

TOSHIBA Field Effect Transistor Silicon N-Channel MOS Type (MACH II π -MOS V)

TPCA8008-H

High Speed Switching Applications

Switching Regulator Applications

DC/DC Converter Applications

Unit: mm

- Small footprint due to a small and thin package
- High-speed switching
- Small gate charge: $Q_{SW} = 3.7 \text{ nC (typ.)}$
- Low drain-source ON-resistance: $R_{DS(ON)} = 0.47\Omega \text{ (typ.)}$
- High forward transfer admittance: $|Y_{fs}| = 3.3\text{S (typ.)}$
- Low leakage current: $I_{DSS} = 100 \mu\text{A (max)}$ ($V_{DS} = 250 \text{ V}$)
- Enhancement mode: $V_{th} = 2.0 \text{ to } 4.0 \text{ V}$ ($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

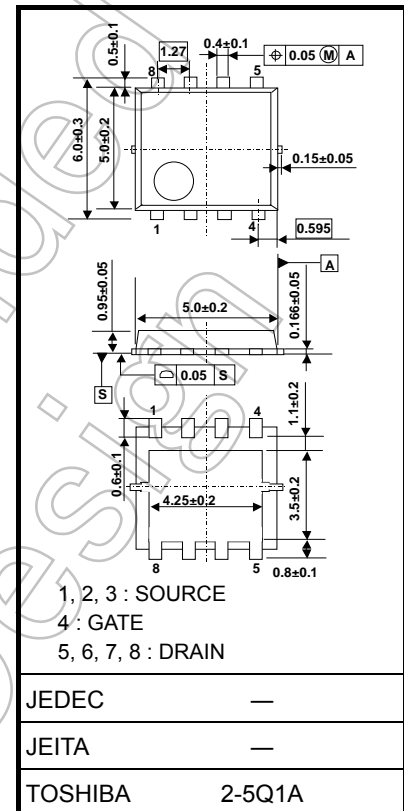
Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristic		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	250	V
Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)		V_{DGR}	250	V
Gate-source voltage		V_{GSS}	± 20	V
Drain current	DC (Note 1)	I_D	4	A
	Pulsed (Note 1)	I_{DP}	8	
Drain power dissipation ($T_c = 25^\circ\text{C}$)		P_D	45	W
Drain power dissipation ($t = 10 \text{ s}$) (Note 2a)		P_D	2.8	W
Drain power dissipation ($t = 10 \text{ s}$) (Note 2b)		P_D	1.6	W
Single-pulse avalanche energy (Note 3)		E_{AS}	11	mJ
Avalanche current		I_{AR}	4	A
Repetitive avalanche energy ($T_c = 25^\circ\text{C}$) (Note 4)		E_{AR}	4.5	mJ
Channel temperature		T_{ch}	150	$^\circ\text{C}$
Storage temperature range		T_{stg}	-55 to 150	$^\circ\text{C}$

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

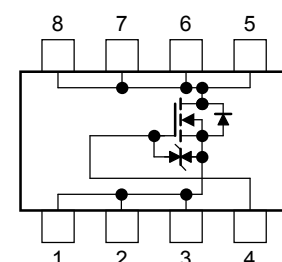
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within 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.



Weight: 0.069 g (typ.)

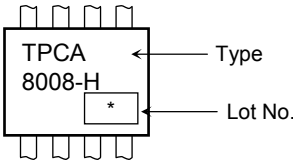
Circuit Configuration



Thermal Characteristics

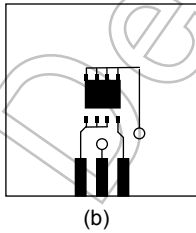
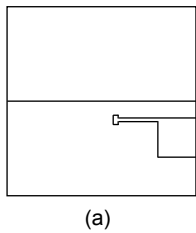
Characteristic	Symbol	Max	Unit
Thermal resistance, channel to case ($T_c=25^{\circ}\text{C}$)	$R_{th} (ch-c)$	2.78	$^{\circ}\text{C/W}$
Thermal resistance, channel to ambient ($t = 10\text{ s}$) (Note 2a)	$R_{th} (ch-a)$	44.6	$^{\circ}\text{C/W}$
Thermal resistance, channel to ambient ($t = 10\text{ s}$) (Note 2b)	$R_{th} (ch-a)$	78.1	$^{\circ}\text{C/W}$

Marking (Note 5)



Note 1: The channel temperature should not exceed 150°C during use.

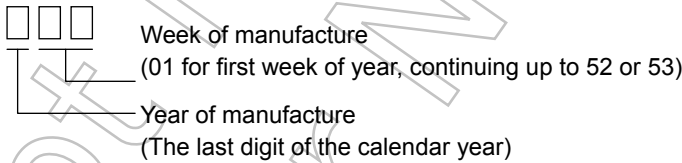
Note 2: (a) Device mounted on a glass-epoxy board (a) (b) Device mounted on a glass-epoxy board (b)



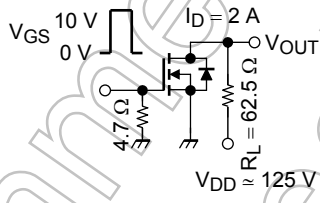
Note 3: $V_{DD} = 50\text{ V}$, $T_{ch} = 25^{\circ}\text{C}$ (initial), $L = 1\text{ mH}$, $R_G = 25\ \Omega$, $I_{AR} = 4\text{ A}$

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

Note 5: * Weekly code: (Three digits)

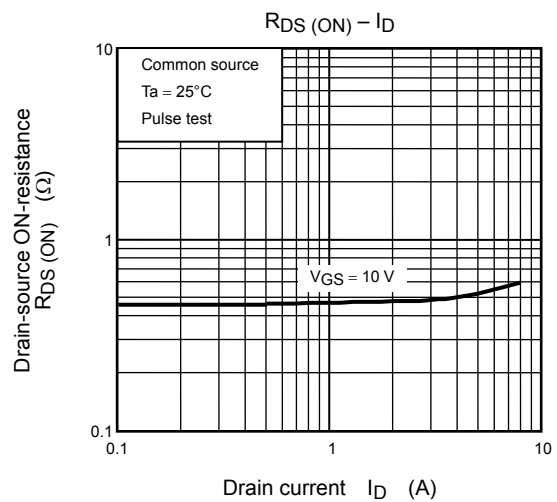
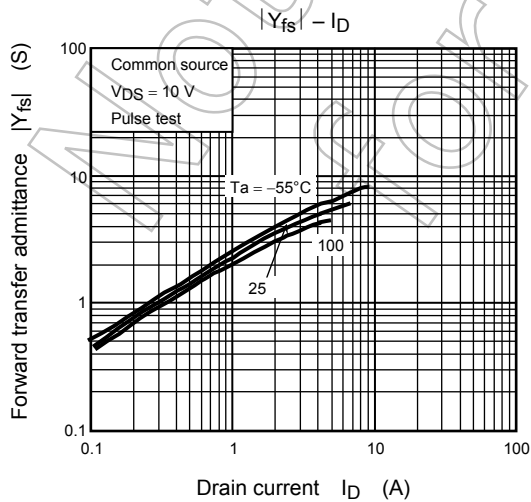
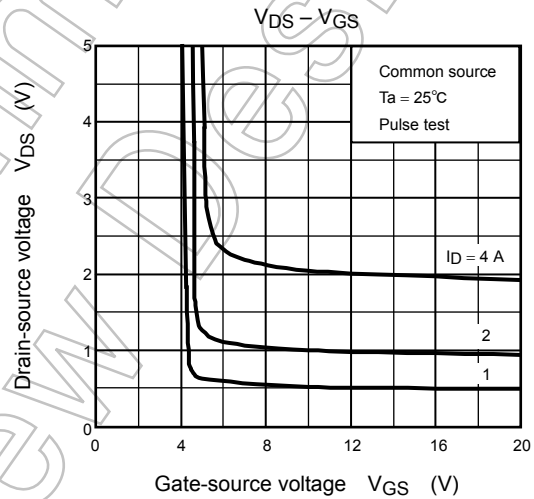
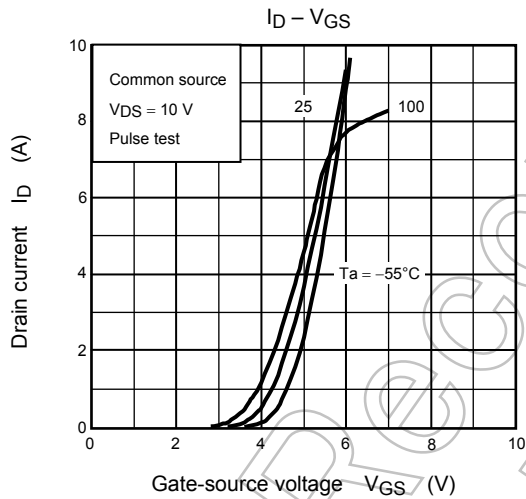
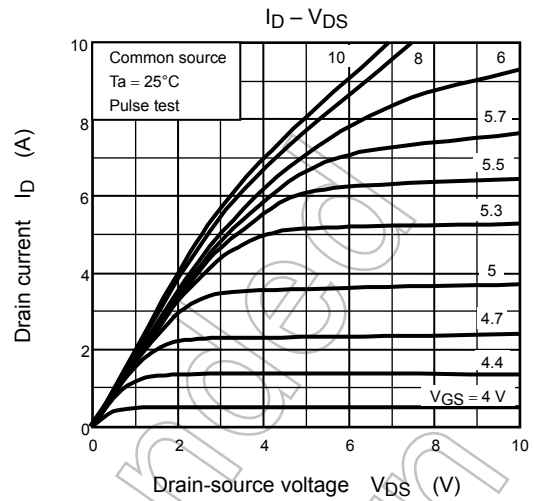
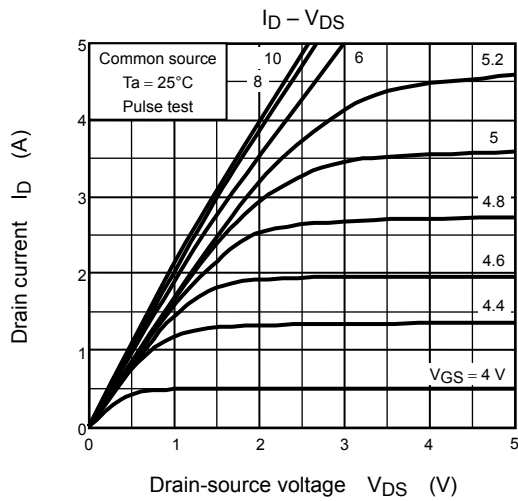


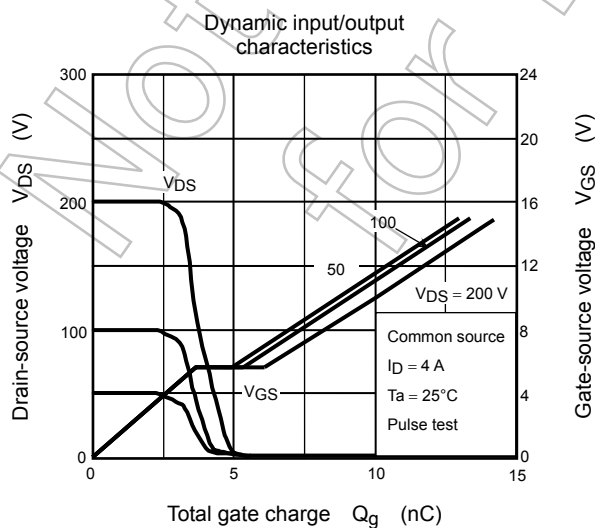
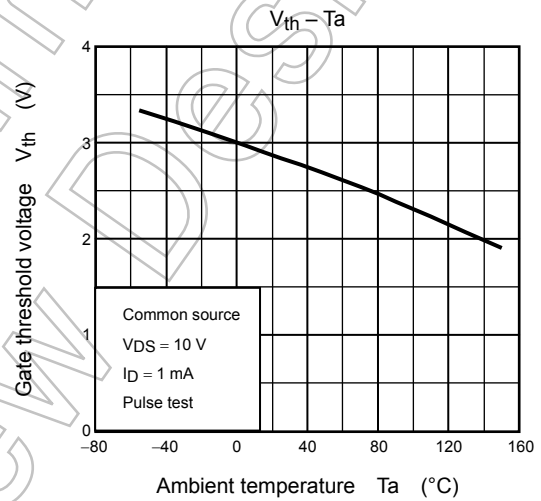
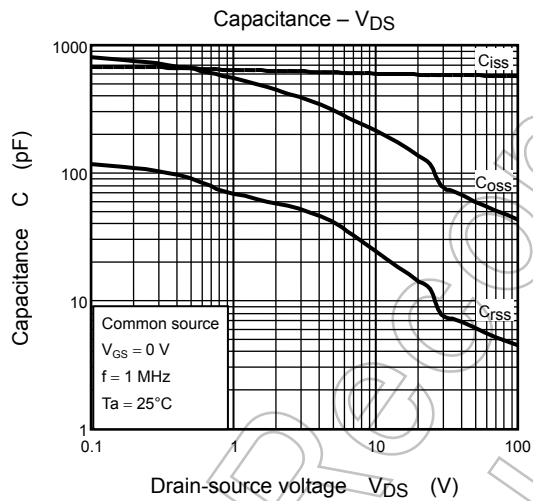
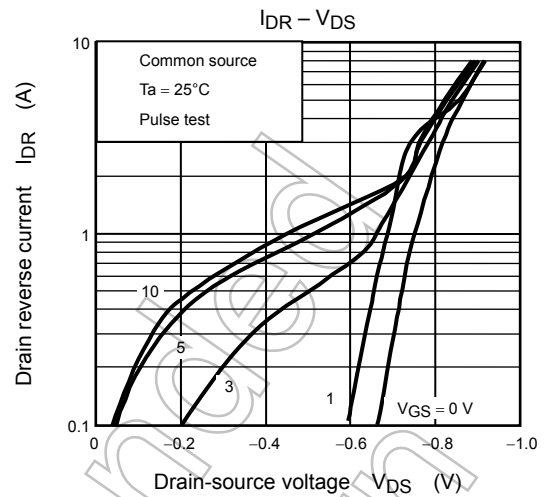
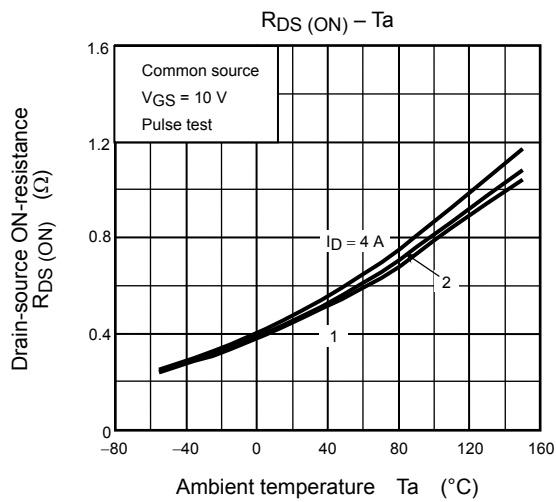
Electrical Characteristics (Ta = 25°C)

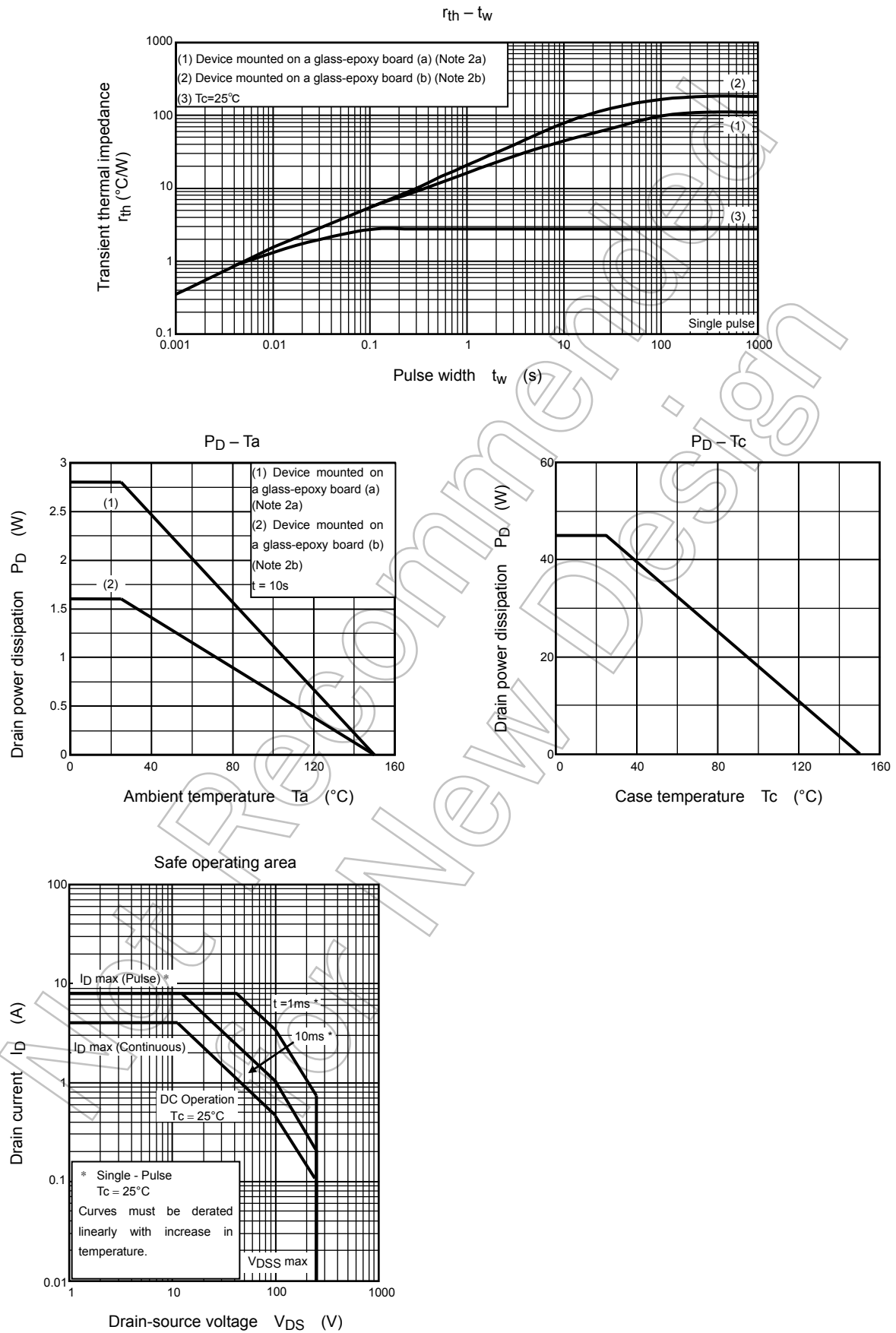
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I _{GSS}	V _{GS} = ±16 V, V _{DS} = 0 V	—	—	±10	μA
Drain cutoff current		I _{DSS}	V _{DS} = 250 V, V _{GS} = 0 V	—	—	100	μA
Drain-source breakdown voltage		V _{(BR) DSS}	I _D = 10 mA, V _{GS} = 0 V	250	—	—	V
		V _{(BR) DSX}	I _D = 10 mA, V _{GS} = −5 V	250	—	—	
			I _D = 10 mA, V _{GS} = −20 V	200	—	—	
Gate threshold voltage		V _{th}	V _{DS} = 10 V, I _D = 1 mA	2.0	—	4.0	V
Drain-source ON-resistance		R _{DS (ON)}	V _{GS} = 10 V, I _D = 2 A	—	0.47	0.58	Ω
Forward transfer admittance		Y _{fs}	V _{DS} = 10 V, I _D = 2 A	1.5	3.3	—	S
Input capacitance		C _{iss}	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	—	600	—	pF
Reverse transfer capacitance		C _{rss}		—	20	—	
Output capacitance		C _{oss}		—	220	—	
Switching time	Rise time	t _r	 <p>V_{GS} 10 V 0 V I_D = 2 A 4.7 Ω 62.5 Ω V_{DD} ≈ 125 V R_L = 62.5 Ω V_{OUT} Duty ≤ 1%, t_w = 10 μs</p>	—	8	—	ns
	Turn-on time	t _{on}		—	17	—	
	Fall time	t _f		—	13	—	
	Turn-off time	t _{off}		—	70	—	
Total gate charge (gate-source plus gate-drain)		Q _g	V _{DD} ≈ 200 V, V _{GS} = 10 V, I _D = 4 A	—	10	—	nC
Gate-source charge		Q _{gs}		—	7.6	—	
Gate-drain (“Miller”) charge		Q _{gd}		—	2.4	—	
Gate switch charge		Q _{sw}		—	3.7	—	

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

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	8	A
Forward voltage (diode)		V_{DSF}	$I_{DR} = 4 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	-2.0	V







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