

# AP2716KD

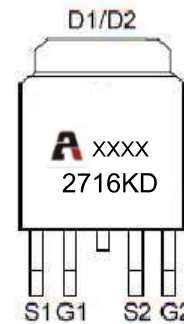
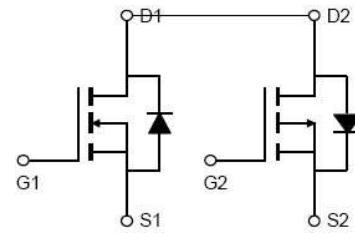
## N and P-Channel Enhancement Mosfet

# AIIPOWER

## DATA SHEET

### Feature

- **N-Channel**  
 $V_{DD}=40V, I_D=20A$   
 $R_{DS(on)} < 22m\Omega @ V_{GS}=10V$   
 $R_{DS(on)} < 30m\Omega @ V_{GS}=4.5V$
- **P-Channel**  
 $V_{DD}=-40V, I_D=-20A$   
 $R_{DS(on)} < 54m\Omega @ V_{GS}=-10V$   
 $R_{DS(on)} < 70m\Omega @ V_{GS}=-4.5V$
- Lead free product is acquired
- High power and current handling capability
- Surface mount package



Marking and pin assignment

### Application

- PWM applications
- Load Switch
- Power management

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
2716KD	AP2716KD	TO-252-4		-	2500

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

Parameter	Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage	$V_{DS}$	40	-40	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	$\pm 20$	V
Continuous Drain Current ( $T_a=25^\circ\text{C}$ )	$I_D$	20	-20	A
Continuous Drain Current ( $T_a=100^\circ\text{C}$ )	$I_D$	14	-14	A
Pulsed Drain Current <sup>(1)</sup>	$I_{DM}$	60	-60	A
Power Dissipation	$P_D$	31.5	31.5	W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	80	80	$^\circ\text{C/W}$
Junction Temperature	$T_J$	150	150	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-55~ +150	-55~ +150	$^\circ\text{C}$

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N and P-Channel Enhancement Mosfet

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DATA SHEET

## N-CH ELECTRICAL CHARACTERISTICS(T<sub>a</sub>=25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
<b>Static Characteristics</b>						
Drain-source breakdown voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA	40			V
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> = 40V, V <sub>GS</sub> = 0V			1	μA
Gate-body leakage current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V			±100	nA
Gate threshold voltage <sup>(2)</sup>	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	1	1.6	2.5	V
Drain-source on-resistance <sup>(2)</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 4A		16	22	mΩ
		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 6A		22	30	
<b>Dynamic characteristics</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V, f = 1MHz		1050		pF
Output Capacitance	C <sub>oss</sub>			84		
Reverse Transfer Capacitance	C <sub>rss</sub>			72		
<b>Switching characteristics</b>						
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> = 20V, I <sub>D</sub> = 5A, R <sub>L</sub> = 6Ω V <sub>GS</sub> = 10V, R <sub>G</sub> = 1Ω		11		ns
Turn-on rise time	t <sub>r</sub>			13		
Turn-off delay time	t <sub>d(off)</sub>			36		
Turn-off fall time	t <sub>f</sub>			9		
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = 20V, I <sub>D</sub> = 5A, V <sub>GS</sub> = 10V		11		nC
Gate-Source Charge	Q <sub>gs</sub>			1.9		
Gate-Drain Charge	Q <sub>gd</sub>			2.2		
<b>Source-Drain Diode characteristics</b>						
Diode Forward voltage <sup>(2)</sup>	V <sub>DS</sub>	V <sub>GS</sub> = 0V, I <sub>S</sub> = 10A			1.2	V
Diode Forward current <sup>(3)</sup>	I <sub>S</sub>		-	-	10	A

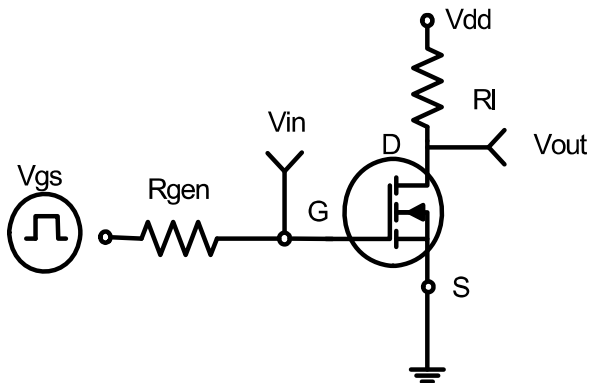
**P-CH ELECTRICAL CHARACTERISTICS(T<sub>a</sub>=25°C unless otherwise noted)**

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
<b>Static Characteristics</b>						
Drain-source breakdown voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA	-40			V
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> = -40V, V <sub>GS</sub> = 0V			1	μA
Gate-body leakage current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V			±100	nA
Gate threshold voltage <sup>(2)</sup>	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA	-1	-1.6	-2.5	V
Drain-source on-resistance <sup>(2)</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = -10V, I <sub>D</sub> = -10A		44	54	mΩ
		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -6A		55	70	
<b>Dynamic characteristics</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V, f = 1MHz		1160		pF
Output Capacitance	C <sub>oss</sub>			155		
Reverse Transfer Capacitance	C <sub>rss</sub>			98		
<b>Switching characteristics</b>						
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> = -20V, I <sub>D</sub> = -5A, R <sub>L</sub> = 6Ω V <sub>GS</sub> = -10V, R <sub>G</sub> = 1Ω		8		ns
Turn-on rise time	t <sub>r</sub>			15		
Turn-off delay time	t <sub>d(off)</sub>			23		
Turn-off fall time	t <sub>f</sub>			9		
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = -20V, I <sub>D</sub> = -5A, V <sub>GS</sub> = -10V		20		nC
Gate-Source Charge	Q <sub>gs</sub>			3.5		
Gate-Drain Charge	Q <sub>gd</sub>			4.2		
<b>Source-Drain Diode characteristics</b>						
Diode Forward voltage <sup>(2)</sup>	V <sub>DS</sub>	V <sub>GS</sub> = 0V, I <sub>S</sub> = -10A			1.2	V
Diode Forward current <sup>(3)</sup>	I <sub>S</sub>		-	-	-10	A

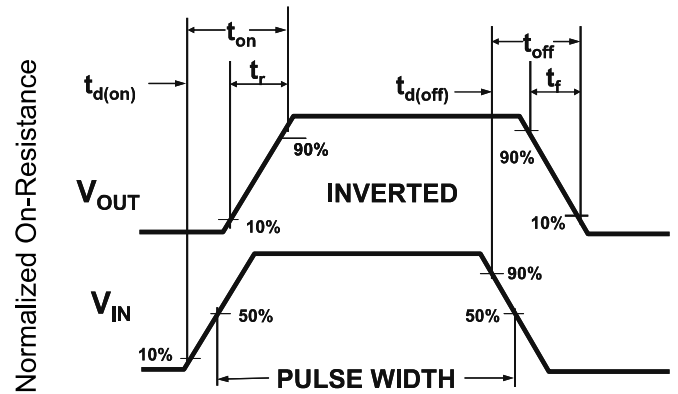
**Notes:**

1. Repetitive Rating: pulse width limited by maximum junction temperature
2. Pulse Test: pulse width ≤ 300μs, duty cycle ≤ 2%
3. Surface Mounted on FR4 Board, t ≤ 10 sec

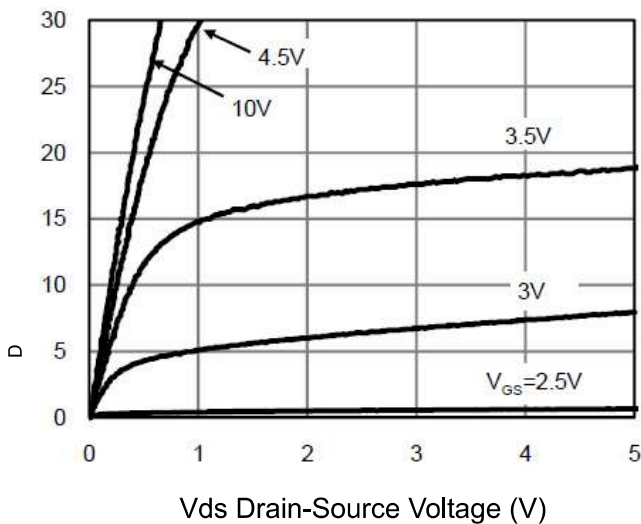
N-Channel



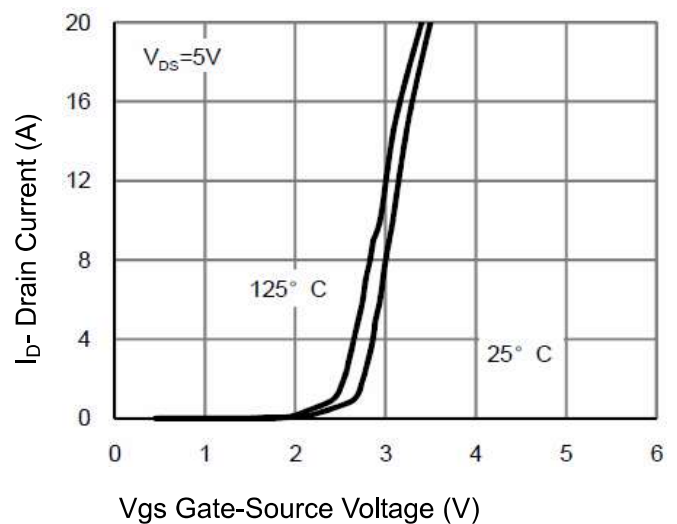
**Figure 1: Switching Test Circuit**



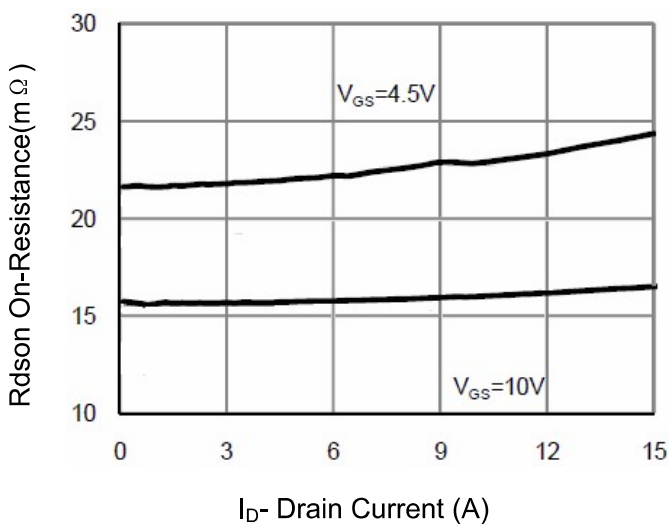
**Figure 2: Switching Waveforms**



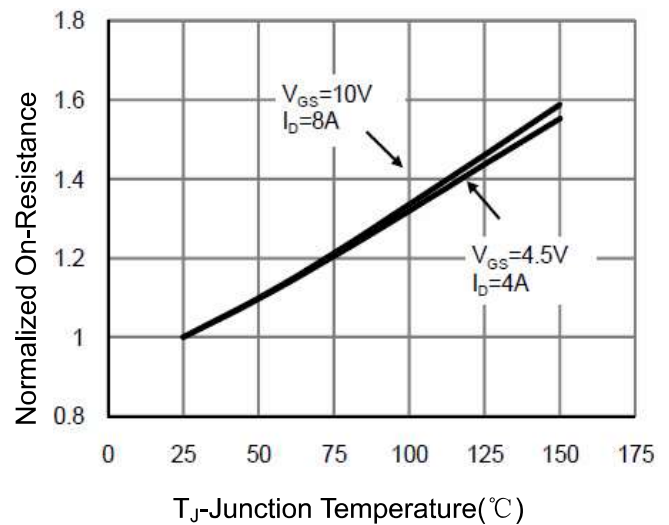
**Figure 3 Output Characteristics**



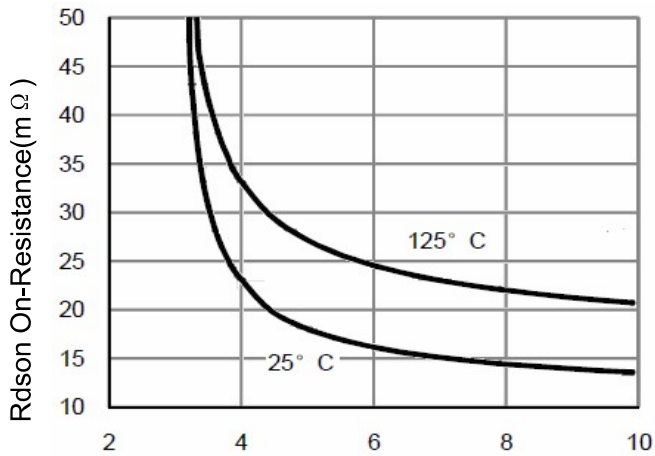
**Figure 4 Transfer Characteristics**



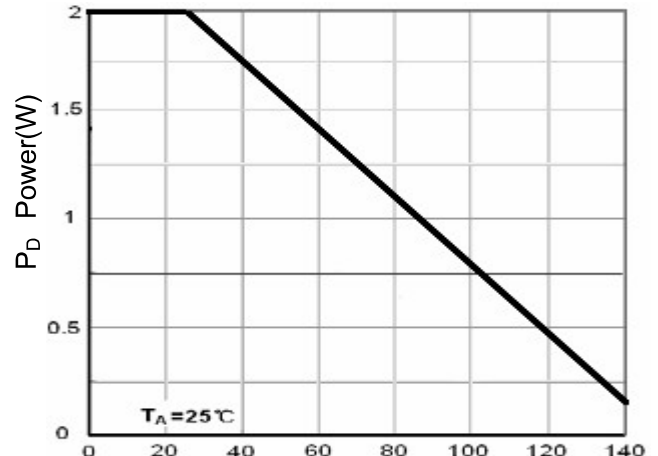
**Figure 5 Drain-Source On-Resistance**



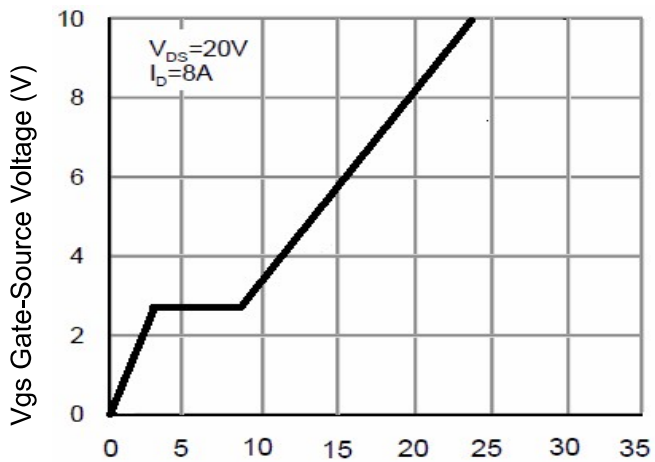
**Figure 6 Drain-Source On-Resistance**



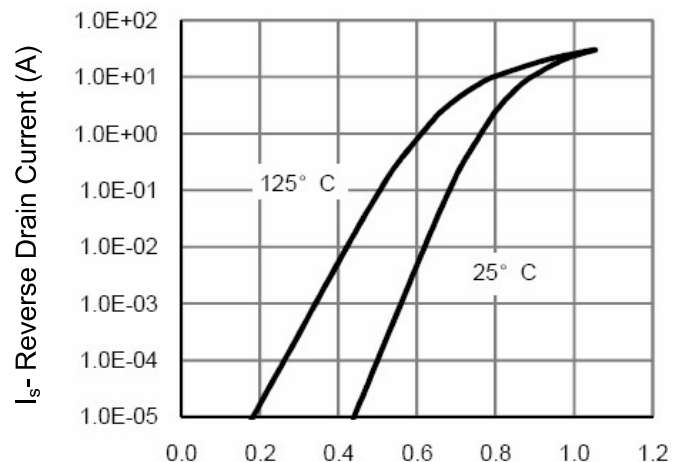
Vgs Gate-Source Voltage (V)  
**Figure 7 Rdson vs Vgs**



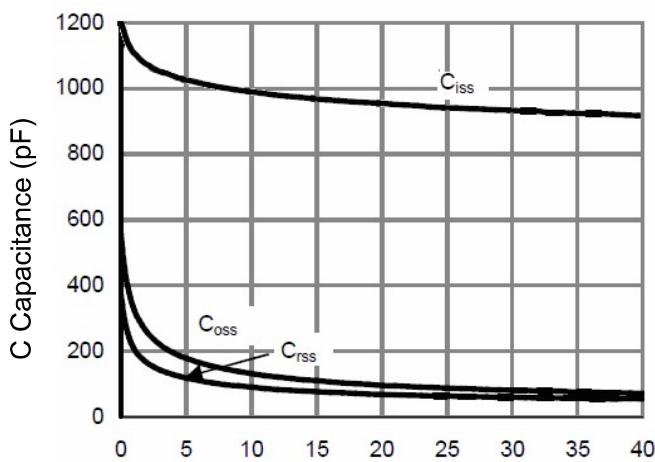
Tj Junction Temperature (°C)  
**Figure 8 Power Dissipation**



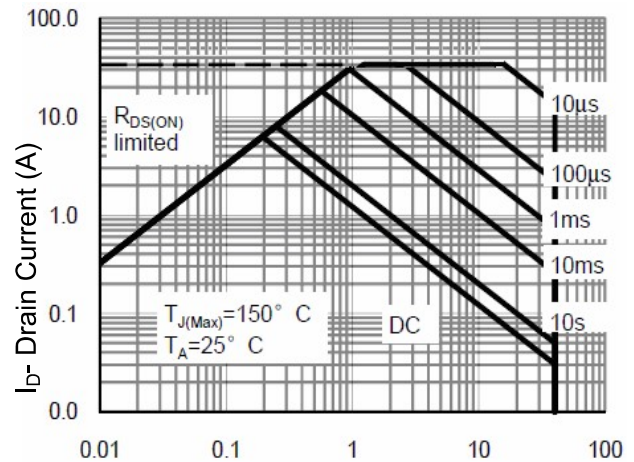
Qg Gate Charge (nC)  
**Figure 9 Gate Charge**



Vds Drain-Source Voltage (V)  
**Figure 10 Source- Drain Diode Forward**

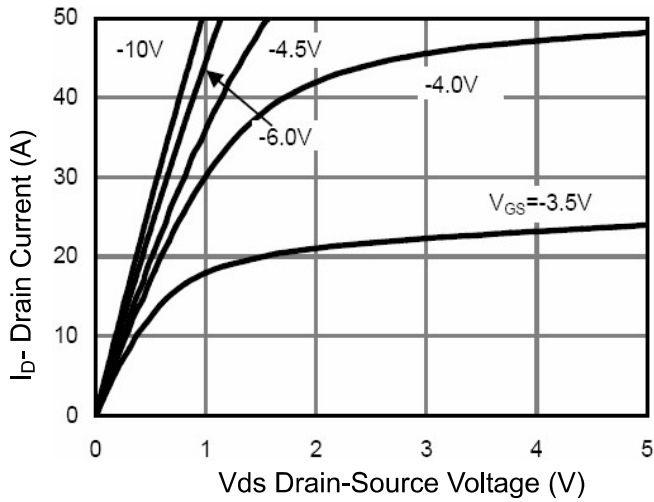


Vds Drain-Source Voltage (V)  
**Figure 11 Capacitance vs Vds**

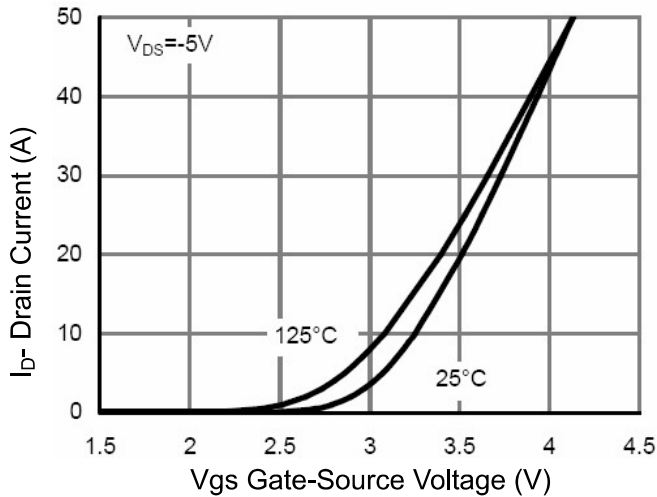


Vds Drain-Source Voltage (V)  
**Figure 12 Safe Operation Area**

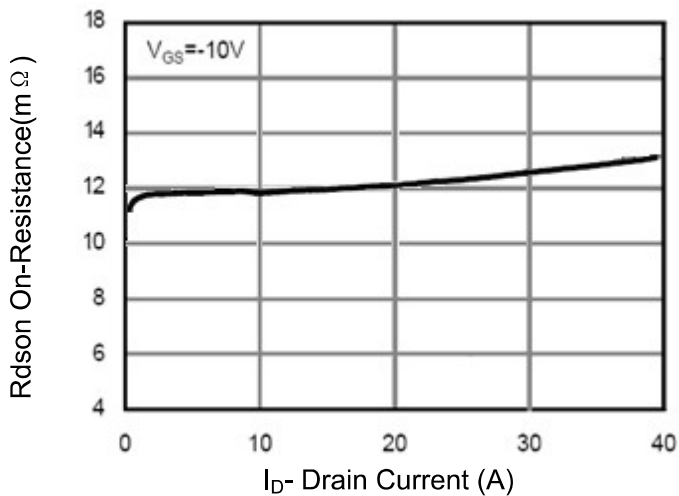
P-Channel



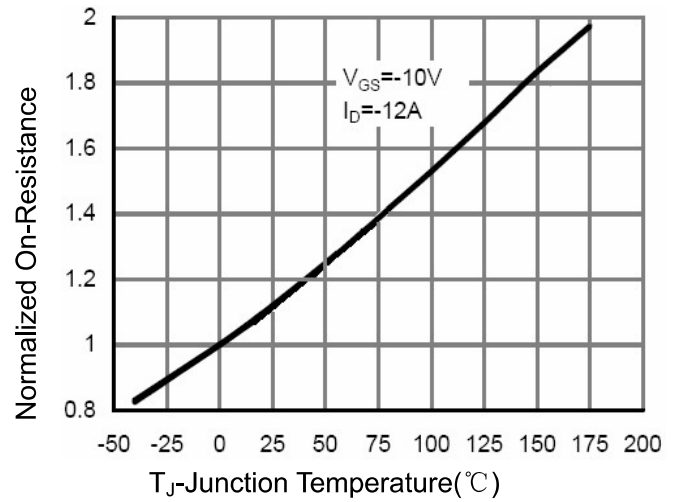
**Figure 1 Output Characteristics**



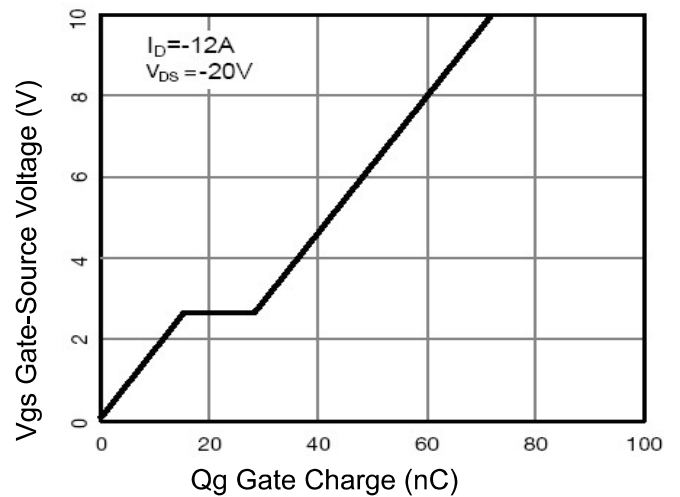
**Figure 2 Transfer Characteristics**



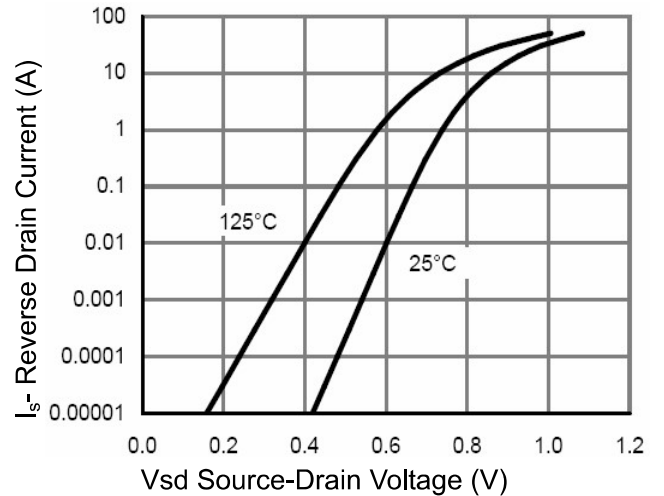
**Figure 3 Rdson- Drain Current**



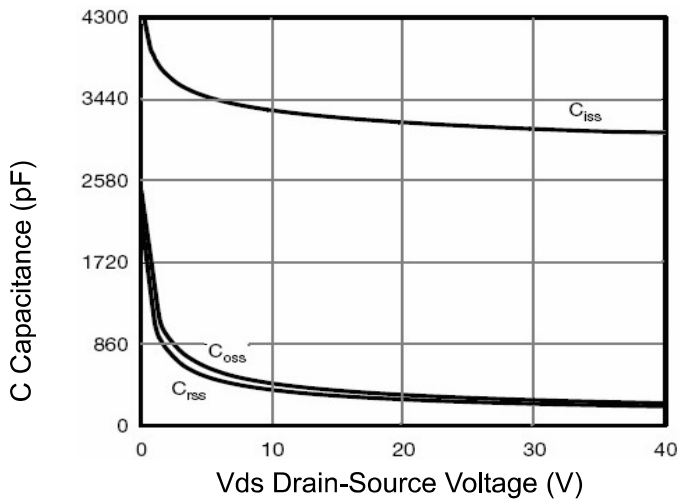
**Figure 4 Rdson-Junction Temperature**



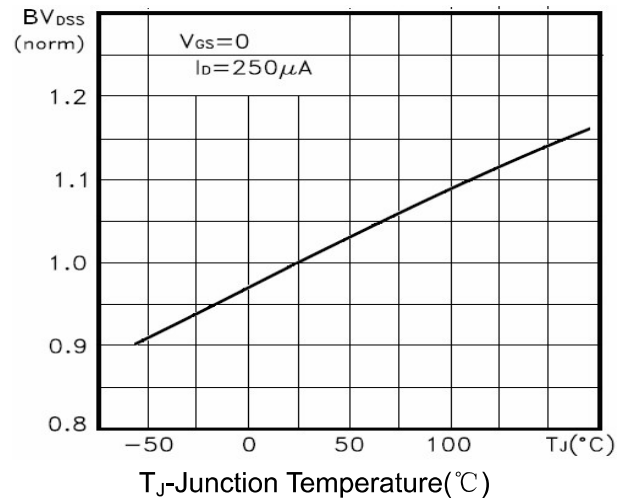
**Figure 5 Gate Charge**



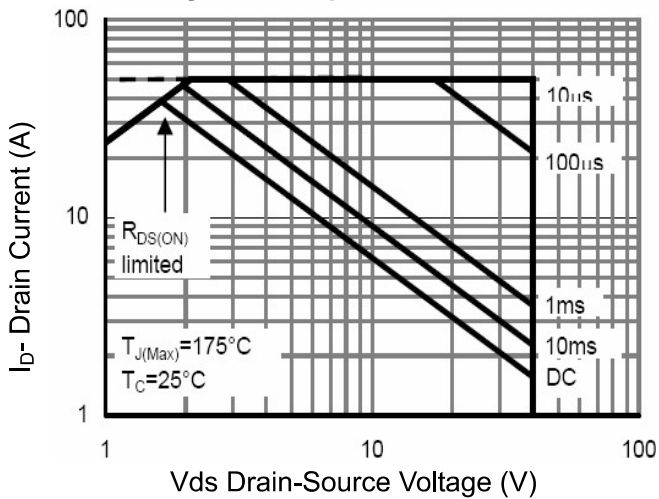
**Figure 6 Source- Drain Diode Forward**



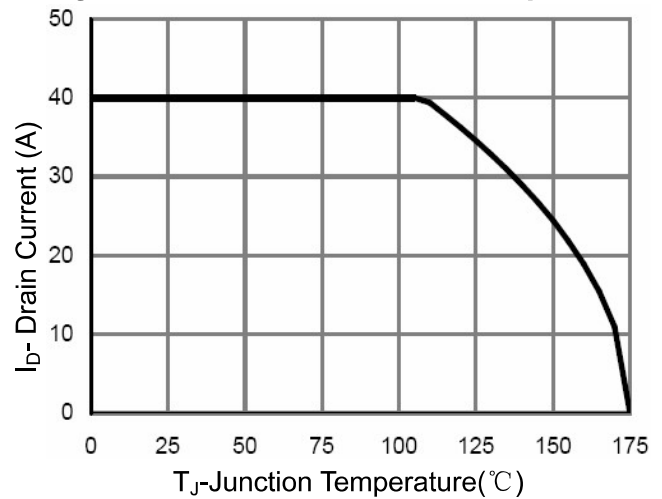
**Figure 7 Capacitance vs Vds**



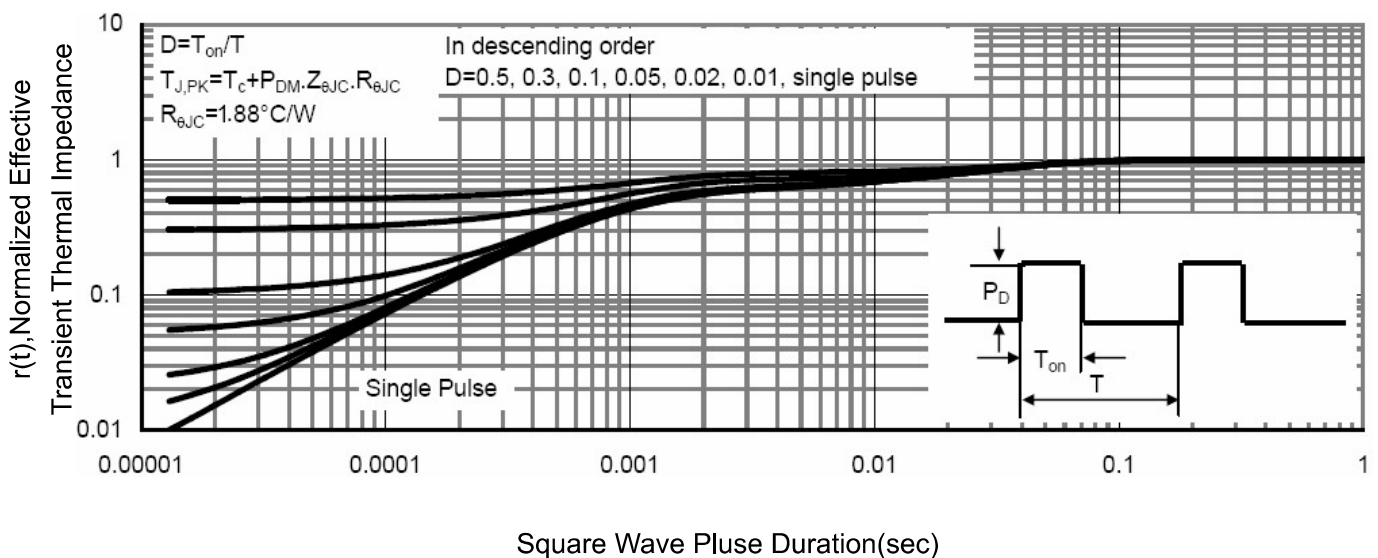
**Figure 9 BV<sub>DSS</sub> vs Junction Temperature**



**Figure 8 Safe Operation Area**

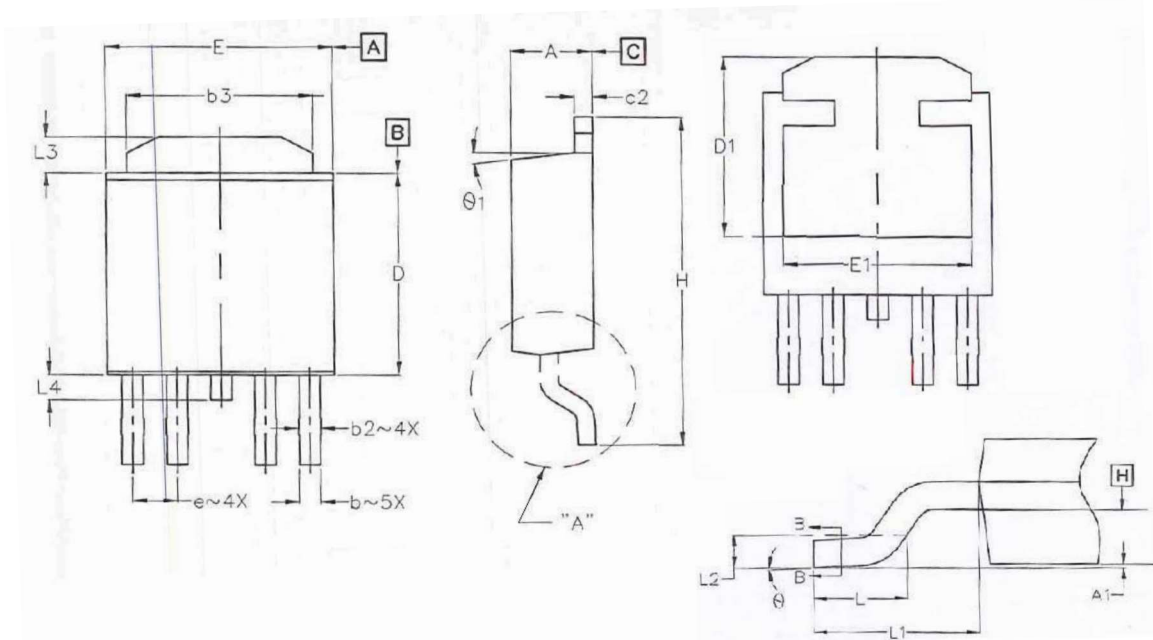


**Figure 10 ID Current Derating vs Junction Temperature**



**Figure 11 Normalized Maximum Transient Thermal Impedance**

**TO-252-4 Package Information**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.184	2.387	0.086	0.094
A1	-	0.127	-	0.094
b	0.508	0.711	0.020	0.028
b1	0.508	0.660	0.020	0.026
b2	0.610	0.787	0.024	0.031
b3	4.953	5.461	0.195	0.215
c	0.460	0.610	0.018	0.024
c1	0.410	0.559	0.016	0.022
C2	0.460	12.950	0.498	0.510
D	4.980	5.180	0.196	0.204
D1	2.650	2.950	0.104	0.116
E	7.900	8.100	0.311	0.319
E1	0.000	0.300	0.000	0.012
e	12.900	13.400	0.508	0.528
H	2.850	3.250	0.112	0.128
L	1.397	1.778	0.055	0.070
L1	2.743	BSC	0.108	BSC
L2	0.508	BSC	0.020	BSC
L3	0.889	1.270	0.035	0.050
L4	-	1.015	-	0.040
θ	0°	10°	0°	10°
θ 1	0°	15°	0°	15°



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