

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOSII)

## 2SK2986

## DC-DC Converter, Relay Drive and Motor Drive Applications

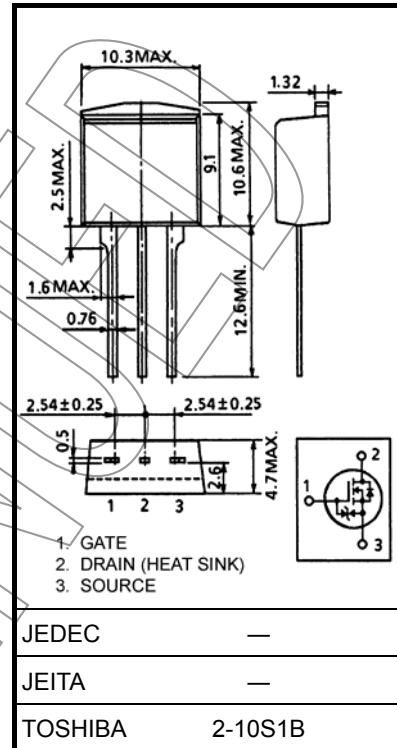
Unit: mm

- Low drain-source ON resistance :  $R_{DS(ON)} = 4.5 \text{ m}\Omega$  (typ.)
- High forward transfer admittance :  $|Y_{fs}| = 80 \text{ S}$  (typ.)
- Low leakage current :  $I_{DSS} = 100 \mu\text{A}$  (max) ( $V_{DS} = 60 \text{ V}$ )
- Enhancement mode :  $V_{th} = 1.3$  to  $2.5 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

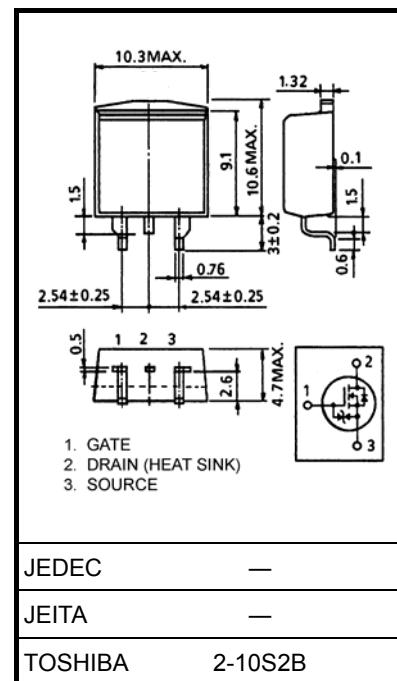
Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics	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	$V_{GSS}$	$\pm 20$	V
Drain current	DC (Note 1)	$I_D$	55
	Pulse ( $t \leq 10 \text{ s}$ ) (Note 1)	$I_{DP}$	70
	Pulse ( $t \leq 1 \text{ ms}$ ) (Note 1)	$I_{DP}$	280
Drain power dissipation ( $T_c = 25^\circ\text{C}$ )	$P_D$	100	W
Single pulse avalanche energy (Note 2)	$E_{AS}$	525	mJ
Avalanche current	$I_{AR}$	55	A
Repetitive avalanche energy (Note 3)	$E_{AR}$	10	mJ
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-55 to 150	$^\circ\text{C}$

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).



Weight: 1.5 g (typ.)



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## Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th}(\text{ch-c})$	1.25	$^\circ\text{C} / \text{W}$
Thermal resistance, channel to ambient	$R_{th}(\text{ch-a})$	83.3	$^\circ\text{C} / \text{W}$

Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2:  $V_{DD} = 25 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 236 \mu\text{H}$ ,  $I_{AR} = 55 \text{ A}$ ,  $R_G = 25 \Omega$ 

Note 3: Repetitive rating: pulse width limited by maximum channel temperature

This transistor is an electrostatic-sensitive device.

Please handle with caution.

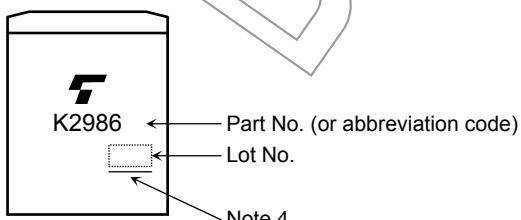
Electrical Characteristics ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 16\text{ V}$ , $V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-off current	$I_{DSS}$	$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$	—	—	100	$\mu\text{A}$
Drain-source breakdown voltage	$V_{(\text{BR})\text{DSS}}$	$I_D = 10\text{ mA}$ , $V_{GS} = 0\text{ V}$	60	—	—	V
	$V_{(\text{BR})\text{DSX}}$	$I_D = 10\text{ mA}$ , $V_{GS} = -20\text{ V}$	40	—	—	
Gate threshold voltage	$V_{th}$	$V_{DS} = 10\text{ V}$ , $I_D = 1\text{ mA}$	1.3	—	2.5	V
Drain-source ON resistance	$R_{DS\text{ (ON)}}$	$V_{GS} = 10\text{ V}$ , $I_D = 35\text{ A}$	—	4.5	5.8	$\text{m}\Omega$
		$V_{GS} = 4\text{ V}$ , $I_D = 35\text{ A}$	—	5.8	10	
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 10\text{ V}$ , $I_D = 35\text{ A}$	40	80	—	S
Input capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$	—	9300	—	pF
Reverse transfer capacitance	$C_{rss}$		—	910	—	
Output capacitance	$C_{oss}$		—	1435	—	
Switching time	Rise time	$t_r$		18	—	ns
	Turn-on time	$t_{on}$		50	—	
	Fall time	$t_f$		110	—	
	Turn-off time	$t_{off}$		480	—	
Total gate charge (gate-source plus gate-drain)	$Q_g$		—	210	—	nC
Gate-source charge	$Q_{gs}$		—	145	—	
Gate-drain ("miller") Charge	$Q_{gd}$		—	65	—	

Source-Drain Ratings and Characteristics ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	$I_{DR}$	—	—	—	55	A
Pulse drain reverse current (Note 1)	$I_{DRP}$	$t \leq 10\text{ s}$	—	—	70	A
		$t \leq 1\text{ ms}$	—	—	280	
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = 55\text{ A}$ , $V_{GS} = 0\text{ V}$	—	—	-1.5	V
Reverse recovery time	$t_{rr}$	$I_{DR} = 55\text{ A}$ , $V_{GS} = 0\text{ V}$ , $dI_{DR} / dt = 50\text{ A} / \mu\text{s}$	—	60	—	ns
Reverse recovery charge	$Q_{rr}$		—	50	—	nC

## Marking

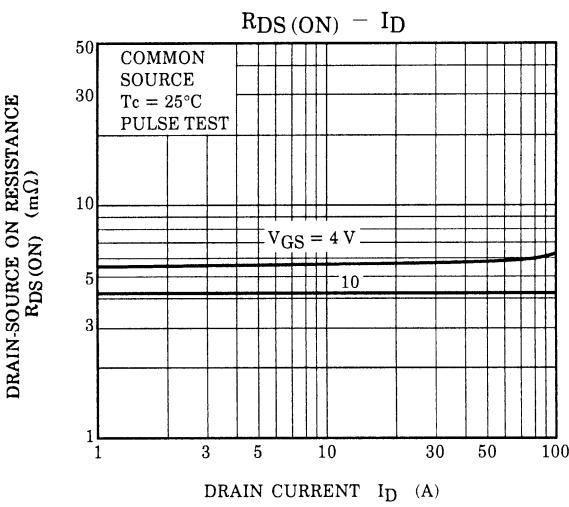
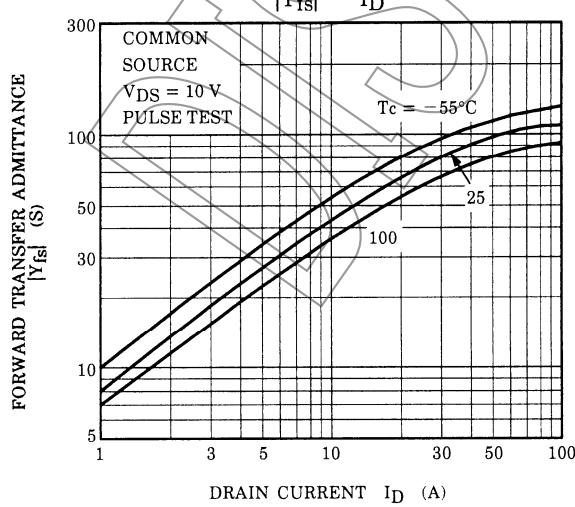
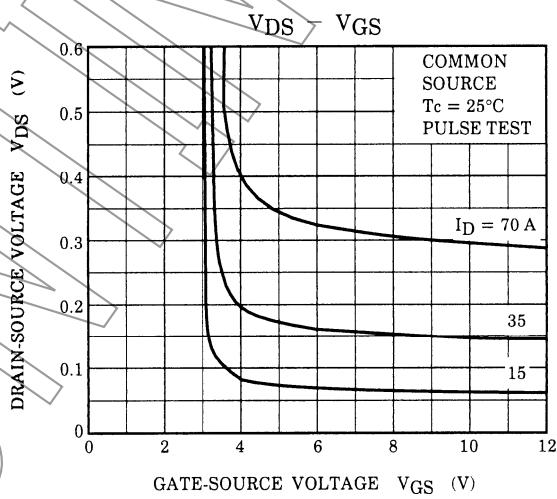
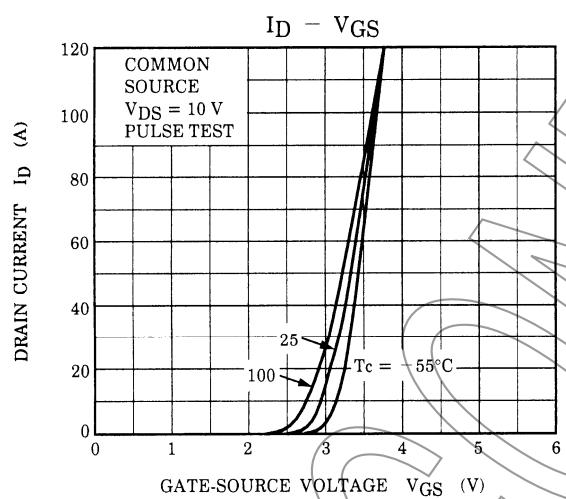
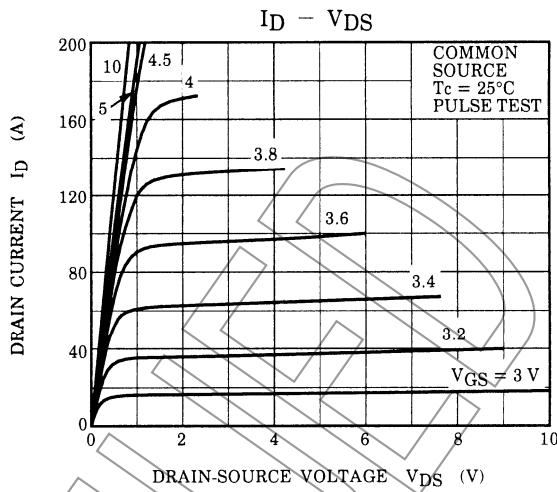
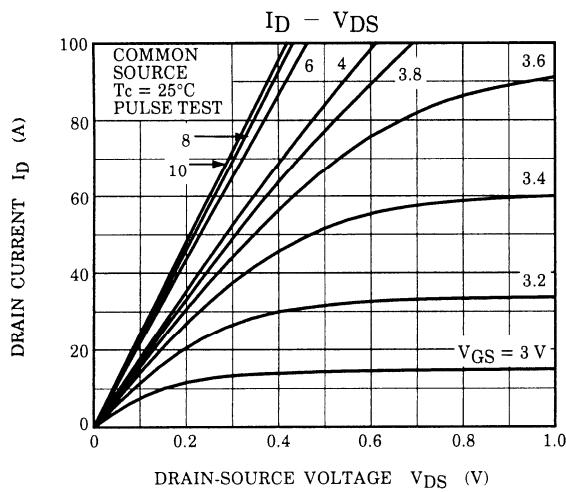


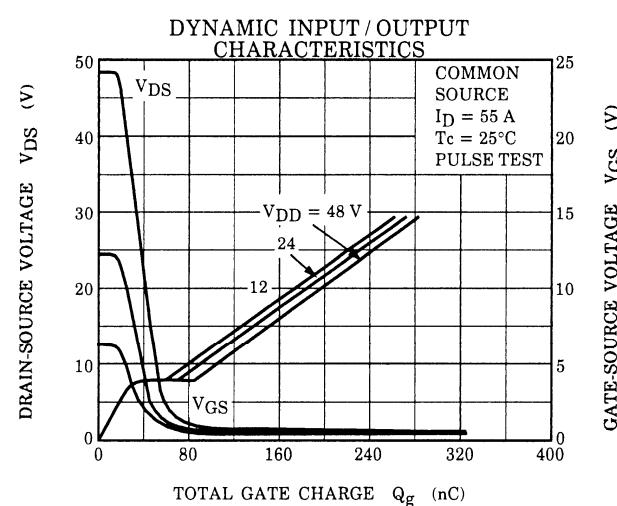
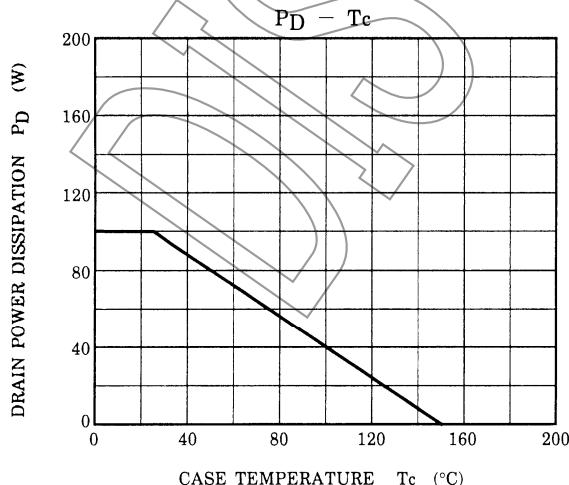
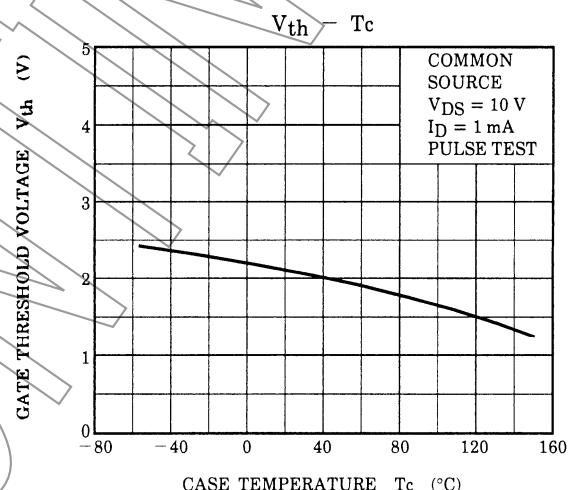
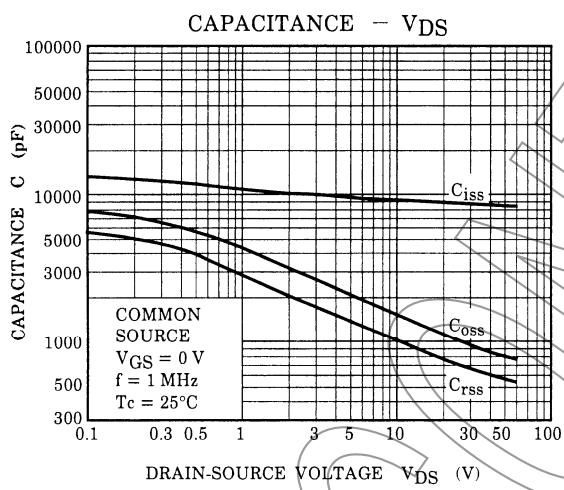
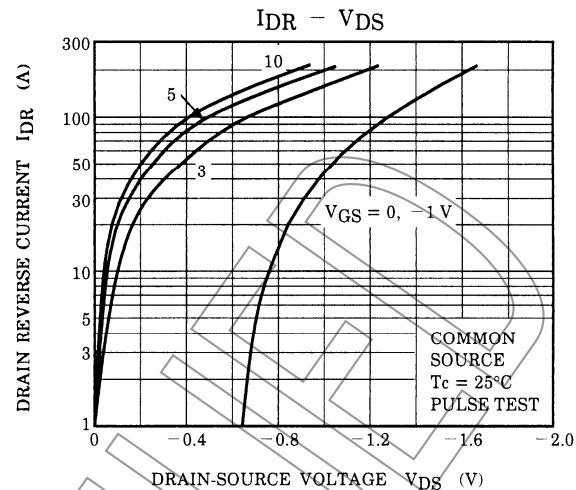
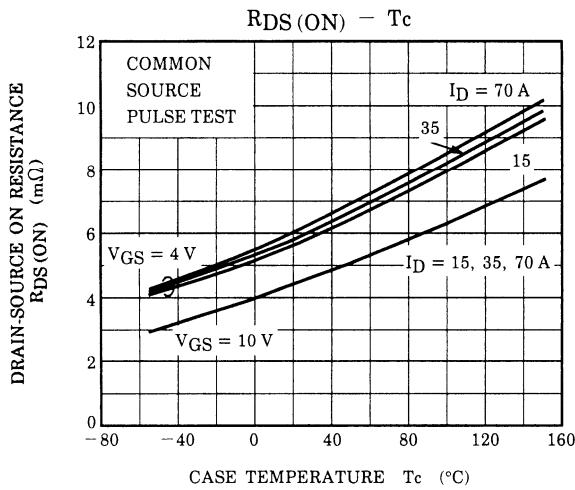
Note 4: A line under a Lot No. identifies the indication of product Labels.

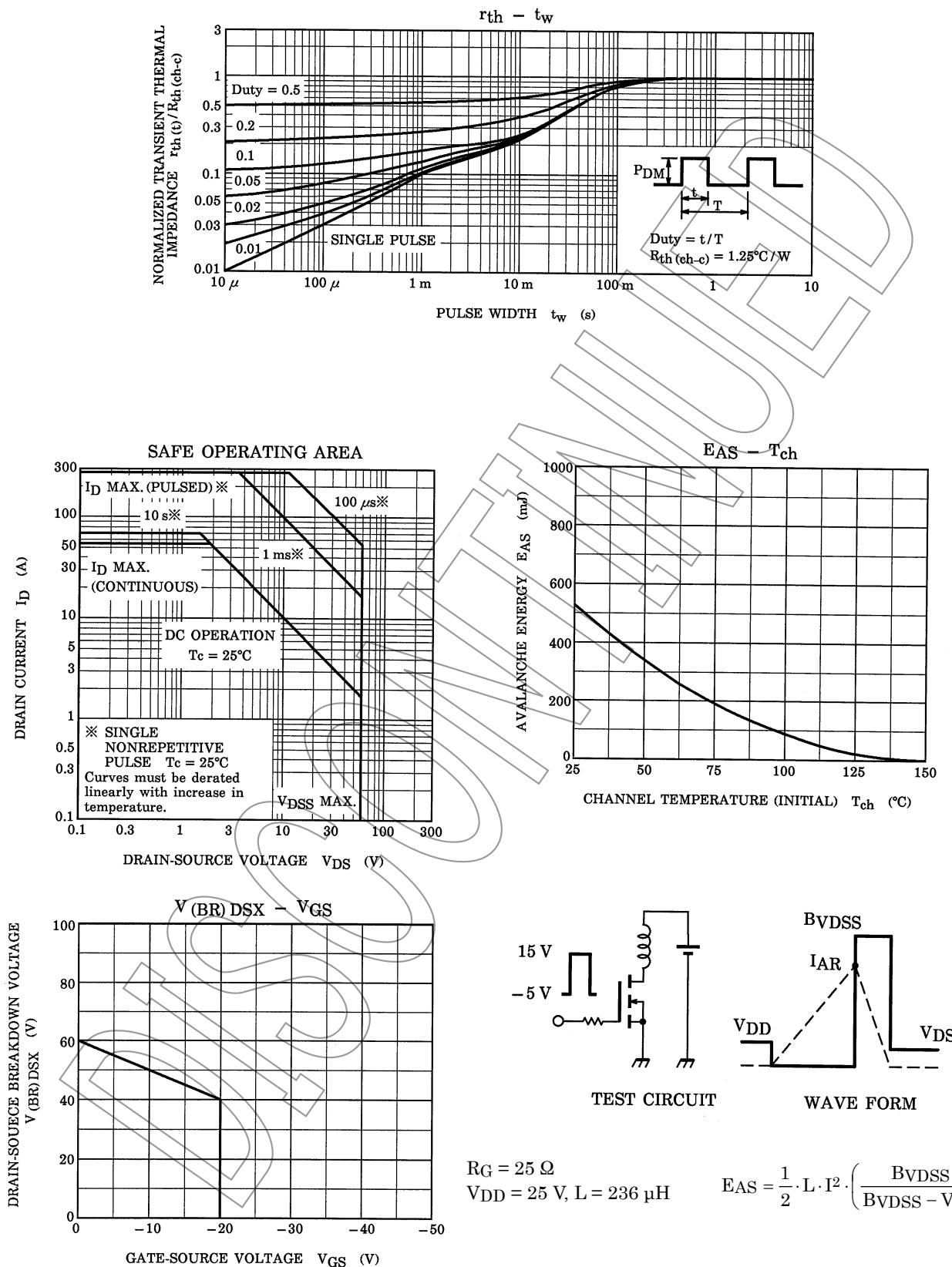
Not underlined: [[Pb]]/INCLUDES > MCV

Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

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