To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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RENESAS

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DATA SHEET

RENESAS

MOS FIELD EFFECT TRANSISTOR
NP88N03KDG

SWITCHING
N-CHANNEL POWER MOS FET

DESCRIPTION

The NP88N03KDG is N-channel MOS Field Effect Transistor designed for high current switching applications.

ORDERING INFORMATION

PART NUMBER	PACKAGE
NP88N03KDG	TO-263 (MP-25ZK)

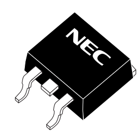
FEATURES

- Channel temperature 175 degree rating
- Super low on-state resistance

  $R_{DS(on)1}$ = 2.4 mΩ MAX. (V_{GS} = 10 V, I_D = 44 A)

  $R_{DS(on)2}$ = 3.9 mΩ MAX. (V_{GS} = 4.5 V, I_D = 44 A)
- Low C_{iss}: C_{iss} = 9000 pF TYP. (V_{DS} = 25 V)
- 4.5 V gate drive type

(TO-263)



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	30	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	±20	V
Drain Current (DC) (T_C = 25°C)	$I_{D(DC)}$	±88	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	±352	A
Total Power Dissipation (T_A = 25°C)	P_{T1}	1.8	W
Total Power Dissipation (T_C = 25°C)	P_{T2}	200	W
Channel Temperature	T_{ch}	175	°C
Storage Temperature	T_{stg}	–55 to +175	°C
Repetitive Avalanche Current Note2	I_{AR}	59	A
Repetitive Avalanche Energy Note2	E_{AR}	348	mJ

Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1%

2. T_{ch} ≤ 150°C, V_{DD} = 15 V, R_G = 25 Ω, V_{GS} = 20 → 0 V

THERMAL RESISTANCE

Channel to Case Thermal Resistance	$R_{th(ch-C)}$	0.75	°C/W
Channel to Ambient Thermal Resistance	$R_{th(ch-A)}$	83.3	°C/W

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Date Published April 2005 NS CP(K)
Printed in Japan

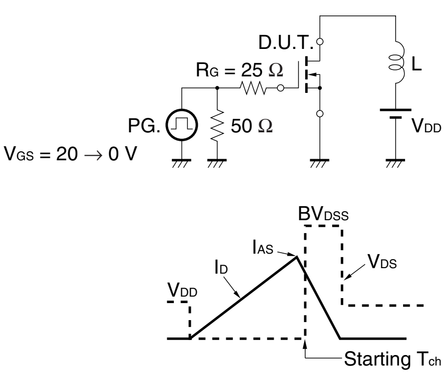
The mark ★ shows major revised points.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

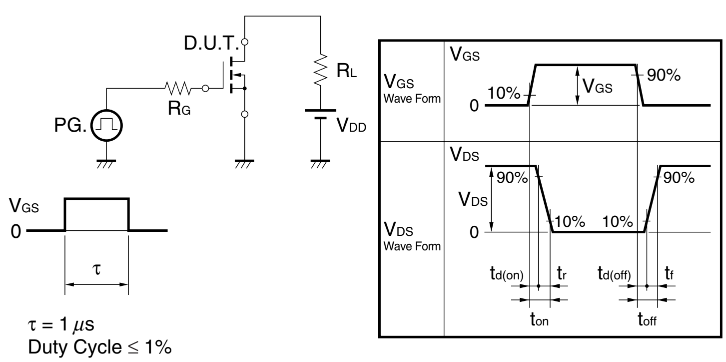
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V			1	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ±20 V, V_{DS} = 0 V			±100	nA
★ Gate to Source Threshold Voltage **Note**	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA	1.5	2.0	2.5	V
Forward Transfer Admittance **Note**	$\mid y_{fs} \mid$	V_{DS} = 10 V, I_D = 44 A	37	75		S
Drain to Source On-state Resistance **Note**	$R_{DS(on)1}$	V_{GS} = 10 V, I_D = 44 A		1.9	2.4	mΩ
	$R_{DS(on)2}$	V_{GS} = 4.5 V, I_D = 44 A		2.4	3.9	mΩ
Input Capacitance	C_{iss}	V_{DS} = 25 V		9000	13500	pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		1100	1650	pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		740	1340	pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 15 V, I_D = 44 A		35	80	ns
Rise Time	t_r	V_{GS} = 10 V		1100	2750	ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 0 Ω		125	250	ns
Fall Time	t_f			23	60	ns
Total Gate Charge	Q_G	V_{DD} = 24 V		165	250	nC
Gate to Source Charge	Q_{GS}	V_{GS} = 10 V		26		nC
Gate to Drain Charge	Q_{GD}	I_D = 88 A		50		nC
Body Diode Forward Voltage **Note**	$V_{F(S-D)}$	I_F = 88 A, V_{GS} = 0 V		0.9	1.5	V
Reverse Recovery Time	t_{rr}	I_F = 88 A, V_{GS} = 0 V		60		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 100 A/μs		78		nC

Note Pulsed

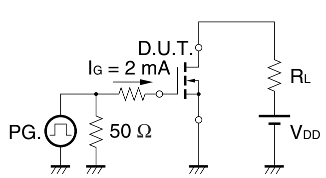
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

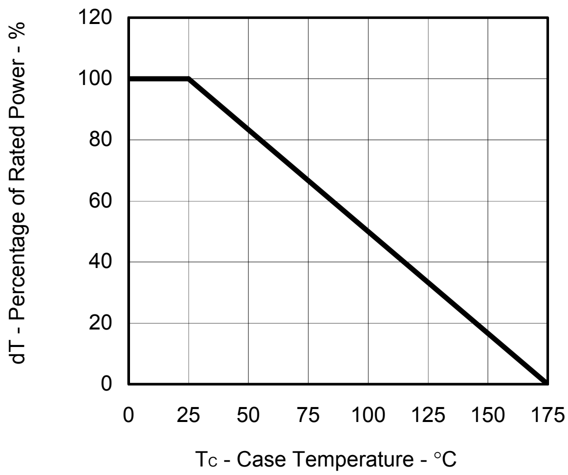


TEST CIRCUIT 3 GATE CHARGE

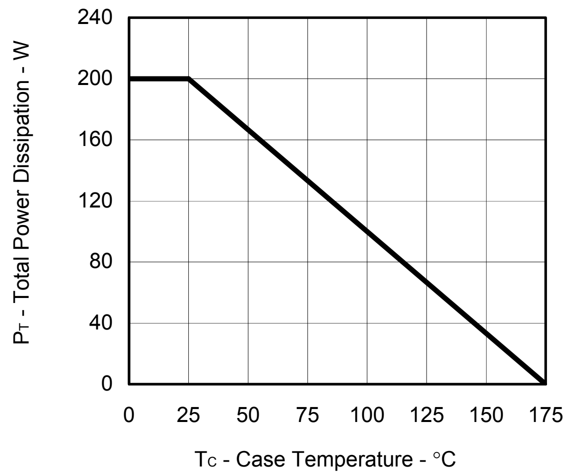


TYPICAL CHARACTERISTICS (T_A = 25°C)

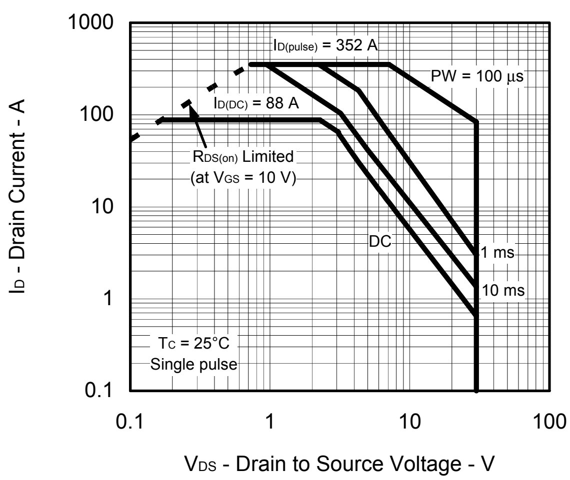
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



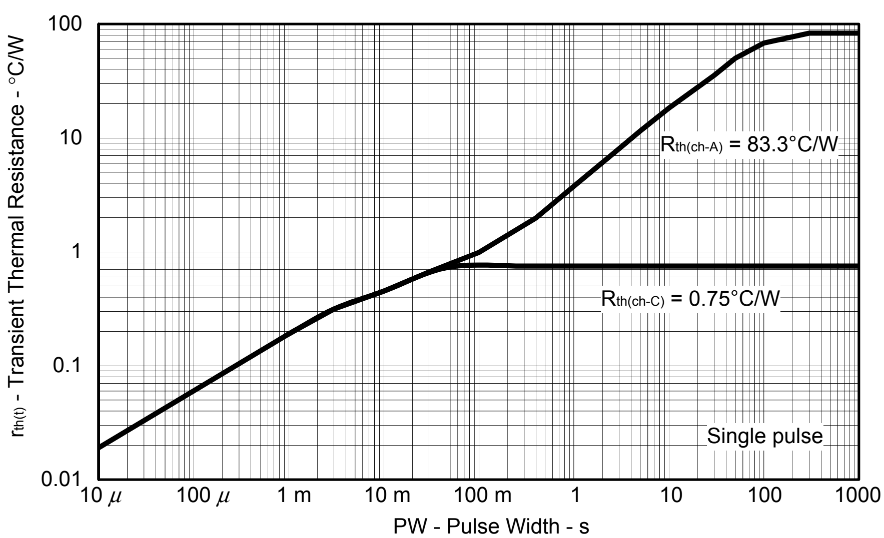
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



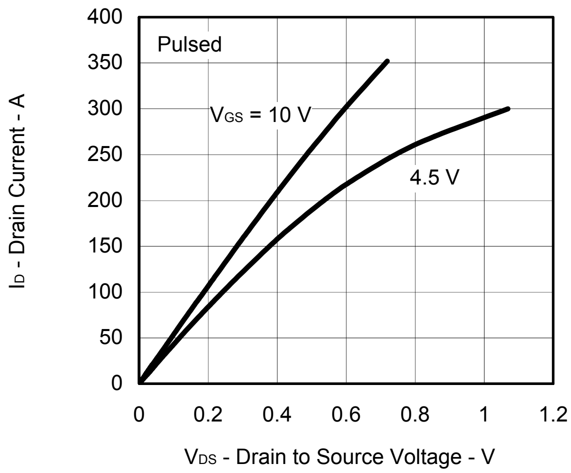
FORWARD BIAS SAFE OPERATING AREA



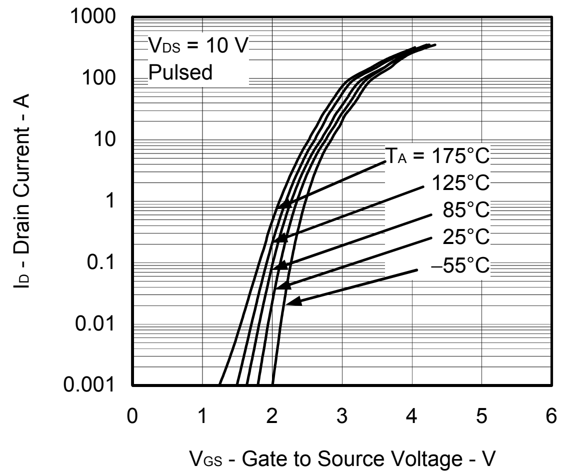
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



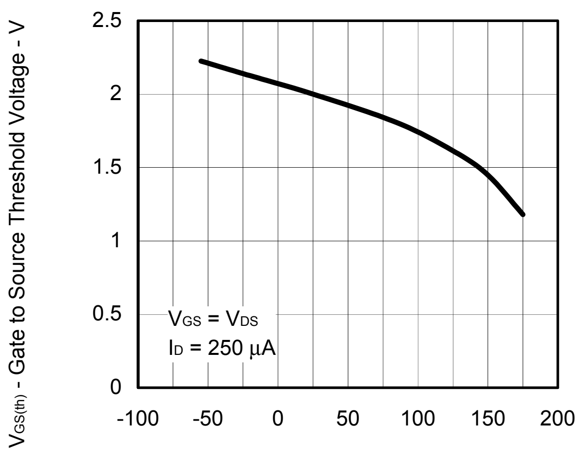
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



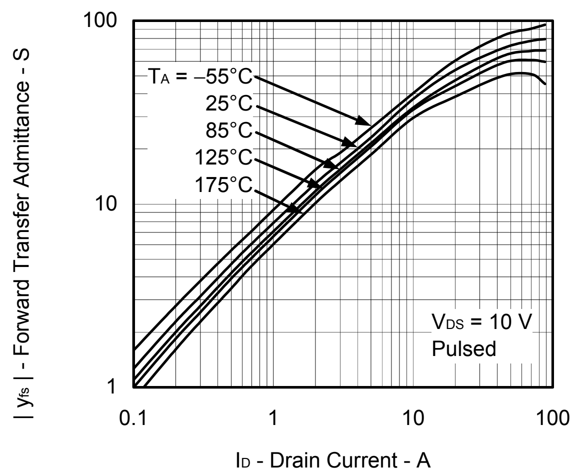
FORWARD TRANSFER CHARACTERISTICS



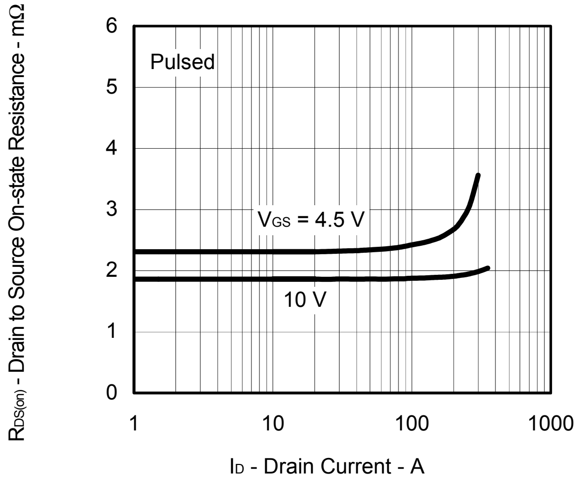
GATE SOURCE THRESHOLD VOLTAGE vs.
CHANNEL TEMPERATURE



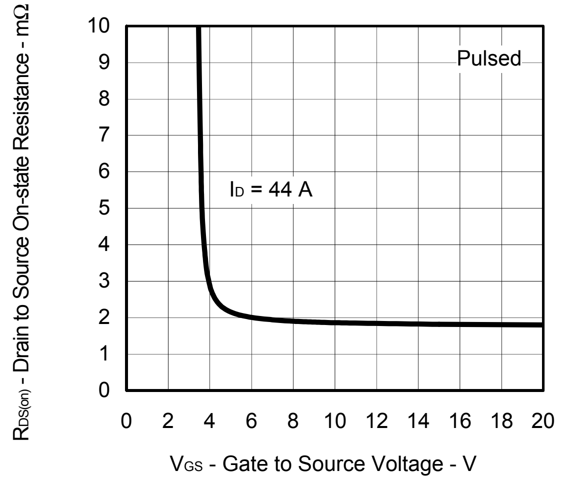
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



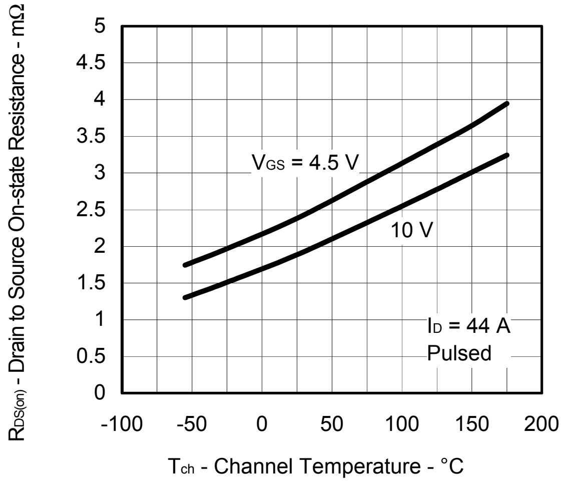
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



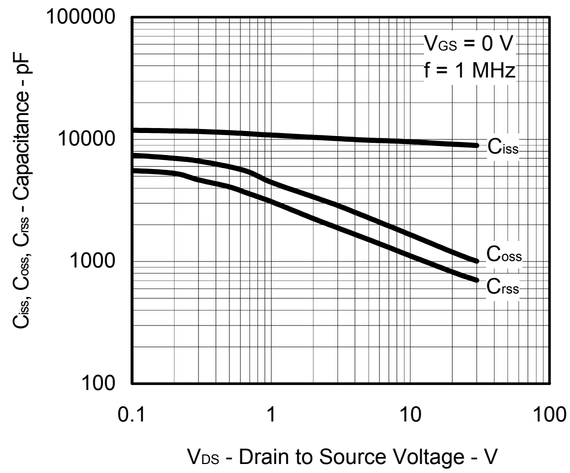
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



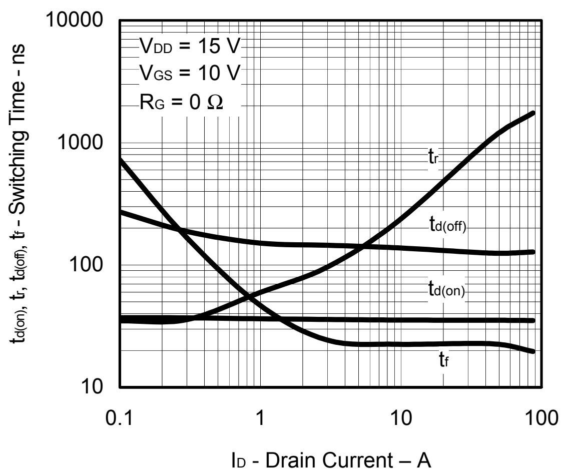
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



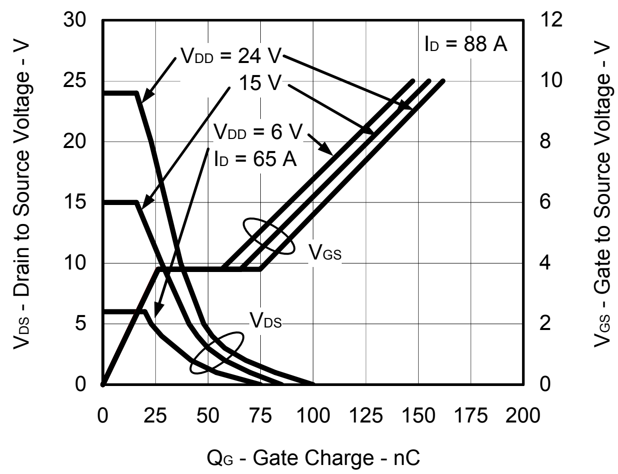
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



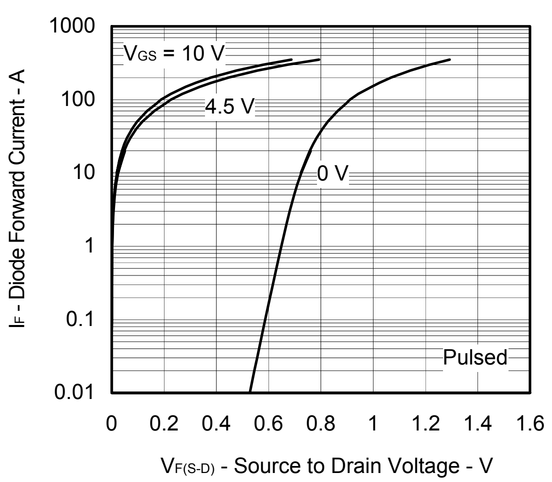
SWITCHING CHARACTERISTICS



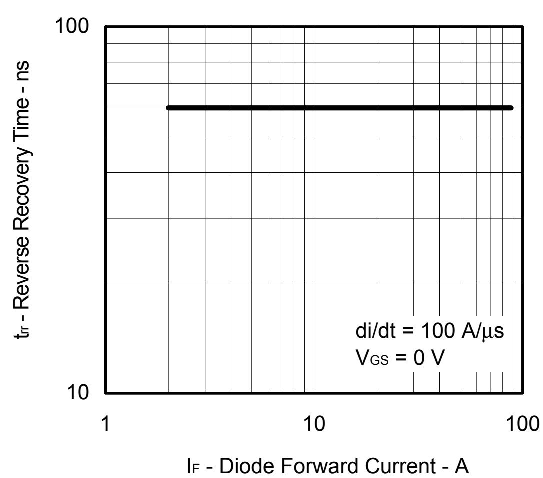
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE

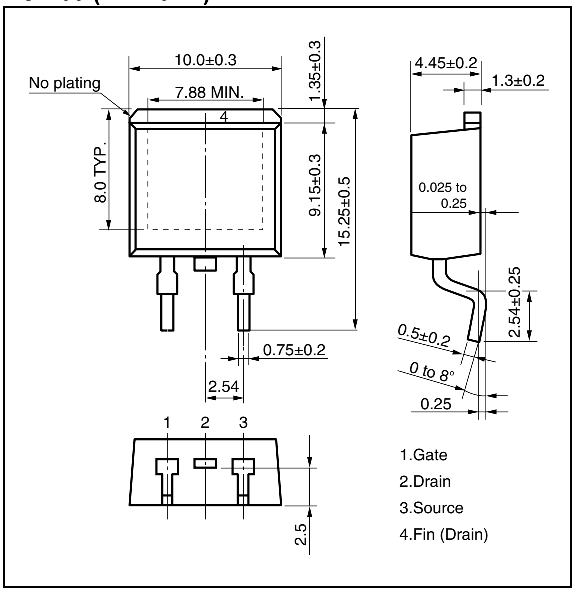


REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT

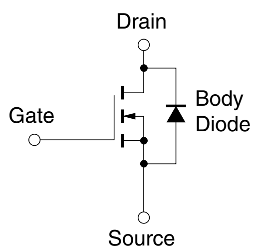


PACKAGE DRAWING (Unit: mm)

TO-263 (MP-25ZK)



EQUIVALENT CIRCUIT



Remark Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred.