordering Information

Type NO.	Marking	Package Code
SMK1430DI SMK1430		D2-PAK

PIN Connections

Absolute maximum ratings

(Tc=25°C)

Characteristic Symbol		Rating	Unit
Drain-source voltage	V_{DSS}	300	V
Gate-source voltage	V_{GSS}	±30	V
Drain current (DC) *	I_D	(Tc=25°C)	14
		(Tc=100°C)	8.4
Drain current (Pulsed) * ⑤	I_{DM}	90	A
Drain power dissipation	P_D	140	W
Avalanche current (Single) ②	I_{AS}	14	A
Single pulsed avalanche energy ②	E_{AS}	800	mJ
Avalanche current (Repetitive) ①	I_{AR}	14	A
Repetitive avalanche energy ①	E_{AR}	25	mJ
Junction temperature	T_J	150	°C
Storage temperature range	T_{sta}	-55~150	

* Limited by maximum junction temperature

Characteristic Symbol		Typ.	Max	Unit
Thermal resistance	Junction-case	$R_{th(J-C)}$	0.89	°C/W
	Junction-ambient	$R_{th(J-a)}$	62.5	

Electrical Characteristics

(Tc=25°C)

Characteristic Symbol		Test Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV_{DSS}	$I_D=250\mu A, V_{GS}=0$	300 -		-	V
Gate threshold voltage	$V_{GS(th)}$	$I_D=250\mu A, V_{DS}=V_{GS}$	3.0 -		5.0	V
Drain-source cut-off current	I_{DSS}	$V_{DS}=300V, V_{GS}=0V$ -		-	1	μA
		$V_{DS}=300V, V_{GS}=0V, TC=125^\circ C$			200	μA
Gate leakage current	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 30V$	- -		± 100	nA
Drain-source on-resistance ④	$R_{DS(ON)}$	$V_{GS}=10V, I_D=7A$ -		0.24	0.29	Ω
Forward transfer conductance ④	g_{fs}	$V_{DS}=5V, I_D=7A$ -		7.8	-	S
Input capacitance	C_{iss} -	$V_{GS}=0V, V_{DS}=25V$ $f=1MHz$		1075	1344	pF
Output capacitance	C_{oss}		-	182	228	
Reverse transfer capacitance	C_{rss}		- 19		23.8	
Turn-on delay time	$t_{d(on)}$ -	$V_{DD}=150V, I_D=14A$ $R_G=25\Omega$		22	-	ns
Rise time	t_r -			145	-	
Turn-off delay time	$t_{d(off)}$ -			45	-	
Fall time	t_f		-	70	-	
Total gate charge	Q_g -	$V_{DS}=240V, V_{GS}=10V$ $I_D=14A$		24	30	nC
Gate-source charge	Q_{gs} -			8.5	-	
Gate-drain charge	Q_{gd}		-	9.5	-	

Source-Drain Diode Ratings and Characteristics

(Tc=25°C)

Characteristic Symbol		Test Condition	Min	Typ	Max	Unit
Source current (DC)	I_S	Integral reverse diode in the MOSFET	-	-	14	A
Source current (Pulsed) ①	I_{SM}		- -		56	
Forward voltage ④	V_{SD} -	$V_{GS}=0V, I_S=14A$ -		-	1.4	V
Reverse recovery time	t_{rr} -	$I_S=14A, V_{GS}=0,$ $dI_S/dt=100A/\mu s$		235	-	ns
Reverse recovery charge	Q_{rr}		- 1.	6	-	μC

Note ;

- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ② $L=6.8mH, I_{AS}=14A, V_{DD}=50V, R_G=25\Omega$
- ③ Pulse Test : Pulse Width < 30 μs , Duty cycle $\leq 2\%$
- ④ Essentially independent of operating temperature
- ⑤ Pulse Width : 300 μs

Electrical Characteristic Curves

Fig. 1 $I_D - V_{DS}$

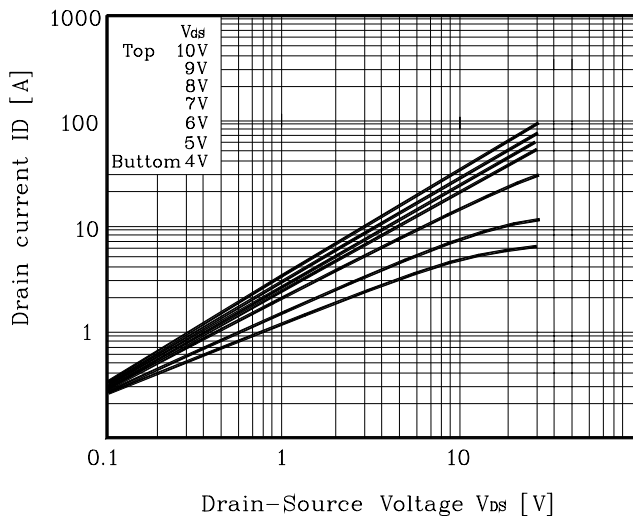


Fig. 2 $I_D - V_{GS}$

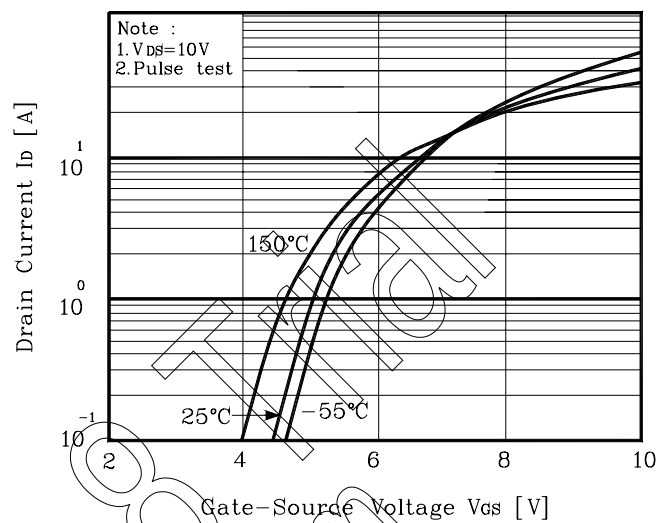


Fig. 3 $R_{DS(on)} - I_D$

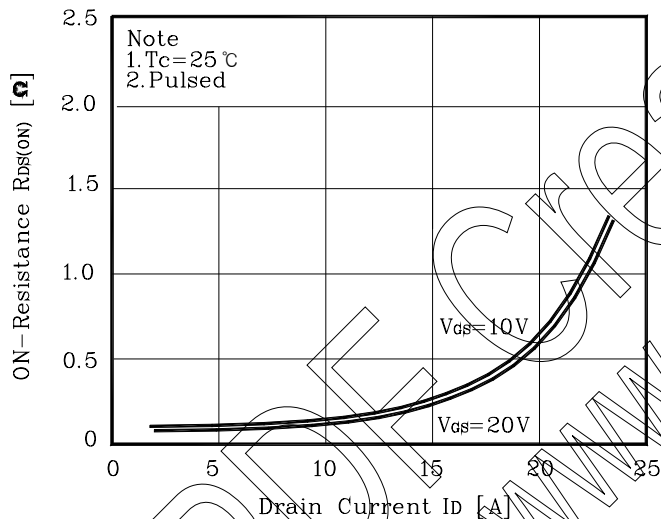


Fig. 4 $I_S - V_{SD}$

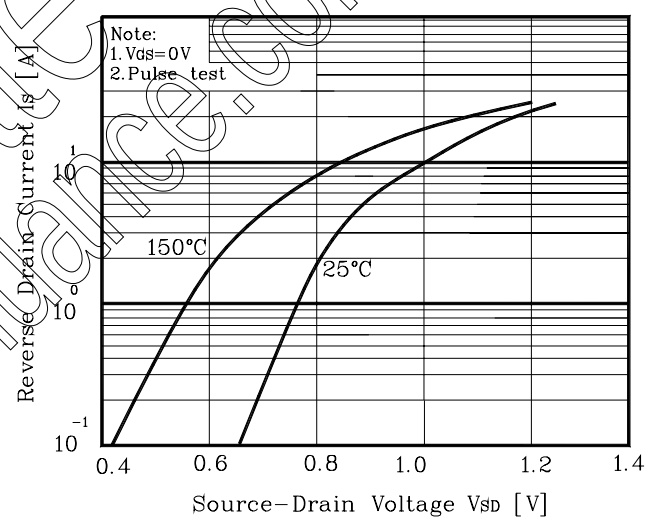


Fig. 5 Capacitance - V_{DS}

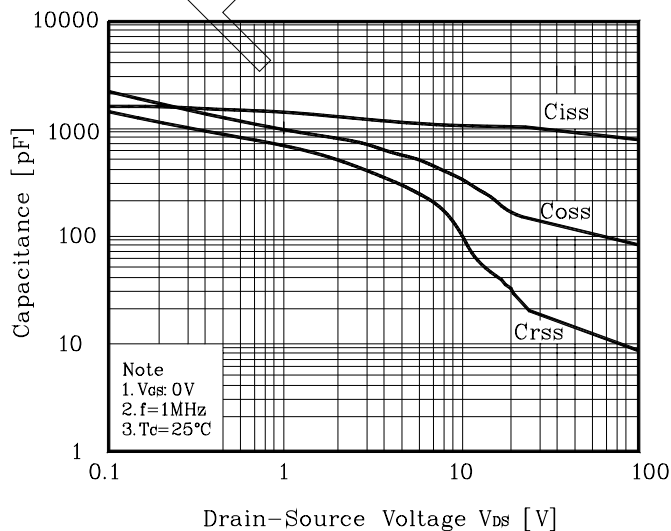


Fig. 6 $V_{GS} - Q_g$

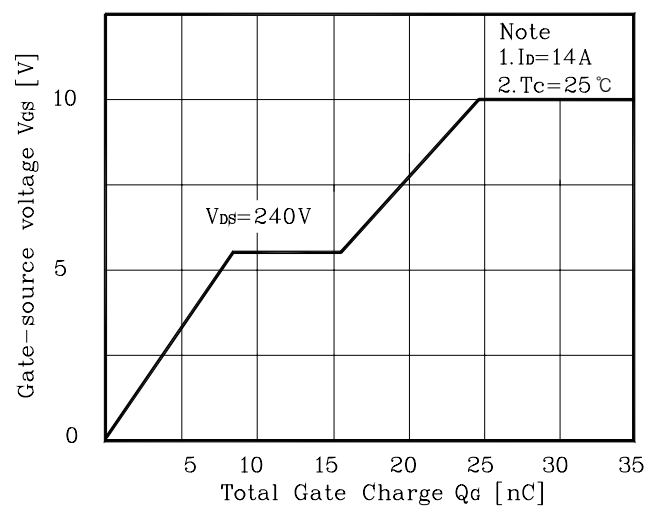


Fig. 7 $V_{DS} - T_J$

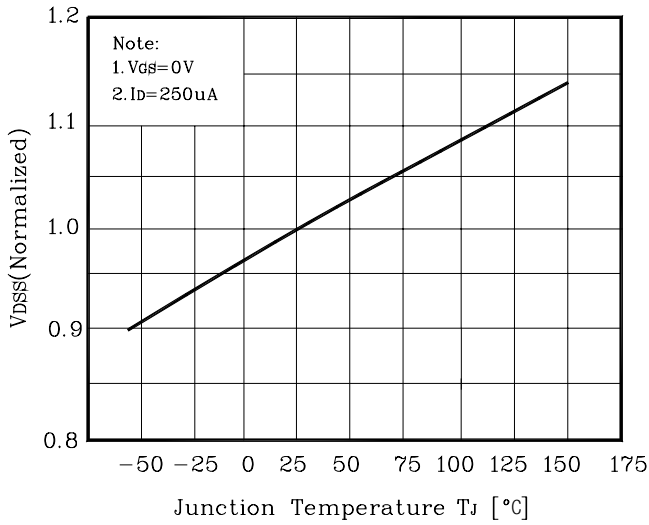


Fig. 8 $R_{DS(on)} - T_J$

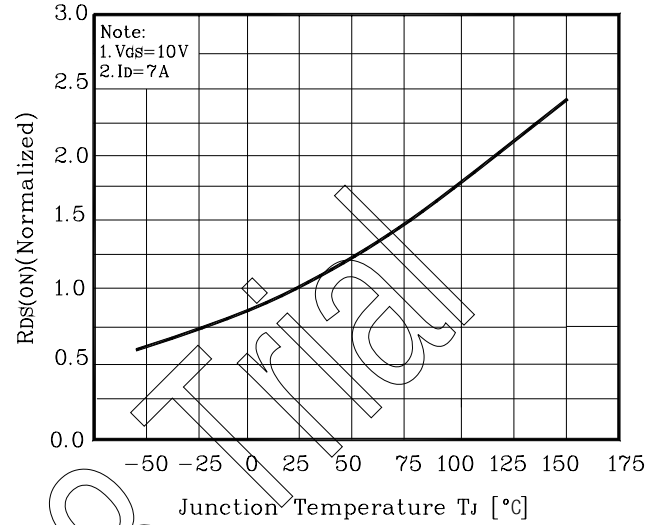


Fig. 9 $I_D - T_C$

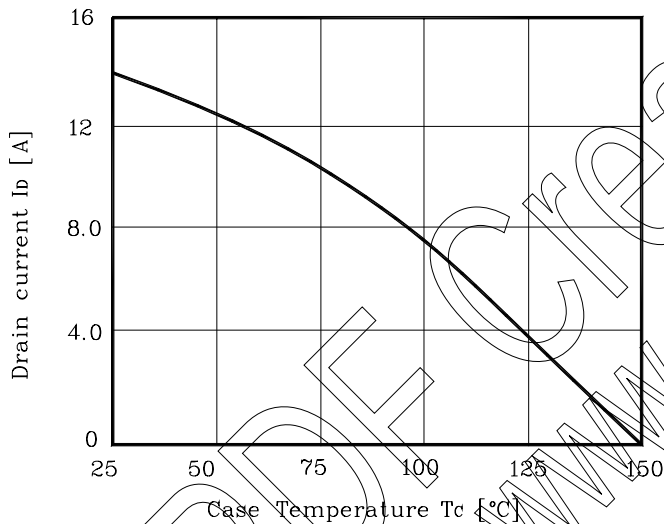


Fig. 10 Safe Operating Area

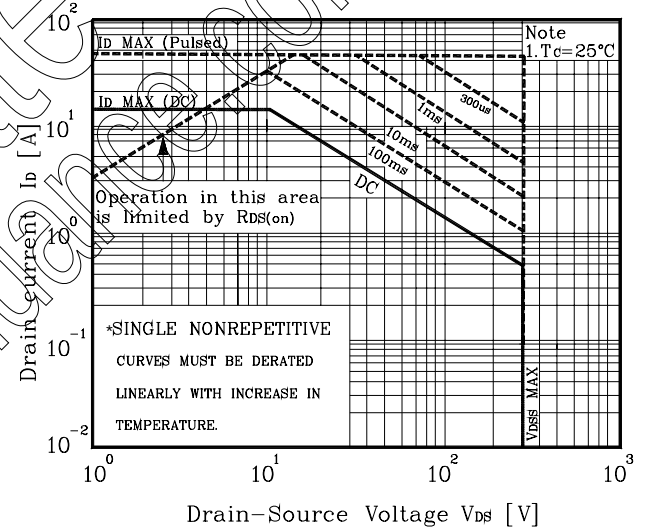


Fig. 11 Transient Thermal Impedance

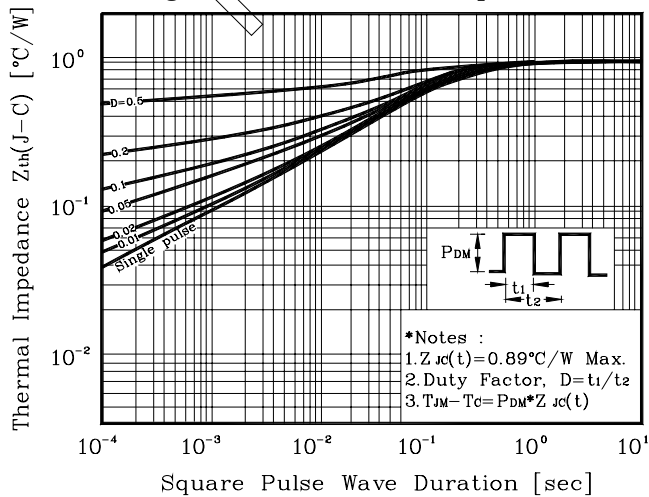


Fig. 11 Gate Charge Test Circuit & Waveform

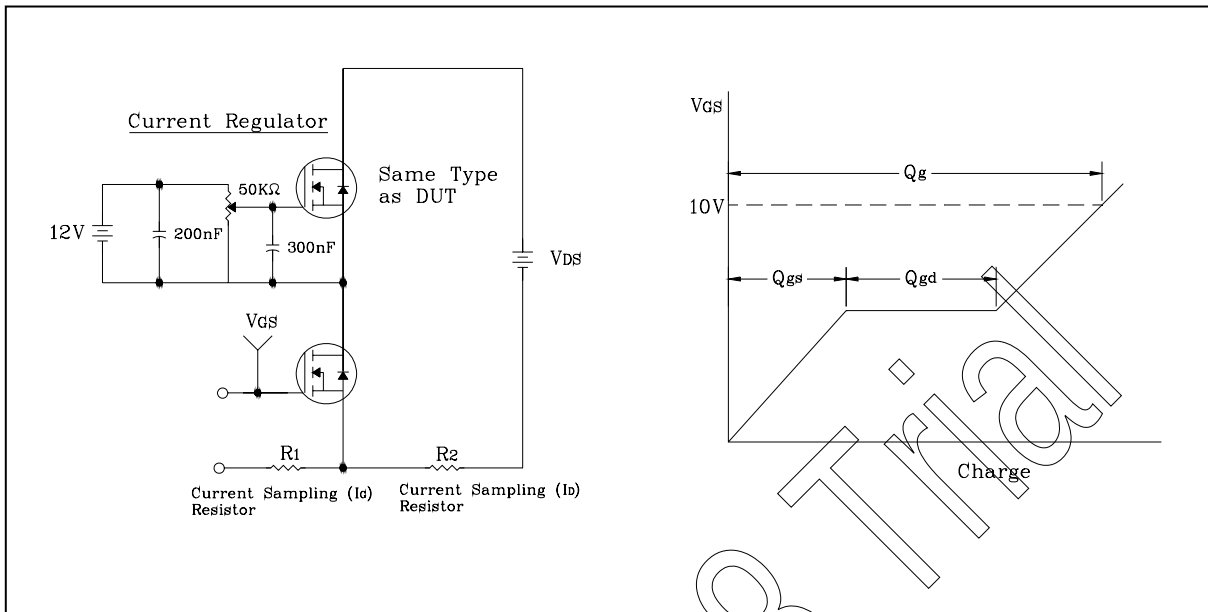


Fig. 12 Resistive Switching Test Circuit & Waveform

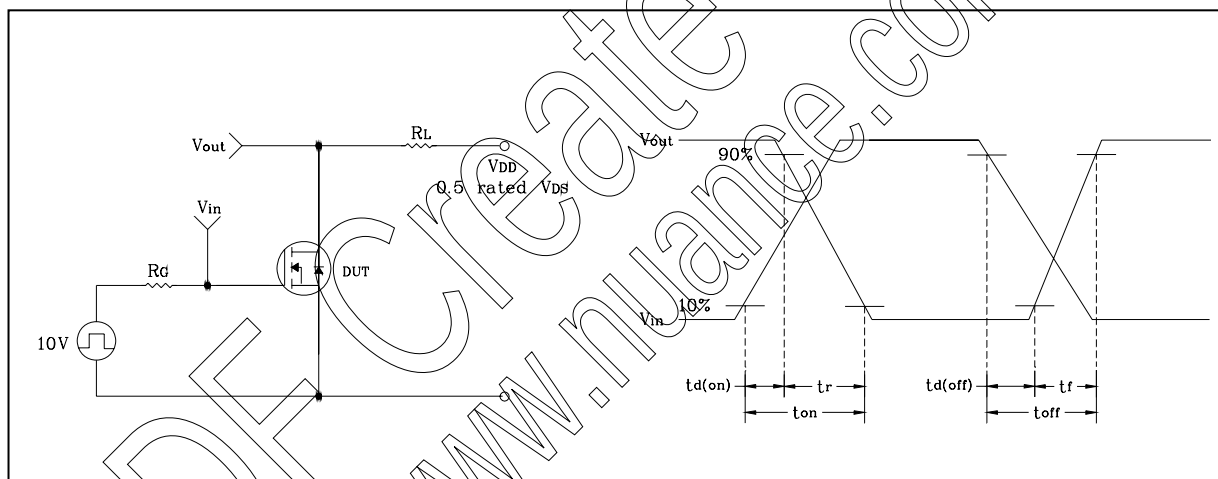


Fig. 13 E_{AS} Test Circuit & Waveform

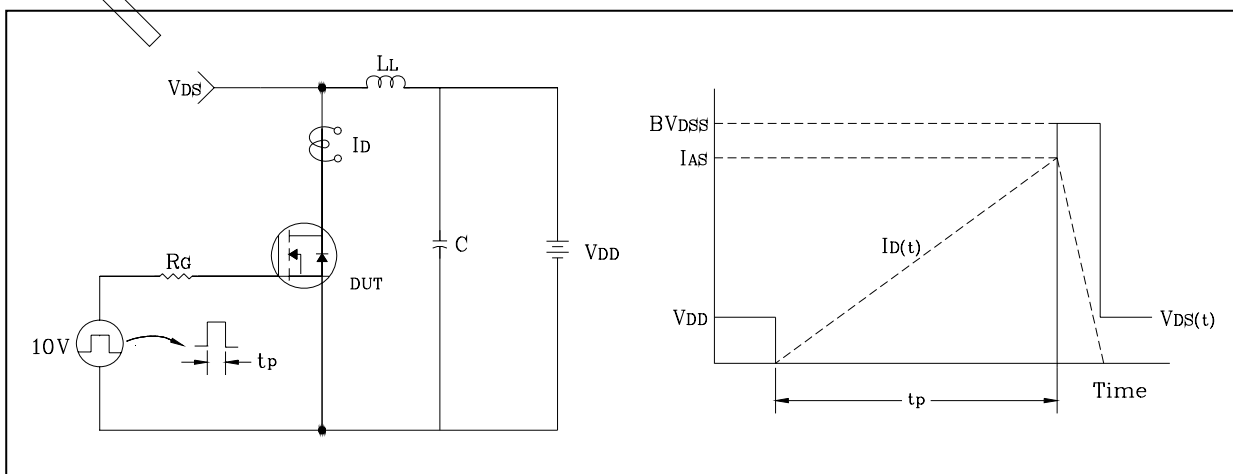
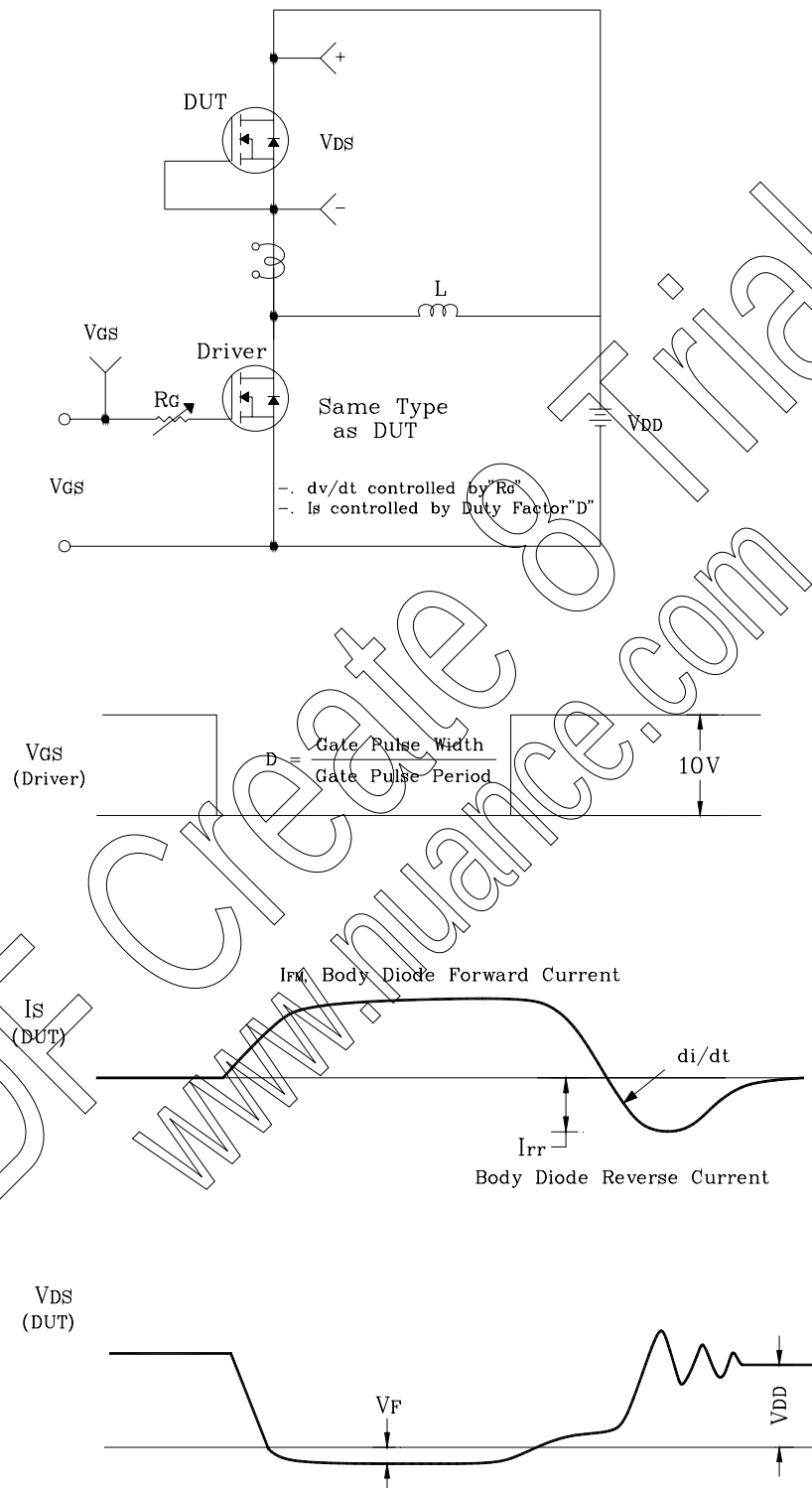
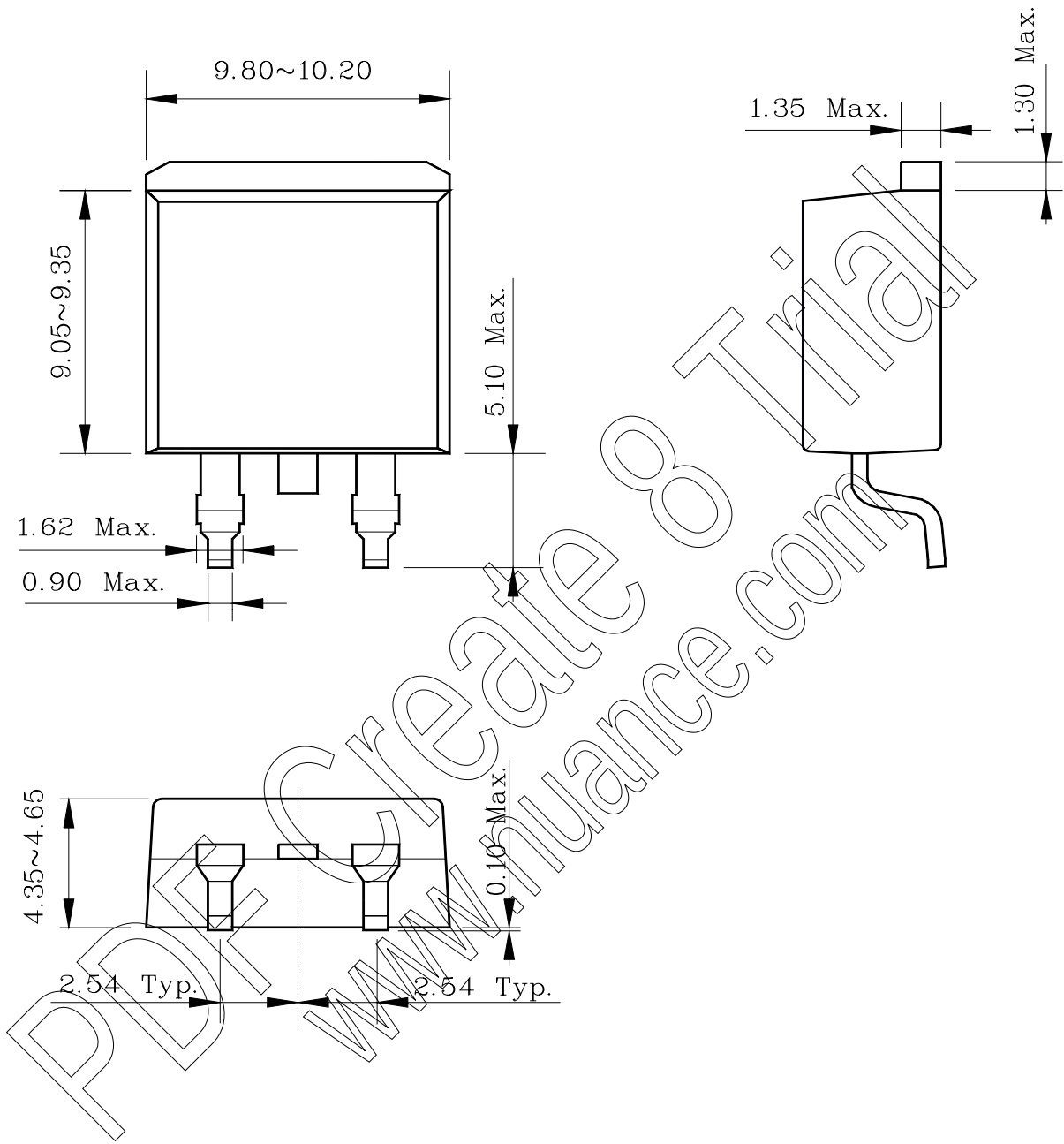


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform



Outline Dimension

u nit: mm



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