

# RJM0407JSC

40 V - 20 A - N/P Channel Power MOS FET (6 in 1 Type)  
High Speed Power Switching

R07DS0368EJ0100

Rev.1.00

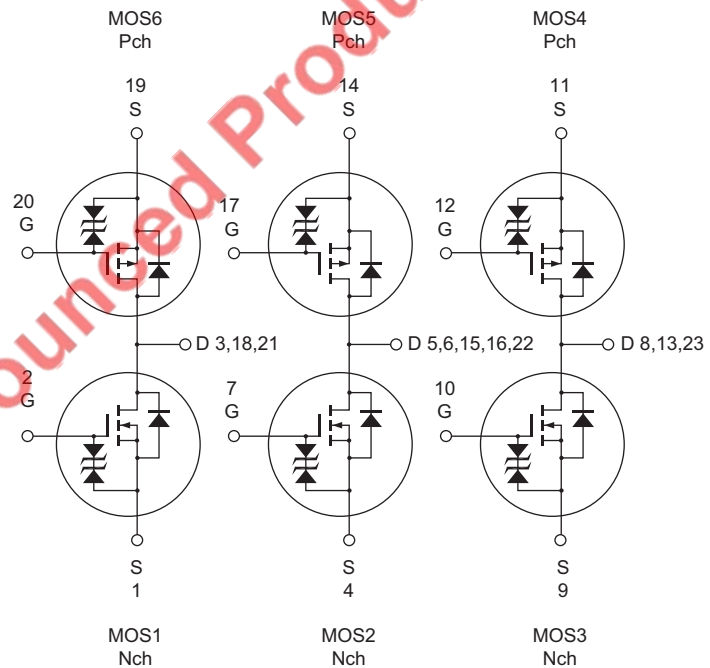
Sep 20, 2012

## Features

- For Automotive applications
- AEC-Q101 compliant
- N/P Channel MOS FET (6 in 1 Type). High density mounting
- Low on-resistance
- Capable of 4.5 V gate drive

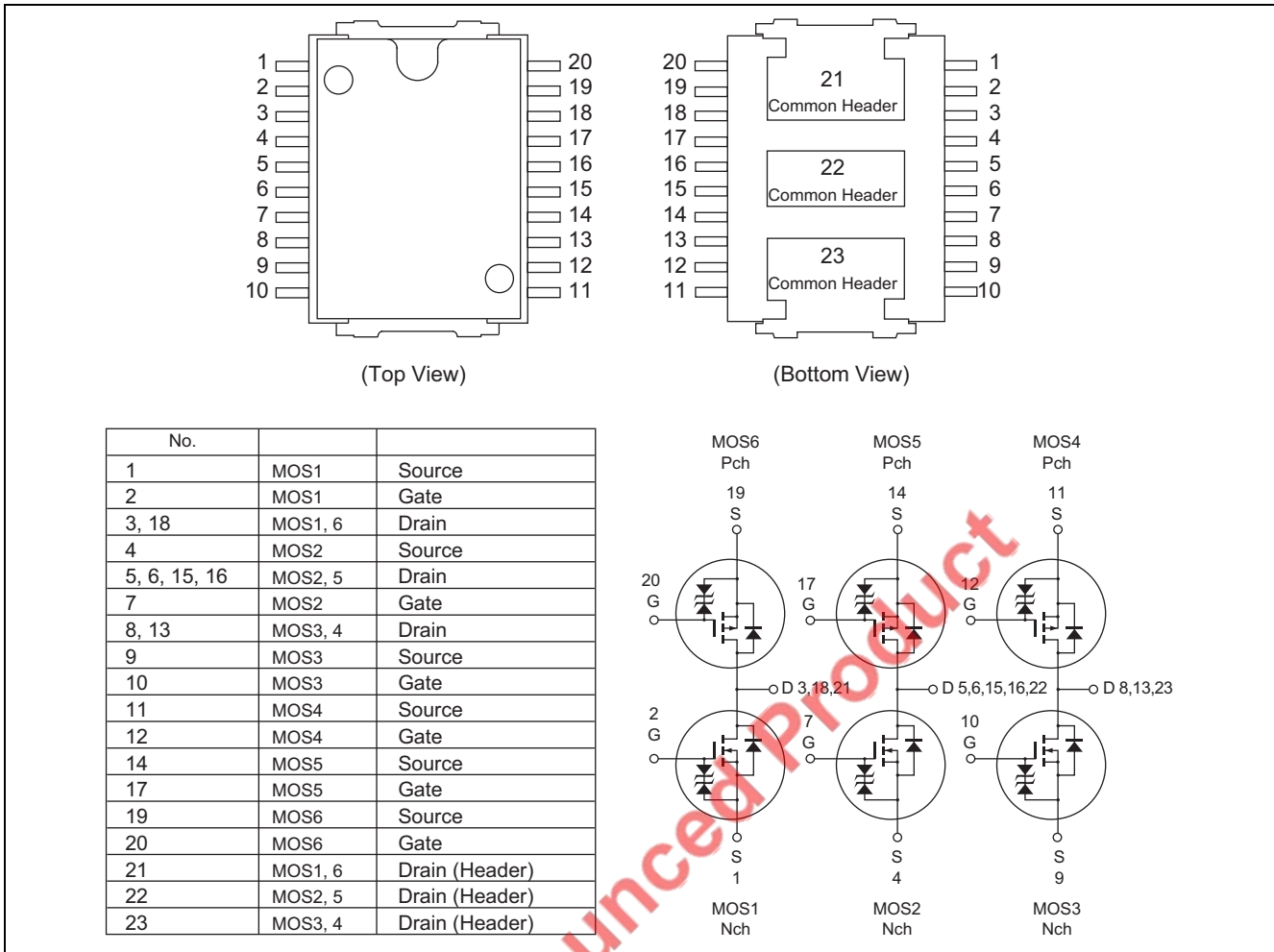
## Outline

RENESAS Package Code: PRSP0020DF-A  
(Package Name: HSOP-20)



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## Pin Arrangement



## Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Value		Unit
		MOS1, 2, 3 (Nch)	MOS4, 5, 6 (Pch)	
Drain to source voltage	V <sub>DSS</sub>	40	-40	V
Gate to source voltage	V <sub>GSS</sub>	±20	±20	V
Drain current	I <sub>D</sub>	20	-20	A
Drain peak current	I <sub>D</sub> (pulse) <sup>Note1</sup>	80	-80	A
Avalanche current	I <sub>AP</sub> <sup>Note3</sup>	15	-15	A
Avalanche energy	E <sub>AR</sub> <sup>Note3</sup>	30	30	mJ
Channel dissipation	P <sub>ch</sub> <sup>Note2</sup>	35	35	W
Channel temperature	T <sub>ch</sub> <sup>Note4</sup>	175	175	°C
Storage temperature	T <sub>stg</sub>	-55 to +150	-55 to +150	°C

- Notes: 1. PW ≤ 10μs duty cycle ≤ 1%  
 2. Tc = 25°C : 1 Drive Operation  
 3. Tch = 25°C, Rg ≥ 50 Ω  
 4. AEC-Q101 compliant.

## Thermal Impedance Characteristics

- Channel to case thermal impedance θ<sub>ch-c</sub>: 4.28°C/W

## Electrical Characteristics

## • MOS1, MOS2, MOS3 (N Channel)

(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Zero gate voltage drain current	$I_{DSS}$	—	—	10	$\mu A$	$V_{DS} = 40 V, V_{GS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	$\pm 10$	$\mu A$	$V_{GS} = \pm 20 V, V_{DS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.5	V	$V_{DS} = 10 V, I_D = 1 mA$
Static drain to source on state resistance	$R_{DS(on)}$	—	17	21	$m\Omega$	$I_D = 10 A^{Note6}, V_{GS} = 10 V$
Static drain to source on state resistance	$R_{DS(on)}$	—	24	34	$m\Omega$	$I_D = 10 A^{Note6}, V_{GS} = 4.5 V$
Input capacitance	$C_{iss}$	—	630	—	pF	$V_{DS} = 10V, V_{GS} = 0,$ $f = 1 MHz$
Output capacitance	$C_{oss}$	—	255	—	pF	
Reverse transfer capacitance	$C_{rss}$	—	185	—	pF	
Total gate charge	$Q_g$	—	16	—	nC	$V_{DD} = 25 V, V_{GS} = 10 V,$ $I_D = 20 A$
Gate to source charge	$Q_{gs}$	—	2	—	nC	
Gate to drain charge	$Q_{gd}$	—	6	—	nC	$V_{GS} = 10 V, I_D = 10 A,$ $V_{DD} \cong 30 V, R_L = 3 \Omega,$ $R_G = 4.7 \Omega$
Turn-on delay time	$t_{d(on)}$	—	9	—	ns	
Rise time	$t_r$	—	14	—	ns	
Turn-off delay time	$t_{d(off)}$	—	33	—	ns	
Fall time	$t_f$	—	14	—	ns	
Body-drain diode forward voltage	$V_{DF}$	—	0.95	1.25	V	$I_F = 20 A, V_{GS} = 0^{Note6}$
Body-drain diode reverse recovery time	$t_{rr}$	—	40	—	ns	$I_F = 20 A, V_{GS} = 0$ $di_F/dt = 100 A/\mu s$

Note: 5. Pulse test

## • MOS4, MOS5, MOS6 (P Channel)

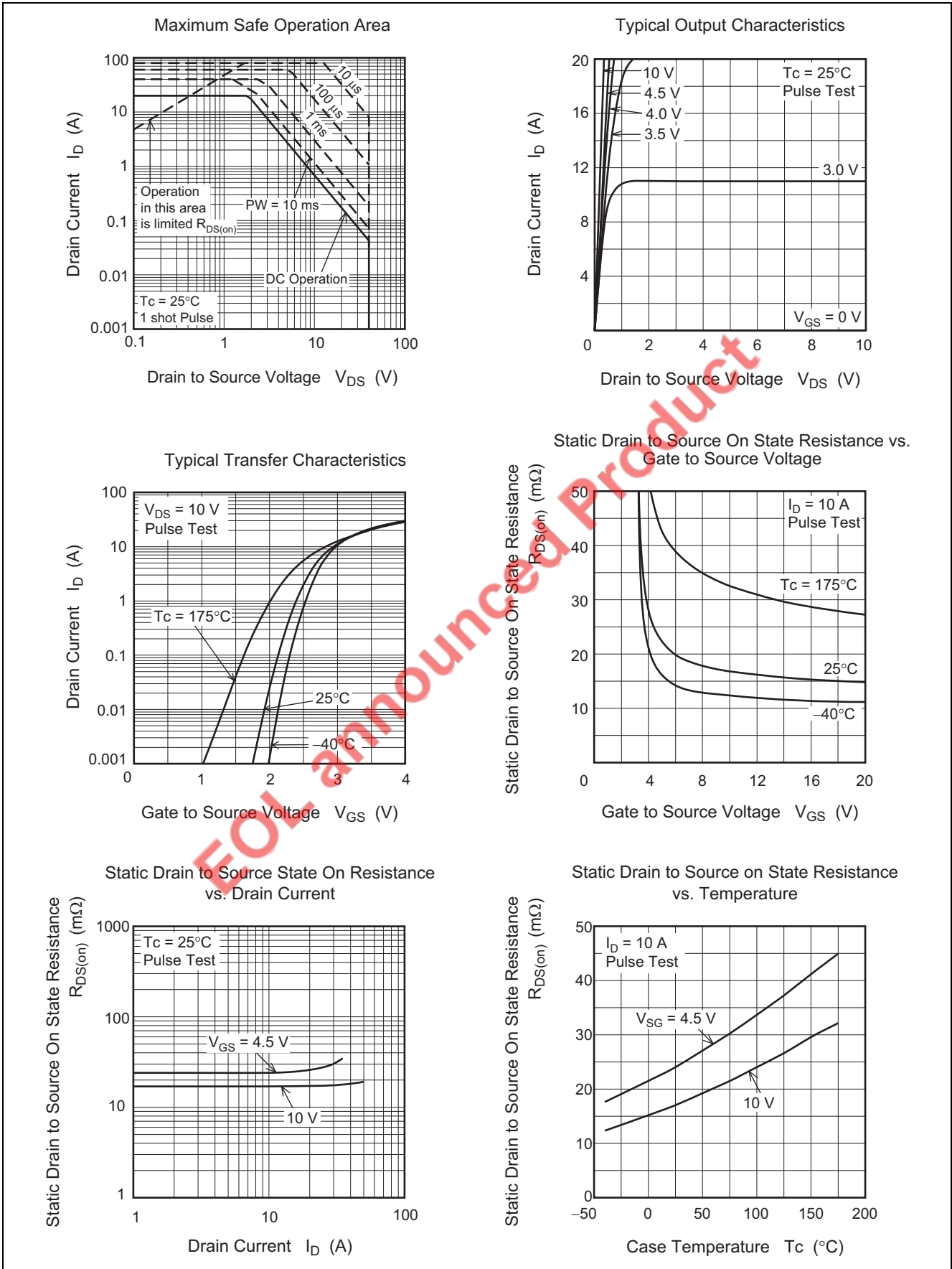
(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Zero gate voltage drain current	$I_{DSS}$	—	—	-10	$\mu A$	$V_{DS} = -40 V, V_{GS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	$\pm 10$	$\mu A$	$V_{GS} = \pm 20 V, V_{DS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	-1.0	—	-2.5	V	$V_{DS} = -10 V, I_D = -1 mA$
Static drain to source on state resistance	$R_{DS(on)}$	—	34	42	$m\Omega$	$I_D = -10 A^{Note7}, V_{GS} = -10 V$
Static drain to source on state resistance	$R_{DS(on)}$	—	48	68	$m\Omega$	$I_D = -10 A^{Note7}, V_{GS} = -4.5 V$
Input capacitance	$C_{iss}$	—	920	—	pF	$V_{DS} = -10 V, V_{GS} = 0,$ $f = 1 MHz$
Output capacitance	$C_{oss}$	—	360	—	pF	
Reverse transfer capacitance	$C_{rss}$	—	260	—	pF	
Total gate charge	$Q_g$	—	22	—	nC	$V_{DD} = -25 V, V_{GS} = -10 V,$ $I_D = -20 A$
Gate to source charge	$Q_{gs}$	—	3	—	nC	
Gate to drain charge	$Q_{gd}$	—	8	—	nC	$V_{GS} = -10 V, I_D = -10 A,$ $V_{DD} \cong -30 V, R_L = 3 \Omega,$ $R_G = 4.7 \Omega$
Turn-on delay time	$t_{d(on)}$	—	19	—	ns	
Rise time	$t_r$	—	32	—	ns	
Turn-off delay time	$t_{d(off)}$	—	32	—	ns	
Fall time	$t_f$	—	14	—	ns	
Body-drain diode forward voltage	$V_{DF}$	—	-0.98	-1.27	V	$I_F = -20 A, V_{GS} = 0^{Note7}$
Body-drain diode reverse recovery time	$t_{rr}$	—	45	—	ns	$I_F = -20 A, V_{GS} = 0$ $di_F/dt = 100 A/\mu s$

Note: 7. Pulse test

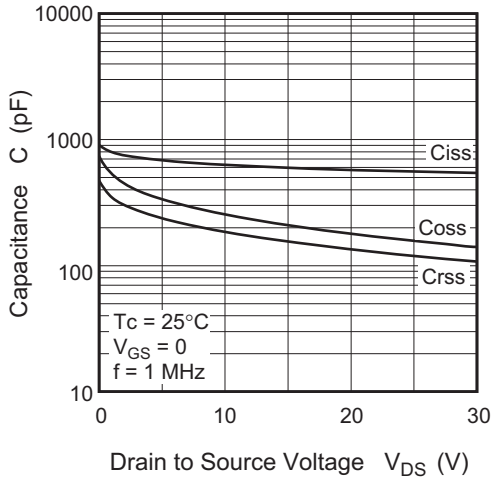
## Main Characteristics

- MOS1, 2, 3 (Nch)

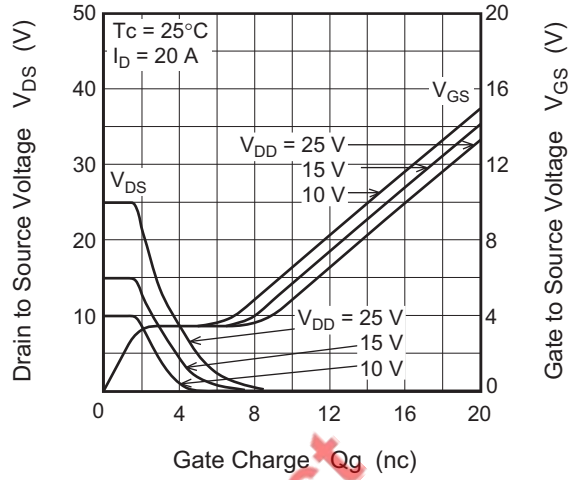


• MOS1, 2, 3(Nch)

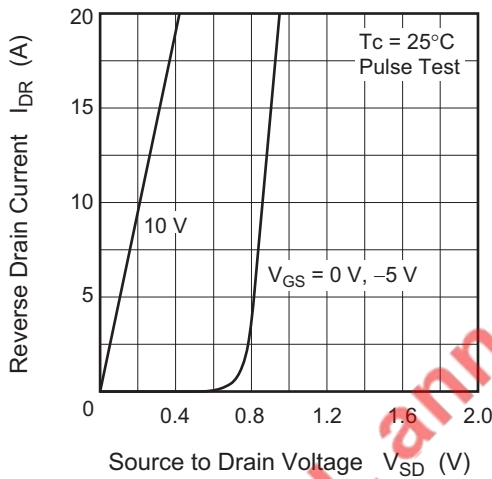
Typical Capacitance vs. Drain to Source Voltage



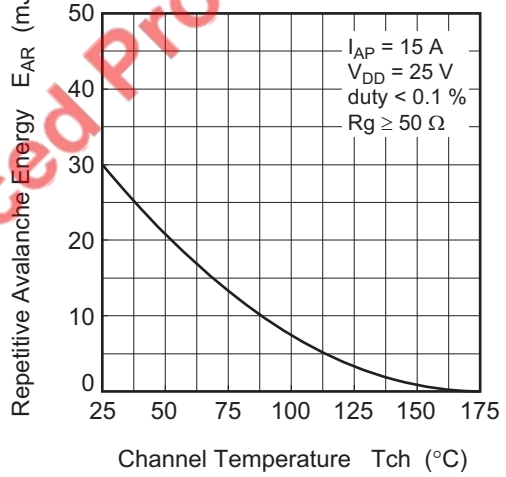
Dynamic Input Characteristics



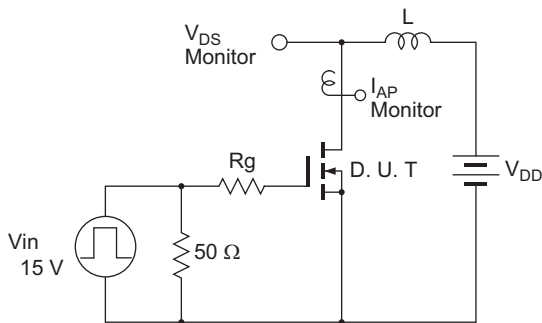
Reverse Drain Current vs. Source to Drain Voltage



Avalanche Energy vs. Channel Temperature Derating

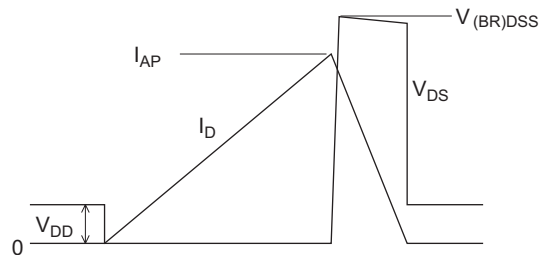


Avalanche Test Circuit

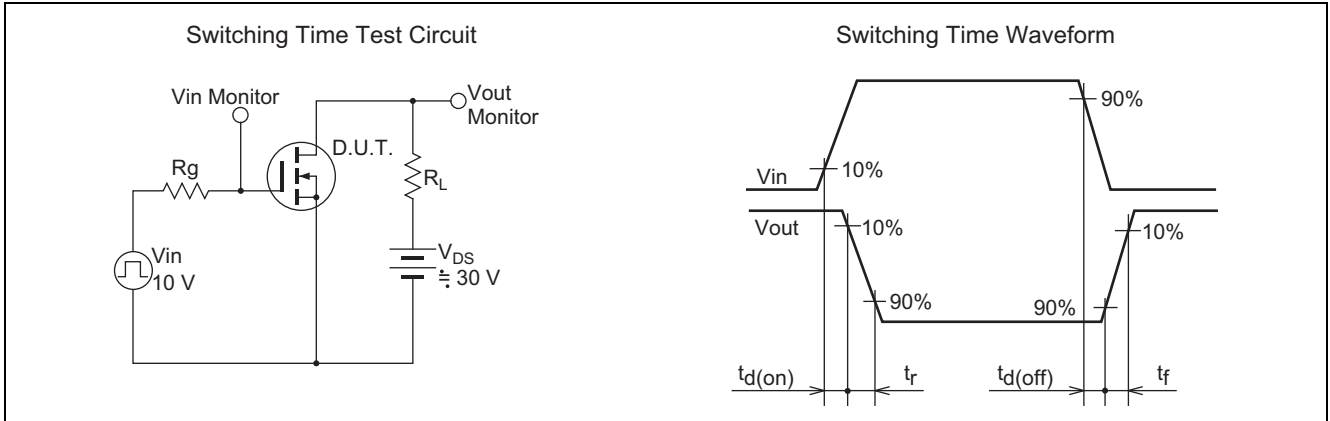


Avalanche Waveform

$$E_{AR} = \frac{1}{2} L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$

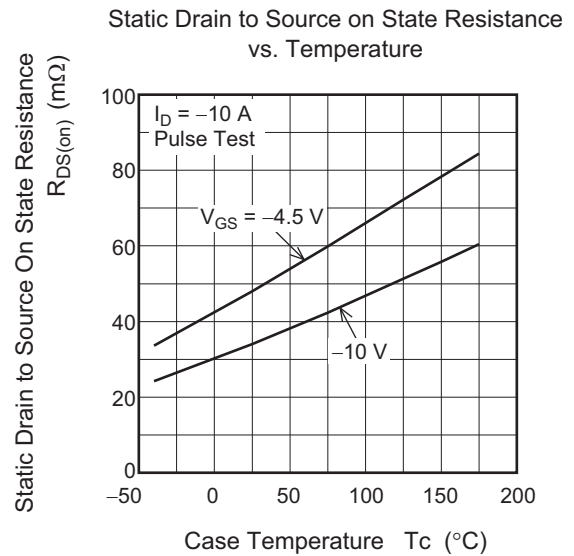
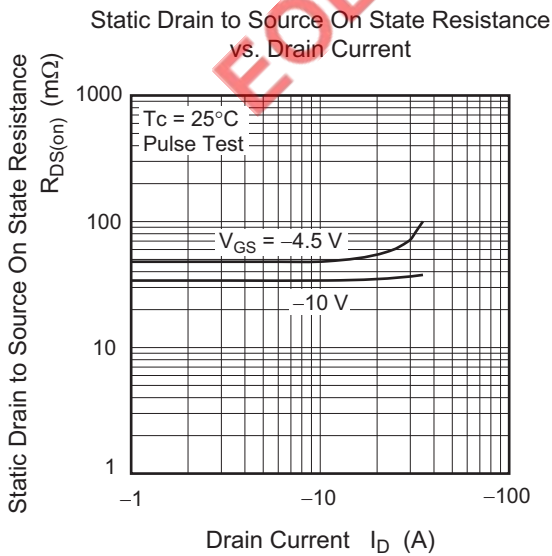
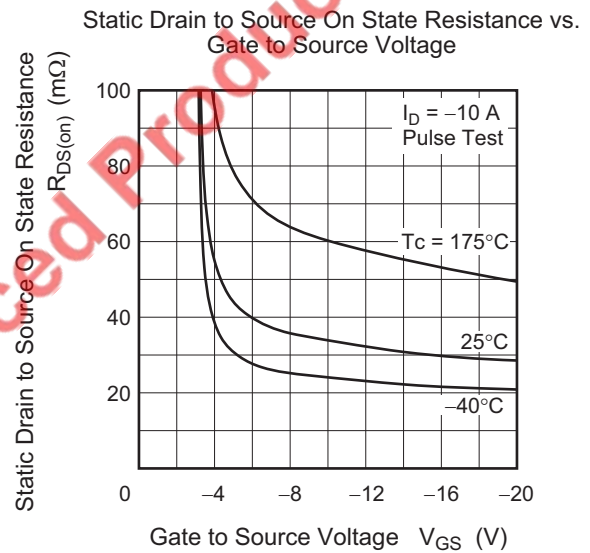
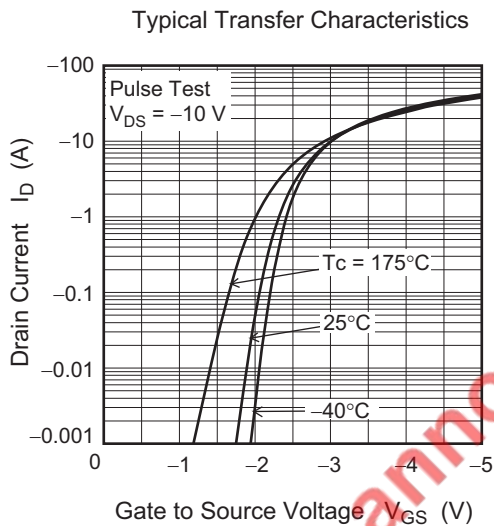
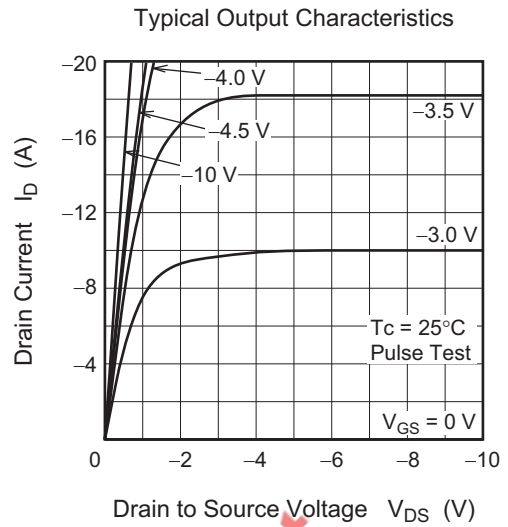
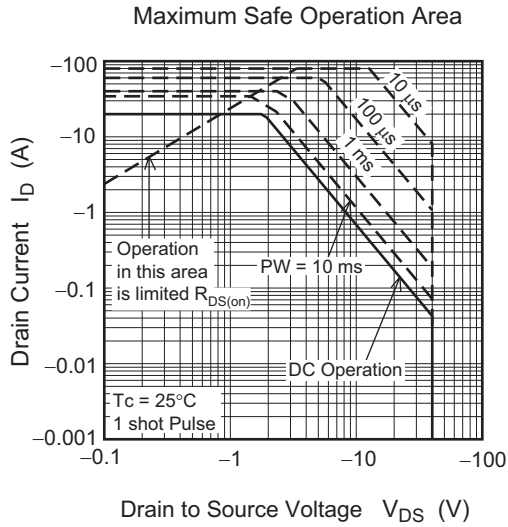


• MOS1, 2, 3 (Nch)

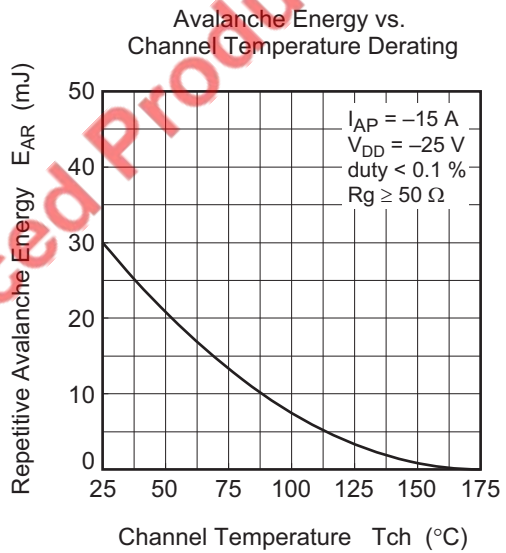
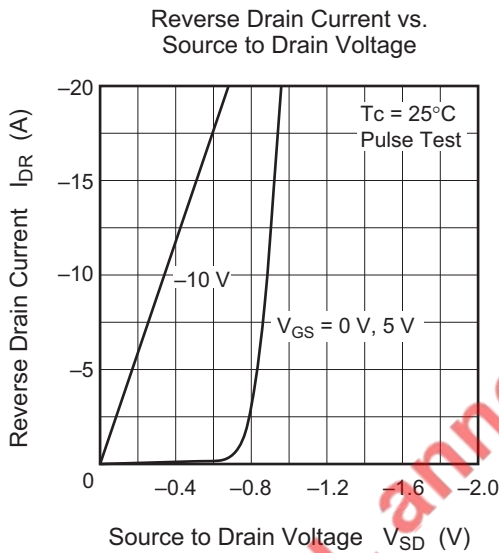
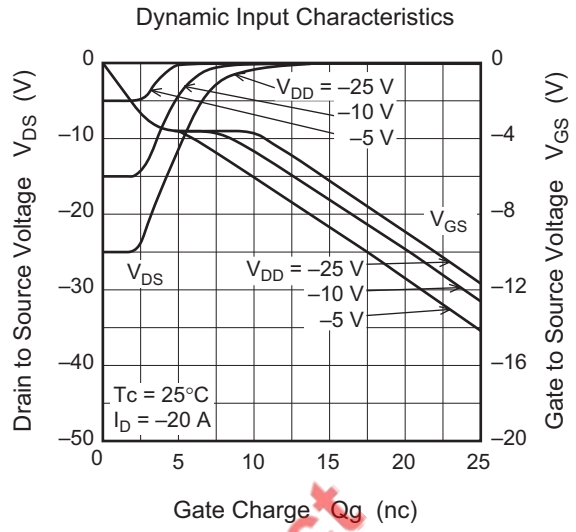
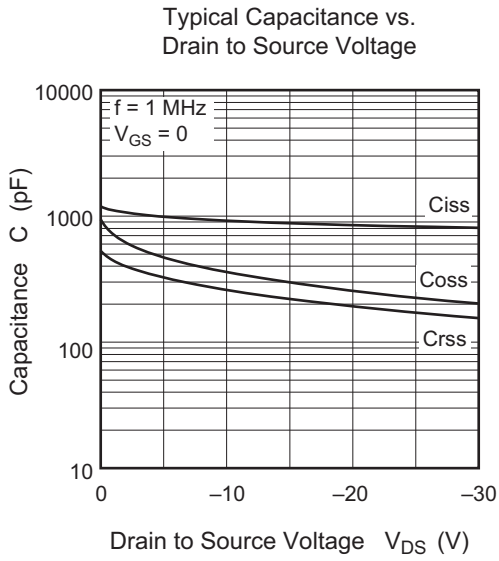


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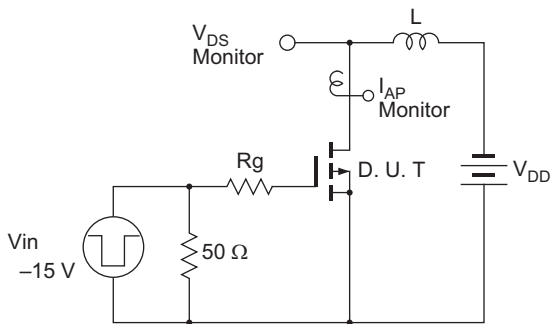
• MOS4, 5, 6 (Pch)



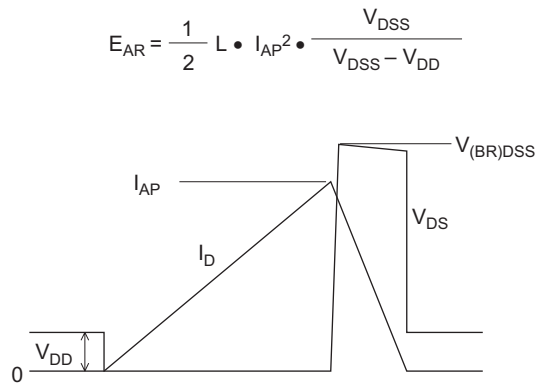
• MOS4, 5, 6 (Pch)



Avalanche Test Circuit

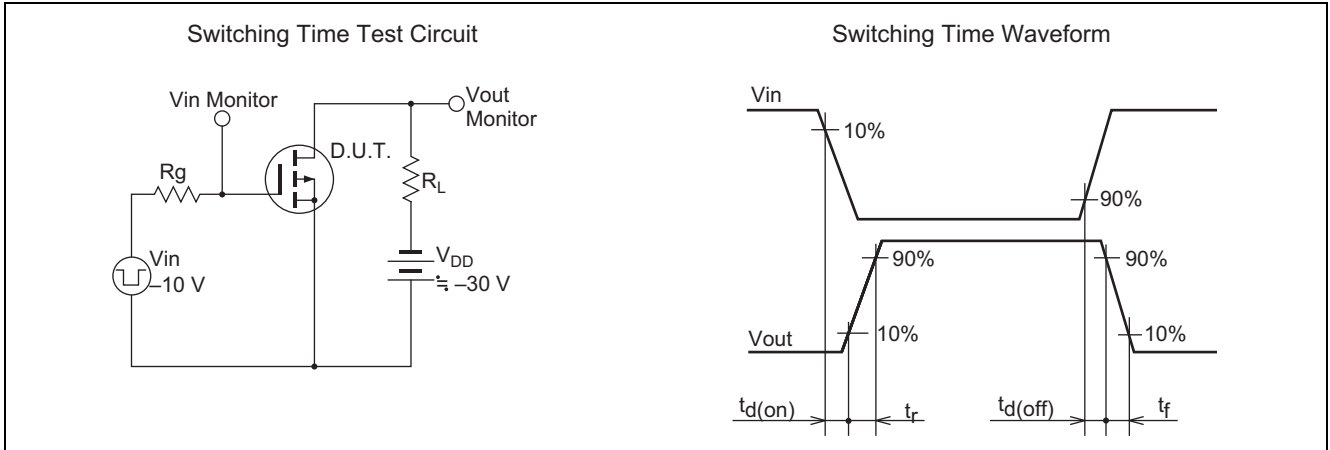


Avalanche Waveform



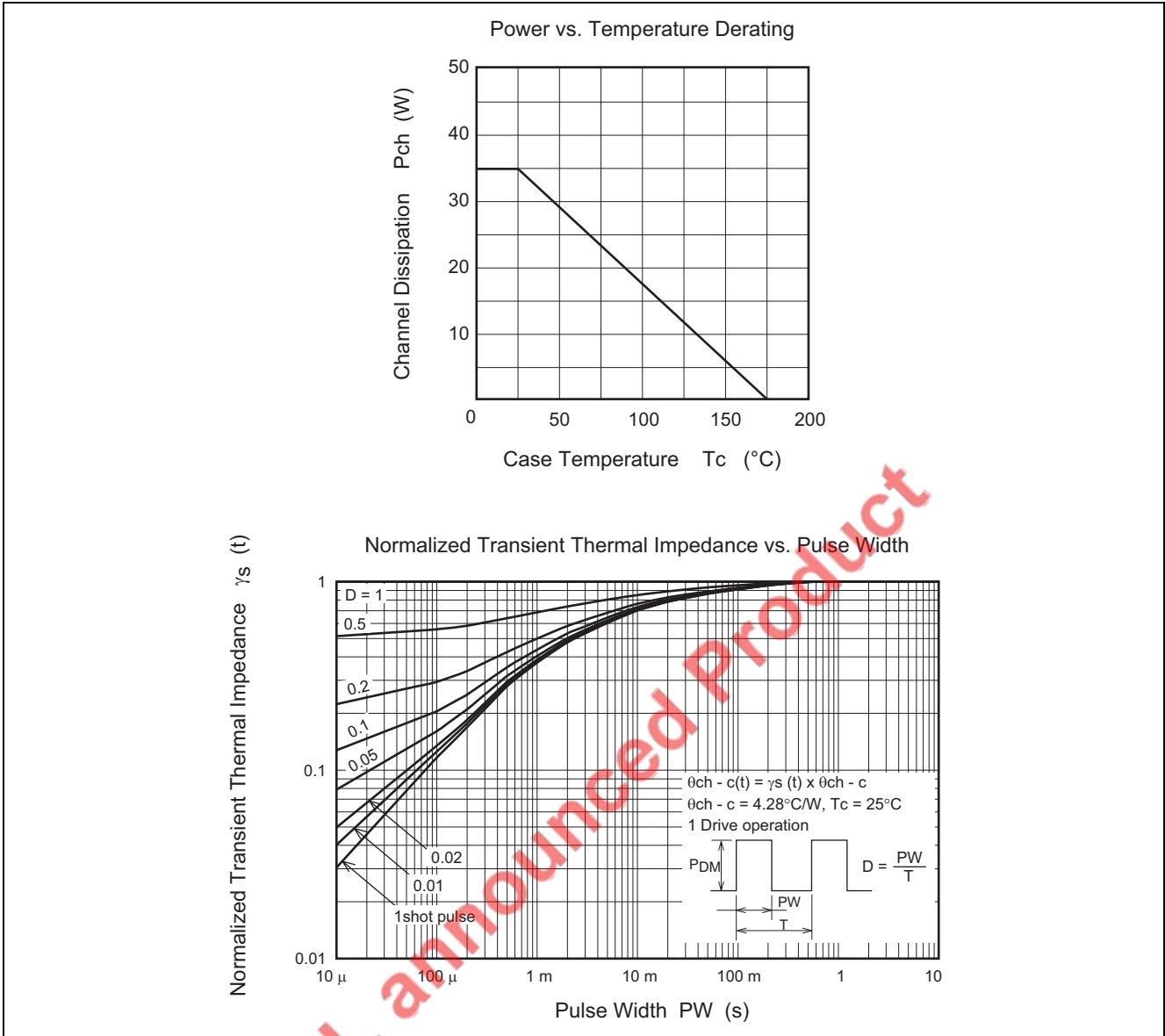


• MOS4, 5, 6 (Pch)

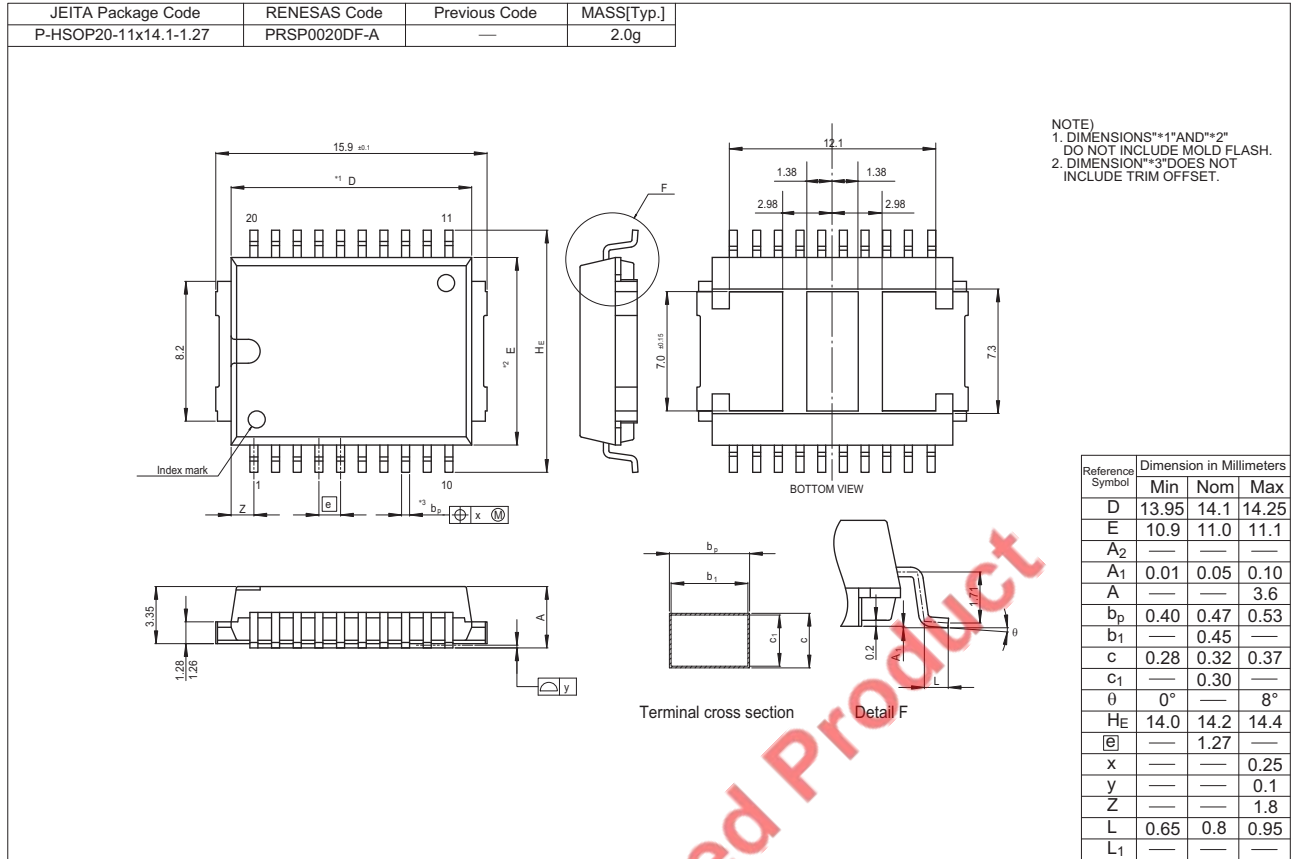


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• Common



### Package Dimensions



### Ordering Information

Orderable Part Number	Quantity	Shipping Container
RJM0407JSC-00-12	700 pcs	Tray

Note: The symbol of 2nd "-" is occasionally presented as "#".

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