

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

TPCA8030-H

High-Efficiency DC-DC Converter Applications

Notebook PC Applications

Portable Equipment Applications

- Small footprint due to a small and thin package
- High-speed switching
- Small gate charge: $Q_{SW} = 5.0 \text{ nC}$ (typ.)
- Low drain-source ON-resistance: $R_{DS(ON)} = 7.3 \text{ m}\Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 60 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 10 \mu\text{A}$ (max) ($V_{DS} = 30 \text{ V}$)
- Enhancement mode: $V_{th} = 1.5$ to 2.5 V ($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

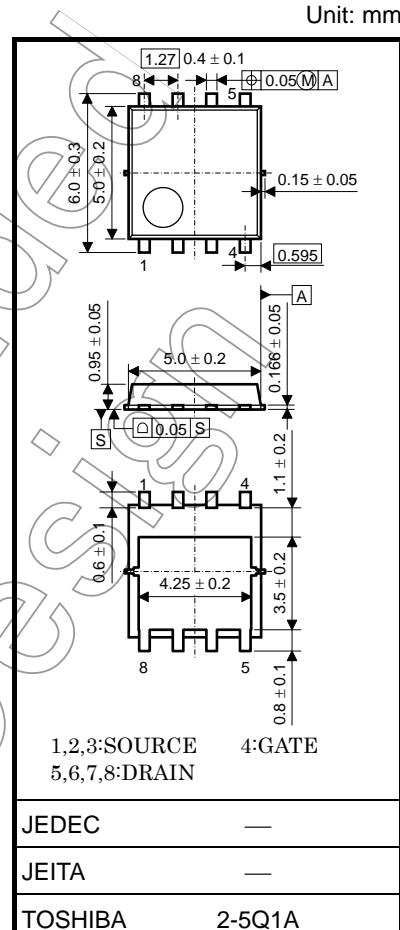
Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristic	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	DC (Note 1)	I_D	A
	Pulsed (Note 1)	I_{DP}	
Drain power dissipation	($T_c = 25^\circ\text{C}$)	P_D	W
Drain power dissipation	($t = 10 \text{ s}$)	P_D	W
	(Note 2a)		
Drain power dissipation	($t = 1.0 \text{ s}$)	P_D	W
	(Note 2b)		
Single-pulse avalanche energy	E_{AS}	75	mJ
	(Note 3)		
Avalanche current	I_{AR}	24	A
Repetitive avalanche energy	E_{AR}	3.0	mJ
	($T_c = 25^\circ\text{C}$) (Note 4)		
Channel temperature	T_{ch}	150	°C
Storage temperature range	T_{sig}	-55 to 150	°C

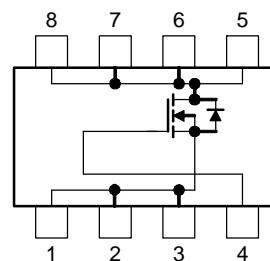
Note: For Notes 1 to 4, refer to the next page.

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).

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



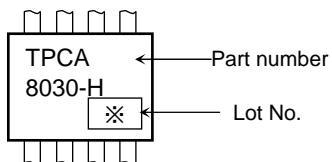
Circuit Configuration



Thermal Characteristics

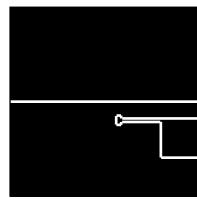
Characteristic	Symbol	Max	Unit
Thermal resistance, channel to case ($T_c = 25^\circ\text{C}$)	R_{th} (ch-c)	4.17	$^\circ\text{C}/\text{W}$
Thermal resistance, channel to ambient ($t = 10$ s) (Note 2a)	R_{th} (ch-a)	44.6	$^\circ\text{C}/\text{W}$
Thermal resistance, channel to ambient ($t = 10$ s) (Note 2b)	R_{th} (ch-a)	78.1	$^\circ\text{C}/\text{W}$

Marking (Note 5)



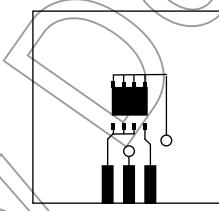
Note 1: Ensure that the channel temperature does not exceed 150°C .

Note 2: (a) Device mounted on a glass-epoxy board (a) (b) Device mounted on a glass-epoxy board (b)



(a)

FR-4
 $25.4 \times 25.4 \times 0.8$
(Unit: mm)



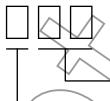
(b)

FR-4
 $25.4 \times 25.4 \times 0.8$
(Unit: mm)

Note 3: $V_{DD} = 24$ V, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 100 \mu\text{H}$, $R_G = 25 \Omega$, $I_{AR} = 24$ A

Note 4: Repetitive rating: pulse width limited by maximum channel temperature

Note 5: * Weekly code: (Three digits)



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

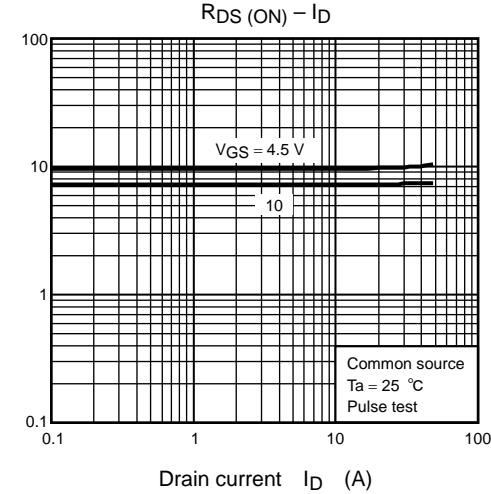
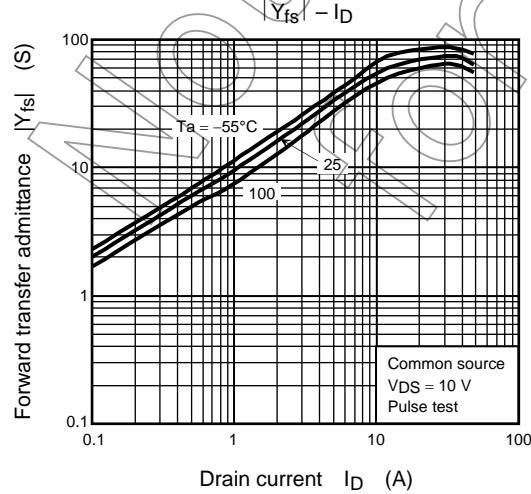
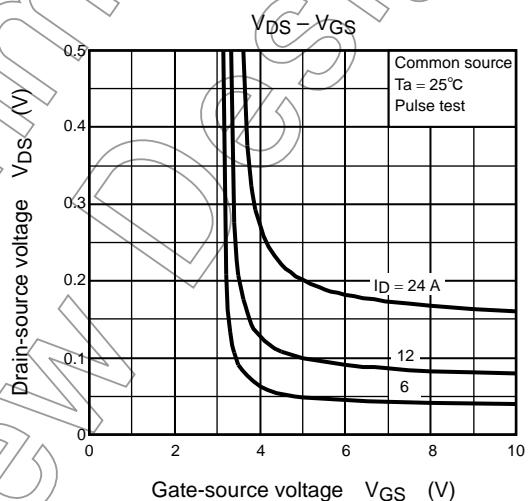
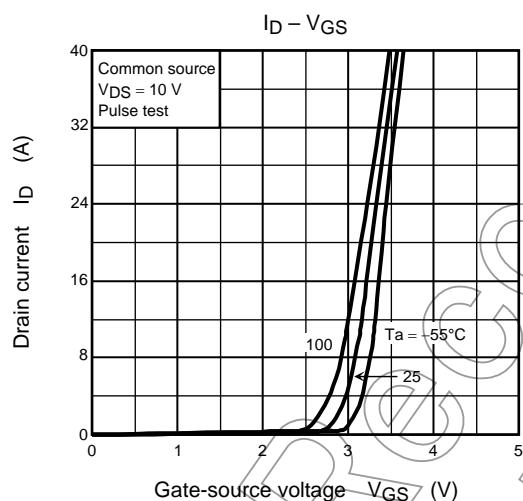
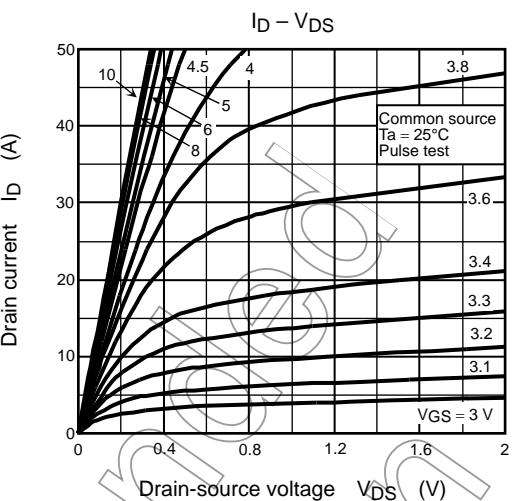
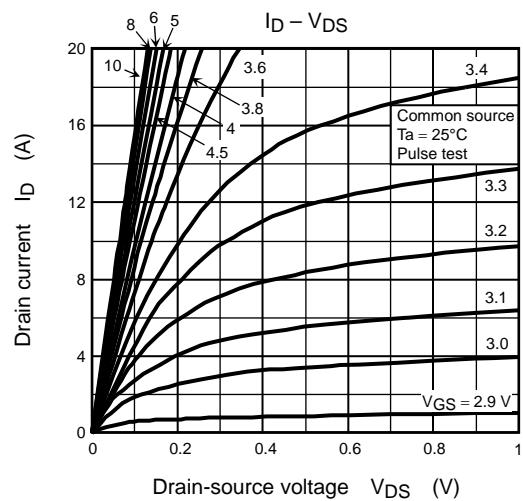
Year of manufacture
(The last digit of the year)

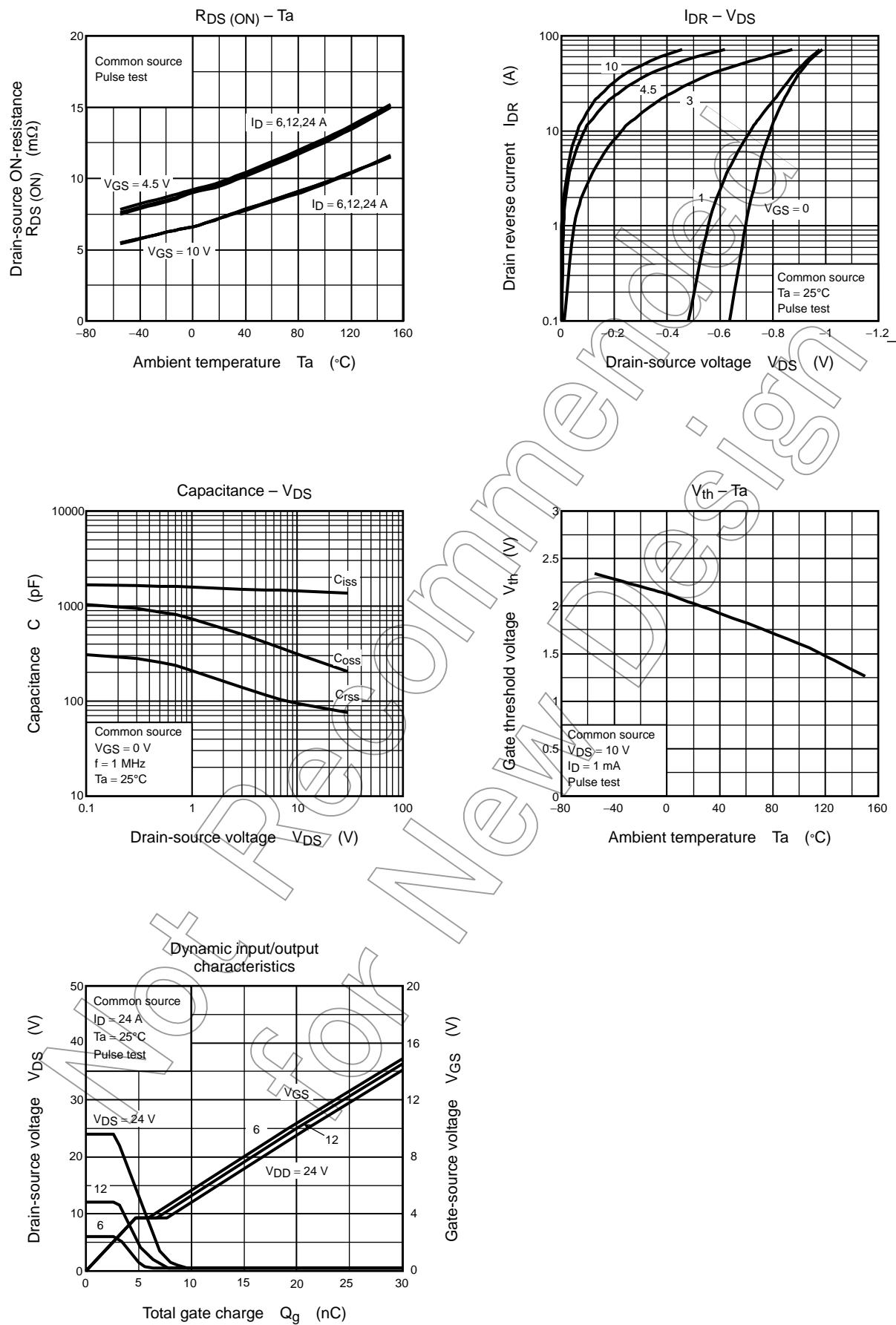
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

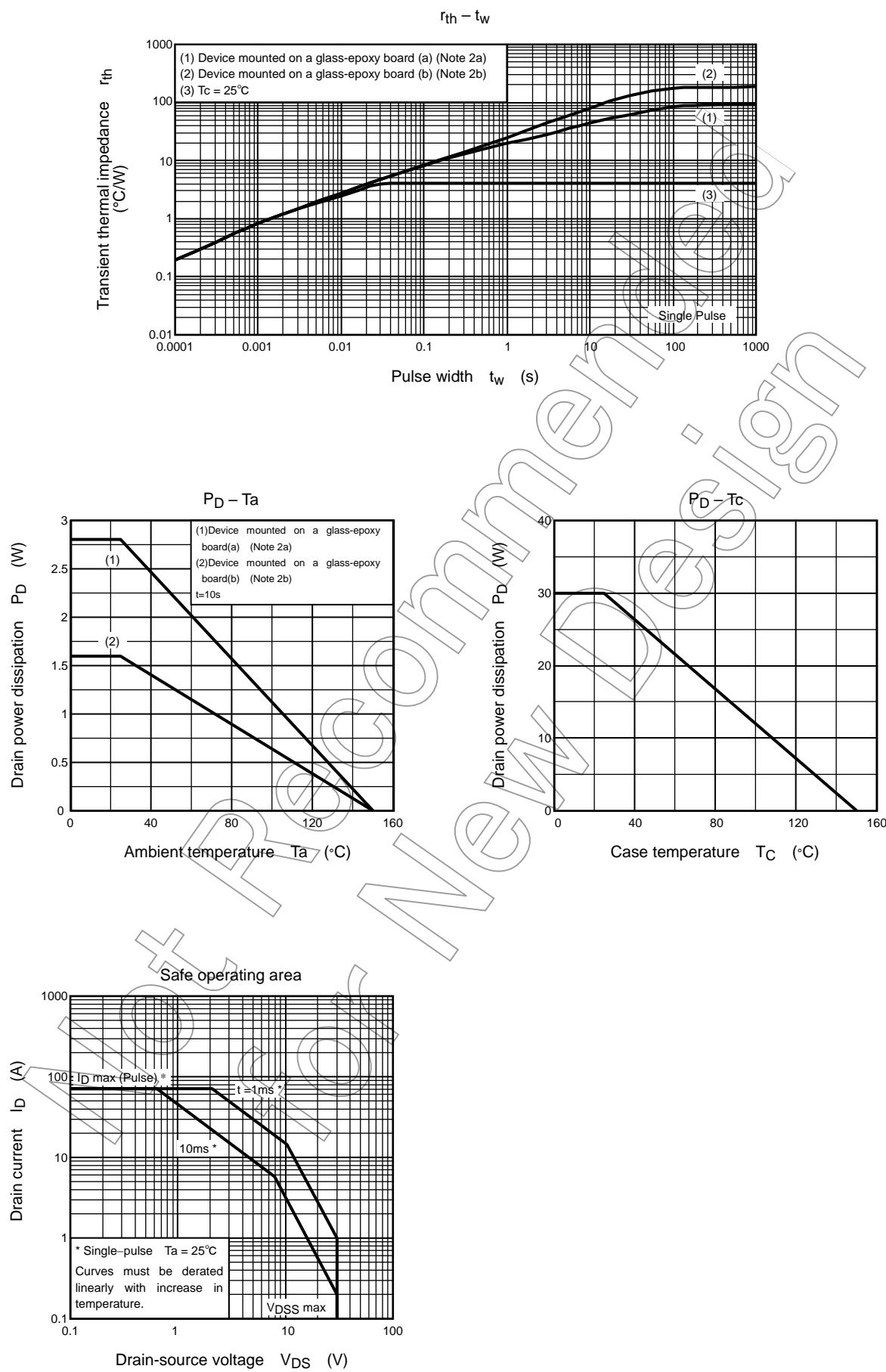
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I_{GSS}	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$	—	—	± 100	nA
Drain cutoff current	I_{DSS}	$V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$	—	—	10	μA
Drain-source breakdown voltage	$V_{(\text{BR})\text{DSS}}$	$I_D = 10\text{ mA}$, $V_{GS} = 0\text{ V}$	30	—	—	V
	$V_{(\text{BR})\text{DSX}}$	$I_D = 10\text{ mA}$, $V_{GS} = -20\text{ V}$	15	—	—	
Gate threshold voltage	V_{th}	$V_{DS} = 10\text{ V}$, $I_D = 1\text{ mA}$	1.5	—	2.5	V
Drain-source ON-resistance	$R_{DS\text{ (ON)}}$	$V_{GS} = 4.5\text{ V}$, $I_D = 12\text{ A}$	—	9.6	13.4	$\text{m}\Omega$
		$V_{GS} = 10\text{ V}$, $I_D = 12\text{ A}$	—	7.3	11.0	
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 10\text{ V}$, $I_D = 12\text{ A}$	30	60	—	S
Input capacitance	C_{iss}	$V_{DS} = 10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$	—	1433	2150	pF
Reverse transfer capacitance	C_{rss}		—	83	125	
Output capacitance	C_{oss}		—	303	—	
Gate resistance	R_g	$V_{DS} = 10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 5\text{ MHz}$	—	1.0	1.5	Ω
Switching time	Rise time	t_r		2.8	—	ns
	Turn-on time	t_{on}		9.3	—	
	Fall time	t_f		3.4	—	
	Turn-off time	t_{off}		21	—	
Total gate charge (gate-source plus gate-drain)	Q_g	$V_{DD} \approx 24\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 24\text{ A}$	—	21	—	nC
		$V_{DD} \approx 24\text{ V}$, $V_{GS} = 5\text{ V}$, $I_D = 24\text{ A}$	—	11	—	
		$V_{DD} \approx 24\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 24\text{ A}$	—	4.7	—	
Gate-source charge 1	Q_{gs1}		—	3.0	—	nC
Gate-drain ("Miller") charge	Q_{gd}		—	5.0	—	
Gate switch charge	Q_{SW}		—	—	—	

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

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current Pulse (Note 1)	I_{DRP}	—	—	—	72	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = 24\text{ A}$, $V_{GS} = 0\text{ V}$	—	—	-1.2	V







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