

PRODUCT SUMMARY				
	V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)	Q _g (Typ.)
N-Channel	12	0.029 at V _{GS} = 4.5 V	4.5 ^a	5.6 nC
		0.034 at V _{GS} = 2.5 V	4.5 ^a	
		0.044 at V _{GS} = 1.8 V	4.5 ^a	
		0.065 at V _{GS} = 1.5 V	4.5 ^a	
P-Channel	- 12	0.061 at V _{GS} = - 4.5 V	- 4.5 ^a	8.2 nC
		0.081 at V _{GS} = - 2.5 V	- 4.5 ^a	
		0.115 at V _{GS} = - 1.8 V	- 4.5 ^a	
		0.170 at V _{GS} = - 1.5 V	- 4.5 ^a	

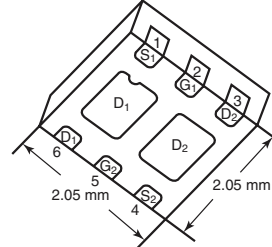
FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Power MOSFETs
- New Thermally Enhanced PowerPAK[®] SC-70 Package
 - Small Footprint Area
 - Low On-Resistance
- Compliant to RoHS Directive 2002/95/EC

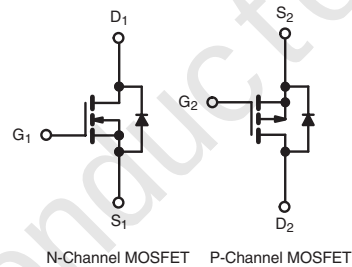
APPLICATIONS

- Load Switch for Portable Devices

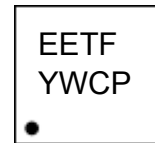
DFN2X2-6L



Equivalent Circuit



MARKING



Y :year code W :week code

ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted					
Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		V _{DS}	12	- 12	V
Gate-Source Voltage		V _{GS}	± 8		
Continuous Drain Current (T _J = 150 °C)	T _C = 25 °C	I _D	4.5 ^a	- 4.5 ^a	A
	T _A = 25 °C		4.5 ^{a, b, c}	- 4.3 ^{b, c}	
Pulsed Drain Current		I _{DM}	20	- 15	
Source Drain Current Diode Current	T _C = 25 °C	I _S	4.5 ^a	- 4.5 ^a	
	T _A = 25 °C		1.6 ^{b, c}	- 1.6 ^{b, c}	
Maximum Power Dissipation	T _C = 25 °C	P _D	6.5	6.5	W
	T _A = 25 °C		1.9 ^{b, c}	1.9 ^{b, c}	
Operating Junction and Storage Temperature Range		T _J , T _{stg}	- 55 to 150		°C
Soldering Recommendations (Peak Temperature) ^{d, e}			260		

THERMAL RESISTANCE RATINGS							
Parameter		Symbol	N-Channel		P-Channel		Unit
			Typ.	Max.	Typ.	Max.	
Maximum Junction-to-Ambient ^{b, f}	t ≤ 5 s	R _{thJA}	52	65	52	65	°C/W
Maximum Junction-to-Case (Drain)	Steady State	R _{thJC}	12.5	16	12.5	16	

Notes:

- a. Package limited.
- b. Surface Mounted on 1" x 1" FR4 board.
- c. t = 5 s.

Electrical Characteristics (T_J=25°C unless otherwise noted)

SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted							
Parameter	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	N-Ch	12			V
		$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	P-Ch	- 12			
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$	N-Ch		12		mV/ $^{\circ}\text{C}$
		$I_D = -250\text{ }\mu\text{A}$	P-Ch		- 3.1		
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	$I_D = 250\text{ }\mu\text{A}$	N-Ch		- 2.5		
		$I_D = -250\text{ }\mu\text{A}$	P-Ch		2.4		
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	N-Ch	0.4		1	V
		$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	P-Ch	- 0.4		- 1	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$	N-Ch			± 100	nA
			P-Ch			± 100	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 12\text{ V}, V_{GS} = 0\text{ V}$	N-Ch			1	μA
		$V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}$	P-Ch			- 1	
On-State Drain Current ^b	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 4.5\text{ V}$	N-Ch	15			A
		$V_{DS} \leq -5\text{ V}, V_{GS} = -4.5\text{ V}$	P-Ch	- 10			
Drain-Source On-State Resistance ^b	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 5\text{ A}$	N-Ch		0.024	0.029	Ω
		$V_{GS} = -4.5\text{ V}, I_D = -3.6\text{ A}$	P-Ch		0.050	0.061	
		$V_{GS} = 2.5\text{ V}, I_D = 4.6\text{ A}$	N-Ch		0.028	0.034	
		$V_{GS} = -2.5\text{ V}, I_D = -3.2\text{ A}$	P-Ch		0.066	0.081	
		$V_{GS} = 1.8\text{ V}, I_D = 4.1\text{ A}$	N-Ch		0.032	0.044	
		$V_{GS} = -1.8\text{ V}, I_D = -1\text{ A}$	P-Ch		0.093	0.115	
Forward Transconductance ^b	g_{fs}	$V_{DS} = 10\text{ V}, I_D = 5\text{ A}$	N-Ch		21		S
		$V_{DS} = -10\text{ V}, I_D = -3.6\text{ A}$	P-Ch		11		
Dynamic ^a							
Input Capacitance	C_{iss}	N-Channel $V_{DS} = 6\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	N-Ch		500		pF
			P-Ch		590		
Output Capacitance	C_{oss}	P-Channel $V_{DS} = -6\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	N-Ch		160		
			P-Ch		280		
Reverse Transfer Capacitance	C_{rss}		N-Ch		100		
			P-Ch		250		
Total Gate Charge	Q_g	$V_{DS} = 6\text{ V}, V_{GS} = 8\text{ V}, I_D = 6.5\text{ A}$	N-Ch		9.7	15	nC
		$V_{DS} = -6\text{ V}, V_{GS} = -8\text{ V}, I_D = -4.5\text{ A}$	P-Ch		13.1	20	
Gate-Source Charge	Q_{gs}	N-Channel $V_{DS} = 6\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 6.5\text{ A}$	N-Ch		5.6	8.5	
			P-Ch		8.2	12.5	
Gate-Drain Charge	Q_{gd}	P-Channel $V_{DS} = -6\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -4.3\text{ A}$	N-Ch		0.72		
			P-Ch		1.2		
Gate Resistance	R_g	$f = 1\text{ MHz}$	N-Ch	0.7	3.5	7	Ω
			P-Ch	2	10	20	

Notes:

a. Guaranteed by design, not subject to production testing.

b. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.

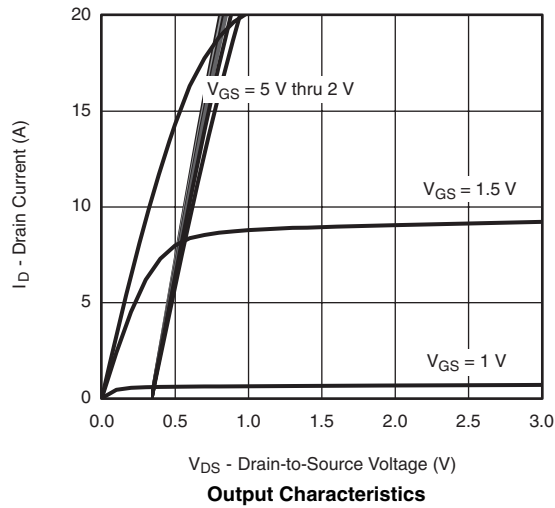
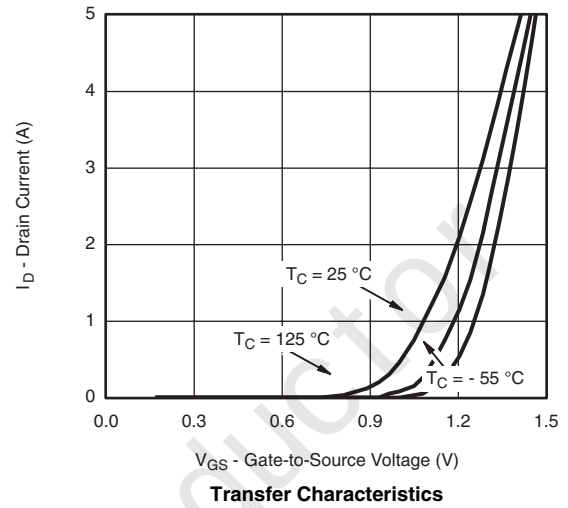
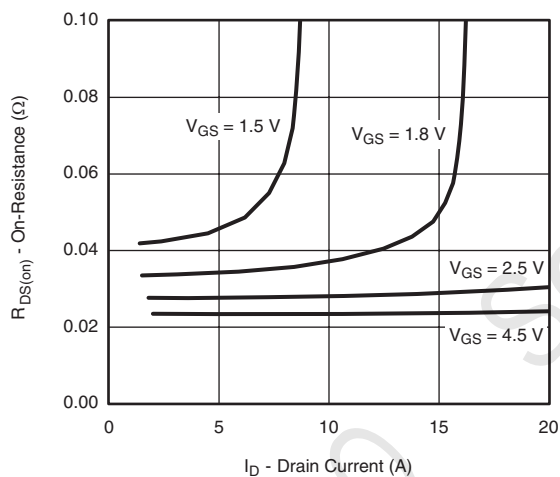
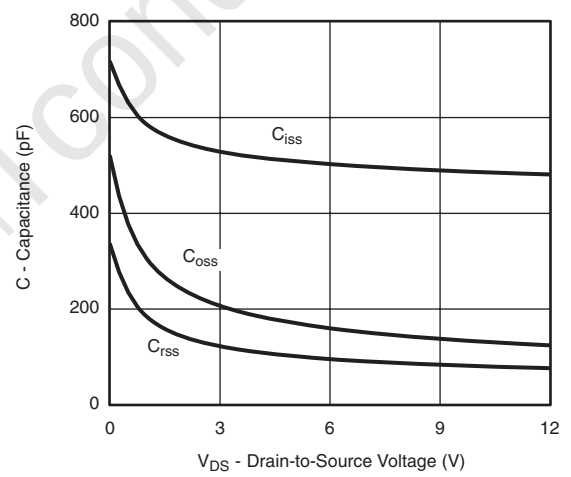
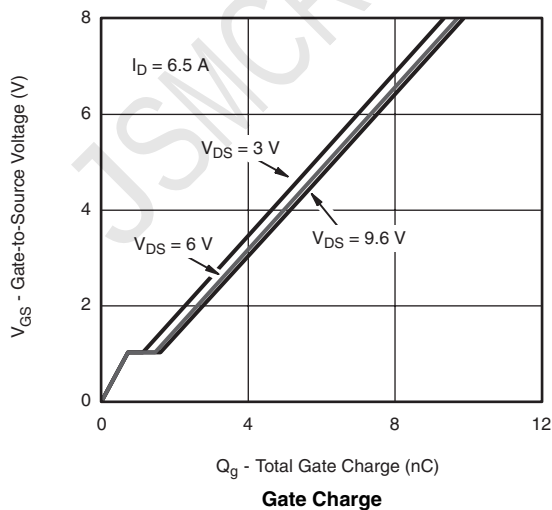
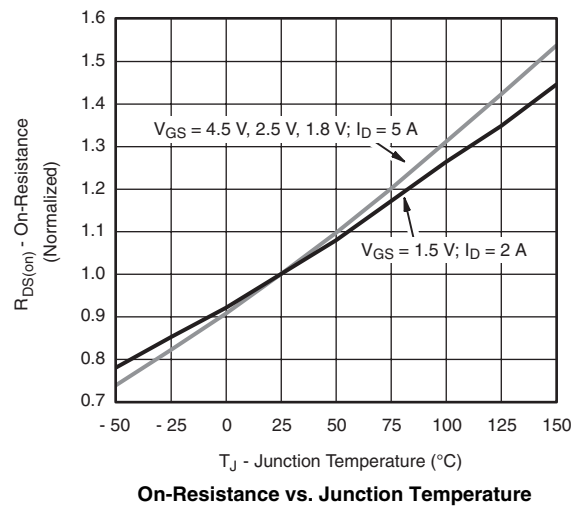
Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

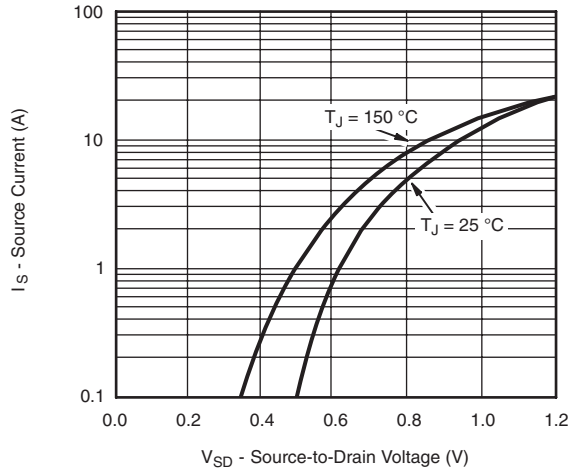
SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted								
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit		
Dynamic ^a								
Turn-On Delay Time	$t_{d(\text{on})}$	N-Channel $V_{DD} = 6\text{ V}$, $R_L = 1.2\text{ }\Omega$ $I_D \cong 5.2\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\text{ }\Omega$	N-Ch		10	15	ns	
			P-Ch		30	40		
Rise Time	t_r		N-Ch		10	15		
			P-Ch		25	40		
Turn-Off Delay Time	$t_{d(\text{off})}$	P-Channel $V_{DD} = -6\text{ V}$, $R_L = 1.6\text{ }\Omega$ $I_D \cong -3.8\text{ A}$, $V_{GEN} = -4.5\text{ V}$, $R_g = 1\text{ }\Omega$	N-Ch		22	30		
			P-Ch		30	45		
Fall Time	t_f		N-Ch		10	15		
			P-Ch		20	30		
Turn-On Delay Time	$t_{d(\text{on})}$	N-Channel $V_{DD} = 6\text{ V}$, $R_L = 1.2\text{ }\Omega$ $I_D \cong 5.2\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\text{ }\Omega$	N-Ch		5	10		
			P-Ch		8	15		
Rise Time	t_r		N-Ch		10	15		
			P-Ch		12	20		
Turn-Off Delay Time	$t_{d(\text{off})}$	P-Channel $V_{DD} = -6\text{ V}$, $R_L = 1.6\text{ }\Omega$ $I_D \cong -3.8\text{ A}$, $V_{GEN} = -10\text{ V}$, $R_g = 1\text{ }\Omega$	N-Ch		18	30		
			P-Ch		25	40		
Fall Time	t_f		N-Ch		10	15		
			P-Ch		18	30		
Drain-Source Body Diode Characteristics								
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^{\circ}\text{C}$	N-Ch			4.5	A	
			P-Ch			-4.5		
Pulse Diode Forward Current ^a	I_{SM}		N-Ch			20		
			P-Ch			-10		
Body Diode Voltage	V_{SD}	$I_S = 5.2\text{ A}$, $V_{GS} = 0\text{ V}$	N-Ch		0.85	1.2	V	
		$I_S = -3.4\text{ A}$, $V_{GS} = 0\text{ V}$	P-Ch		-0.8	-1.2		
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 5.2\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^{\circ}\text{C}$	N-Ch		20	40	ns	
			P-Ch		30	60		
Body Diode Reverse Recovery Charge	Q_{rr}		N-Channel	N-Ch		5	10	nC
				P-Ch		12	24	
Reverse Recovery Fall Time	t_a	P-Channel	N-Ch		8		ns	
			P-Ch		16			
Reverse Recovery Rise Time	t_b		N-Ch		12			
			P-Ch		14			

Notes:

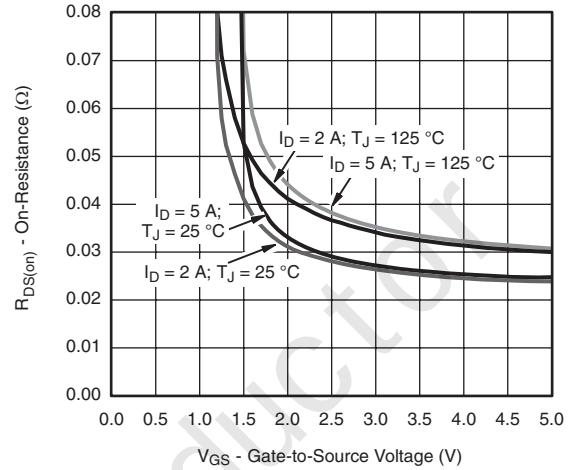
a. Guaranteed by design, not subject to production testing.

b. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

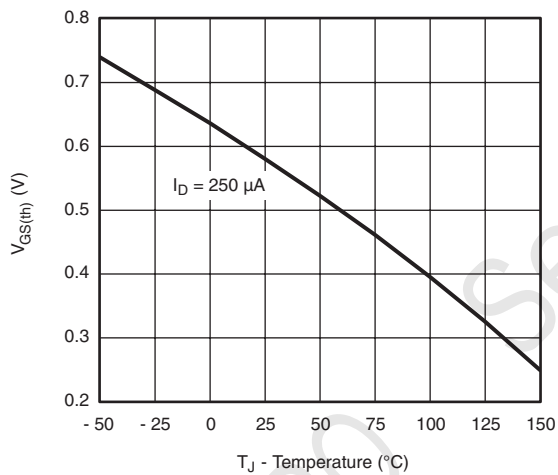
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current and Gate Voltage

Capacitance

Gate Charge

On-Resistance vs. Junction Temperature

N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


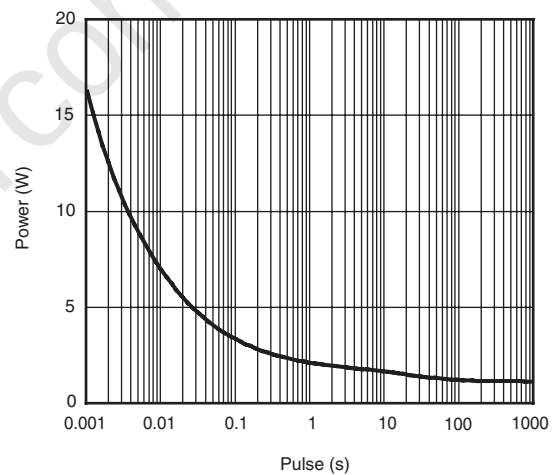
Source-Drain Diode Forward Voltage



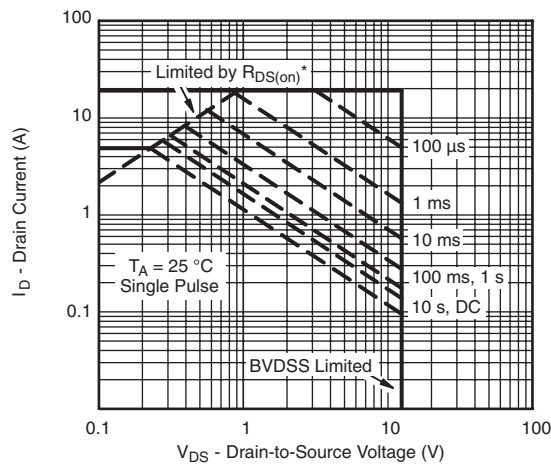
On-Resistance vs. Gate-to-Source Voltage



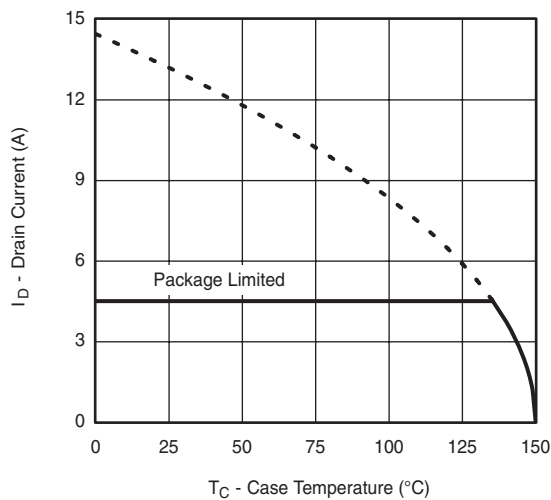
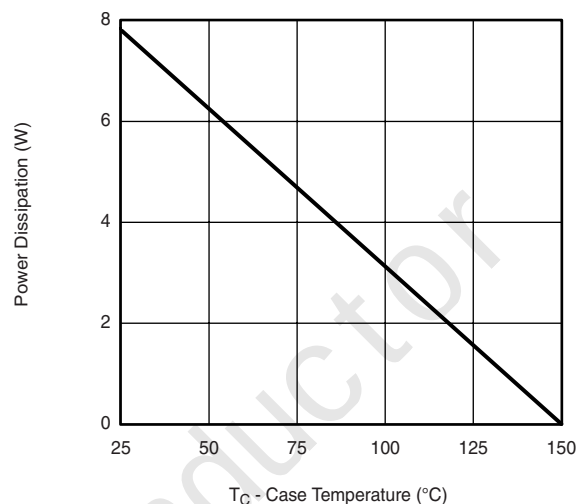
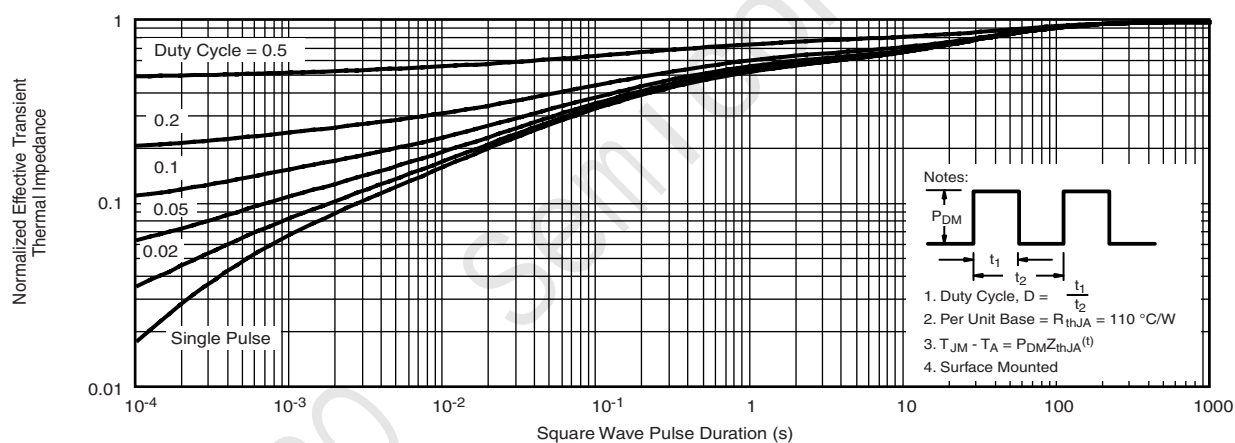
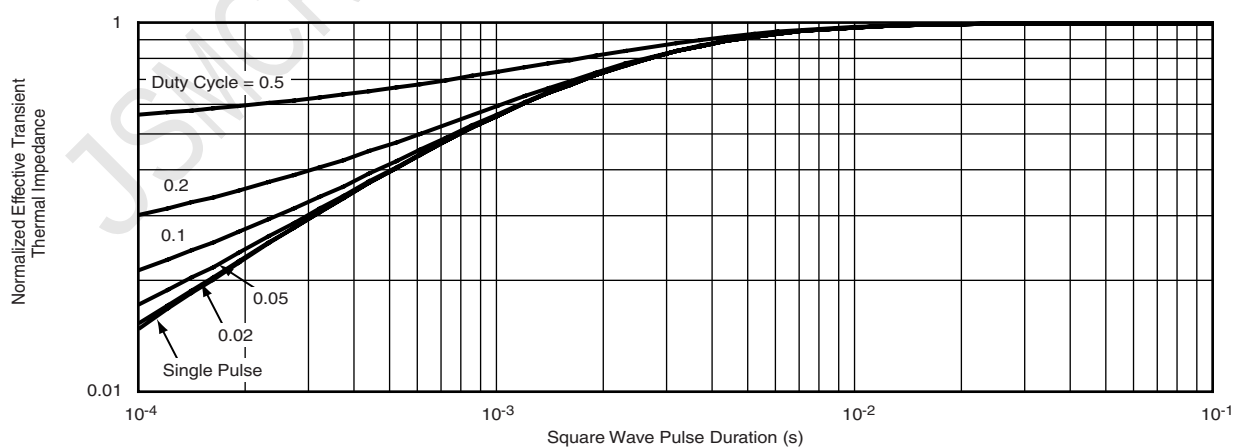
Threshold Voltage

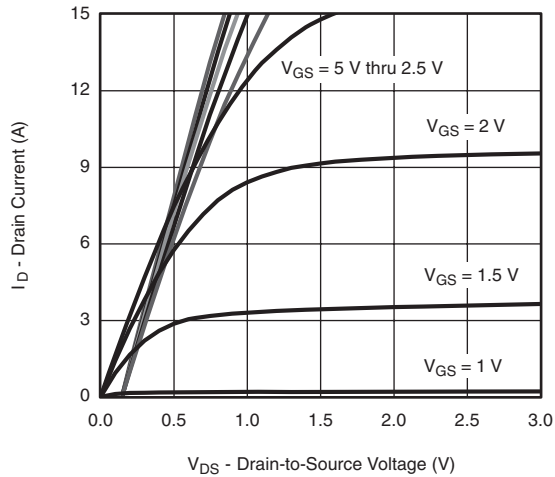
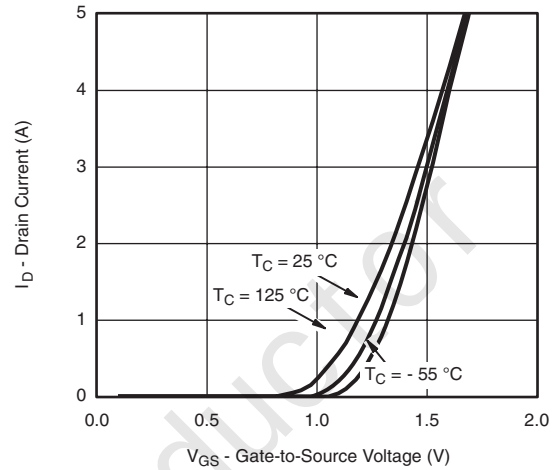
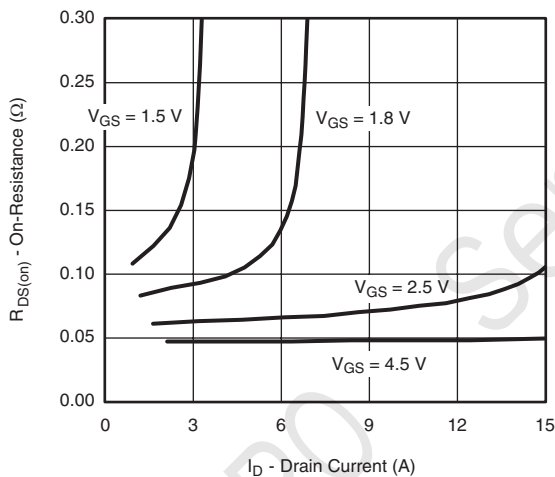
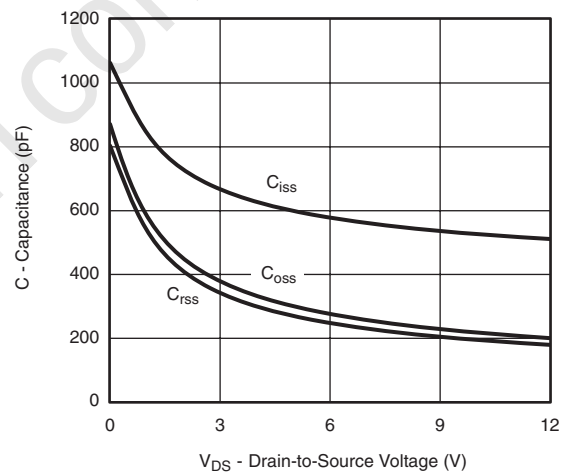
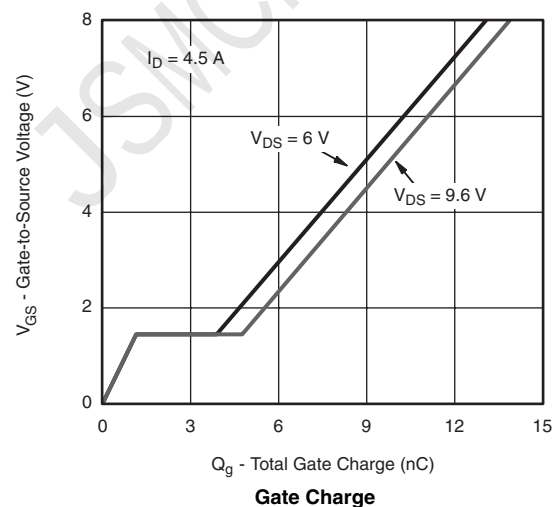
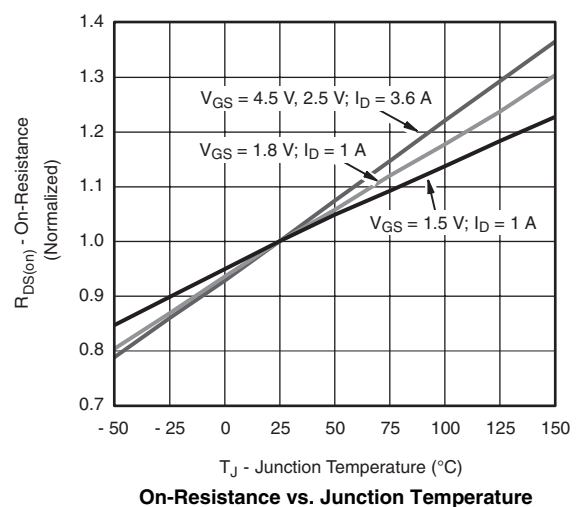


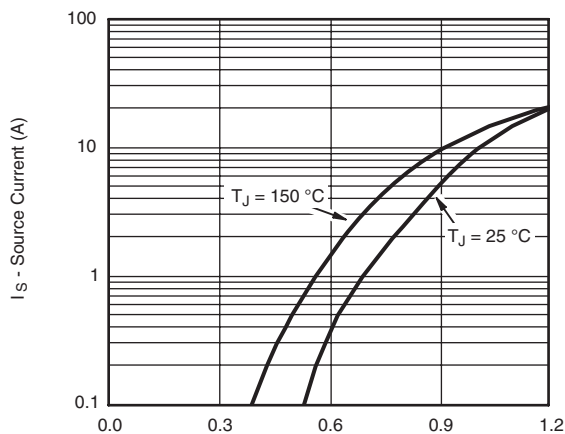
Single Pulse Power (Junction-to-Ambient)


 * $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

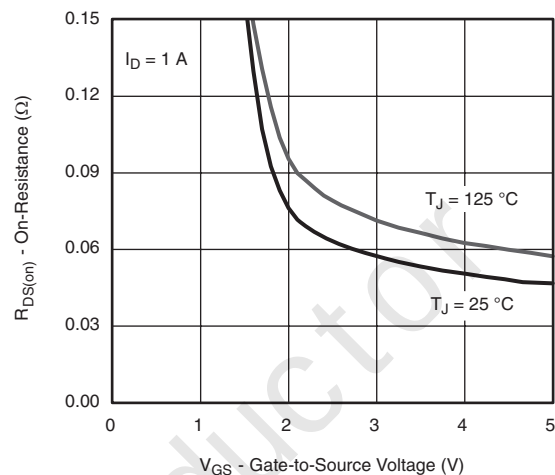
Safe Operating Area, Junction-to-Ambient

N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Current Derating*

Power Derating

Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Thermal Transient Impedance, Junction-to-Case

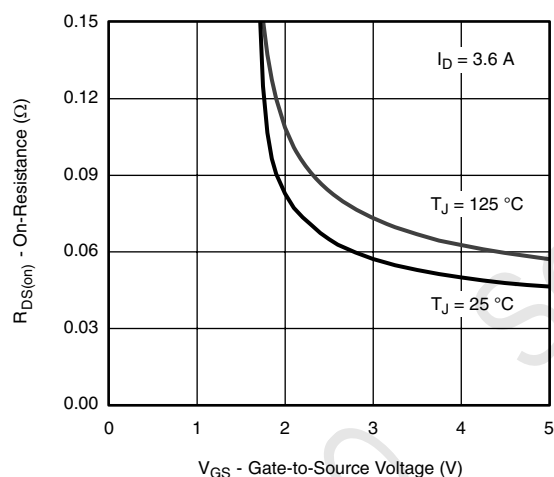
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current and Gate Voltage

Capacitance

Gate Charge

On-Resistance vs. Junction Temperature

P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


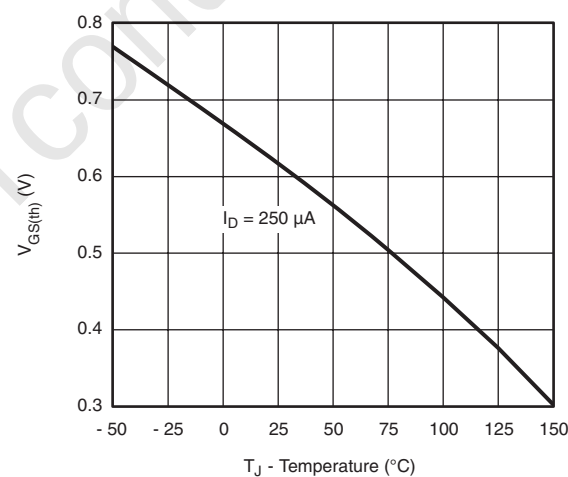
Source-Drain Diode Forward Voltage



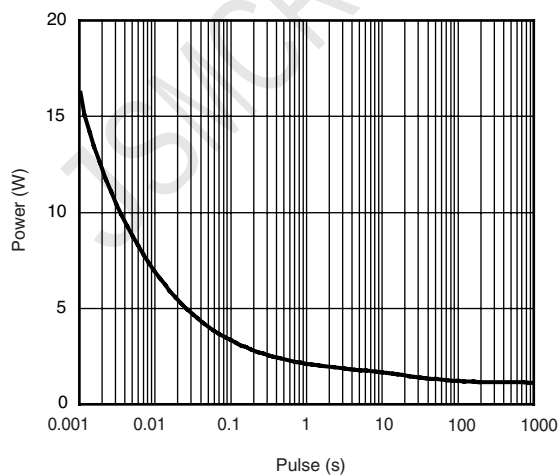
On-Resistance vs. Gate-to-Source Voltage



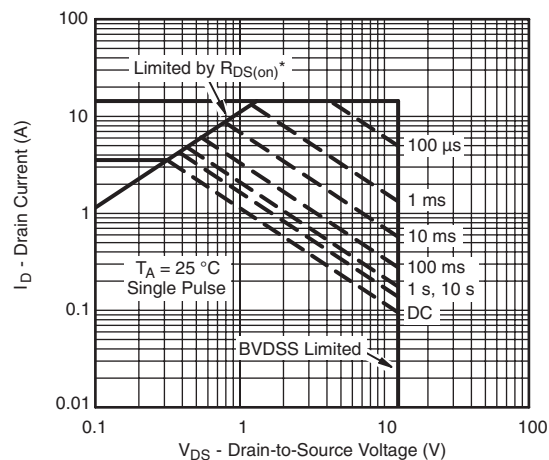
On-Resistance vs. Gate-to-Source Voltage



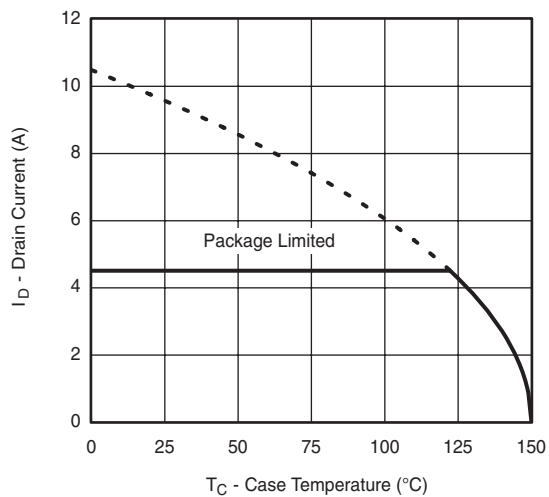
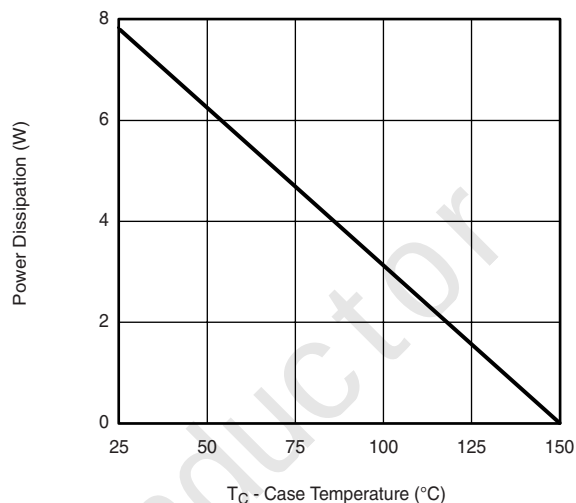
Threshold Voltage

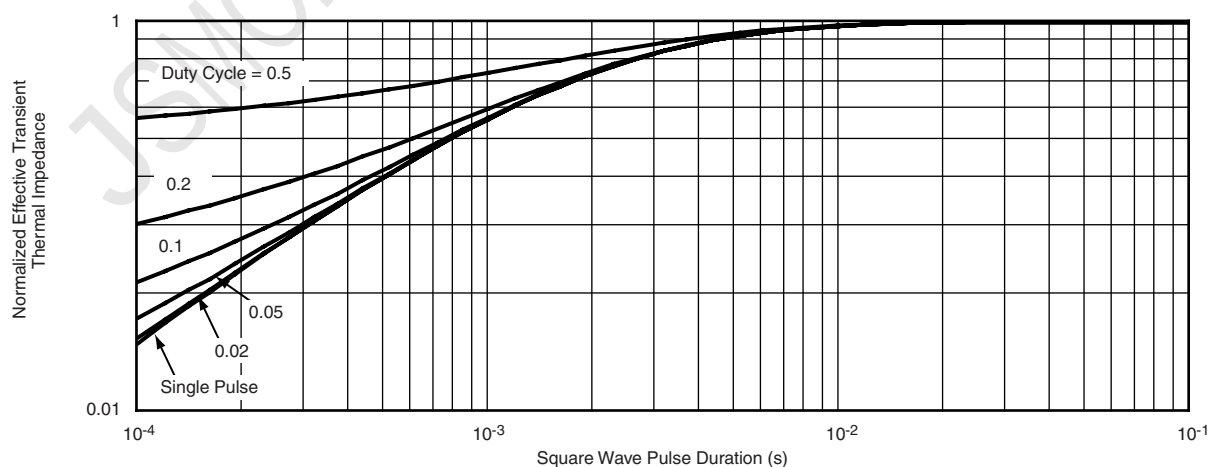


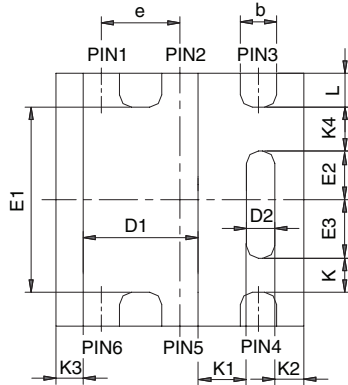
Single Pulse Power, Junction-to-Ambient



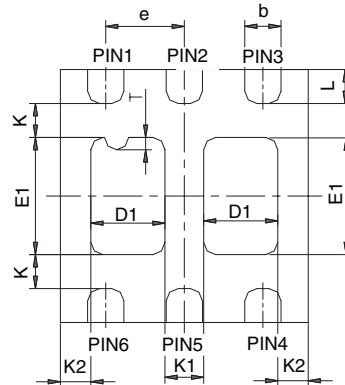
Safe Operating Area, Junction-to-Ambient

P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Current Derating*

Power Derating

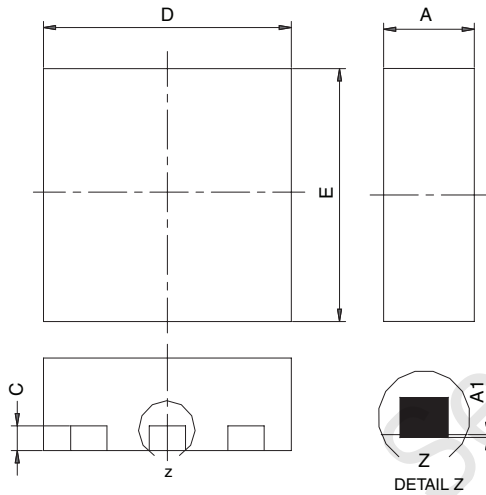
Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Thermal Transient Impedance, Junction-to-Case



BACKSIDE VIEW OF SINGLE



BACKSIDE VIEW OF DUAL



Notes:

1. All dimensions are in millimeters
2. Package outline exclusive of mold flash and metal burr
3. Package outline inclusive of plating

DIM	SINGLE PAD						DUAL PAD					
	MILLIMETERS			INCHES			MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
A	0.675	0.75	0.80	0.027	0.030	0.032	0.675	0.75	0.80	0.027	0.030	0.032
A1	0	-	0.05	0	-	0.002	0	-	0.05	0	-	0.002
b	0.23	0.30	0.38	0.009	0.012	0.015	0.23	0.30	0.38	0.009	0.012	0.015
C	0.15	0.20	0.25	0.006	0.008	0.010	0.15	0.20	0.25	0.006	0.008	0.010
D	1.98	2.05	2.15	0.078	0.081	0.085	1.98	2.05	2.15	0.078	0.081	0.085
D1	0.85	0.95	1.05	0.033	0.037	0.041	0.513	0.613	0.713	0.020	0.024	0.028
D2	0.135	0.235	0.335	0.005	0.009	0.013						
E	1.98	2.05	2.15	0.078	0.081	0.085	1.98	2.05	2.15	0.078	0.081	0.085
E1	1.40	1.50	1.60	0.055	0.059	0.063	0.85	0.95	1.05	0.033	0.037	0.041
E2	0.345	0.395	0.445	0.014	0.016	0.018						
E3	0.425	0.475	0.525	0.017	0.019	0.021						
e	0.65 BSC			0.026 BSC			0.65 BSC			0.026 BSC		
K	0.275 TYP			0.011 TYP			0.275 TYP			0.011 TYP		
K1	0.400 TYP			0.016 TYP			0.320 TYP			0.013 TYP		
K2	0.240 TYP			0.009 TYP			0.252 TYP			0.010 TYP		
K3	0.225 TYP			0.009 TYP								
K4	0.355 TYP			0.014 TYP								
L	0.175	0.275	0.375	0.007	0.011	0.015	0.175	0.275	0.375	0.007	0.011	0.015
T							0.05	0.10	0.15	0.002	0.004	0.006

ECN: C-07431 – Rev. C, 06-Aug-07

DWG: 5934