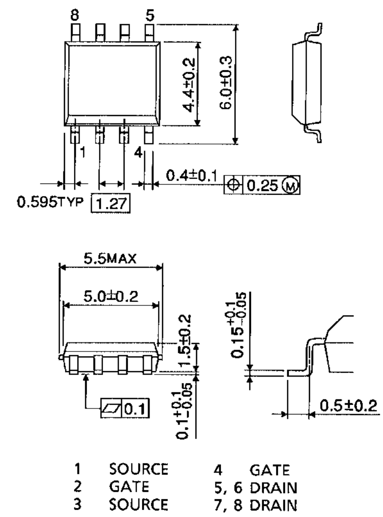
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (π•MOSVI)

TPC8201

Lithium Ion Battery Applications
Portable Equipment Applications
Notebook PCs

Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-6J1E

Weight: 0.08 g (typ.)

- Low drain−source ON resistance : $R_{DS\ (ON)}$ = 37 mΩ (typ.)
- High forward transfer admittance : $|Y_{fs}|$ = 6 S (typ.)
- Low leakage current : I_{DSS} = 10 μA (max) (V_{DS} = 30 V)
- Enhancement−mode : V_{th} = 0.8~2.0 V (V_{DS} = 10 V, I_D = 1 mA)

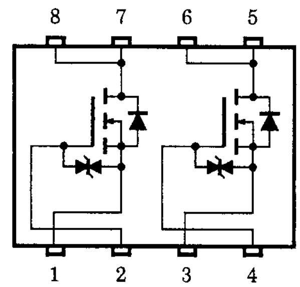
Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	30	V
Drain-gate voltage (R_{GS} = 20kΩ)		V_{DGR}	30	V
Gate-source voltage		V_{GSS}	±20	V
Drain curren	D C (Note 1)	I_D	5	A
	Pulse (Note 1)	I_{DP}	20	
Drain power dissipation (t = 10s) (Note 2a)	Single-device operation (Note 3a)	$P_{D\ (1)}$	1.5	W
	Single-device value at dual operation (Note 3b)	$P_{D(2)}$	1.1	
Drain power dissipation (t = 10s) (Note 2b)	Single-device operation (Note 3a)	$P_{D\ (1)}$	0.75	W
	Single-device value at dual operation (Note 3b)	$P_{D\ (2)}$	0.45	
Single pulse avalanche energy (Note 4)		E_{AS}	32.5	mJ
Avalanche current		I_{AR}	5	A
Repetitive avalanche energy Single-device value at operation (Note 2a, 3b, 5)		E_{AR}	0.1	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	•55~150	°C

Note: For (Note 1), (Note 2a), (Note 2b), (Note 3a), (Note 3b), (Note 4) and (Note 5) please refer to the next page.

This transistor is an electrostatic sensitive device. Please handle with caution.

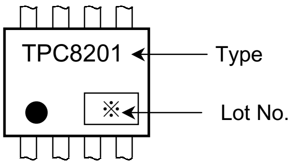
Circuit Configuration



Thermal Characteristics

Characteristics		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10s) (Note 2a)	Single-device operation (Note 3a)	$R_{th\ (ch\text{-}a)\ (1)}$	83.3	°C/W
	Single-device value at dual operation (Note 3b)	$R_{th\ (ch\text{-}a)\ (2)}$	114	
Thermal resistance, channel to ambient (t = 10s) (Note 2b)	Single-device operation (Note 3a)	$R_{th\ (ch\text{-}a)\ (1)}$	167	
	Single-device value at dual operation (Note 3b)	$R_{th\ (ch\text{-}a)\ (2)}$	278	

Marking (Note 6)

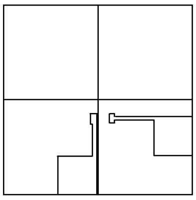


Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2:

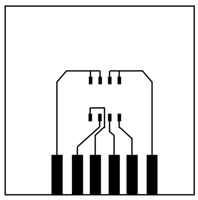
a) Device mounted on a glass-epoxy board (a)

b) Device mounted on a glass-epoxy board (b)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

(a)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

(b)

Note 3:

a) The power dissipation and thermal resistance values are shown for a single device (During single-device operation, power is only applied to one device.).

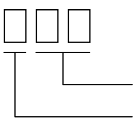
b) The power dissipation and thermal resistance values are shown for a single device (During dual operation, power is evenly applied to both devices.).

Note 4: V_{DD} = 16 V, T_{ch} = 25°C (initial), L = 1.0 mH, R_G = 25 Ω, I_{AR} = 6 A

Note 5: Repetitive rating; pulse width limited by maximum channel temperature.

Note 6: ● on lower right of the marking indicates Pin 1.

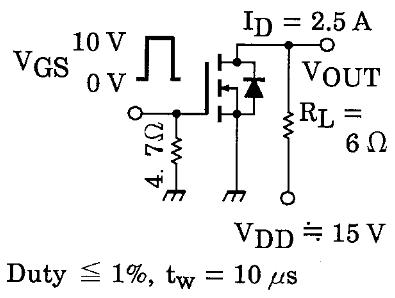
※ Weekly code:(Three digits)



Week of manufacture
(01 for first week of year, continues up to 52 or 53)

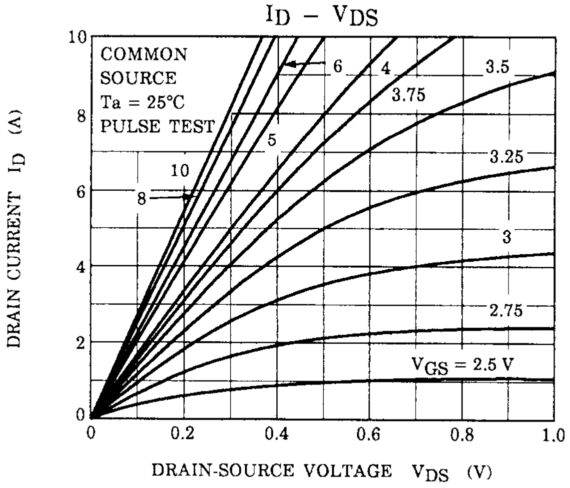
Year of manufacture
(One low-order digits of calendar year)

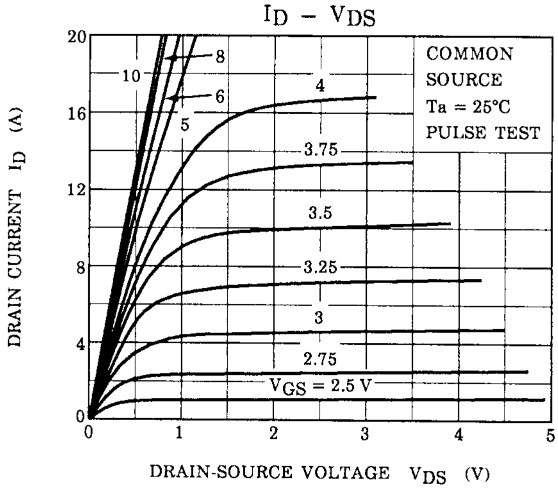
Electrical Characteristics (Ta = 25°C)

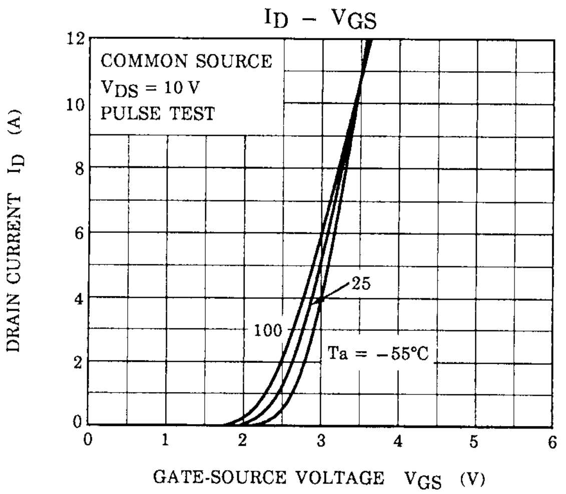
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V	—	—	±10	μA
Drain cut•off current	I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V	—	—	10	μA
Drain•source breakdown voltage	$V_{(BR)\ DSS}$	I_D = 10 mA, V_{GS} = 0 V	30	—	—	V
Gate threshold voltage	V_{th}	V_{DS} = 10 V, I_D = 1 mA	0.8	—	2.0	V
Drain•source ON resistance	$R_{DS\ (ON)}$	V_{GS} = 4 V, I_D = 2.5 A	—	58	80	mΩ
	$R_{DS\ (ON)}$	V_{GS} = 10 V, I_D = 2.5 A	—	37	50	mΩ
Forward transfer admittance	$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 2.5 A	3	6	—	S
Input capacitance	C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	475	—	pF
Reverse transfer capacitance	C_{rss}		—	85	—	
Output capacitance	C_{oss}		—	270	—	
Switching time: Rise time	t_r		—	10	—	ns
Switching time: Turn•on time	t_{on}		—	16	—	
Switching time: Fall time	t_f		—	13	—	
Switching time: Turn•off time	t_{off}		—	70	—	
Total gate charge (Gate•source plus gate•drain)	Q_g	V_{DD} ≈24 V, V_{GS} = 10 V, I_D = 5 A	—	16	—	nC
Gate•source charge	Q_{gs}		—	11	—	
Gate•drain (“miller”) charge	Q_{gd}		—	5	—	

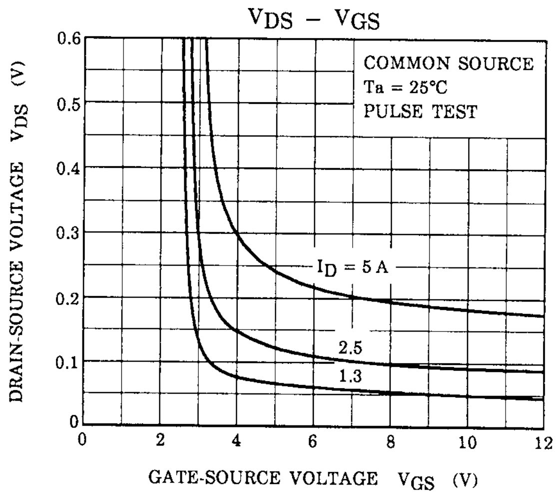
Source•Drain Ratings and Characteristics (Ta = 25°C)

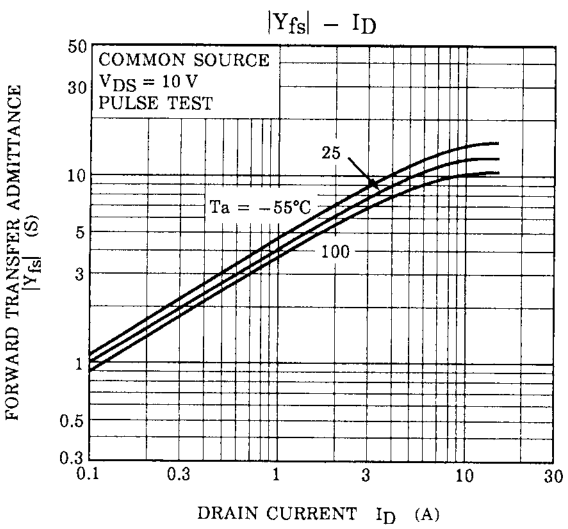
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	20	A
Forward voltage (diode)		V_{DSF}	I_{DR} = 5 A, V_{GS} = 0 V	—	—	•1.2	V

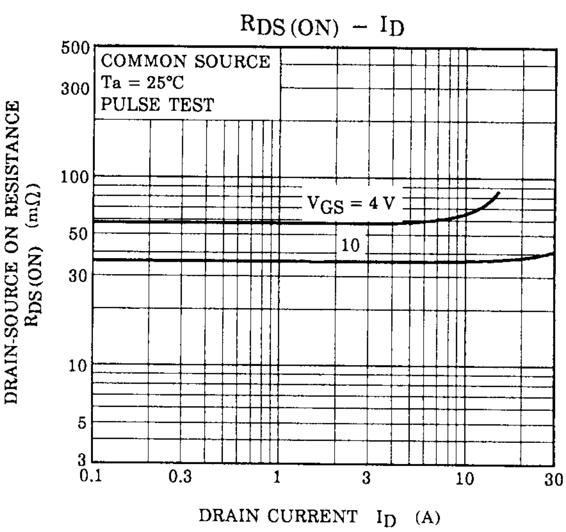

ID – VDS
COMMON SOURCE
Ta = 25°C
PULSE TEST
10
8
6
5
4
3.75
3.5
3.25
3
2.75
VGS = 2.5 V
DRAIN CURRENT ID (A)
DRAIN-SOURCE VOLTAGE VDS (V)

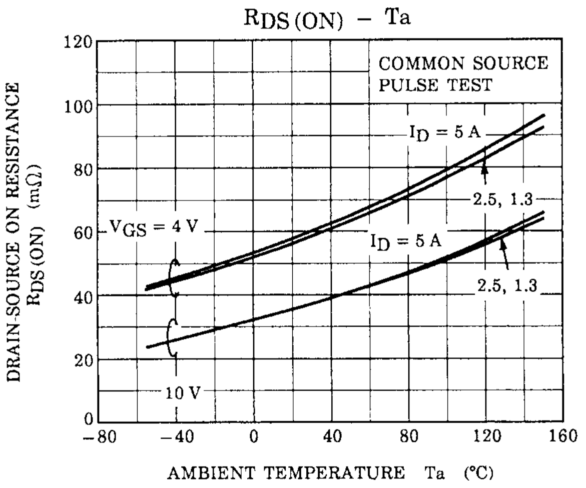

ID – VDS
COMMON SOURCE
Ta = 25°C
PULSE TEST
10
8
6
5
4
3.75
3.5
3.25
3
2.75
VGS = 2.5 V
DRAIN CURRENT ID (A)
DRAIN-SOURCE VOLTAGE VDS (V)

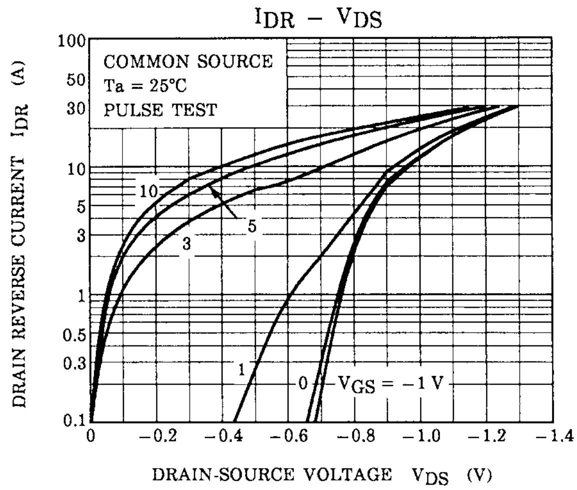

ID – VGS
COMMON SOURCE
VDS = 10 V
PULSE TEST
25
100
Ta = −55°C
DRAIN CURRENT ID (A)
GATE-SOURCE VOLTAGE VGS (V)

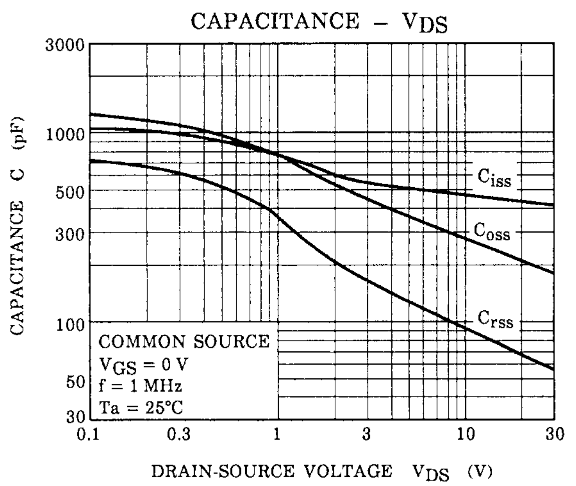

VDS – VGS
COMMON SOURCE
Ta = 25°C
PULSE TEST
ID = 5 A
2.5
1.3
DRAIN-SOURCE VOLTAGE VDS (V)
GATE-SOURCE VOLTAGE VGS (V)

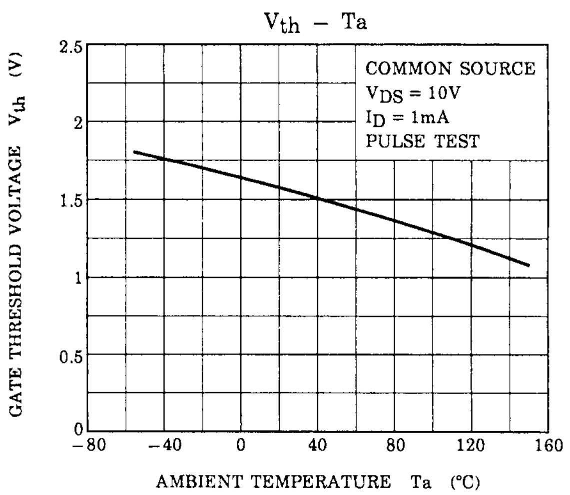

|Yfs| – ID
COMMON SOURCE
VDS = 10 V
PULSE TEST
25
Ta = −55°C
100
FORWARD TRANSFER ADMITTANCE |Yfs| (S)
DRAIN CURRENT ID (A)

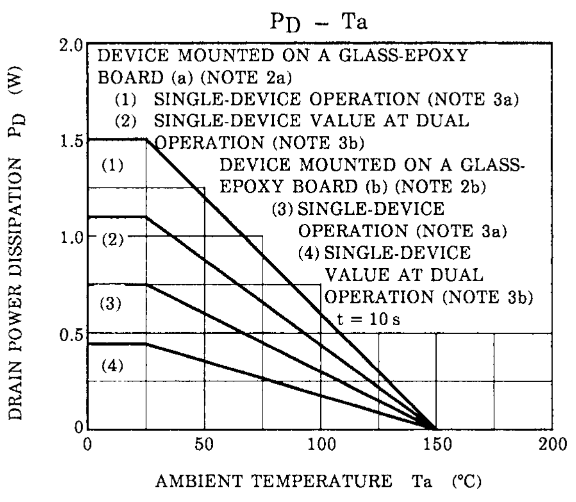

RDS (ON) – ID
COMMON SOURCE
Ta = 25°C
PULSE TEST
VGS = 4 V
10
DRAIN-SOURCE ON RESISTANCE RDS (ON) (mΩ)
DRAIN CURRENT ID (A)

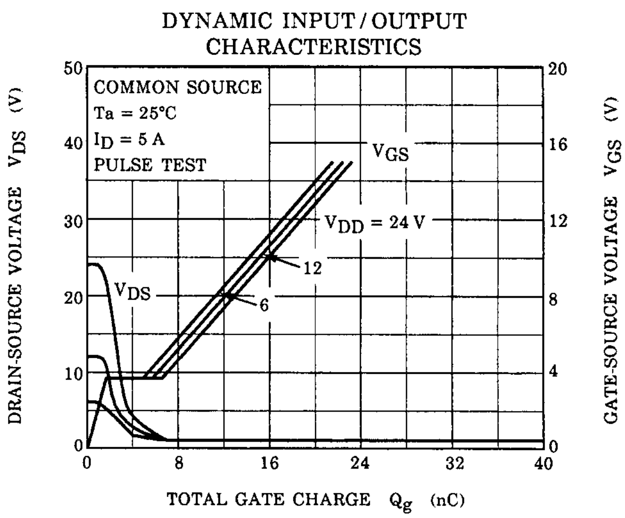

RDS (ON) – Ta
COMMON SOURCE
PULSE TEST
ID = 5 A
2.5, 1.3
VGS = 4 V
ID = 5 A
2.5, 1.3
10 V
DRAIN-SOURCE ON RESISTANCE RDS (ON) (mΩ)
AMBIENT TEMPERATURE Ta (°C)


IDR – VDS
COMMON SOURCE
Ta = 25°C
PULSE TEST
10
5
3
1
0
VGS = −1 V
DRAIN REVERSE CURRENT IDR (A)
DRAIN-SOURCE VOLTAGE VDS (V)

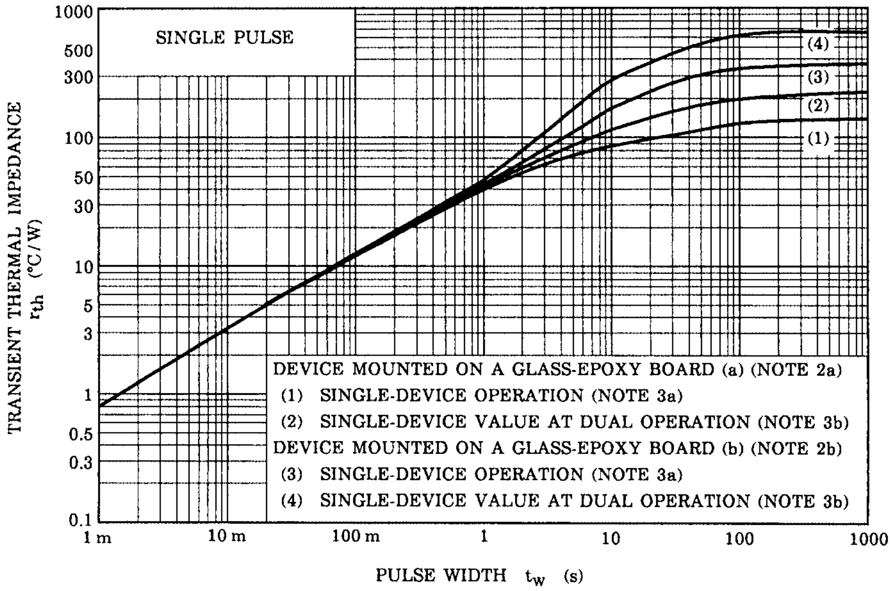

CAPACITANCE – VDS
Ciss
Coss
Crss
COMMON SOURCE
VGS = 0 V
f = 1 MHz
Ta = 25°C
CAPACITANCE C (pF)
DRAIN-SOURCE VOLTAGE VDS (V)


Vth – Ta
COMMON SOURCE
VDS = 10V
ID = 1mA
PULSE TEST
GATE THRESHOLD VOLTAGE Vth (V)
AMBIENT TEMPERATURE Ta (°C)

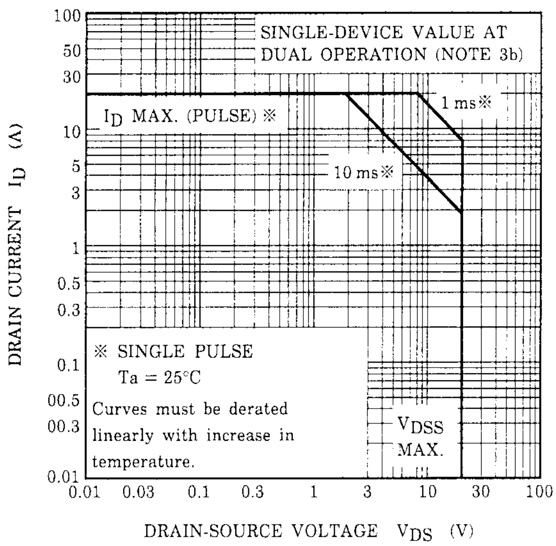

PD – Ta
DEVICE MOUNTED ON A GLASS-EPOXY BOARD (a) (NOTE 2a)
(1) SINGLE-DEVICE OPERATION (NOTE 3a)
(2) SINGLE-DEVICE VALUE AT DUAL OPERATION (NOTE 3b)
DEVICE MOUNTED ON A GLASS-EPOXY BOARD (b) (NOTE 2b)
(3) SINGLE-DEVICE OPERATION (NOTE 3a)
(4) SINGLE-DEVICE VALUE AT DUAL OPERATION (NOTE 3b)
t = 10 s
DRAIN POWER DISSIPATION PD (W)
AMBIENT TEMPERATURE Ta (°C)


DYNAMIC INPUT / OUTPUT CHARACTERISTICS
COMMON SOURCE
Ta = 25°C
ID = 5 A
PULSE TEST
VGS
VDD = 24 V
12
6
VDS
DRAIN-SOURCE VOLTAGE VDS (V)
GATE-SOURCE VOLTAGE VGS (V)
TOTAL GATE CHARGE Qg (nC)

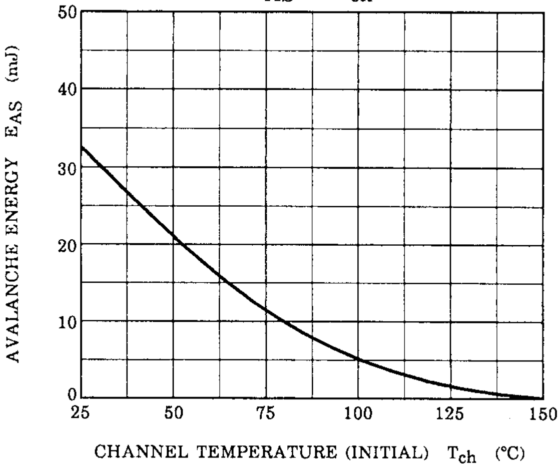
$r_{th} - t_w$

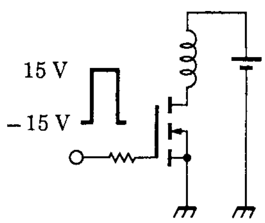


SAFE OPERATING AREA

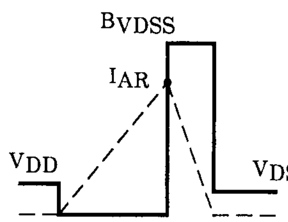


$E_{AS} - T_{ch}$





TEST CIRCUIT



WAVE FORM

T_{ch} = 25°C (Initial)
Peak I_{AR} = 5 A, R_G = 25 Ω
V_{DD} = 24 V, L = 1.0 mH

$$E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left(\frac{B_{VDSS}}{B_{VDSS} - V_{DD}}\right)$$

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000707EAA

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