

Dual N-channel Enhancement Mode Power MOSFET

Features

- Advanced Trench Technology
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- Lead free product is acquired
- 100% UIS TESTED!
- 100% ΔV_{ds} TESTED!

Product Summary

Parameters	Value	Unit
V_{DSS}	60	V
$V_{GS(th)_{Typ}}$	1.6	V
$I_D(@V_{GS}=10V)$	20	A
$R_{DS(ON)_{Typ}}(@V_{GS}=10V)$	30	m Ω

Applications

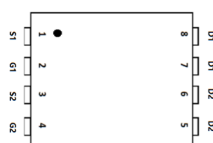
- Load Switch
- PWM Application
- Power Management

Top View

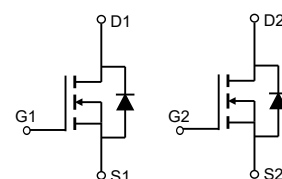
Bottom View



PDFN3x3-8L



Marking



Schematic Diagram

Ordering Information

Device	Marking	Package	Packing	Reel Size	Tape Width	Reel (pcs)
ZK60N20DQ	60N20D	DFN3x3	Reel	N/A	N/A	5000

MAXIMUM RATINGS ($T_a=25^{\circ}\text{C}$ unless otherwise noted)

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	60	V
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current	$T_C = 25^{\circ}\text{C}$	I_D	20	A
	$T_C = 100^{\circ}\text{C}$		10	
Pulsed Drain Current		I_{DM}	80	A
Single Pulsed Avalanche Energy		E_{AS}	25	mJ
Power Dissipation		P_D	34.7	W
Thermal Resistance from Junction to Ambient		$R_{\theta JA}$	61	$^{\circ}\text{C/W}$
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to 175	$^{\circ}\text{C}$

MOSFET ELECTRICAL CHARACTERISTICS

$T_a = 25^\circ\text{C}$ unless otherwise specified

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Off characteristics						
Drain-source breakdown voltage	V _{(BR) DSS}	V _{GS} = 0V, I _D = 250μA	60			V
Zero gate voltage drain current	I _{DSS}	V _{DS} = 60V, V _{GS} =0V			1.0	μA
Gate-body leakage current	I _{GSS}	V _{DS} = 0V, V _{GS} =±20V			±100	nA
On characteristics						
Gate-threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250uA	1.0	1.6	2.5	V
Static drain-source on-sate resistance	R _{DS(on)}	V _{GS} =10V, I _D =10A		30	38	mΩ
		V _{GS} =4.5V, I _D =5A		34	43	mΩ
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V f =1MHz		1220		pF
Output capacitance	C _{oss}			68		
Reverse transfer capacitance	C _{rss}			49		
Gate resistance	R _G	f =1MHz		1.2		Ω
Switching characteristics						
Total gate charge	Q _g	V _{GS} =0 to 10V V _{DS} =30V, I _D =10A		22		nC
Gate-source charge	Q _{gs}			4.2		
Gate-drain charge	Q _{gd}			6.9		
Turn-on delay time	t _{d(on)}	V _{DS} =30V, I _D =10A V _{GS} =10V, R _{GEN} =3Ω		6.4		ns
Turn-on rise time	t _r			15.3		
Turn-off delay time	t _{d(off)}			25		
Turn-off fall time	t _f			7.6		
Drain-Source Diode Characteristics						
Drain-source diode forward voltage	V _{SD}	V _{GS} =0V, I _S =10A			1.2	V
Continuous drain-source diode forward current	I _S				20	A
Reverse recovery time	trr	di/dt = 100A/μs, I _F = 10A		26		ns
Reverse recovery charge	Qrr			45		nC

Notes:

1. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)} = 150^\circ\text{C}$
2. The EAS data shows Max. rating . The test condition is $V_{DD} = 25V, V_{GS} = 10V, L = 0.4mH, I_{AS} = 14A$
3. The data tested by surface mounted on a 1 inch2 FR-4 board with 20Z copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
5. This value is guaranteed by design hence it is not included in the production test.

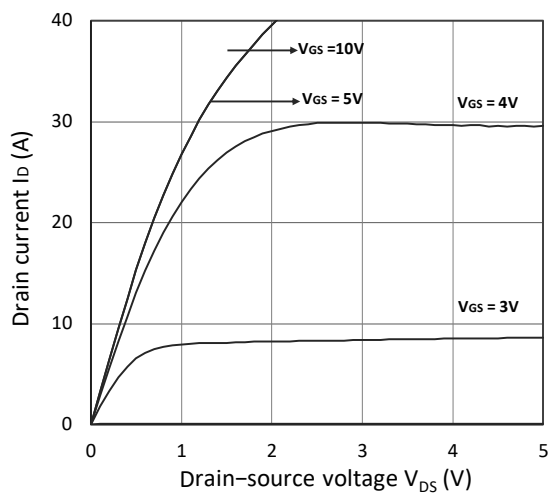


Figure 1. Output Characteristics

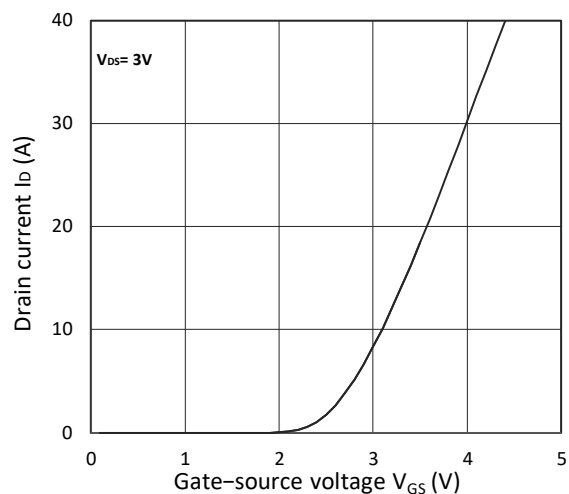


Figure 2. Transfer Characteristics

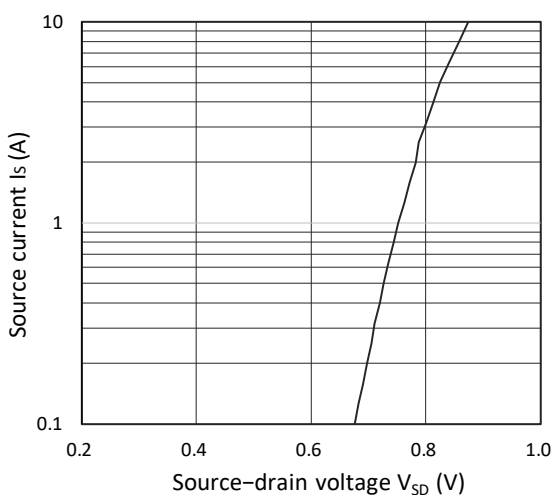


Figure 3. Forward Characteristics of Reverse

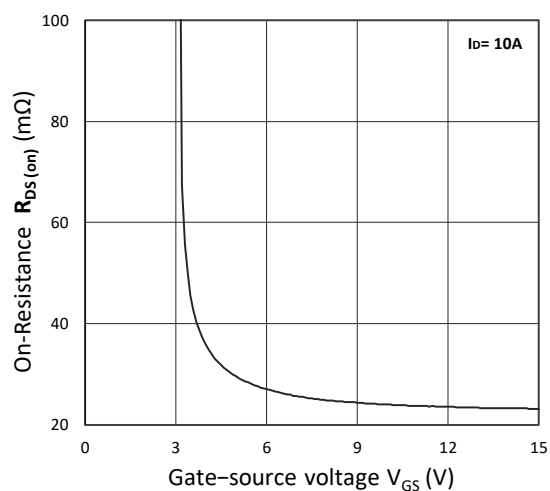


Figure 4. $R_{DS(on)}$ vs. V_{GS}

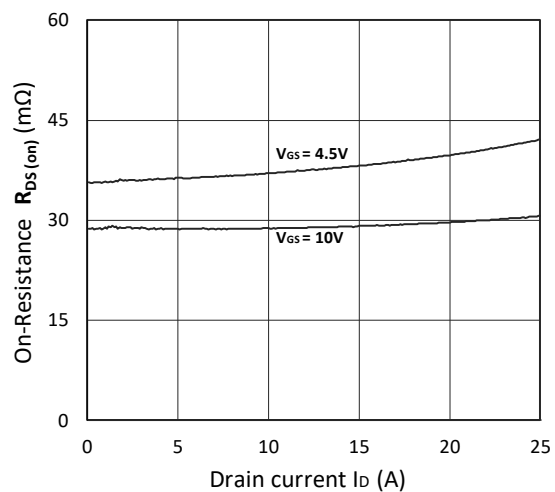


Figure 5. $R_{DS(on)}$ vs. I_D

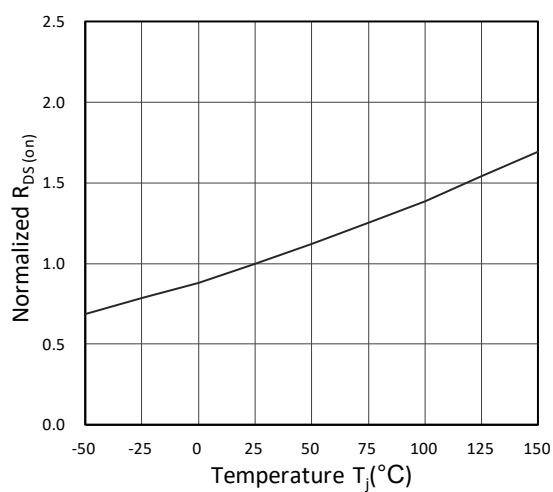


Figure 6. Normalized $R_{DS(on)}$ vs. Temperature

Typical Characteristics

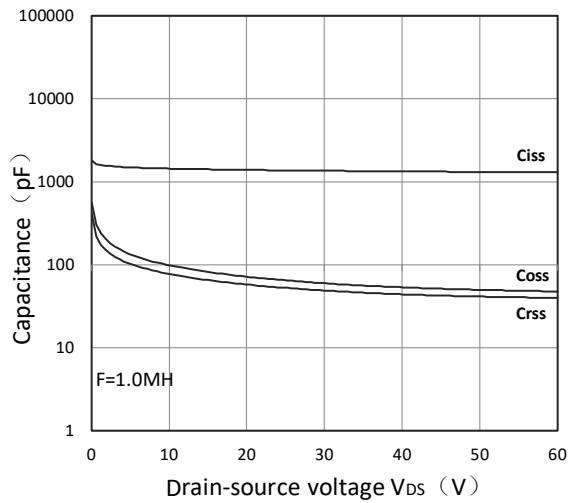


Figure 7. Capacitance Characteristics

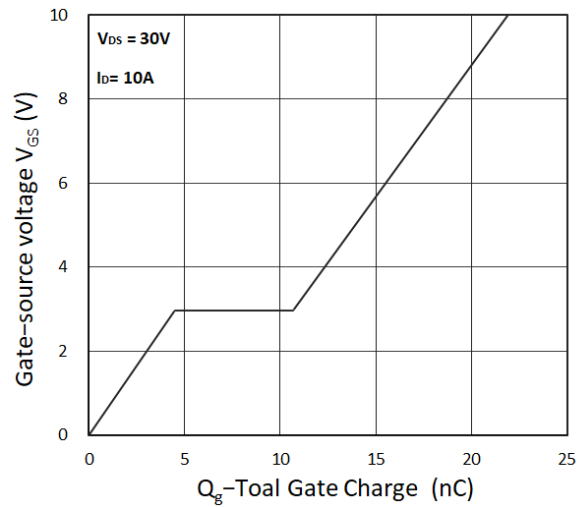


Figure 8. Gate Charge Characteristics

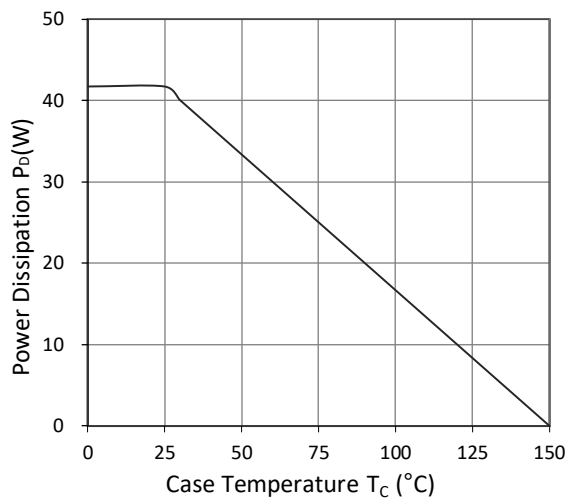


Figure 9. Power Dissipation

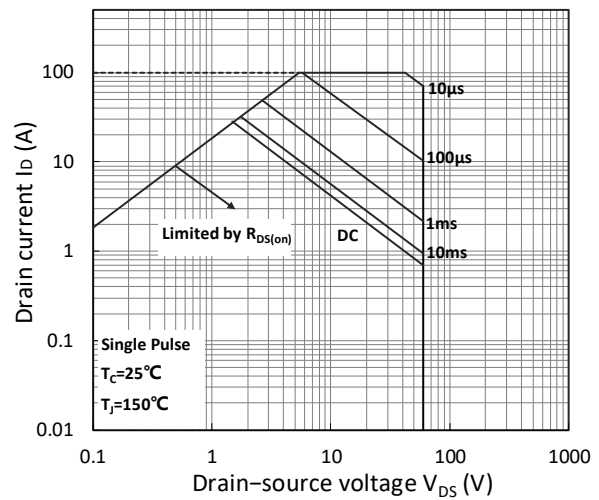


Figure 10. Safe Operating Area

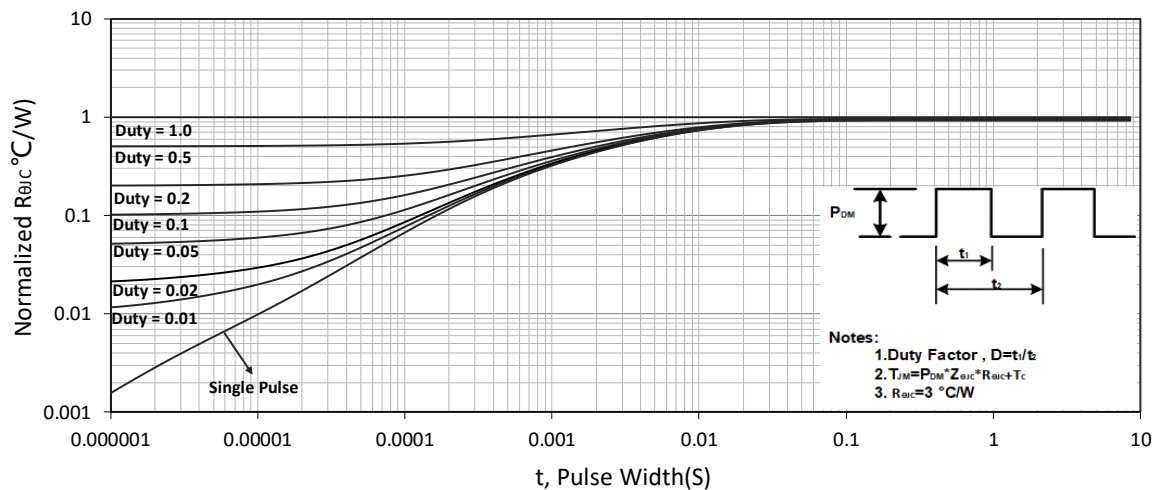
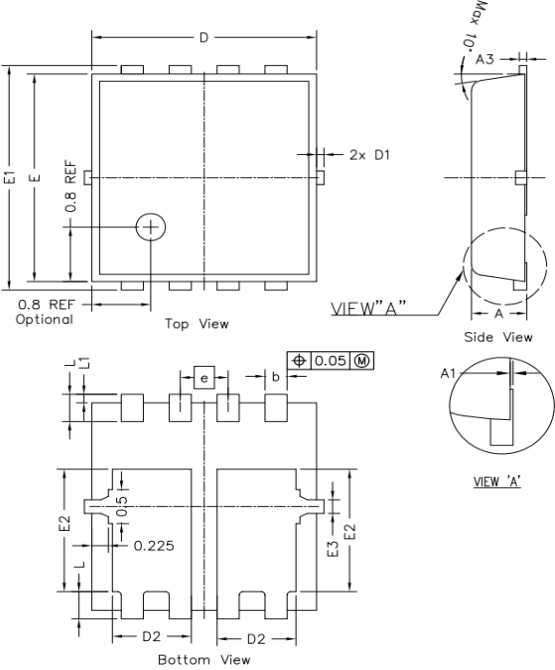


Figure 11. Normalized Maximum Transient Thermal Impedance



SYMBOLS	DIMENSION IN MM			DIMENSION IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.700	0.750	0.800	0.028	0.030	0.031
A1	---	---	0.050	----	----	0.002
A3	0.144	0.152	0.202	0.006	0.006	0.008
b	0.250	0.300	0.350	0.010	0.012	0.014
e	0.65 BSC			0.026 BSC		
D	2.950	3.050	3.150	0.116	0.120	0.124
E	2.950	3.050	3.150	0.116	0.120	0.124
D1	---	---	0.125	----	----	0.005
E1	3.200	3.300	3.400	0.126	0.130	0.134
D2	0.970	1.070	1.170	0.038	0.042	0.046
E2	1.700	1.800	1.900	0.067	0.071	0.075
E3	0.150	0.200	0.250	0.006	0.008	0.010
L	0.300	0.400	0.500	0.012	0.016	0.020
L1	0.075	0.125	0.175	0.003	0.005	0.007