

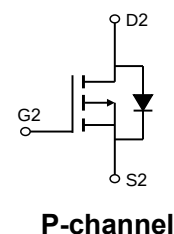
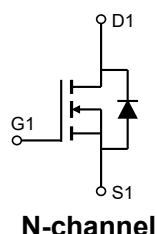
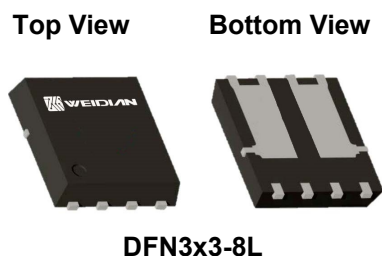
N and P-channel Enhancement Mode Power MOSFET

Features

- Advanced
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- Pb-free Lead Plating
- Halogen-free and RoHS-compliant
- 100% UIS TESTED!, 100% Rg TESTED!

Applications

- Load Switch
- PWM Application
- Power Management



N-Channel

Parameters	Value	Unit
V_{DSS}	30	V
$V_{GS(th_Typ)}$	1.65	V
$I_D(@V_{GS}=10V)$	40	A
$R_{DS(ON_Typ)}(@V_{GS}=10V)$	7.6	mΩ
$R_{DS(ON_Typ)}(@V_{GS}=4.5V)$	11.5	mΩ

P-Channel

Parameters	Value	Unit
V_{DSS}	-30	V
$V_{GS(th_Typ)}$	-1.5	V
$I_D(@V_{GS}=-10V)$	-12	A
$R_{DS(ON_Typ)}(@V_{GS}=-10V)$	13	mΩ
$R_{DS(ON_Typ)}(@V_{GS}=-4.5V)$	17.5	mΩ

Ordering Information

Device	Marking	Package	Packing	Reel Size	Tape Width	Reel (pcs)
ZK3020DQ	3020D	DFN3x3	Reel	N/A	N/A	5000

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

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		V_{DS}	30	-30	V
Gate-Source Voltage		V_{GS}	±12	±12	V
Continuous Drain Current	$T_C = 25^{\circ}\text{C}$	I_D	40	-12	A
	$T_C = 70^{\circ}\text{C}$		25	-7	
Pulsed Drain Current (Note 1)		I_{DM}	55	-43	A
Maximum Power Dissipation	$T_A=25^{\circ}\text{C}$	P_D	3.5	3.5	W
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 To 150	-55 To 150	$^{\circ}\text{C}$

N-CH 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 = 250uA	30			V
Zero gate voltage drain current	I _{DSS}	V _{DS} = 40V, V _{GS} =0V			100	nA
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	1.65	2.5	V
Static drain-source on-sate resistance	R _{DS(on)}	V _{GS} =10V, I _D =20A		7.6	10	mΩ
		V _{GS} =4.5V, I _D =10A		11.5	17	mΩ
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} =15V,V _{GS} =0V f =1MHz		1850		pF
Output capacitance	C _{oss}			150		
Reverse transfer capacitance	C _{rss}			124		
Gate Resistance	R _g	f =1MHz		3.2		Ω
Switching characteristics						
Total gate charge	Q _g	V _{GS} =0 to 4,5V V _{DS} =15V, I _D =10A		10		nC
Gate-source charge	Q _{gs}			3.5		
Gate-drain charge	Q _{gd}			2.2		
Turn-on delay time	t _{d(on)}	V _{DD} =15V,I _D =10A V _{GS} =4.5V,R _{GEN} =3Ω		8		ns
Turn-on rise time	t _r			28		
Turn-off delay time	t _{d(off)}			15		
Turn-off fall time	t _f			7		
Drain-Source Diode Characteristics						
Drain-source diode forward voltage	V _{SD} ④	V _{GS} =0V, I _S =1A			1.2	V
Continuous drain-source diode forward current	I _S ①	T _C =25℃			12.5	A

Notes:

1. The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper.
2. The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
3. The power dissipation is limited by 150°C junction temperature
4. The EAS data shows Max. rating. The test condition is $V_{DD} = 18V, R_G = 25\Omega, V_{GS} = 4.5V, L = 0.1mH, I_{AS} = 11A$
5. The data is theoretically the same as I_D and I_{DM} , in real applications, should be limited by total power dissipation.

P-CH ELECTRICAL CHARACTERISTICS

$T_a=25\text{ }^{\circ}\text{C}$ 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 = -250uA	-30			V
Zero gate voltage drain current	I _{DSS}	V _{DS} = -30V, V _{GS} =0V			-1	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	-1.5	-2.5	V
Static drain-source on-sate resistance	R _{DS(on)}	V _{GS} =-10V, I _D =-10A		13	17	mΩ
		V _{GS} =-4.5V, I _D =-5A		17.5	22	mΩ
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} =-15V,V _{GS} =0V f =1MHz		1267		pF
Output capacitance	C _{oss}			166		
Reverse transfer capacitance	C _{rss}			126		
Gate Resistance	R _g	f =1MHz		12		Ω
Switching characteristics						
Total gate charge	Q _g	V _{GS} =0 to -10V V _{DS} =-15V, I _D =-5A		20		nC
Gate-source charge	Q _{gs}			3		
Gate-drain charge	Q _{gd}			5.5		
Turn-on delay time	t _{d(on)}	V _{DD} =-15V,I _D =-5A V _{GS} =-10V,R _{GEN} =3Ω		7.5		ns
Turn-on rise time	t _r			16		
Turn-off delay time	t _{d(off)}			49		
Turn-off fall time	t _f			32		
Drain-Source Diode Characteristics						
Drain-source diode forward voltage	V _{SD}	V _{GS} =0V, I _S =-5A			-1.2	V
Continuous drain-source diode forward current	I _S	T _C =25℃			-7	A
Reverse recovery time	trr	di/dt = 100A/μs, I _F = -20A		10		ns
Reverse recovery charge	Qrr			3.5		nC

Notes:

- 1、The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper.
- 2、The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- 3、The power dissipation is limited by 150 $^{\circ}\text{C}$ junction temperature
- 4、The EAS data shows Max. rating . The test condition is $V_{DD}=18V, R_G=25\Omega, V_{GS}=4.5V, L=0.1mH, I_{AS}=18A$
- 5、The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

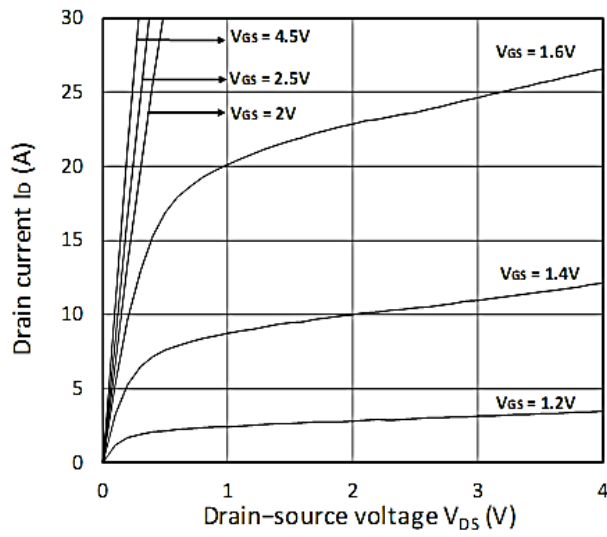


Figure 1. Output Characteristics

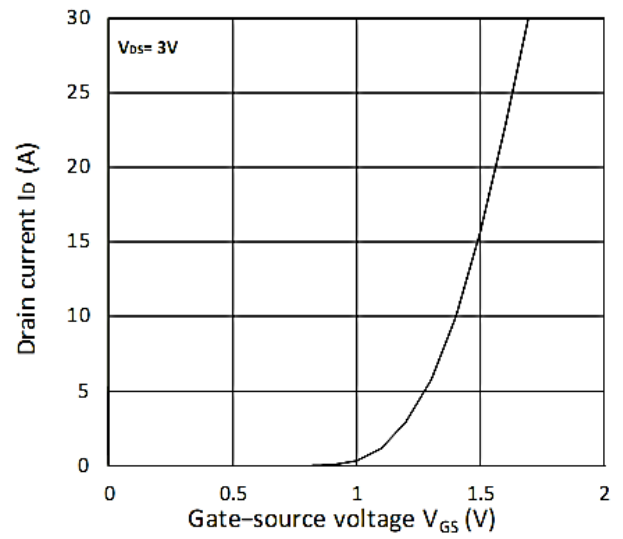


Figure 2. Transfer Characteristics

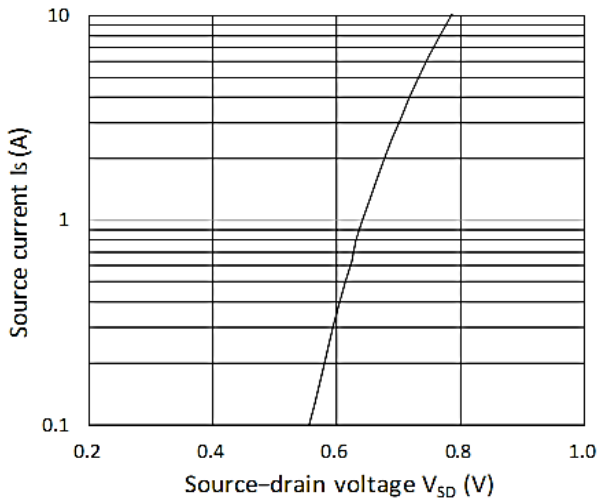


Figure 3. Forward Characteristics of Reverse

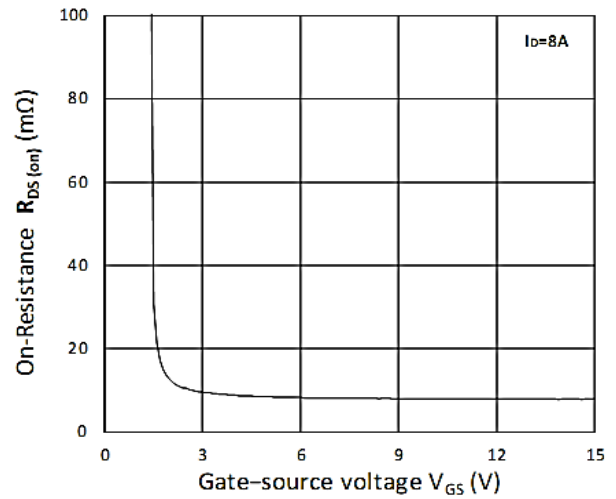


Figure 4. R_DS(ON) vs. V_GS

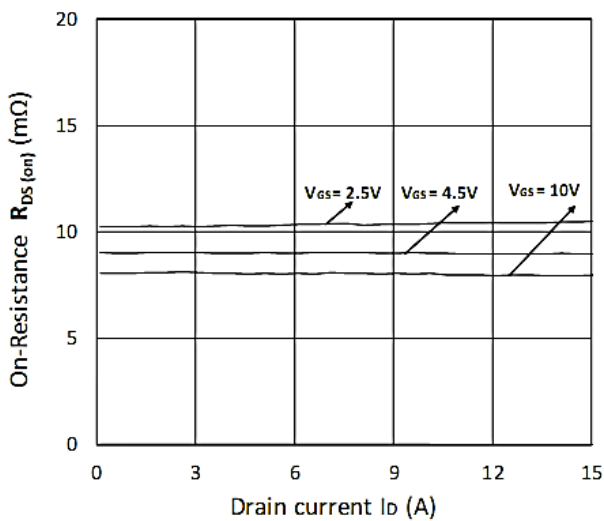


Figure 5. R_DS(ON) vs. I_D

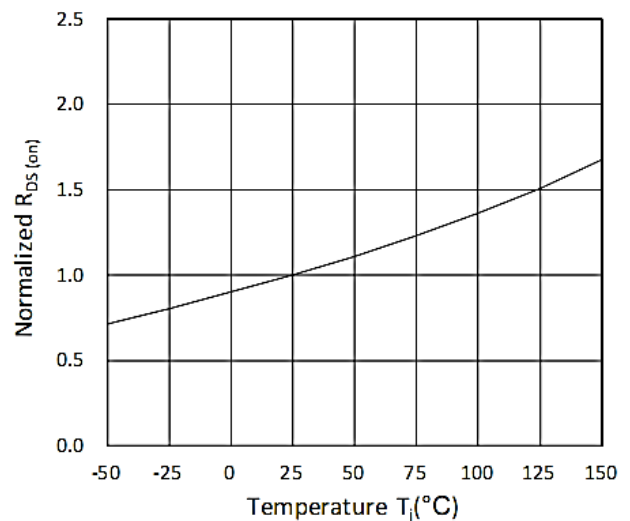


Figure 6. Normalized R_DS(on) vs. Temperature

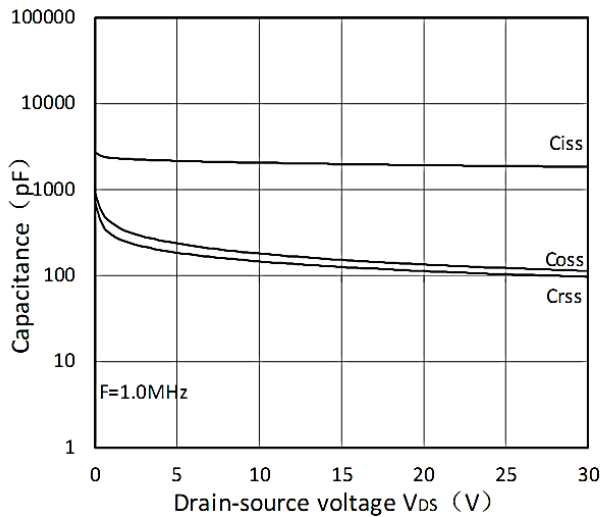


Figure 7. Capacitance Characteristics

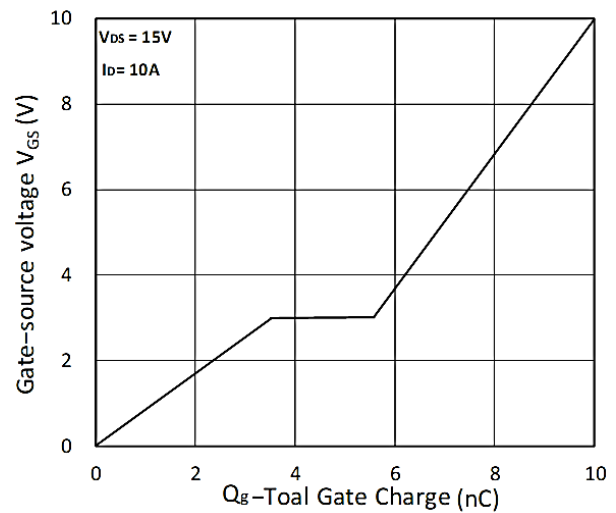


Figure 8. Gate Charge Characteristics

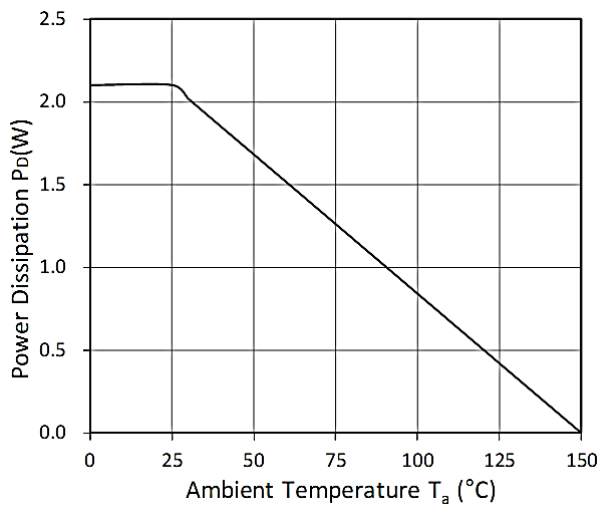


Figure 9. Power Dissipation

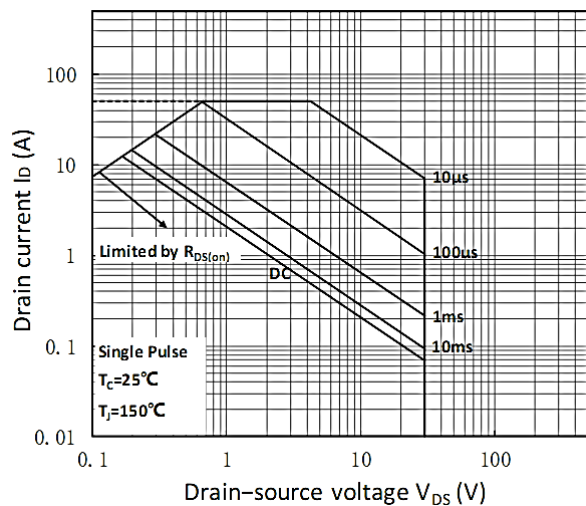


Figure 10. Safe Operating Area

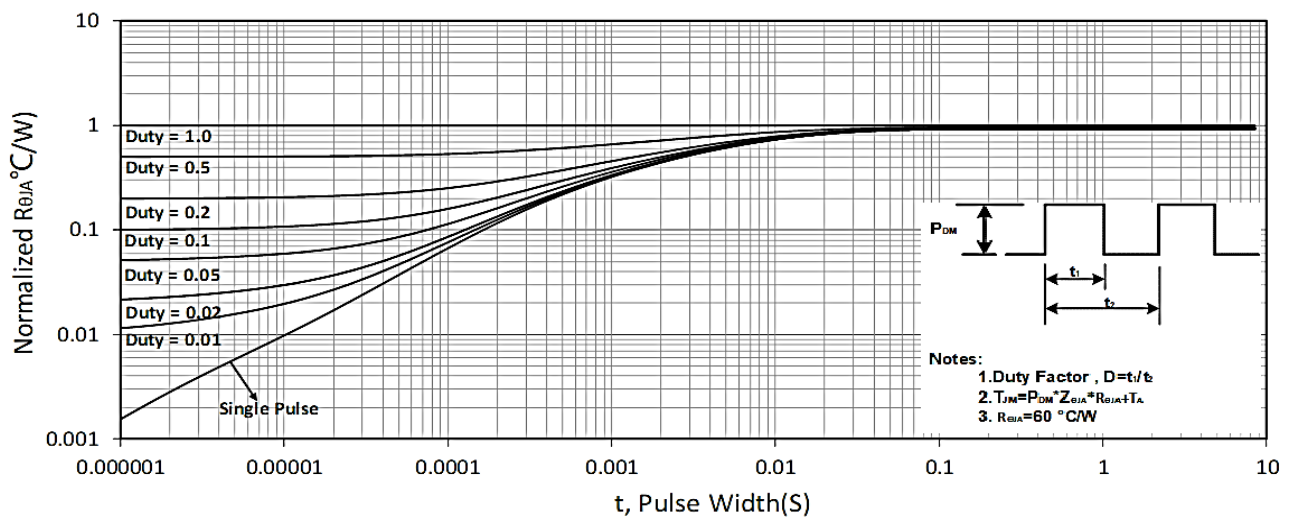


Figure 11. Normalized Maximum Transient Thermal Impedance

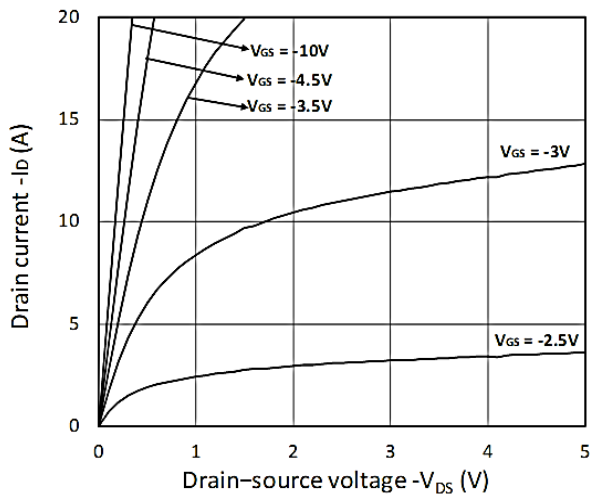


Figure 1. Output Characteristics

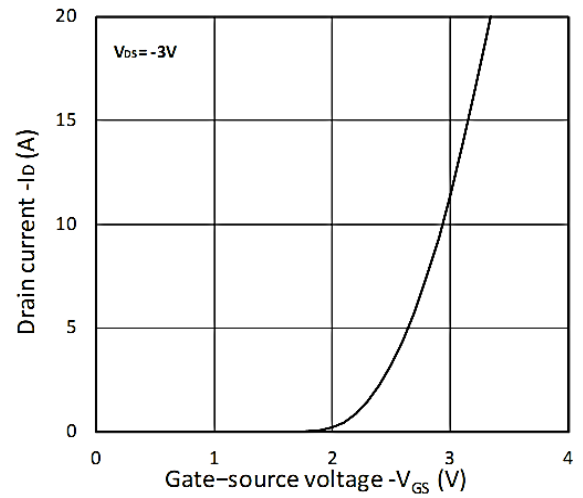


Figure 2. Transfer Characteristics

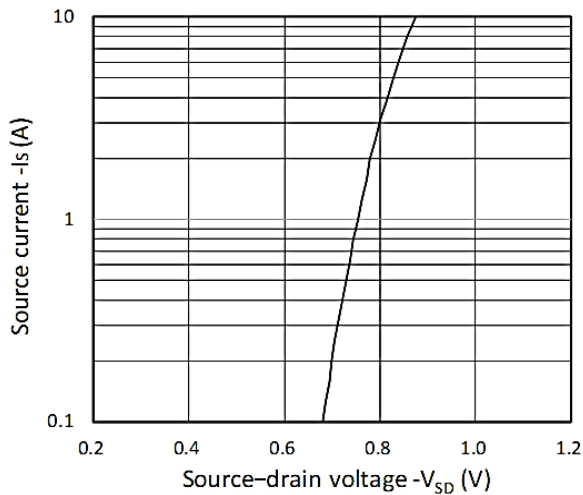


Figure 3. Forward Characteristics of Reverse

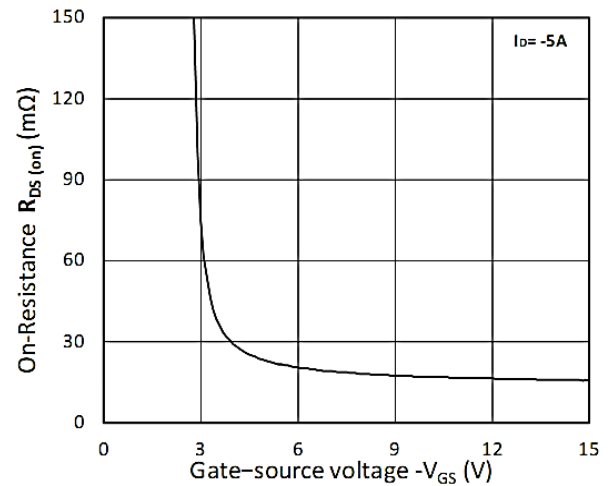


Figure 4. R_DS(ON) vs. V_GS

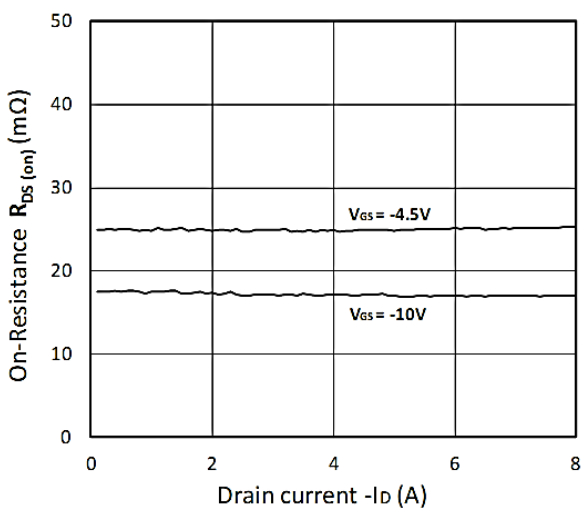


Figure 5. R_DS(ON) vs. I_D

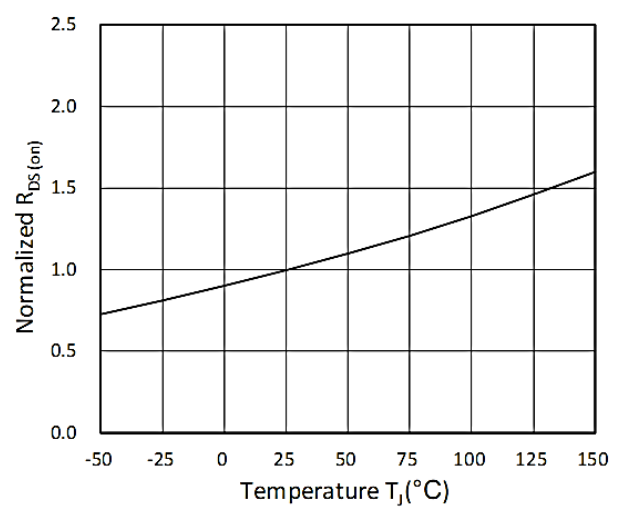


Figure 6. Normalized R_DS(on) vs. Temperature

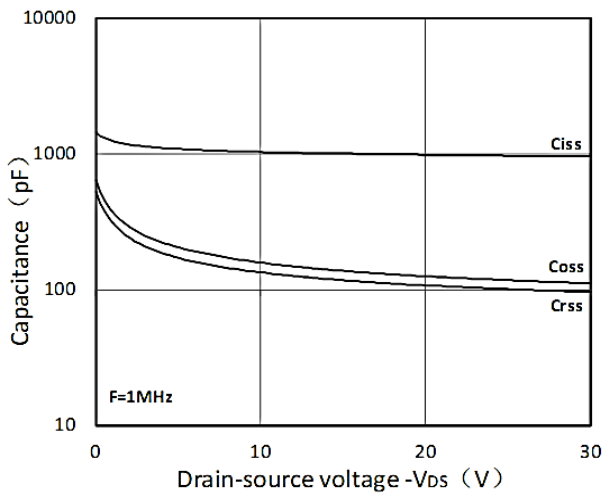


Figure 7. Capacitance Characteristics

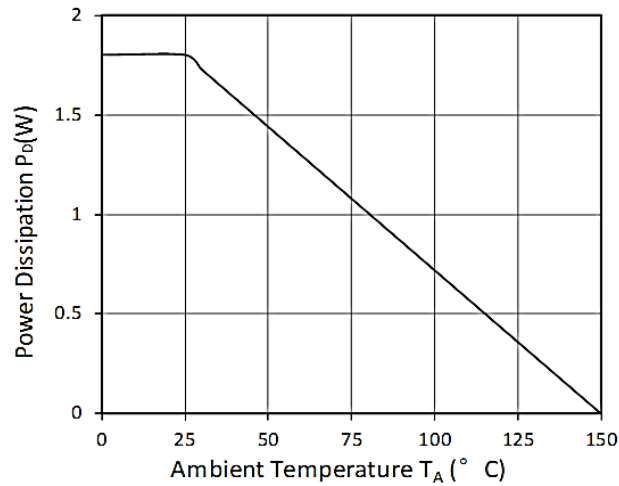


Figure 9. Power Dissipation

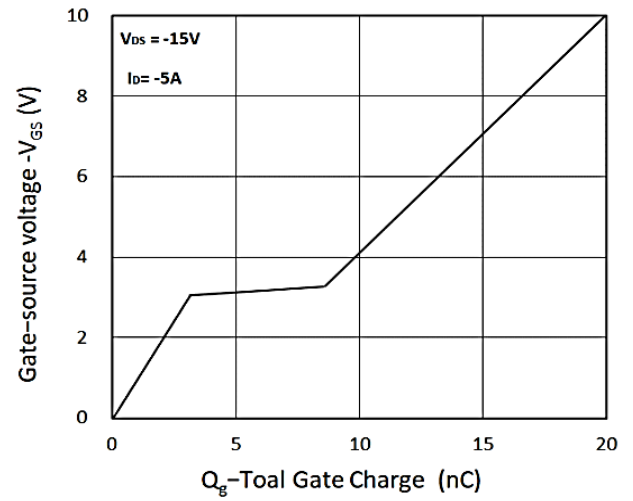


Figure 8. Gate Charge Characteristics

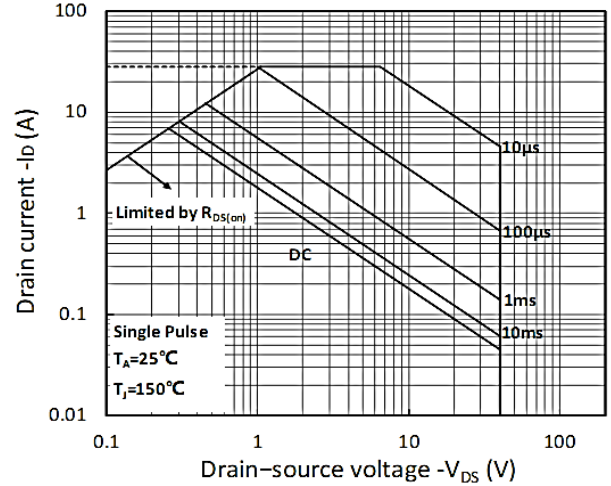


Figure10. Safe Operating Area

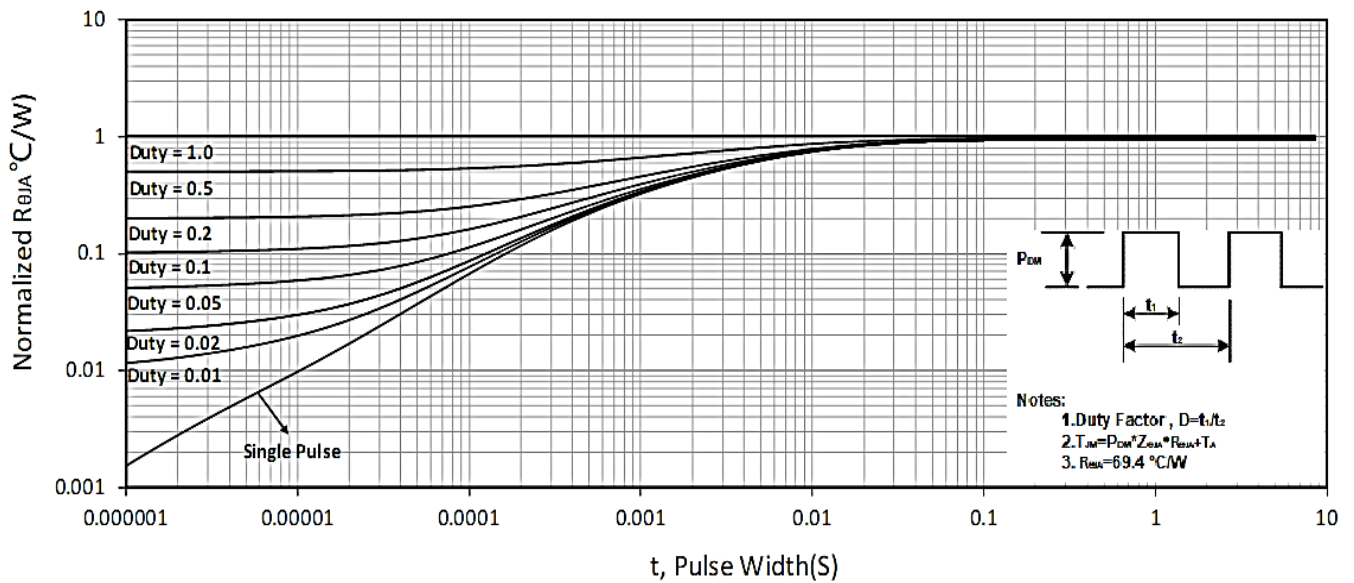
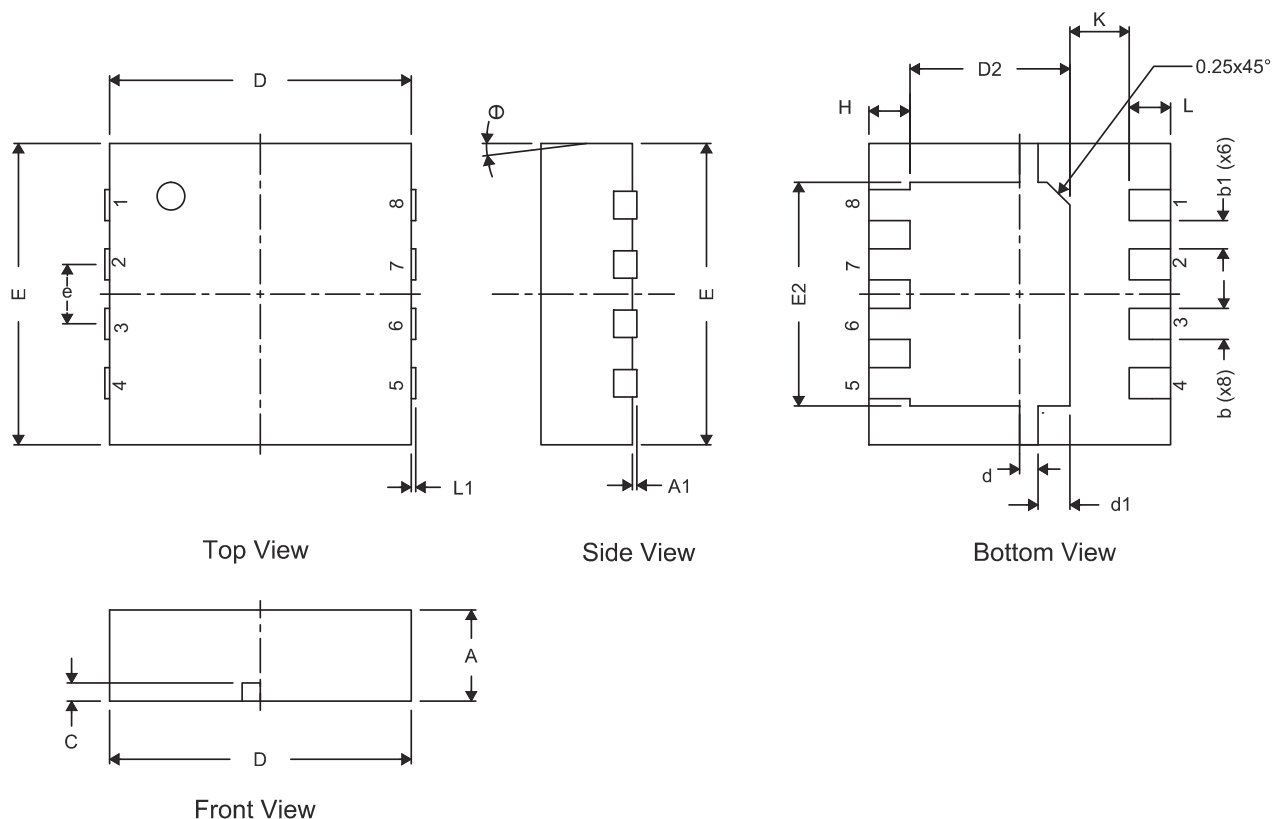


Figure11, Normalized Maximum Transient Thermal Impedance

DFN 3x3 Package Information



DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.950	1.000	1.100	0.037	0.039	0.043
A1	0.000	0.000	0.050	0.000	0.000	0.002
b	0.280	0.340	0.400	0.011	0.013	0.016
b1	0.310 NOM			0.012 NOM		
c	0.150	0.200	0.250	0.006	0.008	0.010
D	3.200	3.300	3.400	0.126	0.130	0.134
D2	1.650	1.750	1.800	0.065	0.069	0.071
d	0.150	0.200	0.250	0.006	0.008	0.010
d1	0.300	0.350	0.400	0.012	0.014	0.016
E	3.200	3.300	3.400	0.126	0.130	0.134
E2	2.350	2.450	2.550	0.093	0.096	0.100
e	0.650 TYP			0.026 TYP		
H	0.35	0.450	0.550	0.014	0.018	0.022
K	0.650 TYP			0.026 TYP		
L	0.35	0.450	0.550	0.014	0.018	0.022
L1	0	—	0	0	—	0
θ	0	—	0	0	—	0