

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

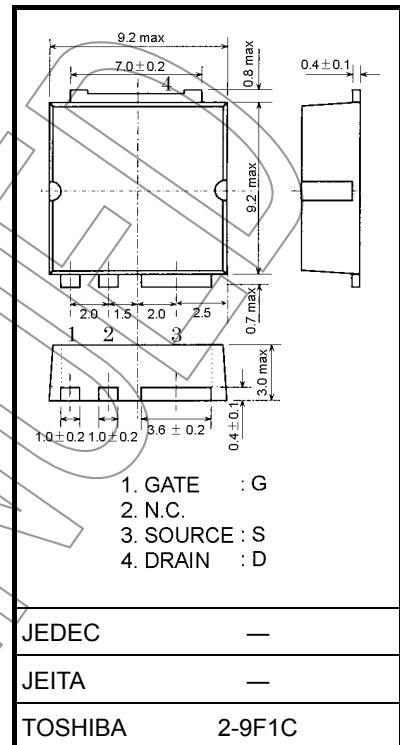
# 2SK3397

Relay Drive and DC-DC Converter Applications

Motor Drive Applications

- Low drain-source ON resistance:  $R_{DS(ON)} = 4.0 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 110 \text{ S}$  (typ.)
- Low leakage current:  $I_{DS} = 10 \mu\text{A}$  (max) ( $V_{DS} = 30 \text{ V}$ )
- Enhancement mode:  $V_{th} = 1.5$  to  $3.0 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

Unit: mm



Weight: 0.74 g (typ.)

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

Characteristics	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	30	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )	$V_{DGR}$	30	V
Gate-source voltage	$V_{GSS}$	±20	V
Drain current	$I_D$ (DC (Note 1))	70	A
	$I_{DP}$ (Pulse (Note 1))	210	
Drain power dissipation ( $T_c = 25^\circ\text{C}$ )	$P_D$	125	W
Single pulse avalanche energy (Note 2)	$E_{AS}$	273	mJ
Avalanche current	$I_{AR}$	70	A
Repetitive avalanche energy (Note 3)	$E_{AR}$	12.5	mJ
Channel temperature	$T_{ch}$	150	°C
Storage temperature range	$T_{stg}$	-55 to 150	°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).

## Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	1.0	°C/W

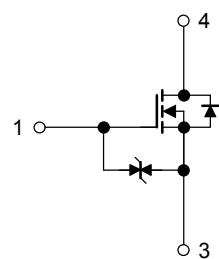
Note 1: Ensure that the channel temperature does not exceed  $150^\circ\text{C}$ .

Note 2:  $V_{DD} = 25 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 40 \mu\text{H}$ ,  $I_{AR} = 70 \text{ A}$ ,  $R_G = 25 \Omega$

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

This transistor is an electrostatic-sensitive device. Handle with care.

## Circuit Configuration



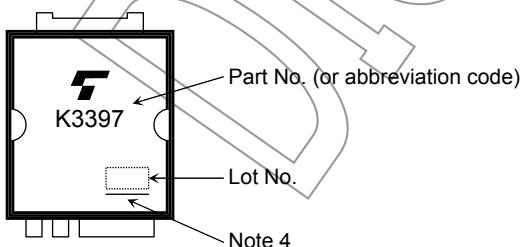
Electrical Characteristics ( $T_a = 25^\circ C$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 16 V, V_{DS} = 0 V$	—	—	$\pm 10$	$\mu A$
Drain cut-OFF current	$I_{DSS}$	$V_{DS} = 30 V, V_{GS} = 0 V$	—	—	10	$\mu A$
Drain-source breakdown voltage	$V_{(BR) DSS}$	$I_D = 10 mA, V_{GS} = 0 V$	30	—	—	V
	$V_{(BR) DSX}$	$I_D = 10 mA, V_{GS} = -20 V$	15	—	—	
Gate threshold voltage	$V_{th}$	$V_{DS} = 10 V, I_D = 1 mA$	1.5	—	3.0	V
Drain-source ON resistance	$R_{DS} (\text{ON})$	$V_{GS} = 10 V, I_D = 35 A$	—	4.0	6.0	$m\Omega$
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 10 V, I_D = 35 A$	55	110	—	S
Input capacitance	$C_{iss}$	$V_{DS} = 10 V, V_{GS} = 0 V, f = 1 \text{ MHz}$	—	5000	—	pF
Reverse transfer capacitance	$C_{rss}$		—	550	—	
Output capacitance	$C_{oss}$		—	1000	—	
Switching time	Rise time	$t_r$		—	8.0	—
	Turn-ON time	$t_{on}$		—	25	—
	Fall time	$t_f$		—	48	—
	Turn-OFF time	$t_{off}$		—	180	—
Total gate charge (gate-source plus gate-drain)	$Q_g$	$V_{DD} \approx 24 V, V_{GS} = 10 V, I_D = 70 A$	—	110	—	nC
Gate-source charge	$Q_{gs}$		—	87	—	
Gate-drain ("miller") charge	$Q_{gd}$		—	23	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	$I_{DR}$	—	—	—	70	A
Pulse drain reverse current (Note 1)	$I_{DRP}$	—	—	—	210	A
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = 70 A, V_{GS} = 0 V$	—	—	-1.7	V
Reverse recovery time	$t_{rr}$	$I_{DR} = 70 A, V_{GS} = 0 V$	—	40	—	ns
Reverse recovery charge	$Q_{rr}$	$dI_{DR}/dt = 30 A/\mu s$	—	40	—	nC

## Marking

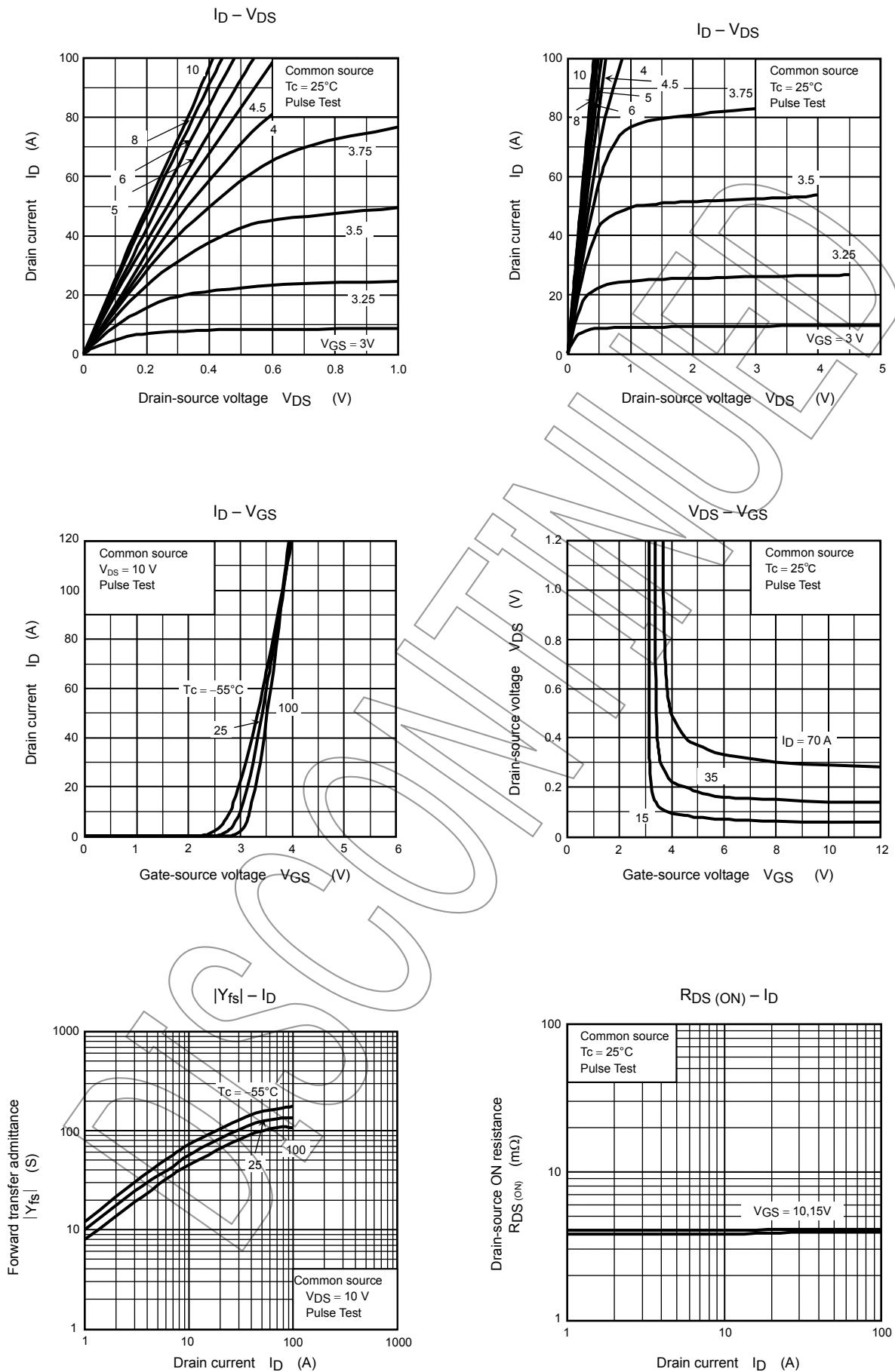


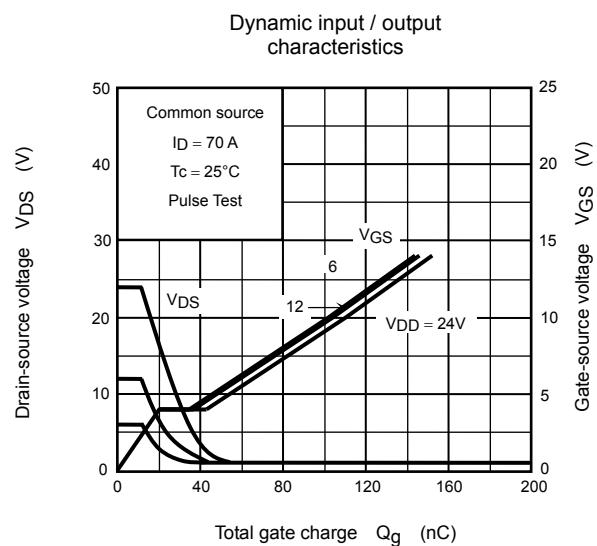
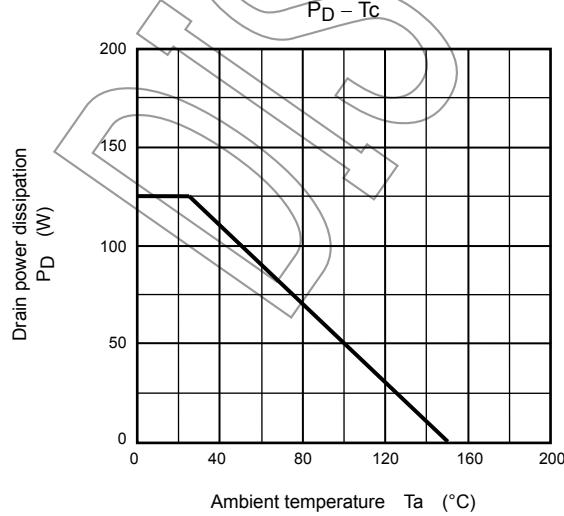
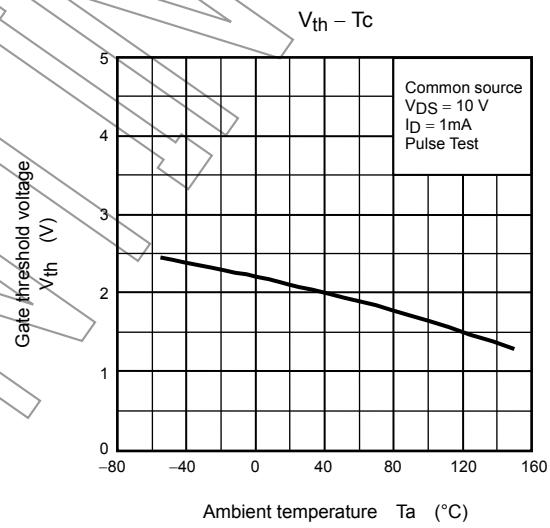
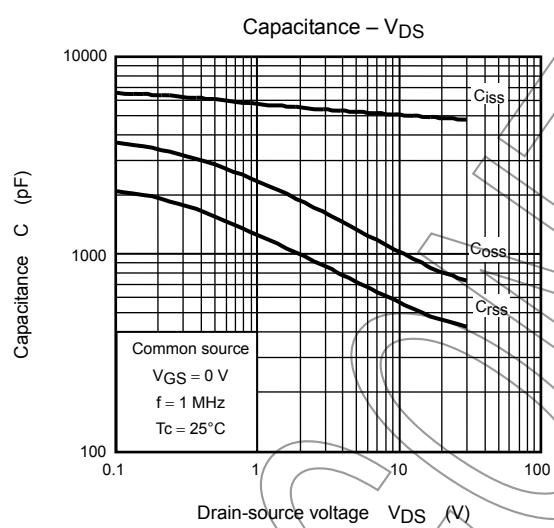
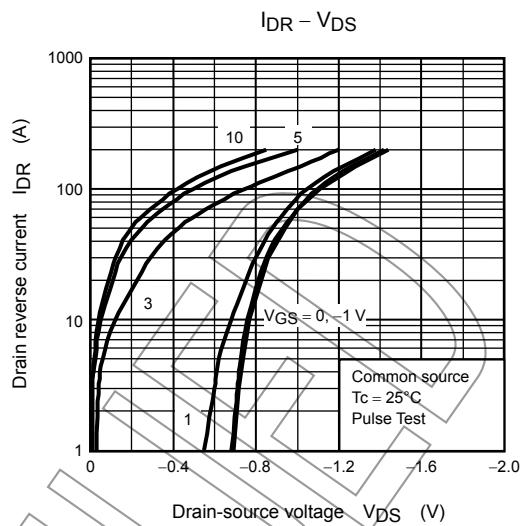
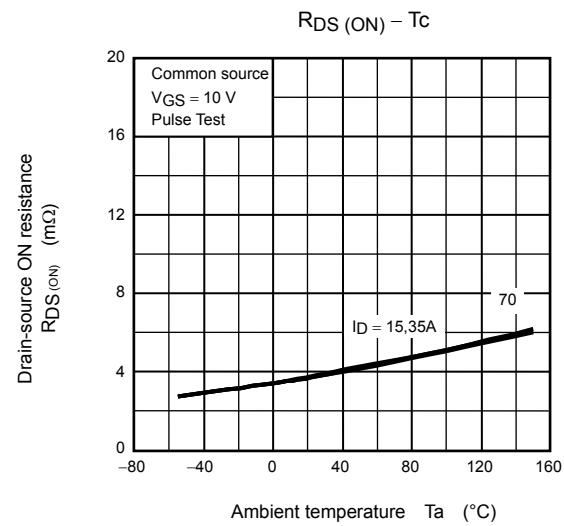
Note 4: A line under a Lot No. identifies the indication of product Labels.

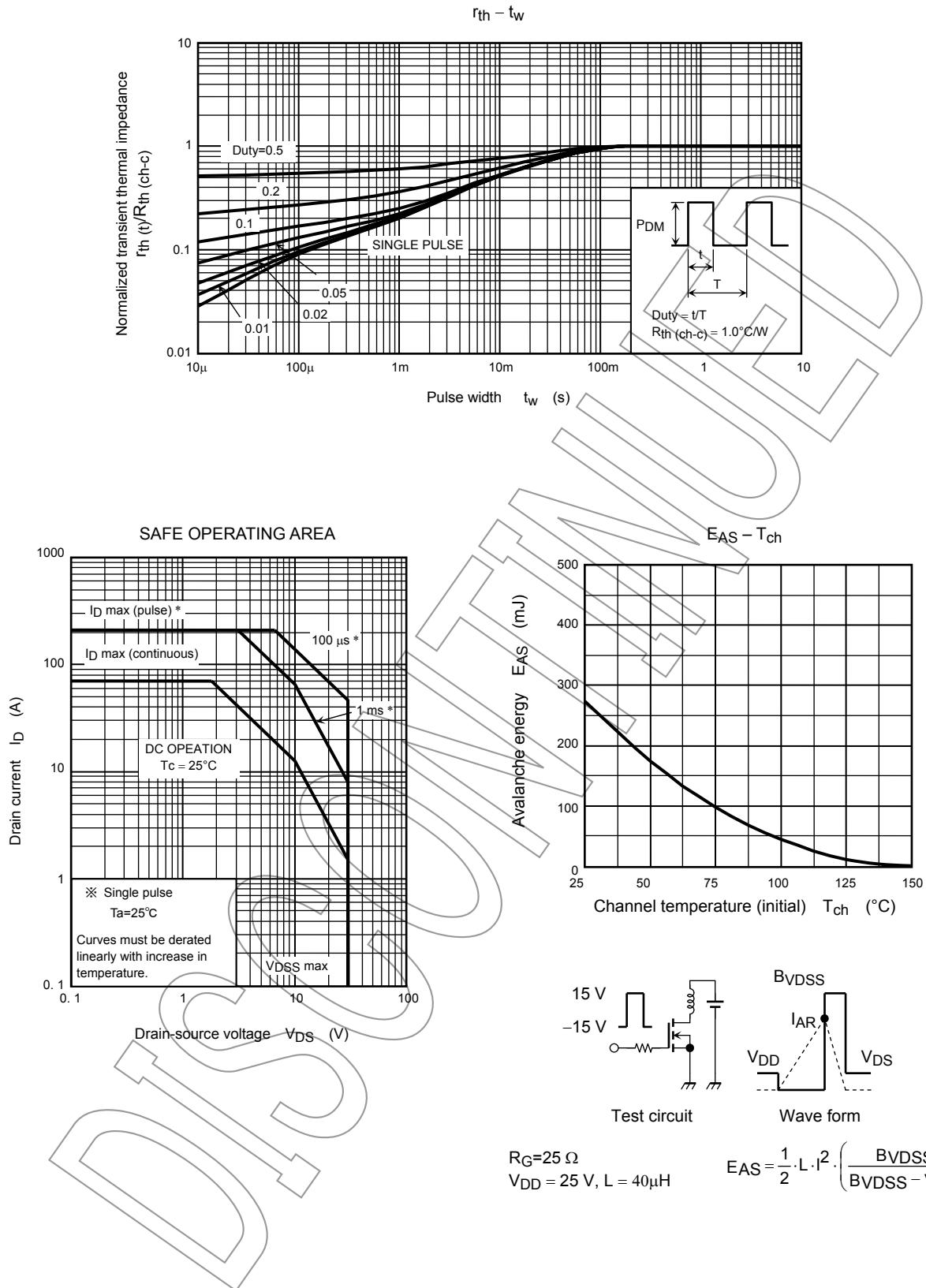
Not underlined: [[Pb]]/INCLUDES > MCV

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