

TOSHIBA POWER MOS FET MODULE SILICON N CHANNEL MOS TYPE (L²- π -MOS V 4 IN 1)

MP4210

HIGH POWER, HIGH SPEED SWITCHING APPLICATIONS
FOR PRINTER HEAD PIN DRIVER AND PULSE MOTOR DRIVER
FOR SOLENOID DRIVER

- 4 V Gate Drive Available
- Small Package by Full Molding (SIP 10 Pin)
- High Drain Power Dissipation (4 Devices Operation)
: $P_T = 4 \text{ W}$ ($T_a = 25^\circ\text{C}$)
- Low Drain-Source ON Resistance : $R_{DS(ON)} = 0.12 \Omega$ (typ.)
- High Forward Transfer Admittance : $|Y_{fs}| = 5.0 \text{ S}$ (typ.)
- Low Leakage Current : $I_{GSS} = \pm 10 \mu\text{A}$ (max.) ($V_{GS} = \pm 16 \text{ V}$)
 $I_{DSS} = 100 \mu\text{A}$ (max.) ($V_{DS} = 60 \text{ V}$)
- Enhancement-Mode : $V_{th} = 0.8 \sim 2.0 \text{ V}$
($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

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

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V_{DSS}	60	V
Drain-Gate Voltage ($R_{GS} = 20 \text{ k}\Omega$)		V_{DGR}	60	V
Gate-Source Voltage		V_{GSS}	± 20	V
Drain Current	DC	I_D	5	A
	Pulse	I_{DP}	20	
Drain Power Dissipation (1 Device Operation, $T_a = 25^\circ\text{C}$)		P_D	2.0	W
Drain Power Dissipation (4 Devices Operation, $T_a = 25^\circ\text{C}$)		P_{DT}	4.0	W
Single Pulse Avalanche Energy*		E_{AS}	129	mJ
Avalanche Current		I_{AR}	5	A
Repetitive Avalanche Energy**	1 Device Operation	E_{AR}	0.2	mJ
	4 Devices Operation	E_{ART}	0.4	
Channel Temperature		T_{ch}	150	$^\circ\text{C}$
Storage Temperature Range		T_{stg}	$-55 \sim 150$	$^\circ\text{C}$

Note ;

* Avalanche energy (single pulse) applied condition

 $V_{DD} = 25 \text{ V}$, Starting $T_{ch} = 25^\circ\text{C}$, $L = 7 \text{ mH}$, $R_G = 25 \Omega$, $I_{AR} = 5 \text{ A}$

** Repetitive rating; Pulse Width Limited by maximum channel temperature.

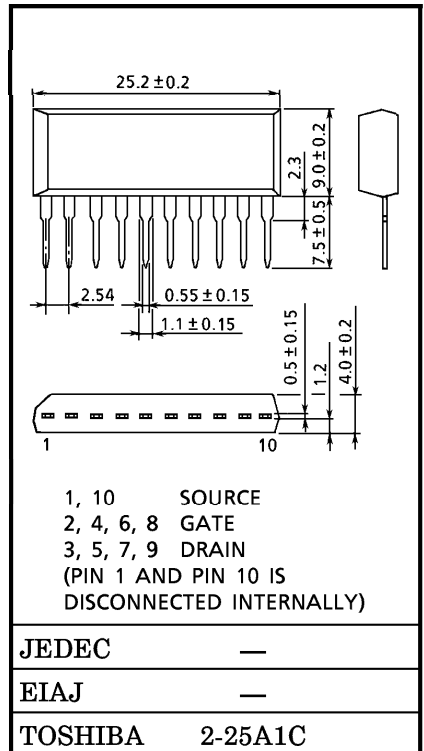
This transistor is an electrostatic sensitive device. Please handle with caution.

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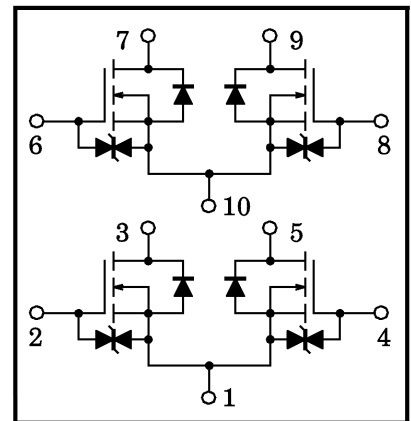
INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 2.1 g (typ.)

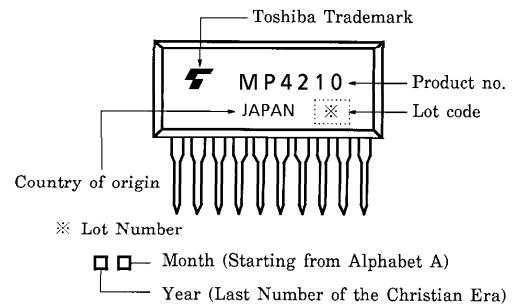
ARRAY CONFIGURATION



THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance of Channel to Ambient (4 Devices Operation, $T_a = 25^\circ\text{C}$)	$\Sigma R_{\text{th(ch-a)}}$	31.2	$^\circ\text{C/W}$
Maximum Lead Temperature for Soldering Purposes (3.2 mm from Case for $t = 10$ s)	T_L	260	$^\circ\text{C}$

MARKING

ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

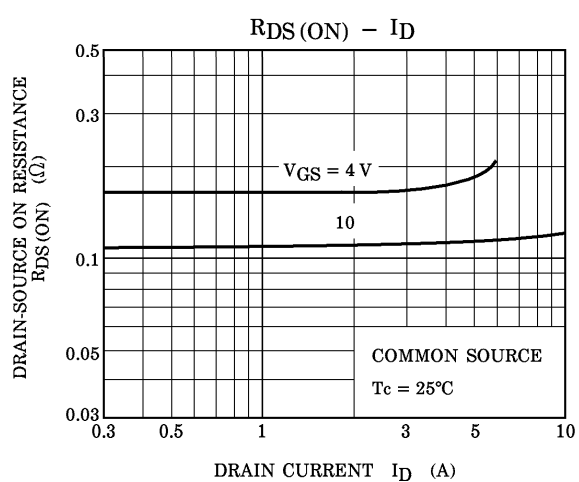
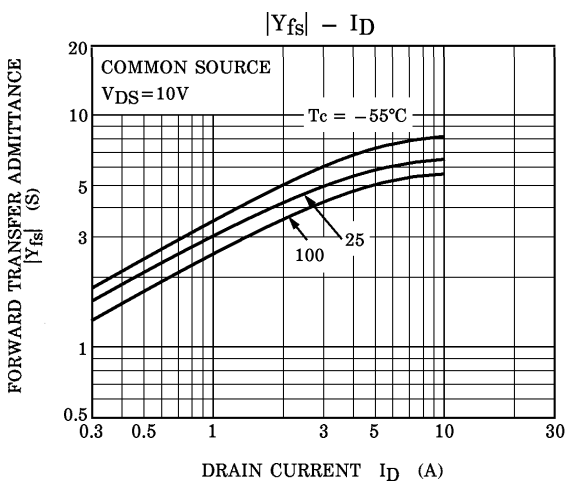
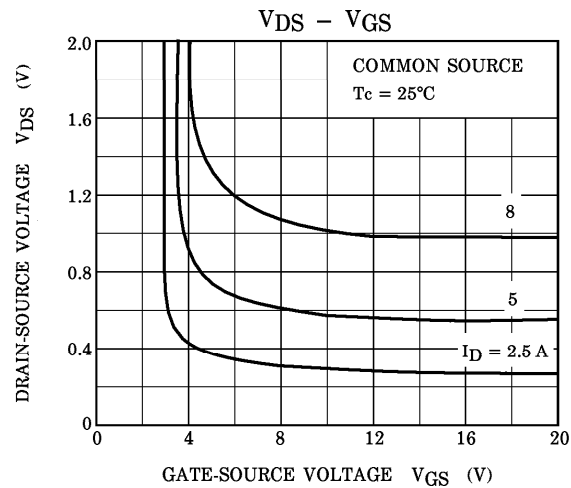
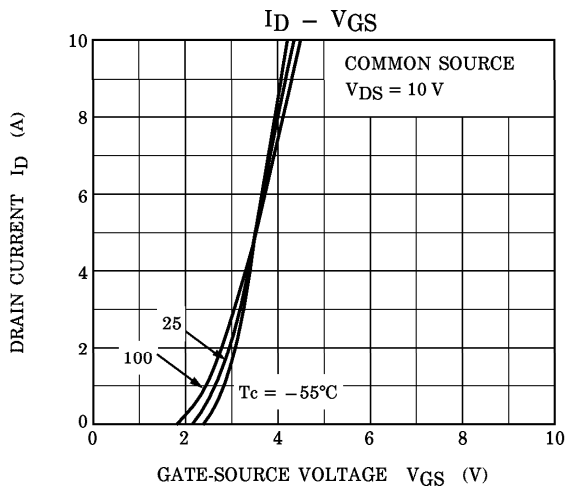
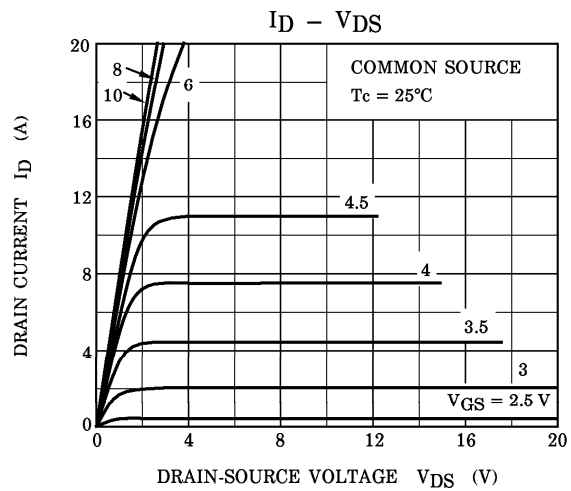
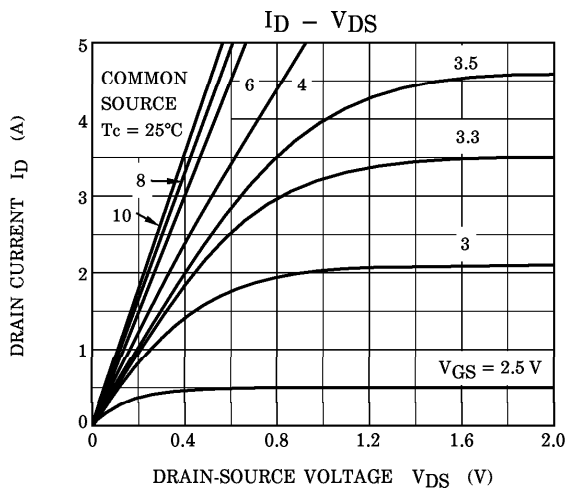
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GSS}	$V_{\text{GS}} = \pm 16 \text{ V}, V_{\text{DS}} = 0 \text{ V}$	—	—	± 10	μA
Drain Cut-off Current		I_{DSS}	$V_{\text{DS}} = 60 \text{ V}, V_{\text{GS}} = 0 \text{ V}$	—	—	100	μA
Drain-Source Breakdown Voltage		$V_{(\text{BR})\text{DSS}}$	$I_{\text{D}} = 10 \text{ mA}, V_{\text{GS}} = 0 \text{ V}$	60	—	—	V
Gate Threshold Voltage		V_{th}	$V_{\text{DS}} = 10 \text{ V}, I_{\text{D}} = 1 \text{ mA}$	0.8	—	2.0	V
Drain-Source ON Resistance		$R_{\text{DS(ON)}}$	$V_{\text{GS}} = 4 \text{ V}, I_{\text{D}} = 2.5 \text{ A}$	—	0.21	0.32	Ω
			$V_{\text{GS}} = 10 \text{ V}, I_{\text{D}} = 2.5 \text{ A}$	—	0.12	0.16	
Forward Transfer Admittance		$ Y_{\text{fs}} $	$V_{\text{DS}} = 10 \text{ V}, I_{\text{D}} = 2.5 \text{ A}$	3.0	5.0	—	S
Input Capacitance		C_{iss}	$V_{\text{DS}} = 10 \text{ V}, V_{\text{GS}} = 0 \text{ V}$ $f = 1 \text{ MHz}$	—	370	—	pF
Reverse Transfer Capacitance		C_{rss}		—	60	—	
Output Capacitance		C_{oss}		—	180	—	
Switching Time	Rise Time	t_r		—	18	—	ns
	Turn-on Time	t_{on}		—	25	—	
	Fall Time	t_f		—	55	—	
	Turn-off Time	t_{off}		—	170	—	
Total Gate Charge (Gate-Source Plus Gate-Drain)		Q_g	$V_{\text{DD}} \cong 48 \text{ V}, V_{\text{GS}} = 10 \text{ V}$ $I_{\text{D}} = 5 \text{ A}$	—	12	—	nC
Gate-Source Charge		Q_{gs}		—	8	—	
Gate-Drain ("Miller") Charge		Q_{gd}		—	4	—	

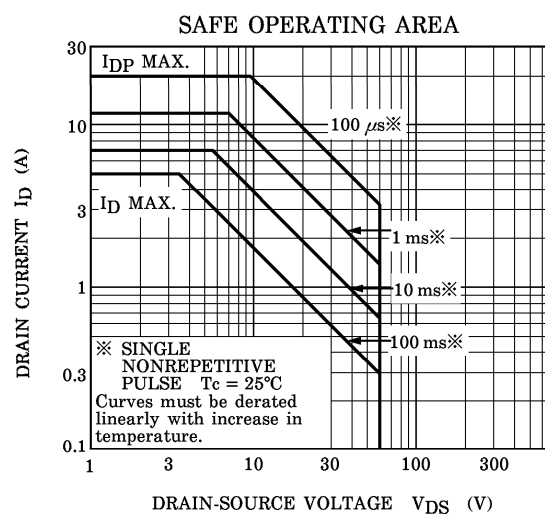
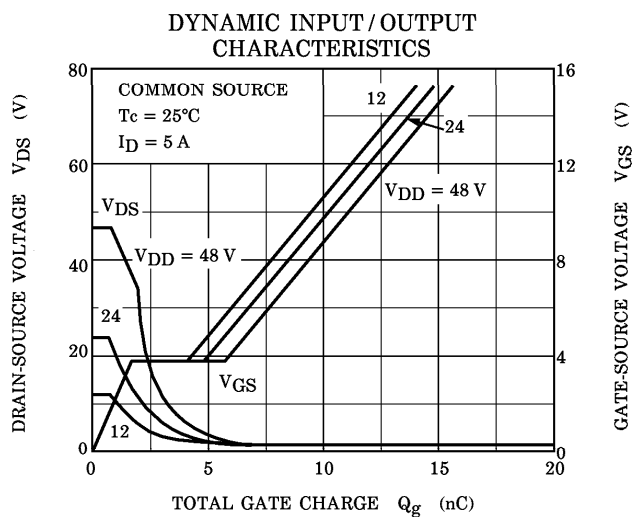
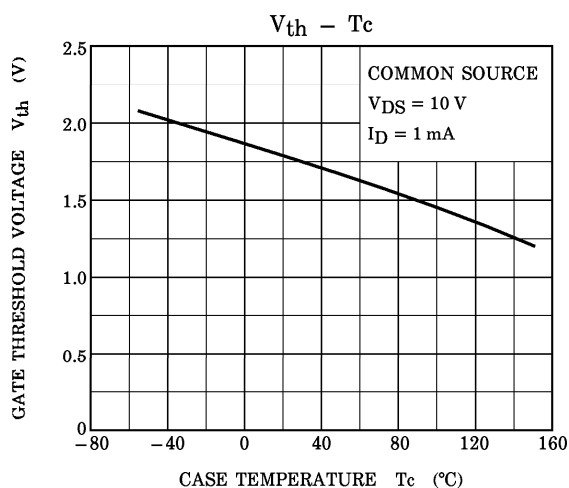
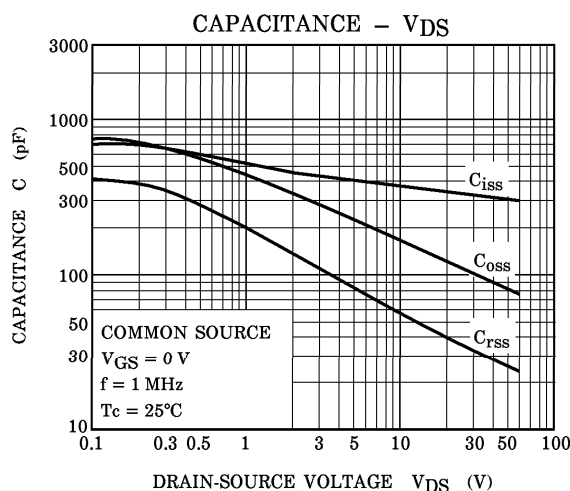
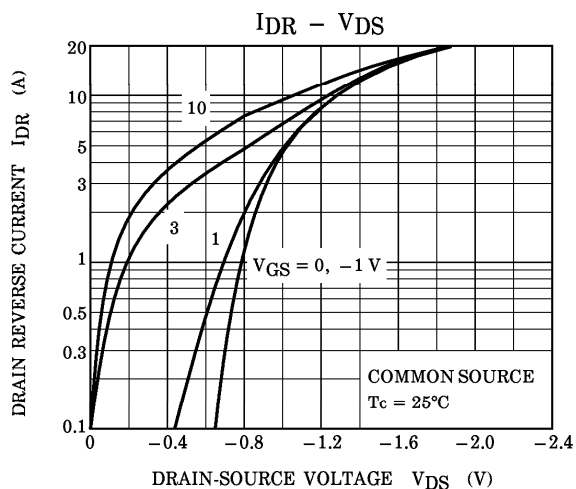
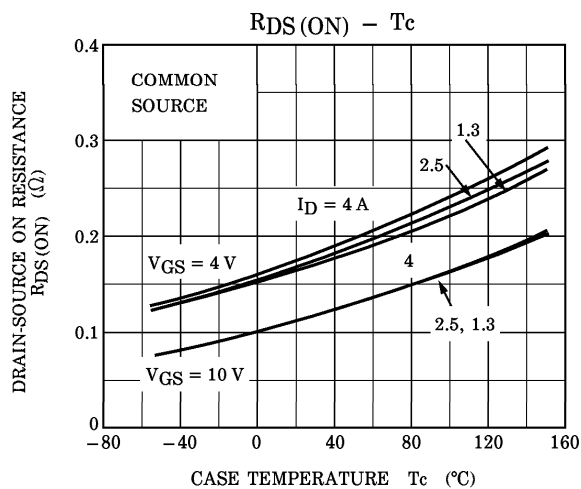
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

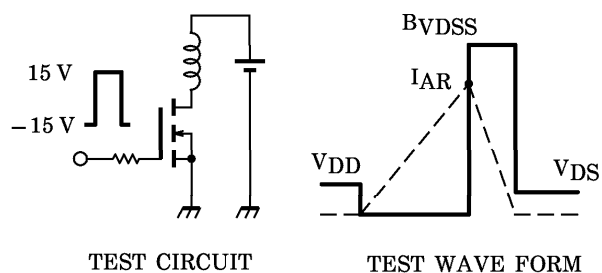
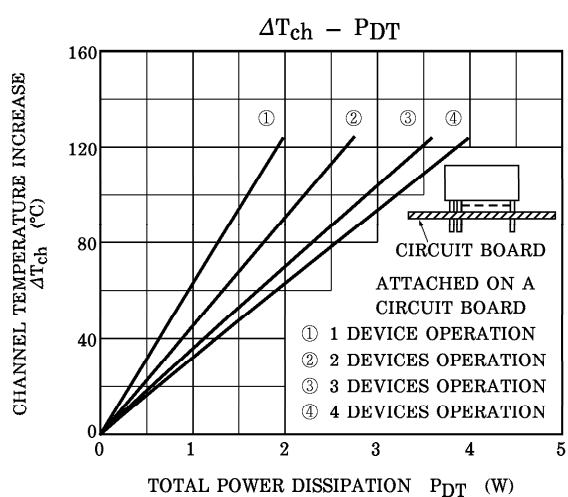
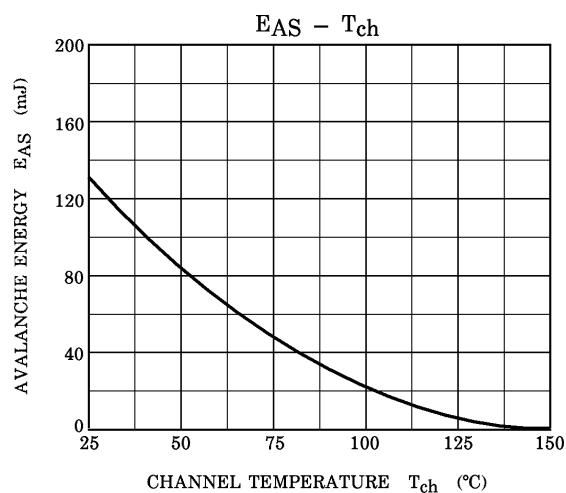
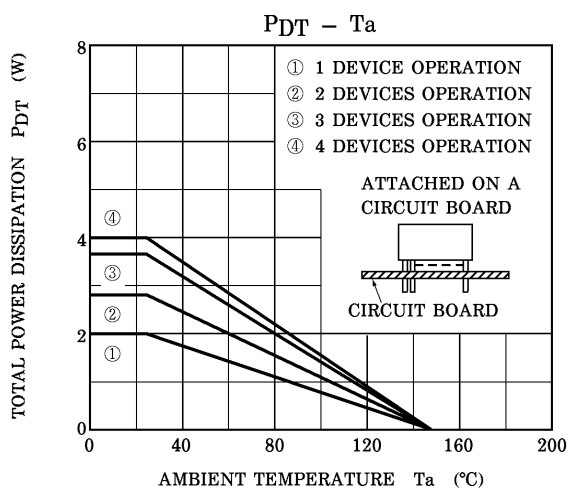
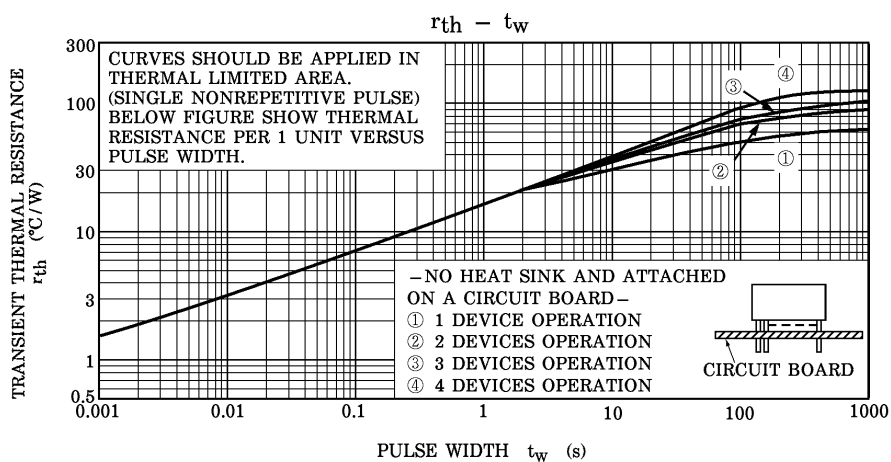
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	I_{DR}	—	—	—	5	A
Pulse Drain Reverse Current	I_{DRP}	—	—	—	20	A
Diode Forward Voltage	V_{DSF}	$I_{\text{DR}} = 5 \text{ A}, V_{\text{GS}} = 0 \text{ V}$	—	—	-1.7	V
Reverse Recovery Time	t_{rr}	$I_{\text{DR}} = 5 \text{ A}, V_{\text{GS}} = 0 \text{ V}$	—	70	—	ns
Reverse Recovery Charge	Q_{rr}	$dI_{\text{DR}}/dt = 50 \text{ A}/\mu\text{s}$	—	0.1	—	μC

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Peak $I_{AR} = 5 \text{ A}$, $R_G = 25 \Omega$
 $V_{DD} = 25 \text{ V}$, $L = 7 \text{ mH}$

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