

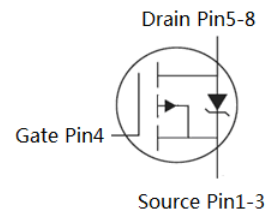
## Features

- P-Channel, -5V Logic Level Control
- Very low on-resistance  $R_{DS(on)}$  @  $V_{GS}=-4.5V$
- Fast Switching
- Enhancement mode
- 100% Avalanche Tested
- Pb-free lead plating; RoHS compliant



Part ID	Package Type	Marking	Tape and reel information
VSP020P06MS	PDFN5x6	020P06M	3000pcs/reel

$V_{DS}$	-60	V
$R_{DS(on),TYP@ V_{GS}=-10V}$	10	m $\Omega$
$R_{DS(on),TYP@ V_{GS}=-4.5V}$	13	m $\Omega$
$I_D$	-65	A

**PDFN5x6**

**Maximum ratings, at  $T_j=25^\circ\text{C}$ , unless otherwise specified**

Symbol	Parameter	Rating	Unit	
<b>Common Ratings (<math>T_c=25^\circ\text{C}</math> Unless Otherwise Noted)</b>				
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	-60	V	
$T_{STG} T_J$	Storage and operating temperature range ①	-55 to 150	$^\circ\text{C}$	
$I_S$	Diode Continuous Forward Current	$T_c = 25^\circ\text{C}$ -65	A	
<b>Mounted on Large Heat Sink</b>				
$I_D$	Continuous Drain current @ $V_{GS}=-10V$	$T_c = 25^\circ\text{C}$	-65	A
		$T_c = 100^\circ\text{C}$	-42	A
$I_{DM}$	Pulse Drain Current Tested ②	$T_c = 25^\circ\text{C}$	-230	A
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ\text{C}$	83	W
$R_{\theta JC}$	Thermal Resistance-Junction to Case		1.5	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient		48	$^\circ\text{C/W}$
<b>Drain-Source Avalanche Ratings</b>				
EAS	Avalanche Energy, Single Pulsed ③		289	mJ

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
<b>Static Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA	-60	--	--	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current(Tc=25°C)	V <sub>DS</sub> =-60V, V <sub>GS</sub> =0V	--	--	-1	μA
	Zero Gate Voltage Drain Current(Tc=125°C)	V <sub>DS</sub> =-60V, V <sub>GS</sub> =0V	--	--	-100	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	--	--	±100	nA
V <sub>GS(TH)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-1.0	-2.0	-3.0	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance ②	V <sub>GS</sub> =-10V, I <sub>D</sub> =-40A	--	10	15	mΩ
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance ②	V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-20A	--	13	20	mΩ
<b>Dynamic Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V, f=1MHz	--	6430	--	pF
C <sub>oss</sub>	Output Capacitance		--	340	--	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	310	--	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =-30V, I <sub>D</sub> =-20A, V <sub>GS</sub> =-10V	--	85	--	nC
Q <sub>gs</sub>	Gate-Source Charge		--	18	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	22	--	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> =-30V, I <sub>D</sub> =-10A, R <sub>G</sub> =6.8Ω, V <sub>GS</sub> =-10V	--	19	--	nS
t <sub>r</sub>	Turn-on Rise Time		--	24	--	nS
t <sub>d(off)</sub>	Turn-Off Delay Time		--	92	--	nS
t <sub>f</sub>	Turn-Off Fall Time		--	43	--	nS
<b>Source- Drain Diode Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>						
V <sub>SD</sub>	Forward on voltage	I <sub>SD</sub> =-2A, V <sub>GS</sub> =0V	--	-0.71	-1.2	V
t <sub>rr</sub>	Reverse Recovery Time	T <sub>J</sub> =25°C, I <sub>sd</sub> =-20A, V <sub>GS</sub> =0V	--	32	--	nS
Q <sub>rr</sub>	Reverse Recovery Charge	di/dt=-500A/μs		185		nC

**NOTE:**

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Pulse width ≤ 300μs; duty cycle ≤ 2%.
- ③ Limited by T<sub>Jmax</sub>, starting T<sub>J</sub> = 25°C, L = 0.5mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = -34A, V<sub>GS</sub> = -10V. Part not recommended for use above this value

### Typical Characteristics

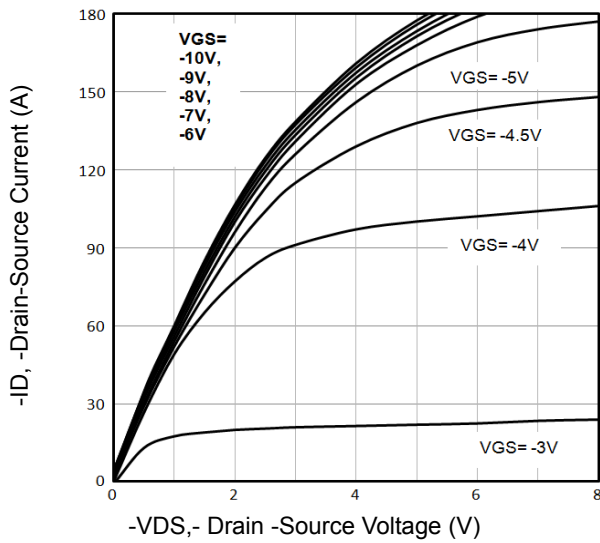


Fig1. Typical Output Characteristics

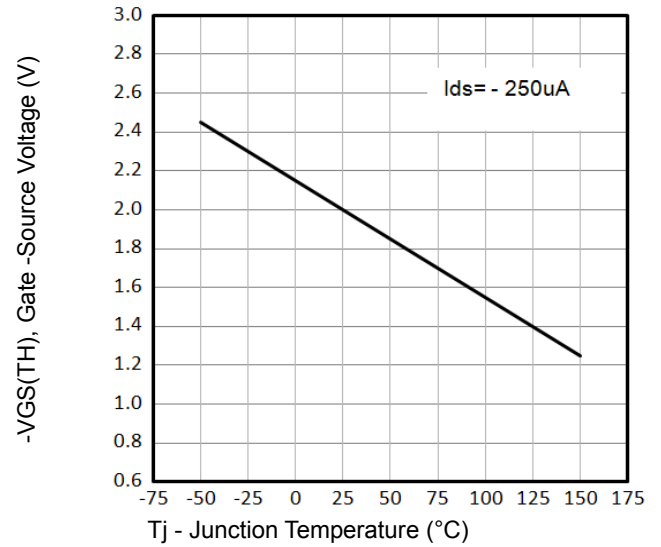


Fig2.  $-V_{GS(TH)}$  Gate -Source Voltage Vs.  $T_j$

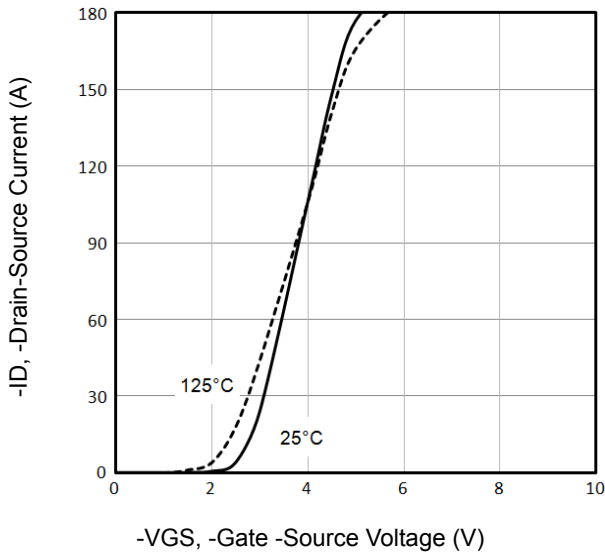


Fig3. Typical Transfer Characteristics

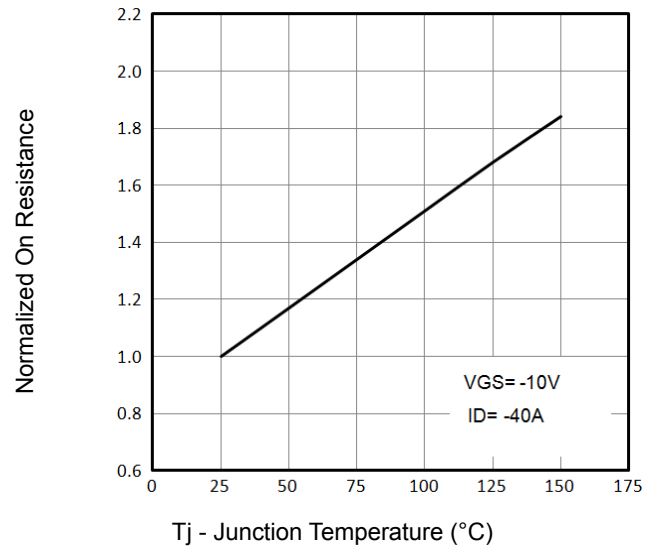


Fig4. Normalized On-Resistance Vs.  $T_j$

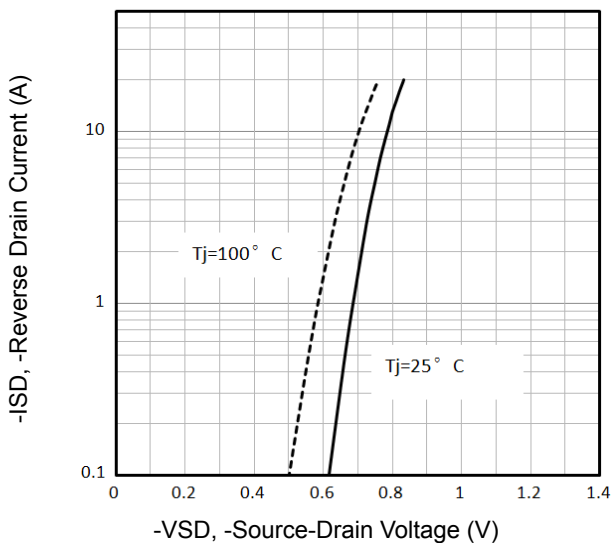


Fig5. Typical Source-Drain Diode Forward Voltage

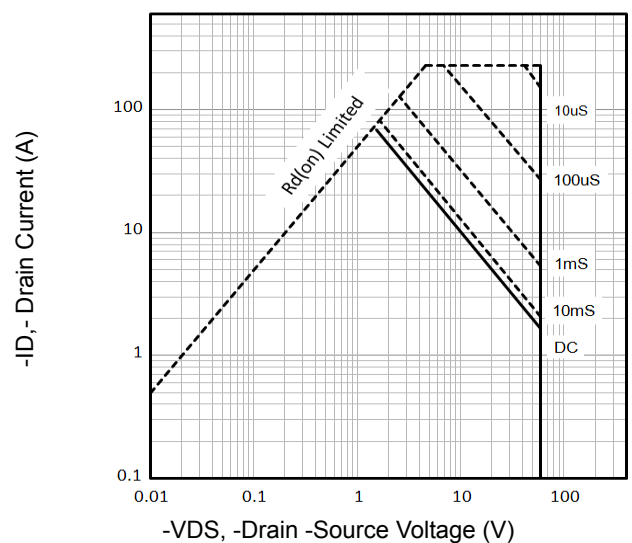


Fig6. Maximum Safe Operating Area

Typical Characteristics

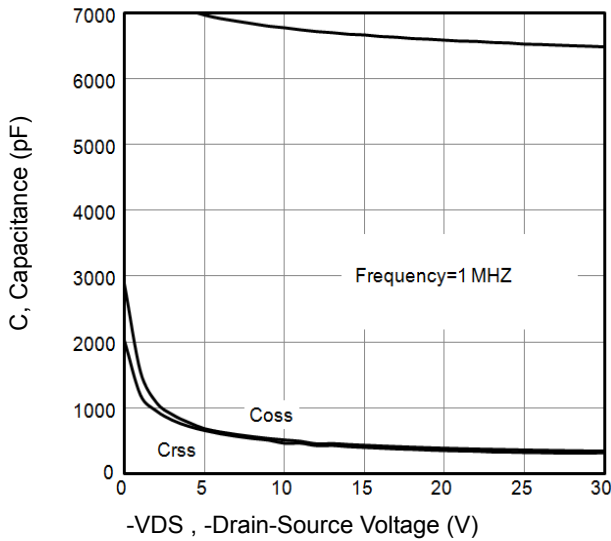


Fig7. Typical Capacitance Vs.Drain-Source Voltage

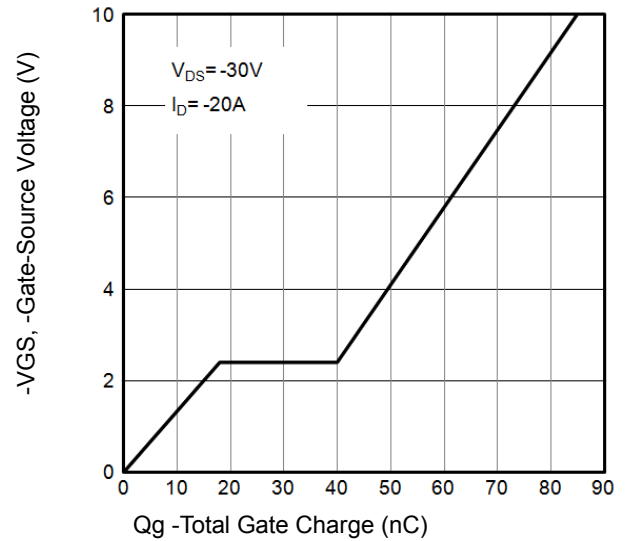


Fig8. Typical Gate Charge Vs.Gate-Source Voltage

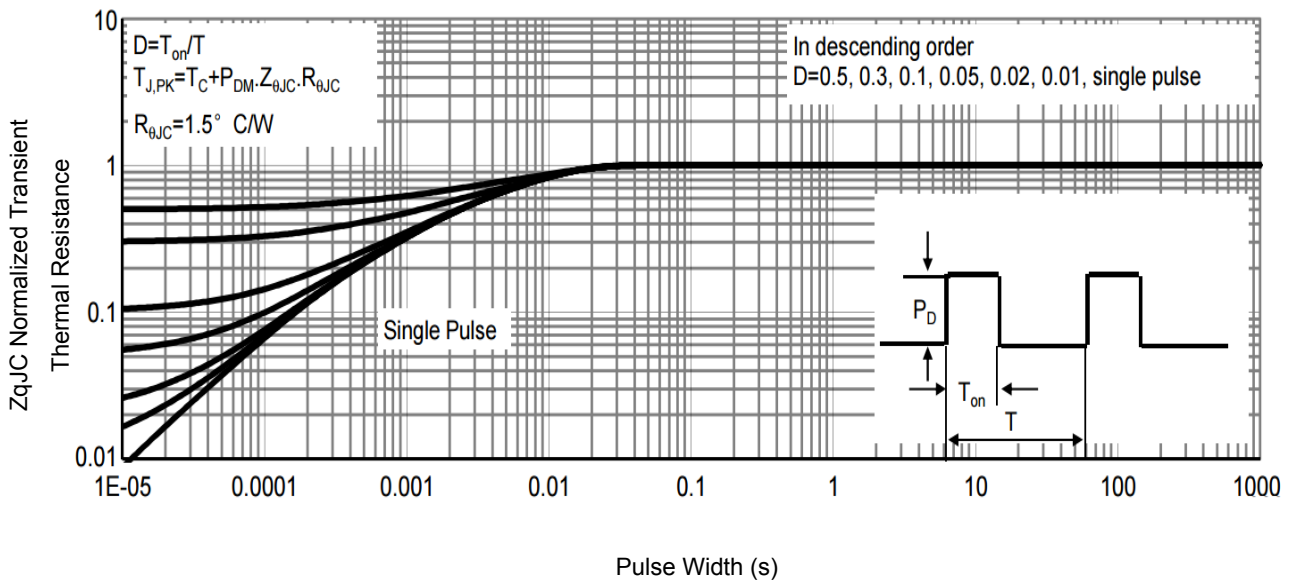


Fig9. Normalized Maximum Transient Thermal Impedance

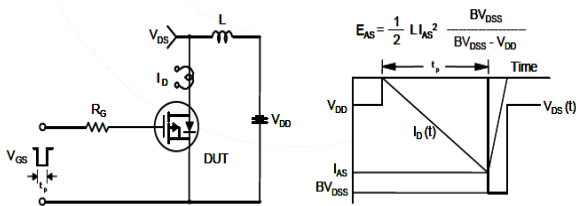


Fig10. Unclamped Inductive Test Circuit and Waveforms

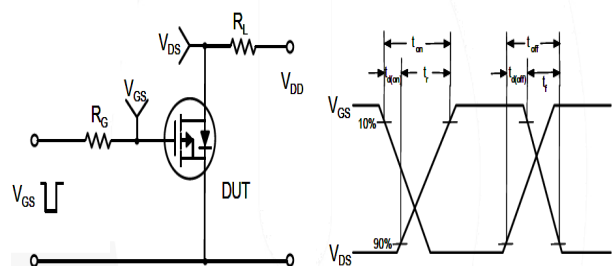
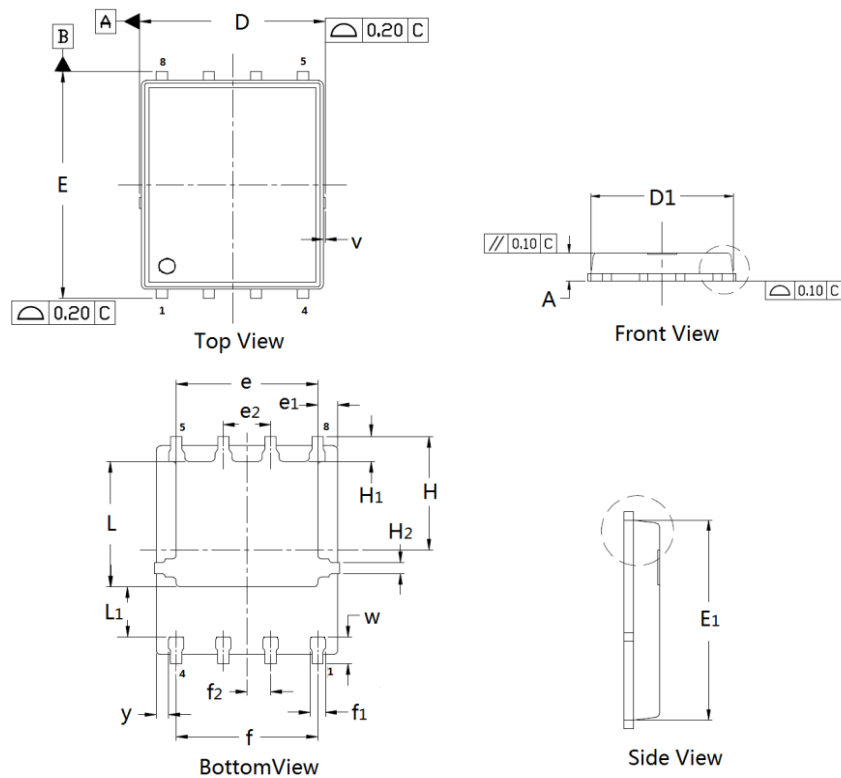


Fig11. Switching Time Test Circuit and waveforms

PDFN5×6 Package Outline Data



DIMENSIONS ( unit : mm )

Symbol	Min	Typ	Max	Symbol	Min	Typ	Max
A	0.90	1.02	1.10	D	4.90	4.98	5.10
D <sub>1</sub>	4.80	4.89	5.00	E	6.00	6.11	6.20
E <sub>1</sub>	5.65	5.74	5.85	e	3.72	3.80	3.92
e <sub>1</sub>	--	0.54	--	e <sub>2</sub>	--	1.27	--
f	--	3.82	--	f <sub>1</sub>	0.31	0.37	0.51
f <sub>2</sub>	--	0.64	--	H	--	3.15	--
H <sub>1</sub>	0.59	0.63	0.79	H <sub>2</sub>	0.26	0.28	0.32
L	3.38	3.45	3.58	L <sub>1</sub>	--	1.39	--
v	--	0.13	--	w	0.64	0.68	0.84
y	--	0.34	--		--		--

Customer Service

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