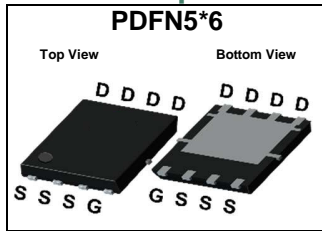
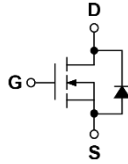


## N-Channel Enhancement Mode MOSFET

### Pin Description



### Symbol



### Product Summary

Symbol	N-Channel	Unit
$V_{DSS}$	40	V
$R_{DS(ON)-Max}$	1	m $\Omega$
ID	250	A

### Feature

- Fast switching speed
- Reliable and Rugged
- ROHS Compliant & Halogen-Free
- 100% UIS and Rg Tested
- Moisture Sensitivity Level MSL1

### Applications

- DC-to-DC converters
- Switch Mode Power Supply
- Brushless DC motor control

### Ordering Information

Orderable Part Number	Package Type	Form	Shipping	Marking
SL250N04Q	PDFN5*6	Tape & Reel	5000 / Tape & Reel	

### Absolute Maximum Ratings (T<sub>J</sub>=25°C Unless Otherwise Noted)

Symbol	Parameter	N-Channel	Unit	
$V_{DSS}$	Drain-Source Voltage	40	V	
$V_{GSS}$	Gate-Source Voltage	±20		
$T_J$	Maximum Junction Temperature	150	°C	
$T_{STG}$	Storage Temperature Range	-55 to 150	°C	
$I_S$	Diode Continuous Forward Current	T <sub>C</sub> =25°C	100	A
$I_{DM}$	Pulse Drain Current Tested	T <sub>C</sub> =25°C	400 <sup>①</sup>	A
$I_D$	Continuous Drain Current	T <sub>C</sub> =25°C	250	A
		T <sub>C</sub> =100°C	162	
$P_D$	Maximum Power Dissipation	T <sub>C</sub> =25°C	89	W
		T <sub>C</sub> =100°C	36	
$I_D$	Continuous Drain Current	T <sub>A</sub> =25°C	39	A
		T <sub>A</sub> =70°C	31	
$P_D$	Maximum Power Dissipation	T <sub>A</sub> =25°C	2.1	W
		T <sub>A</sub> =70°C	1.3	
$I_{AS}$ <sup>②</sup>	Avalanche Current, Single pulse	L=0.1mH	64	A
		L=0.5mH	34	
$E_{AS}$ <sup>②</sup>	Avalanche Energy, Single pulse	L=0.1mH	204	mJ
		L=0.5mH	290	

### Thermal Characteristics

Symbol	Parameter	Rating	Unit	
$R_{\theta JC}$	Thermal Resistance-Junction to Case	Steady State	1.3	°C/W
$R_{\theta JA}$ <sup>③</sup>	Thermal Resistance-Junction to Ambient	Steady State	60	°C/W

Note ① : Max. current is limited by bonding

Note ② : UIS tested and pulse width are limited by maximum junction temperature 150°C

Note ③ : Surface Mounted on 1in<sup>2</sup> FR-4 board with 1oz

**N-Channel Electrical Characteristics** ( $T_J=25^\circ\text{C}$  Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static Electrical Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=250\mu A$	40	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=32V, V_{GS}=0V$	-	-	1	$\mu A$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	1	1.7	2.3	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
$R_{DS(on)}^{(4)}$	Drain-Source On-state Resistance	$V_{GS}=10V, I_{DS}=20A$	-	0.8	1.0	m $\Omega$
		$V_{GS}=4.5V, I_{DS}=10A$	-	1.25	1.6	
<b>gfs</b>	Forward Transconductance	$V_{DS}=5V, I_{DS}=10A$	-	45	-	S
<b>Dynamic Characteristics <sup>(6)</sup></b>						
$R_G$	Gate Resistance	$V_{GS}=0V, V_{DS}=0V,$ Freq.=1MHz	-	1.2	-	$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=20V,$ Freq.=1MHz	-	4928	-	pF
$C_{oss}$	Output Capacitance		-	2000	-	
$C_{rss}$	Reverse Transfer Capacitance		-	65	-	
$t_{d(on)}$	Turn-on Delay Time	$V_{GS}=10V, V_{DS}=20V,$ $I_D=20A, R_{GEN}=3\Omega$	-	10.7	-	nS
$t_r$	Turn-on Rise Time		-	25.3	-	
$t_{d(off)}$	Turn-off Delay Time		-	65.2	-	
$t_f$	Turn-off Fall Time		-	53.6	-	
$Q_g$	Total Gate Charge	$V_{GS}=10V, V_{DS}=20V,$ $I_D=20A$	-	69	-	nC
$Q_{gs}$	Gate-Source Charge		-	16.5	-	
$Q_{gd}$	Gate-Drain Charge		-	10	-	
<b>Source-Drain Characteristics</b>						
$V_{SD}^{(4)}$	Diode Forward Voltage	$I_{SD}=10A, V_{GS}=0V$	-	0.72	1.1	V
$t_{rr}$	Reverse Recovery Time	$I_F=20A, V_R=20V$	-	48.6	-	nS
$Q_{rr}$	Reverse Recovery Charge	$di_F/dt=100A/\mu s$	-	35.5	-	nC

Note <sup>(4)</sup> : Pulse test (pulse width $\leq 300\mu s$ , duty cycle $\leq 2\%$ ).

Note <sup>(5)</sup> : Guaranteed by design, not subject to production testing.

**N-Channel Typical Characteristics**

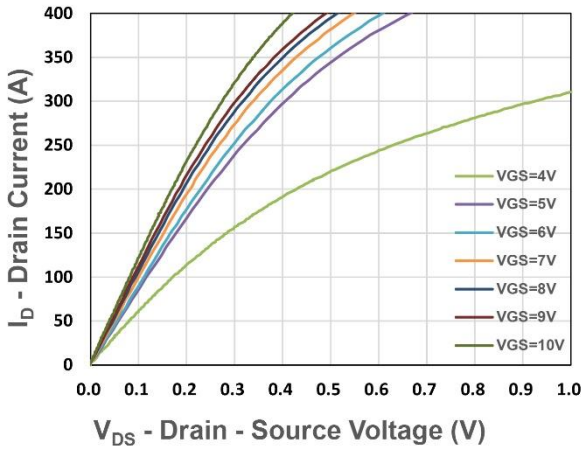


Figure 1. Output Characteristics

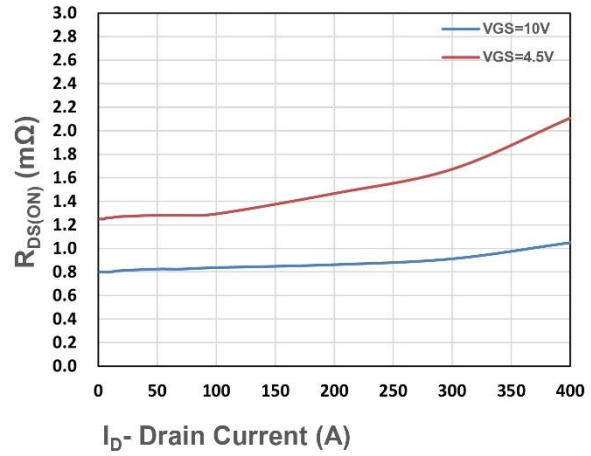


Figure 2. On-Resistance vs. ID

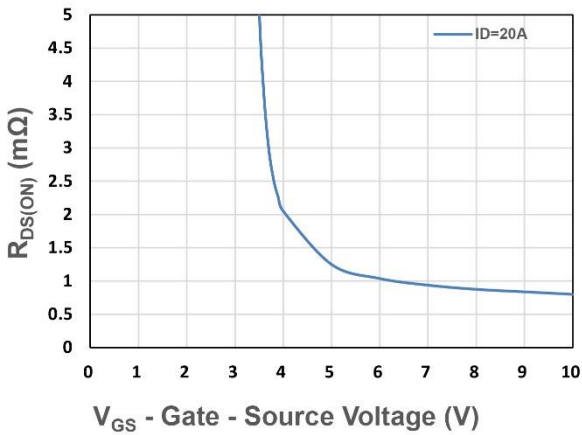


Figure 3. On-Resistance vs. VGS

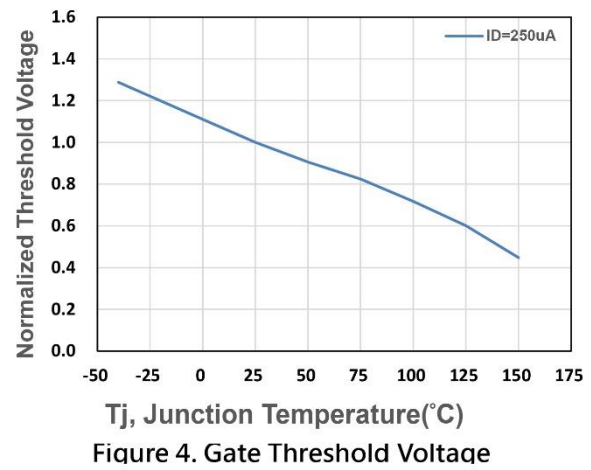


Figure 4. Gate Threshold Voltage

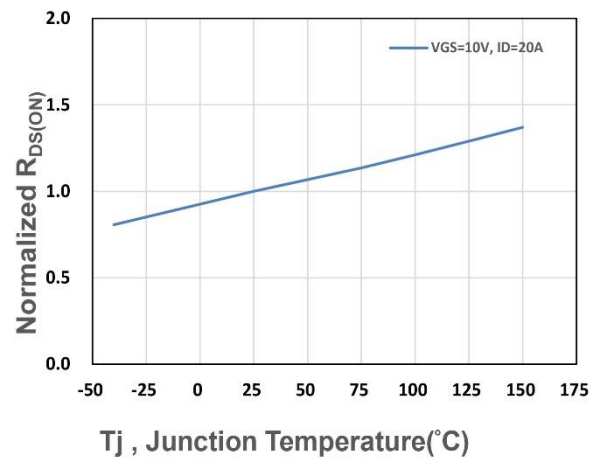


Figure 5. Drain-Source On Resistance

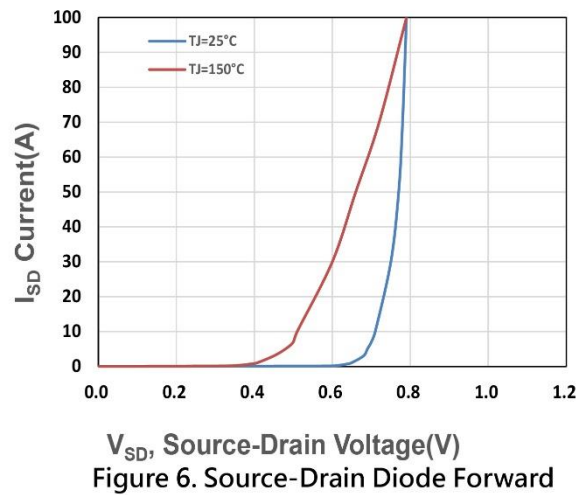
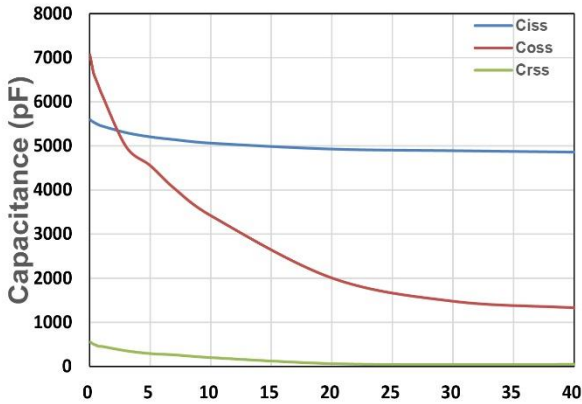
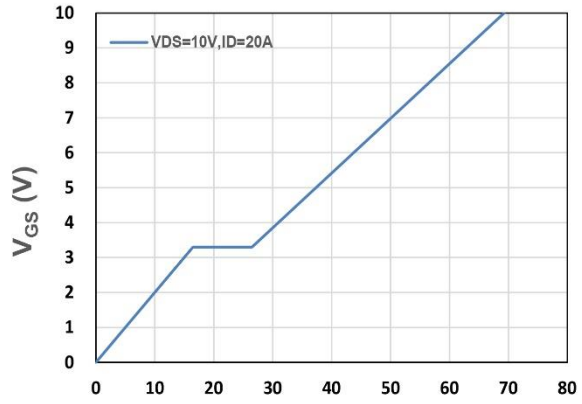


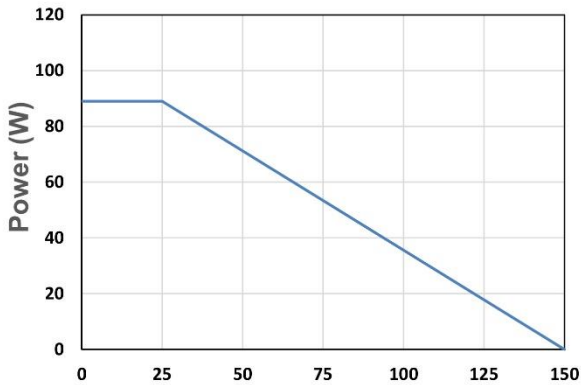
Figure 6. Source-Drain Diode Forward



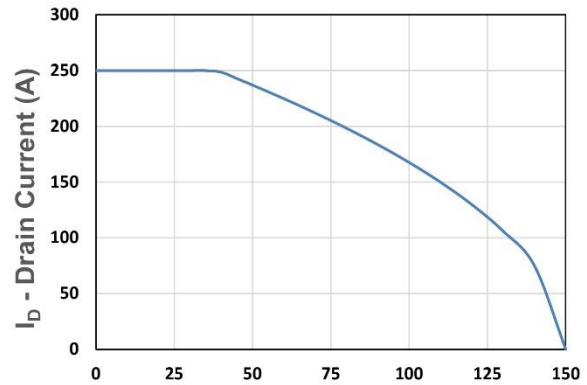
**V<sub>DS</sub> - Drain - Source Voltage (V)**  
Figure 7. Capacitance



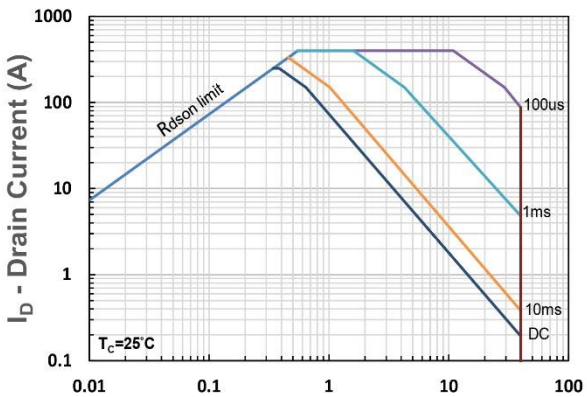
**Qg, Total Gate Charge (nC)**  
Figure 8. Gate Charge Characteristics



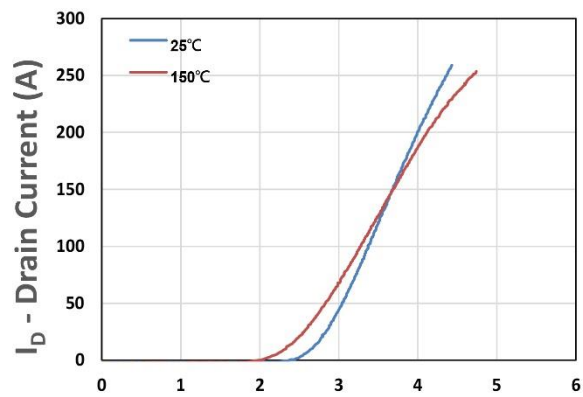
**Tc - Case Temperature (°C)**  
Figure 9. Power Dissipation



**Tc - Case Temperature (°C)**  
Figure 10. Drain Current



**V<sub>DS</sub> - Drain-Source Voltage (V)**  
Figure 11. Safe Operating Area



**V<sub>GS</sub> - Gate - Source Voltage (V)**  
Figure 12. Transfer Characteristics

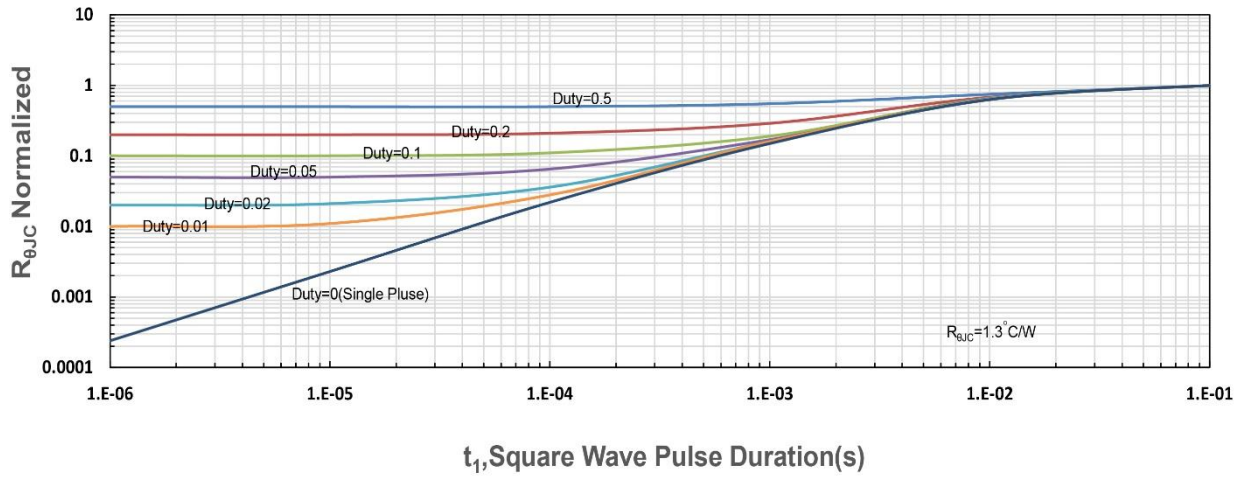


Figure 13.  $R_{\theta JC}$  Transient Thermal Impedance

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