

N-CHANNEL MOS FIELD EFFECT TRANSISTOR
 FOR SWITCHING

DESCRIPTION

The μ PA2503, which has a heat spreader, is N-channel MOS Field Effect Transistor designed for power management applications of notebook computers.

FEATURES

- μ PA2503 has a thin surface mount package with a heat spreader. The land size is same as 8-pin TSSOP.
- Low on-state resistance
 $R_{DS(on)1} = 9.5 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10.0 \text{ V, } I_D = 8.0 \text{ A)}$
 $R_{DS(on)2} = 15.1 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.5 \text{ V, } I_D = 8.0 \text{ A)}$
- Low C_{iss} : 1200 pF TYP. ($V_{DS} = 10.0 \text{ V, } V_{GS} = 0 \text{ V}$)

ORDERING INFORMATION

PART NUMBER	PACKAGE
μ PA2503TM	8PIN HWSOP

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$)

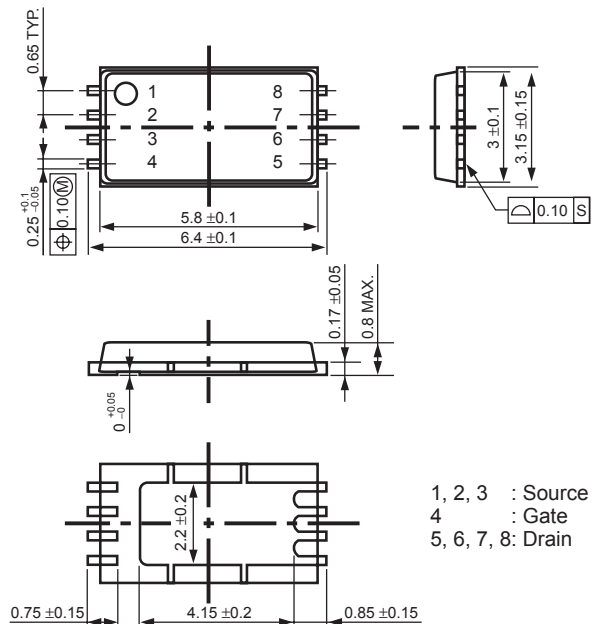
Drain to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	30.0	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	V_{GSS}	± 20.0	V
Drain Current (DC) ^{Note1}	$I_{D(DC)}$	± 16.0	A
Drain Current (pulse) ^{Note2}	$I_{D(pulse)}$	± 64.0	A
Total Power Dissipation ^{Note1}	P_T	2.7	W
Channel Temperature	T_{ch}	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to +150	$^\circ\text{C}$
Single Avalanche Current ^{Note3}	I_{AS}	16.0	A
Single Avalanche Energy ^{Note3}	E_{AS}	25.6	mJ

- Notes**
1. Mounted on FR-4 board of $25 \text{ cm}^2 \times 1.6 \text{ mm}$, $PW \leq 10 \text{ sec}$
 2. $PW \leq 10 \mu\text{s}$, Duty Cycle $\leq 1\%$
 3. Starting $T_{ch} = 25^\circ\text{C}$, $V_{DD} = 30 \text{ V}$, $R_G = 25 \Omega$, $V_{GS} = 20.0 \rightarrow 0 \text{ V}$

Remark The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

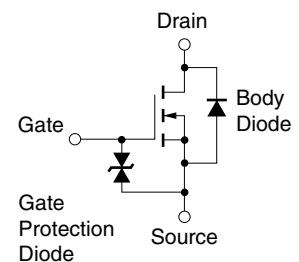
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PACKAGE DRAWING (Unit: mm)



1, 2, 3 : Source
 4 : Gate
 5, 6, 7, 8: Drain

EQUIVALENT CIRCUIT

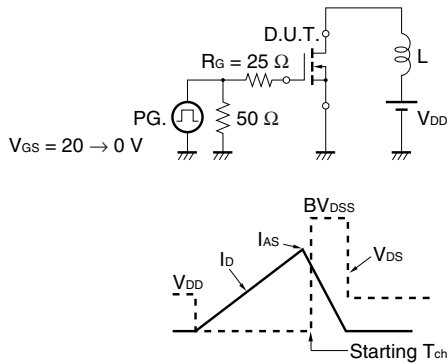


ELECTRICAL CHARACTERISTICS (TA = 25°C)

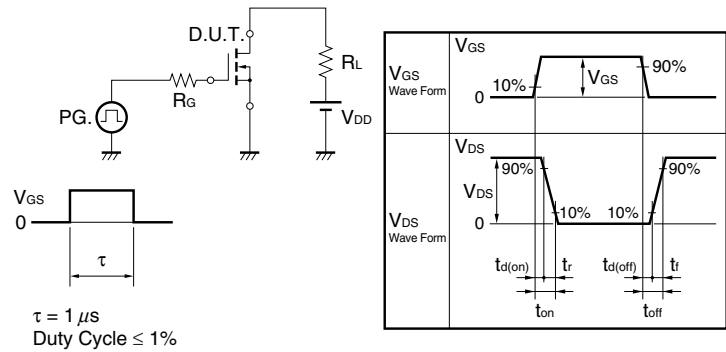
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 30.0 \text{ V}, V_{GS} = 0 \text{ V}$			1.0	μA
Gate Leakage Current	I_{GSS}	$V_{GS} = \pm 18.0 \text{ V}, V_{DS} = 0 \text{ V}$			± 10.0	μA
Gate Cut-off Voltage	$V_{GS(off)}$	$V_{DS} = 10.0 \text{ V}, I_D = 1.0 \text{ mA}$	1.5		2.5	V
Forward Transfer Admittance ^{Note}	$ y_{fs} $	$V_{DS} = 10.0 \text{ V}, I_D = 8.0 \text{ A}$	5			S
Drain to Source On-state Resistance ^{Note}	$R_{DS(on)1}$	$V_{GS} = 10.0 \text{ V}, I_D = 8.0 \text{ A}$		7.5	9.5	$\text{m}\Omega$
	$R_{DS(on)2}$	$V_{GS} = 4.5 \text{ V}, I_D = 8.0 \text{ A}$		11.0	15.1	$\text{m}\Omega$
Input Capacitance	C_{iss}	$V_{DS} = 10.0 \text{ V}$		1200		pF
Output Capacitance	C_{oss}	$V_{GS} = 0 \text{ V}$		320		pF
Reverse Transfer Capacitance	C_{rss}	$f = 1.0 \text{ MHz}$		190		pF
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 15.0 \text{ V}, I_D = 8.0 \text{ A}$		12		ns
Rise Time	t_r	$V_{GS} = 10.0 \text{ V}$		17		ns
Turn-off Delay Time	$t_{d(off)}$	$R_G = 10 \Omega$		52		ns
Fall Time	t_f			15		ns
Total Gate Charge	Q_G	$V_{DD} = 15.0 \text{ V}$		15		nC
Gate to Source Charge	Q_{GS}	$V_{GS} = 5.0 \text{ V}$		4		nC
Gate to Drain Charge	Q_{GD}	$I_D = 16.0 \text{ A}$		7		nC
Body Diode Forward Voltage ^{Note}	$V_{F(S-D)}$	$I_F = 16.0 \text{ A}, V_{GS} = 0 \text{ V}$		0.84		V
Reverse Recovery Time	t_{rr}	$I_F = 16.0 \text{ A}, V_{GS} = 0 \text{ V}$		28		ns
Reverse Recovery Charge	Q_{rr}	$di/dt = 100 \text{ A}/\mu\text{s}$		18		nC

Note Pulsed: $PW \leq 350 \mu\text{s}$, Duty Cycle $\leq 2\%$

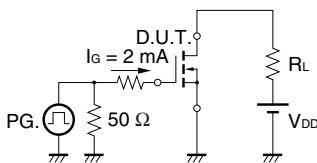
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

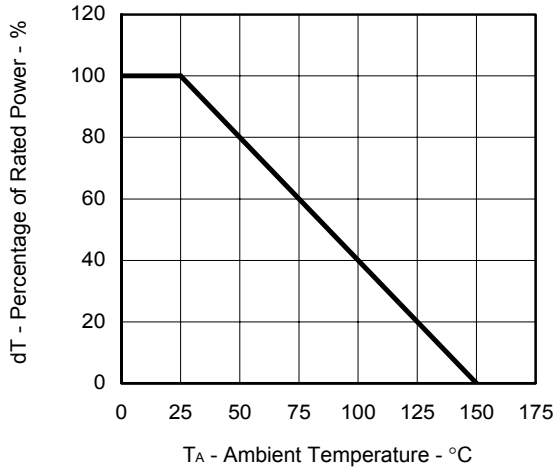


TEST CIRCUIT 3 GATE CHARGE

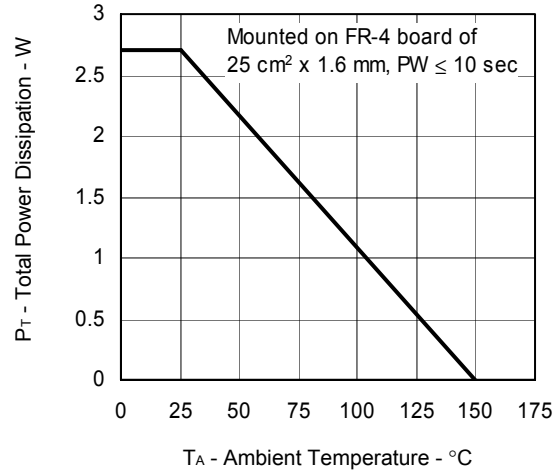


TYPICAL CHARACTERISTICS (T_A = 25°C)

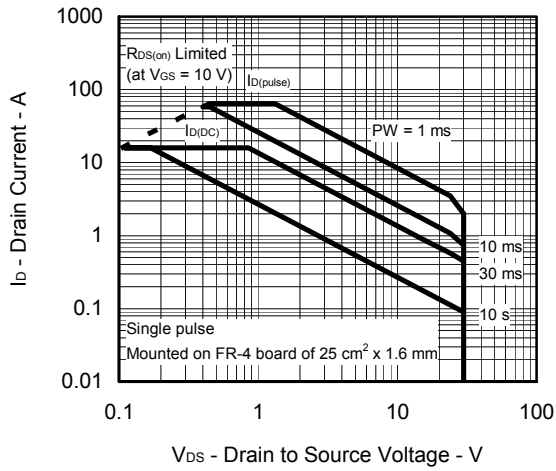
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



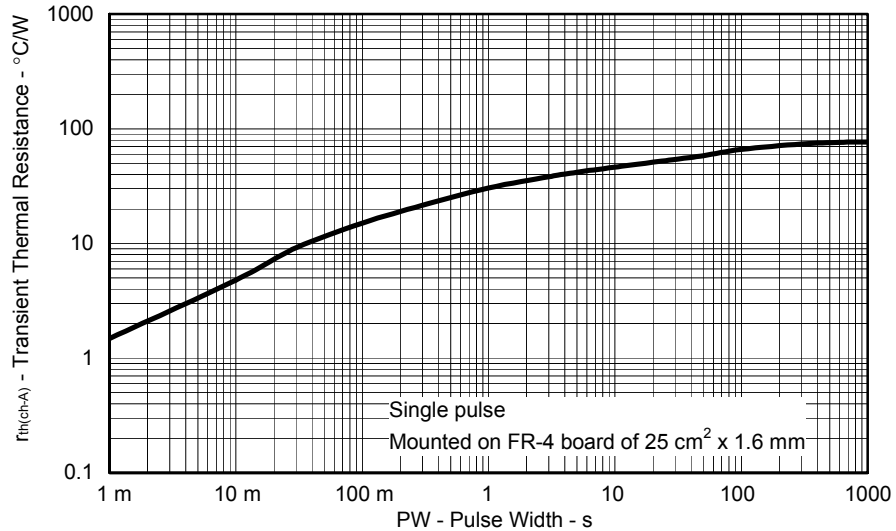
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



FORWARD BIAS SAFE OPERATING AREA

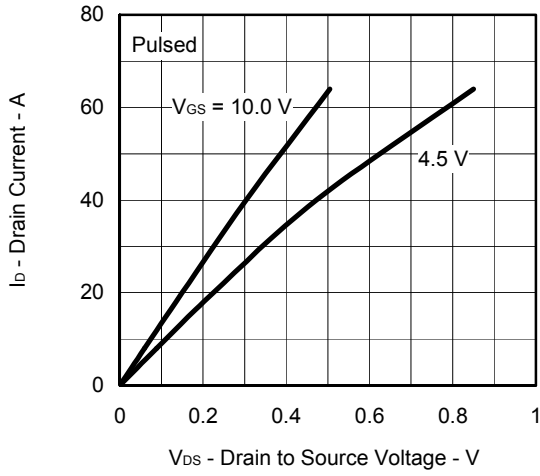


TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

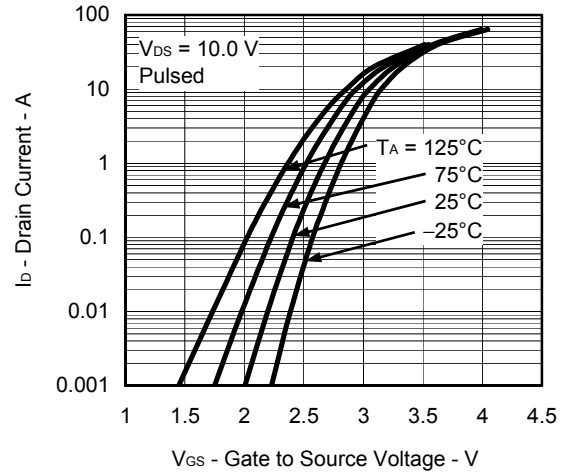


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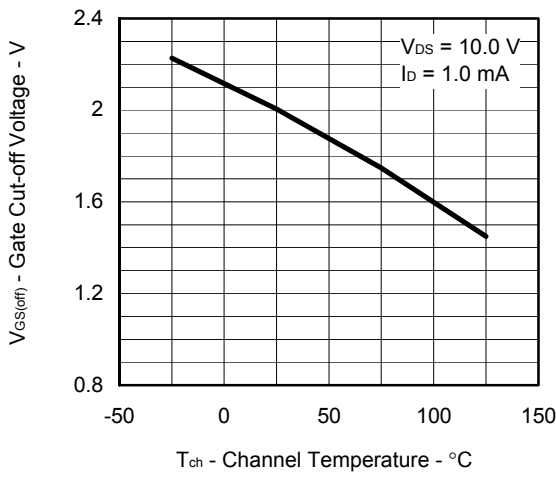
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



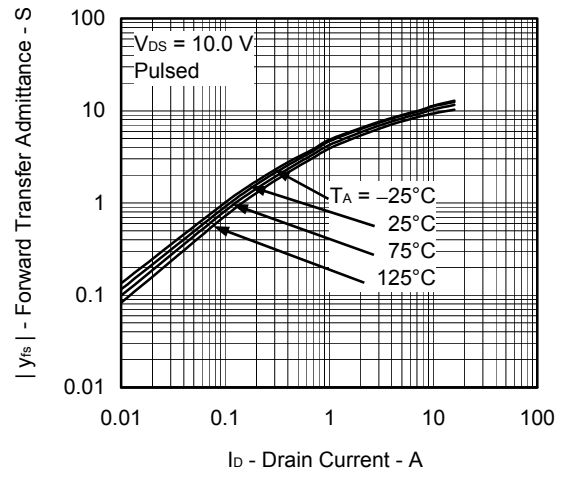
FORWARD TRANSFER CHARACTERISTICS



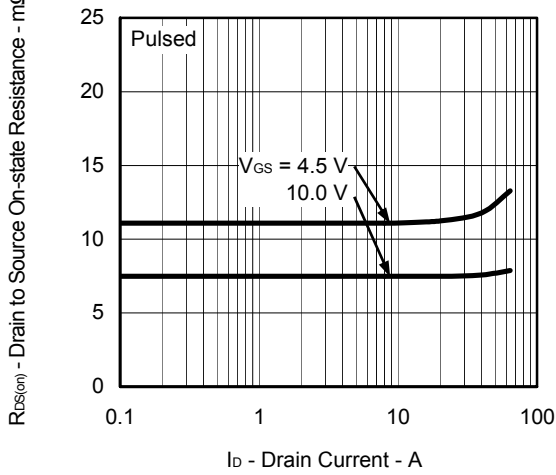
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



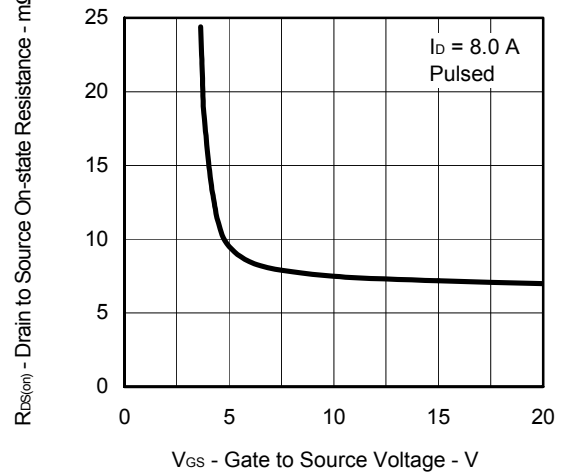
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



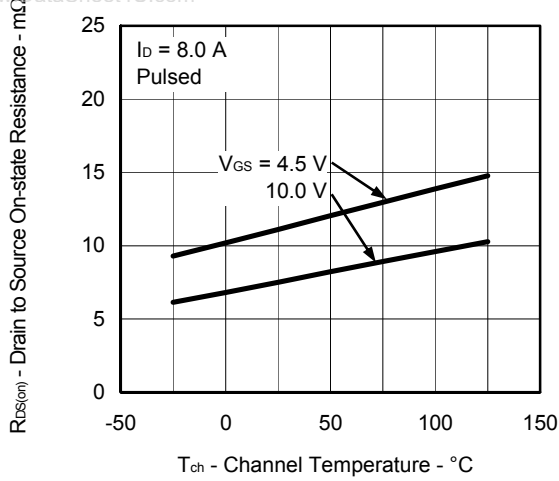
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



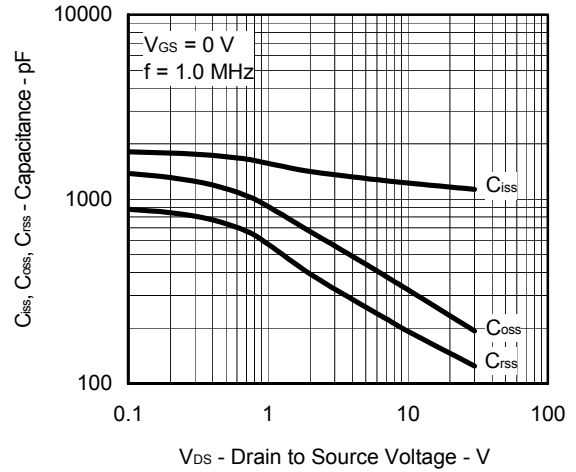
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



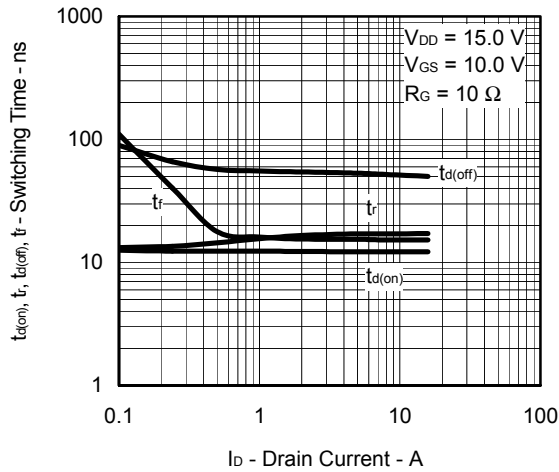
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



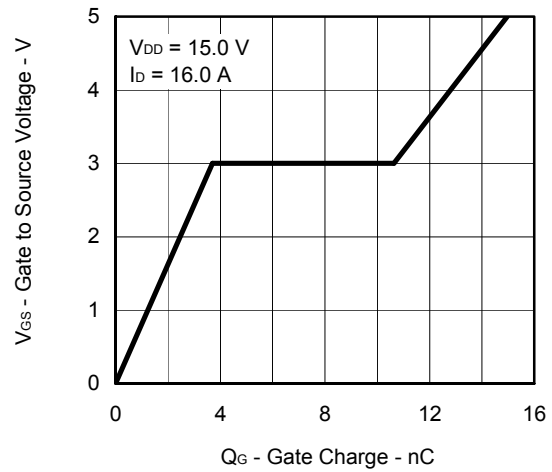
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



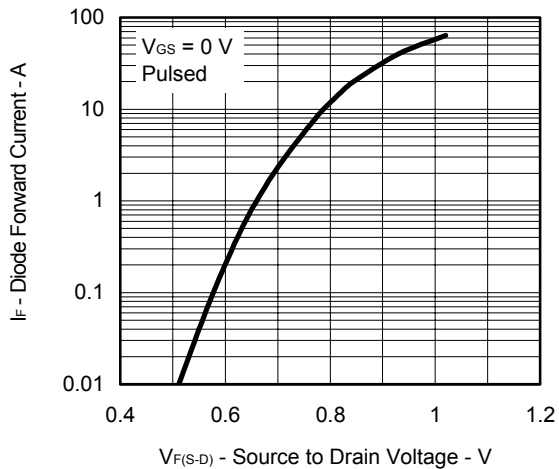
SWITCHING CHARACTERISTICS



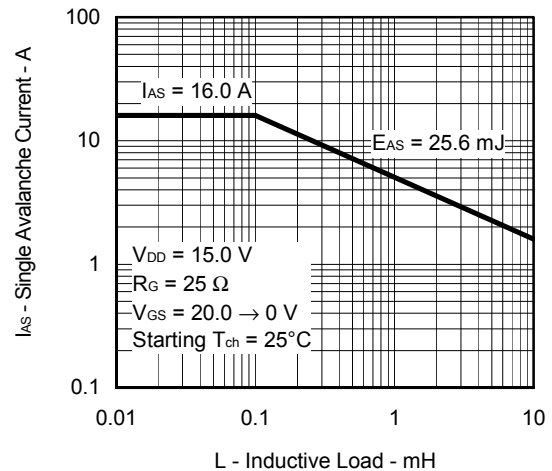
DYNAMIC INPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



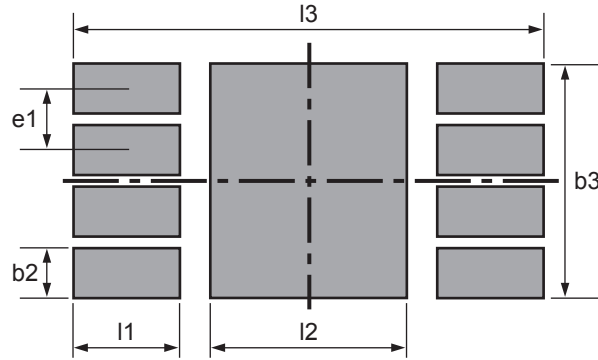
SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD



EXAMPLE OF THE LAND PATTERN

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Please optimize the land pattern in consideration of density, appearance of solder fillets, common difference, etc in an actual design.



- e1: 0.65
 - b2: 0.35
 - b3: 2.7
 - l1: 1.3
 - l2: 3.7
 - l3: 7.1
- (Unit: mm)

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