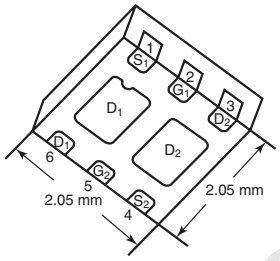
JSMICRO SEMICONDUCTOR

SIA517DJ-T1-GE3

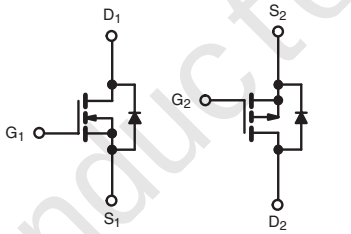
N- and P-Channel 12-V (D-S) MOSFET

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]	

DFN2X2-6L



Equivalent Circuit



N-Channel MOSFET P-Channel MOSFET

MARKING

Y :year code W :week code

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

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							
			N-Channel		P-Channel		
Parameter		**Symbol**	**Typ.**	**Max.**	**Typ.**	**Max.**	**Unit**
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 °C, unless otherwise noted							
Parameter	**Symbol**	**Test Conditions**		**Min.**	**Typ.**	**Max.**	**Unit**
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	N-Ch	12			V
		V_{GS} = 0 V, I_D = - 250 µA	P-Ch	- 12			
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA	N-Ch		12		mV/°C
		I_D = - 250 µA	P-Ch		- 3.1		
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	I_D = 250 µA	N-Ch		- 2.5		
		I_D = - 250 µA	P-Ch		2.4		
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	N-Ch	0.4		1	V
		V_{DS} = V_{GS}, I_D = - 250 µA	P-Ch	- 0.4		- 1	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 8 V	N-Ch			± 100	nA
			P-Ch			± 100	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 12 V, V_{GS} = 0 V	N-Ch			1	µA
		V_{DS} = - 12 V, V_{GS} = 0 V	P-Ch			- 1	
On-State Drain Current[b]	$I_{D(on)}$	$V_{DS} \geq$ 5 V, V_{GS} = 4.5 V	N-Ch	15			A
		$V_{DS} \leq$ - 5 V, V_{GS} = - 4.5 V	P-Ch	- 10			
Drain-Source On-State Resistance[b]	$R_{DS(on)}$	V_{GS} = 4.5 V, I_D = 5 A	N-Ch		0.024	0.029	Ω
		V_{GS} = - 4.5 V, I_D = - 3.6 A	P-Ch		0.050	0.061	
		V_{GS} = 2.5 V, I_D = 4.6 A	N-Ch		0.028	0.034	
		V_{GS} = - 2.5 V, I_D = - 3.2 A	P-Ch		0.066	0.081	
		V_{GS} = 1.8 V, I_D = 4.1 A	N-Ch		0.032	0.044	
		V_{GS} = - 1.8 V, I_D = - 1 A	P-Ch		0.093	0.115	
Forward Transconductance[b]	g_{fs}	V_{DS} = 10 V, I_D = 5 A	N-Ch		21		S
		V_{DS} = - 10 V, I_D = - 3.6 A	P-Ch		11		
Dynamic[a]							
Input Capacitance	C_{iss}	N-Channel V_{DS} = 6 V, V_{GS} = 0 V, f = 1 MHz	N-Ch		500		pF
			P-Ch		590		
Output Capacitance	C_{oss}		N-Ch		160		
			P-Ch		280		
Reverse Transfer Capacitance	C_{rss}	P-Channel V_{DS} = - 6 V, V_{GS} = 0 V, f = 1 MHz	N-Ch		100		
			P-Ch		250		
Total Gate Charge	Q_g	V_{DS} = 6 V, V_{GS} = 8 V, I_D = 6.5 A	N-Ch		9.7	15	nC
		V_{DS} = - 6 V, V_{GS} = - 8 V, I_D = - 4.5 A	P-Ch		13.1	20	
		N-Channel V_{DS} = 6 V, V_{GS} = 4.5 V, I_D = 6.5 A	N-Ch		5.6	8.5	
			P-Ch		8.2	12.5	
Gate-Source Charge	Q_{gs}		N-Ch		0.72		
		P-Channel V_{DS} = - 6 V, V_{GS} = - 4.5 V, I_D = - 4.3 A	P-Ch		1.2		
Gate-Drain Charge	Q_{gd}		N-Ch		0.74		
			P-Ch		2.8		
Gate Resistance	R_g	f = 1 MHz	N-Ch	0.7	3.5	7	Ω
			P-Ch	2	10	20	

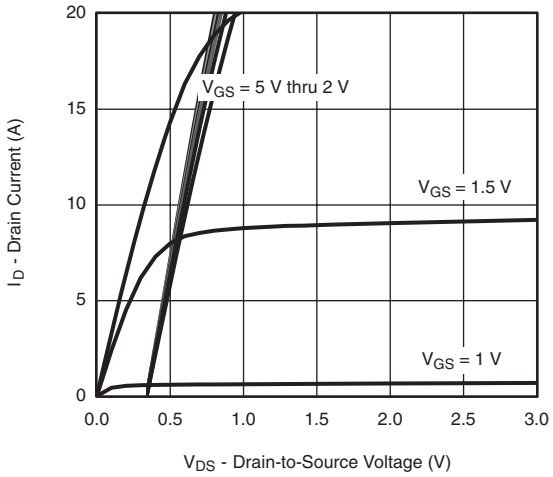
Notes:
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.

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

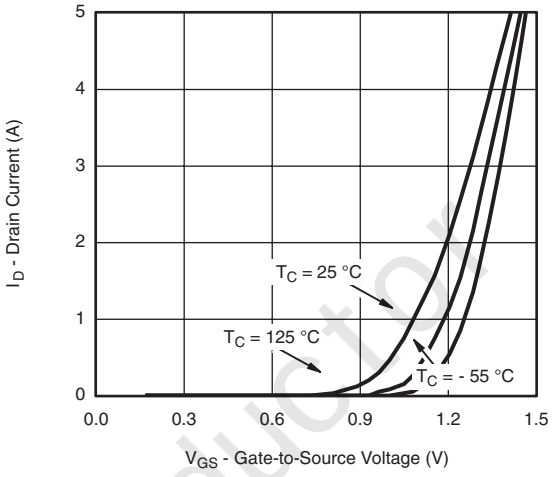
SPECIFICATIONS T_J = 25 °C, unless otherwise noted							
Parameter	**Symbol**	**Test Conditions**		**Min.**	**Typ.**	**Max.**	**Unit**
Dynamic[a]							
Turn-On Delay Time	$t_{d(on)}$	N-Channel V_{DD} = 6 V, R_L = 1.2 Ω, $I_D \cong$ 5.2 A, V_{GEN} = 4.5 V, R_g = 1 Ω	N-Ch		10	15	ns
			P-Ch		30	40	
Rise Time	t_r		N-Ch		10	15	
			P-Ch		25	40	
Turn-Off Delay Time	$t_{d(off)}$	P-Channel V_{DD} = - 6 V, R_L = 1.6 Ω, $I_D \cong$ - 3.8 A, V_{GEN} = - 4.5 V, R_g = 1 Ω	N-Ch		22	30	
			P-Ch		30	45	
Fall Time	t_f		N-Ch		10	15	
			P-Ch		20	30	
Turn-On Delay Time	$t_{d(on)}$	N-Channel V_{DD} = 6 V, R_L = 1.2 Ω, $I_D \cong$ 5.2 A, V_{GEN} = 10 V, R_g = 1 Ω	N-Ch		5	10	
			P-Ch		8	15	
Rise Time	t_r		N-Ch		10	15	
			P-Ch		12	20	
Turn-Off Delay Time	$t_{d(off)}$	P-Channel V_{DD} = - 6 V, R_L = 1.6 Ω, $I_D \cong$ - 3.8 A, V_{GEN} = - 10 V, R_g = 1 Ω	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 °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 A, V_{GS} = 0 V	N-Ch		0.85	1.2	V
		I_S = - 3.4 A, V_{GS} = 0 V	P-Ch		- 0.8	- 1.2	
Body Diode Reverse Recovery Time	t_{rr}	N-Channel I_F = 5.2 A, dI//dt = 100 A/µs, T_J = 25 °C	N-Ch		20	40	ns
			P-Ch		30	60	
Body Diode Reverse Recovery Charge	Q_{rr}		N-Ch		5	10	nC
			P-Ch		12	24	
Reverse Recovery Fall Time	t_a	P-Channel I_F = - 3.8 A, dI/dt = - 100 A/µs, T_J = 25 °C	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 ≤ 300 µs, duty cycle ≤ 2 %.

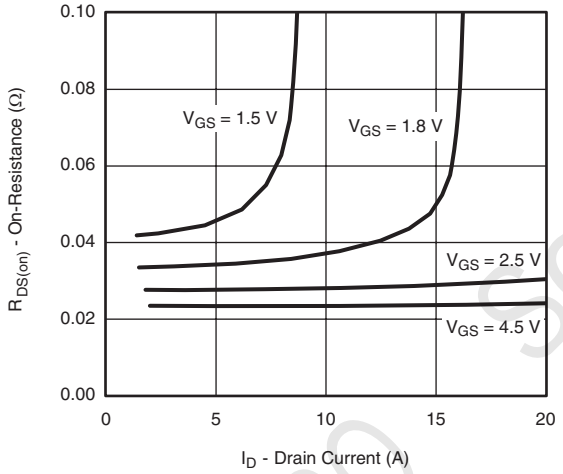
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



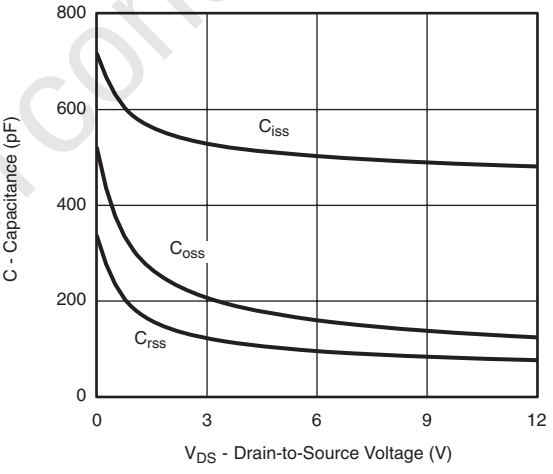
Output Characteristics



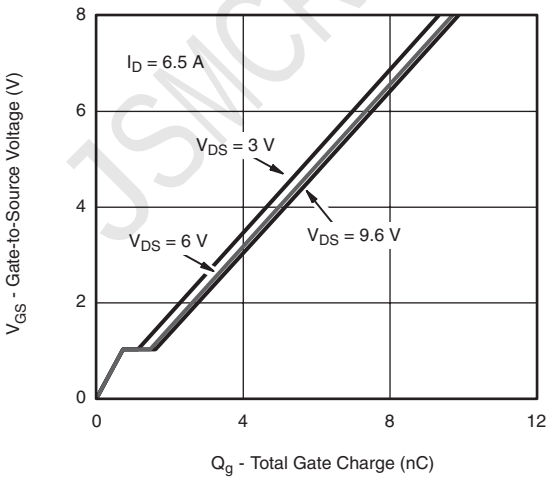
Transfer Characteristics



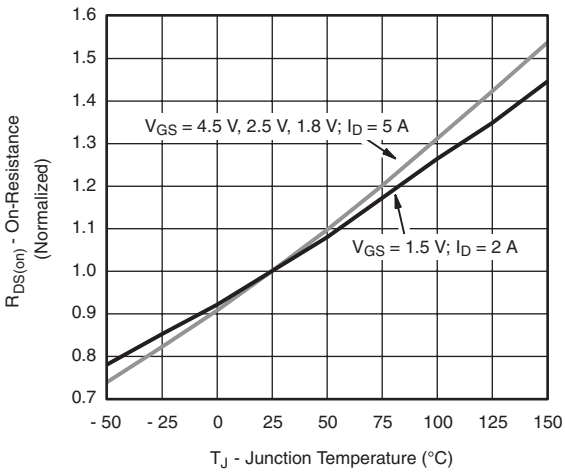
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

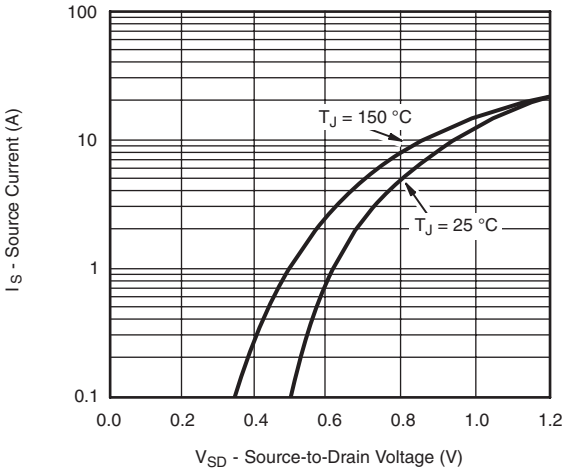


Gate Charge

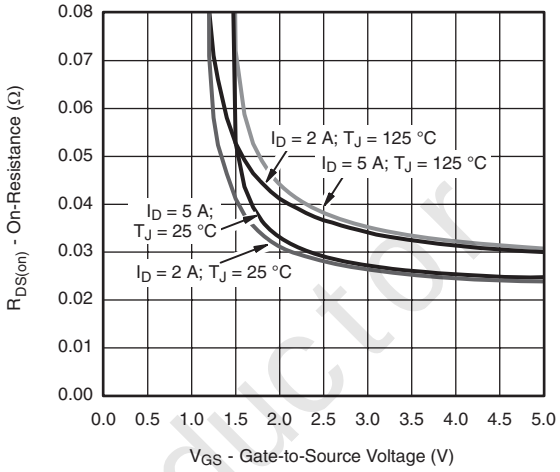


On-Resistance vs. Junction Temperature

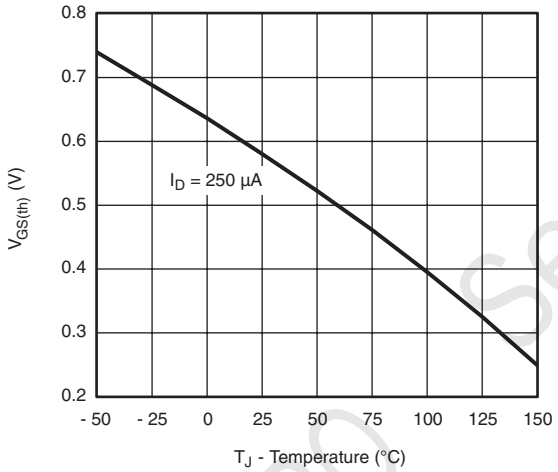
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



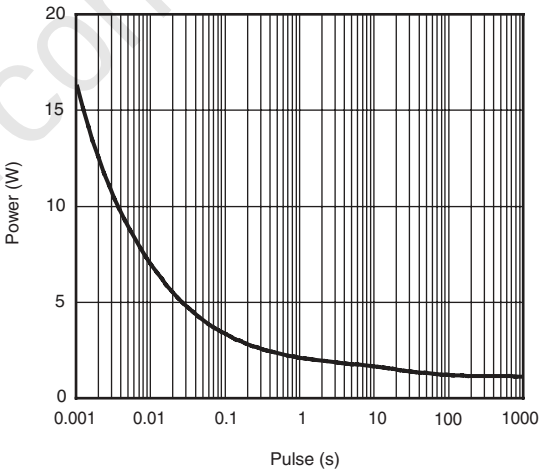
Source-Drain Diode Forward Voltage



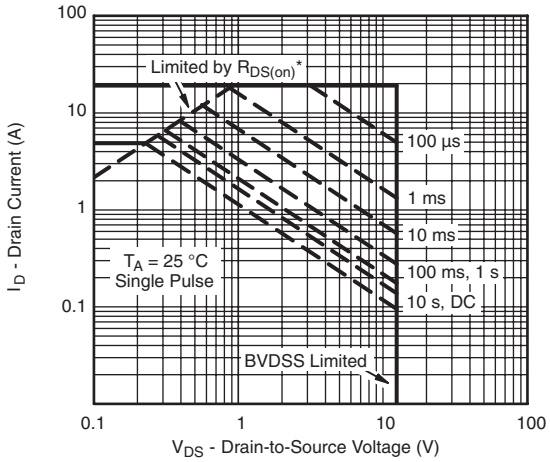
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



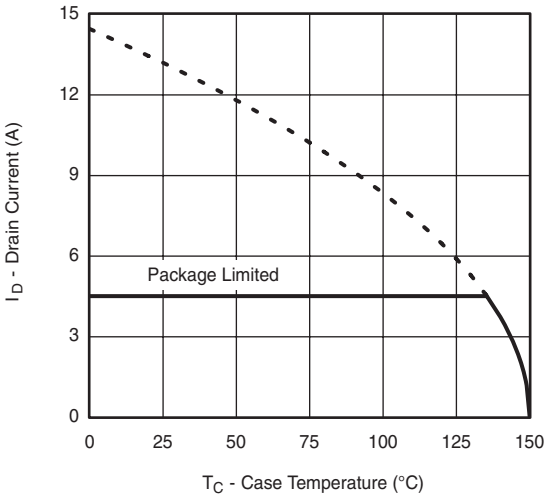
Single Pulse Power (Junction-to-Ambient)



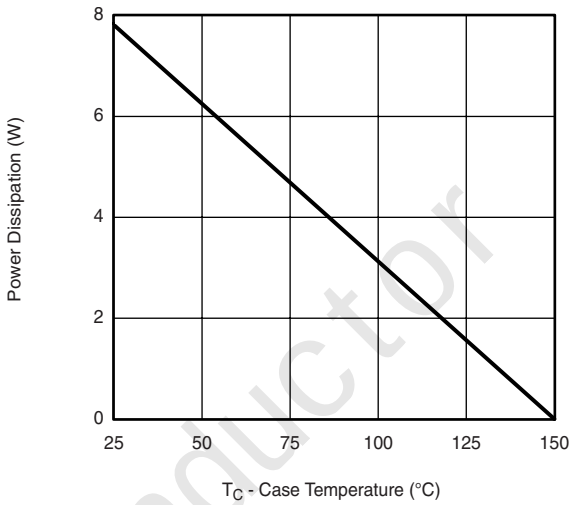
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

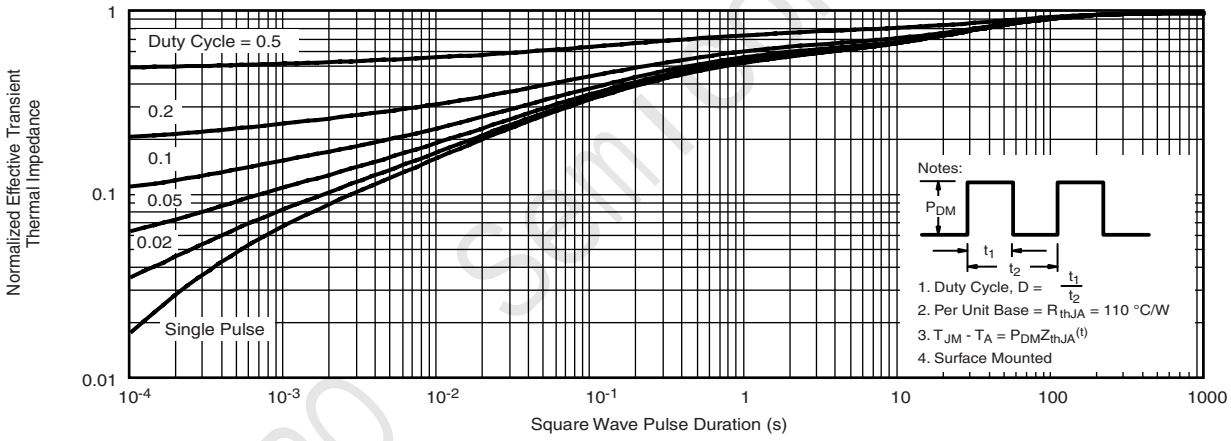
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



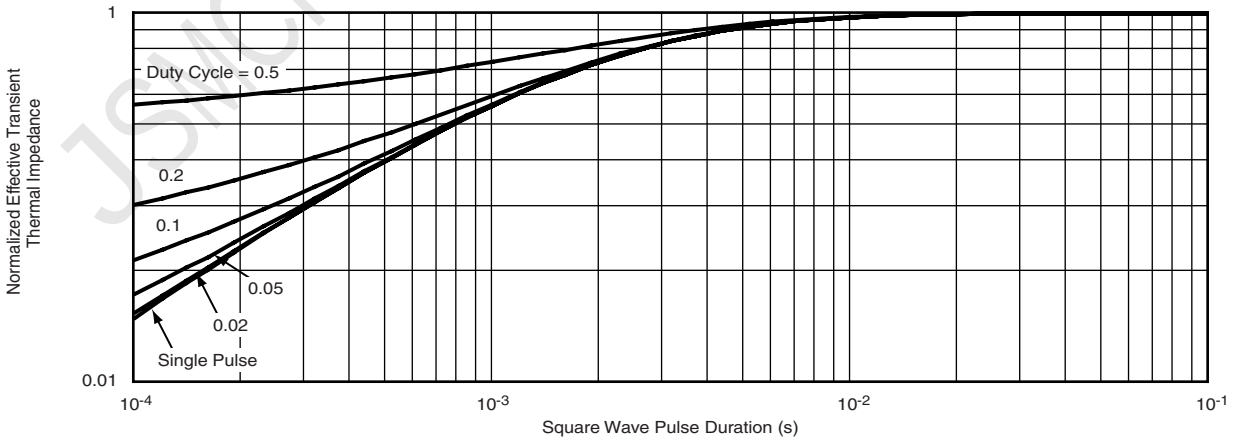
Current Derating*



Power Derating

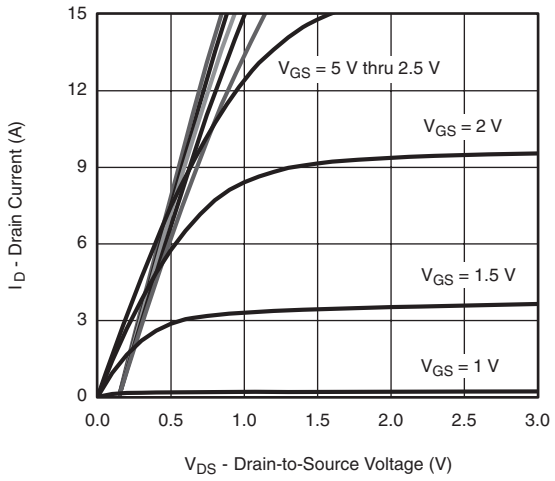


Normalized Thermal Transient Impedance, Junction-to-Ambient

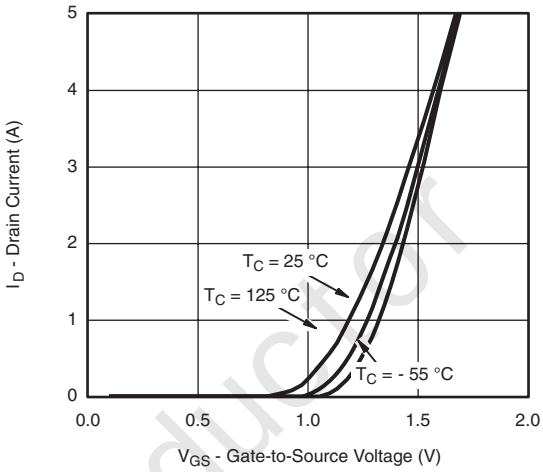


Normalized Thermal Transient Impedance, Junction-to-Case

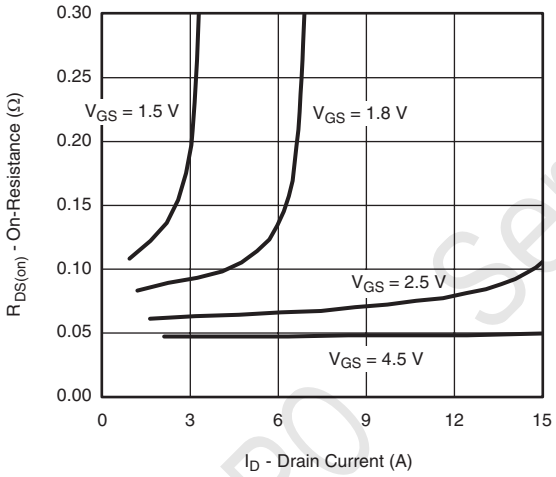
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



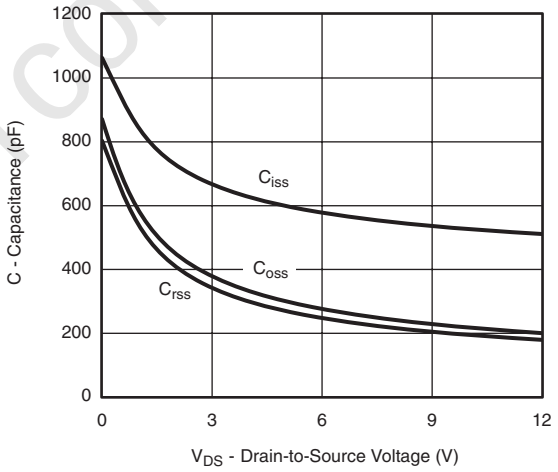
Output Characteristics



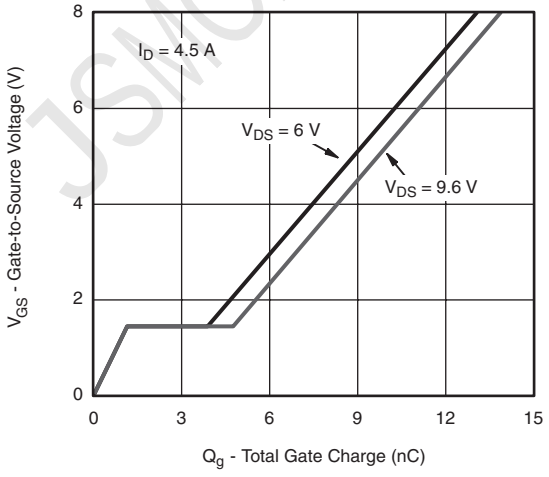
Transfer Characteristics



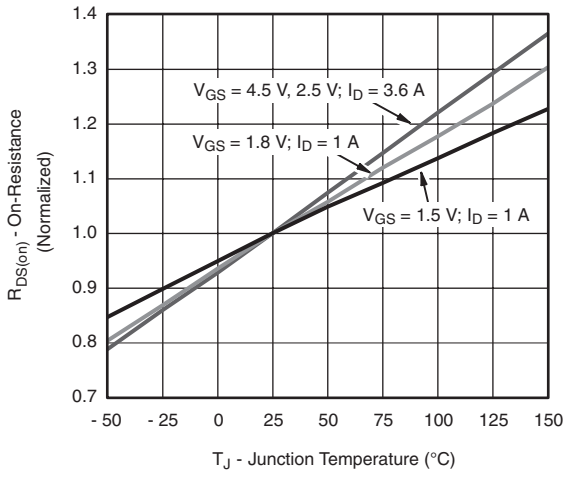
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

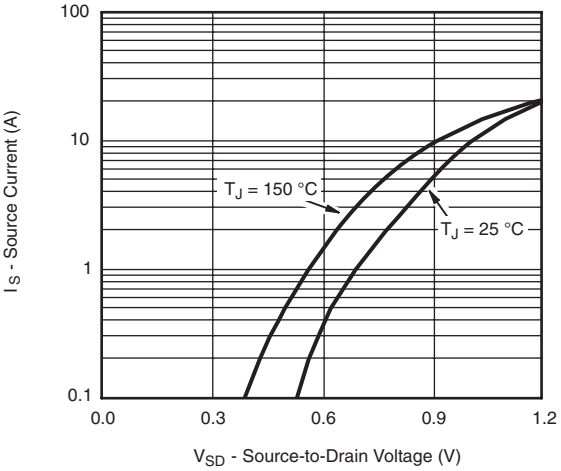


Gate Charge

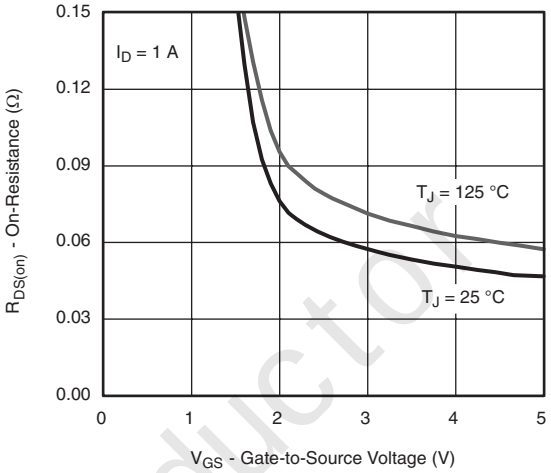


On-Resistance vs. Junction Temperature

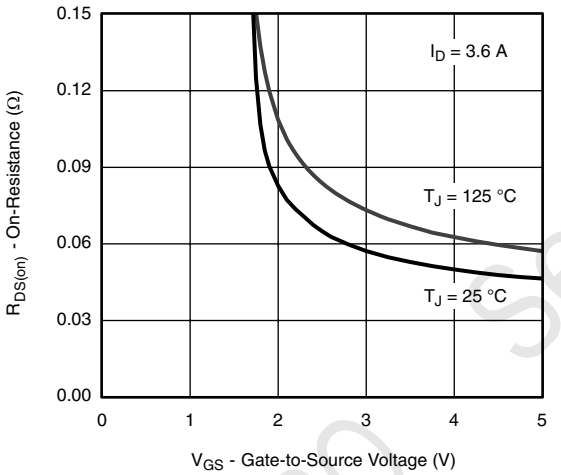
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



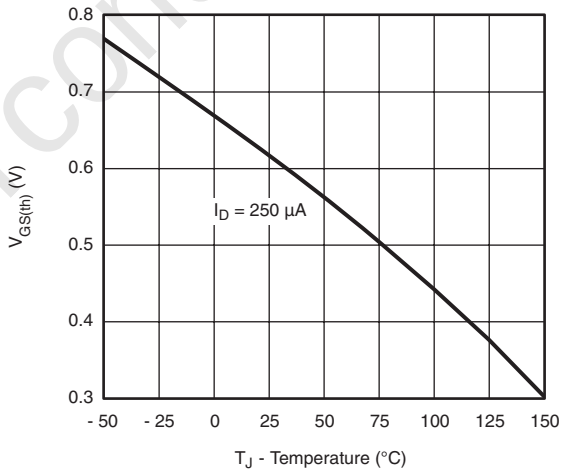
Soure-Drain Diode Forward Voltage



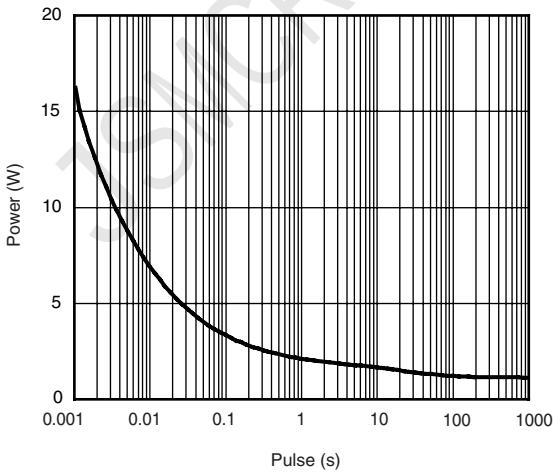
On-Resistance vs. Gate-to-Source Voltage



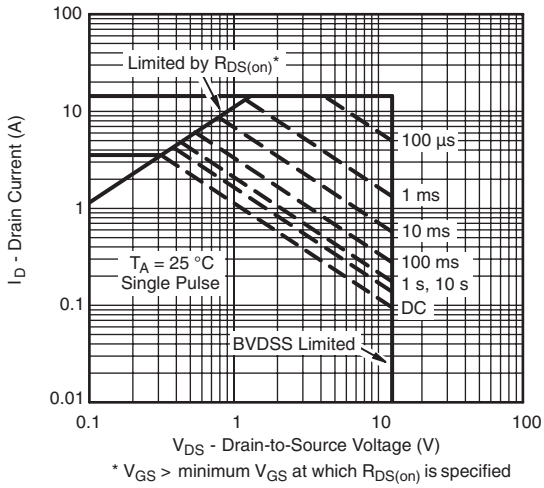
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



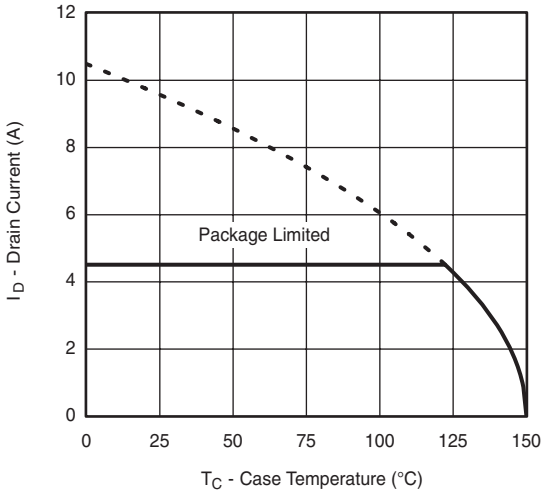
Single Pulse Power, Junction-to-Ambient



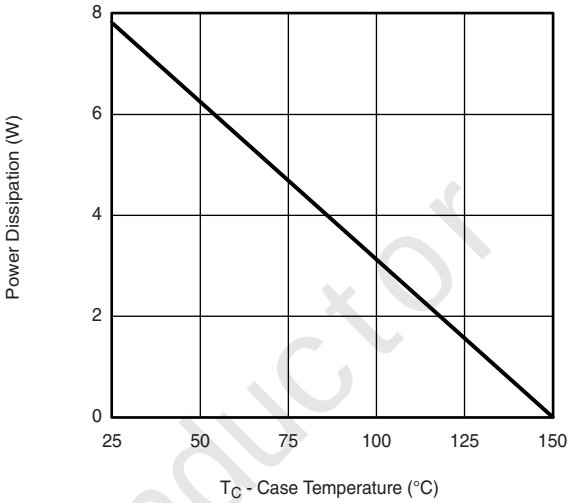
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

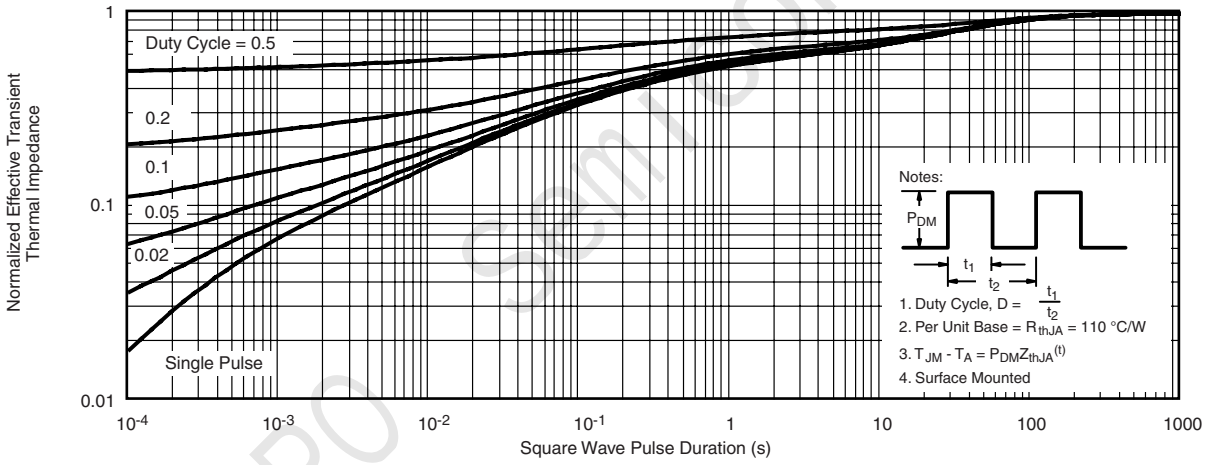
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



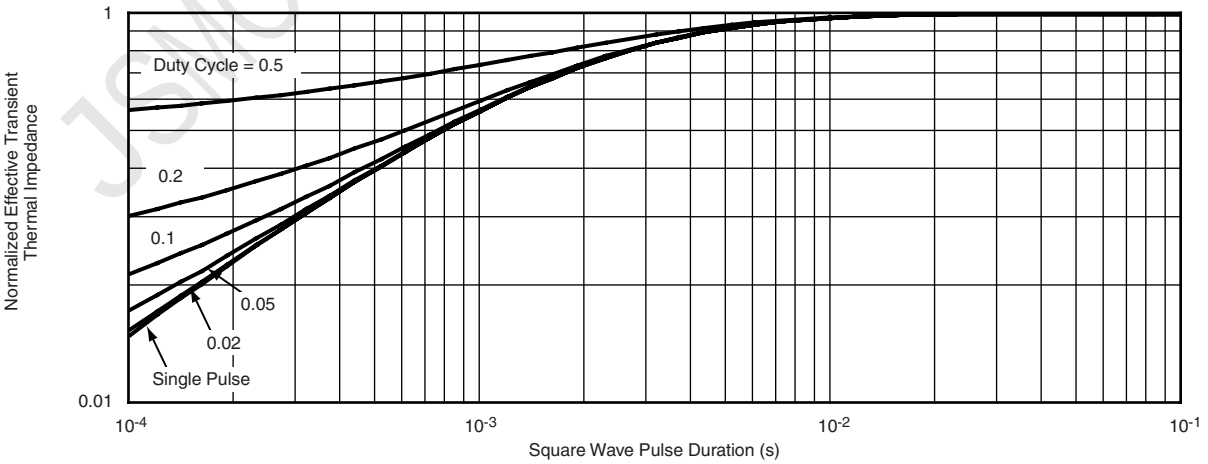
Current Derating*



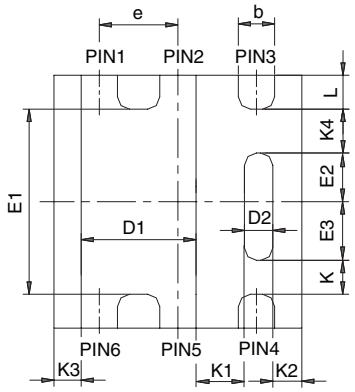
Power Derating



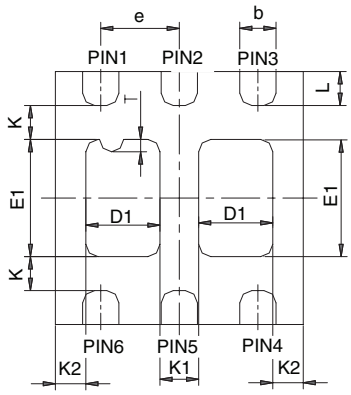
Normalized Thermal Transient Impedance, Junction-to-Ambient



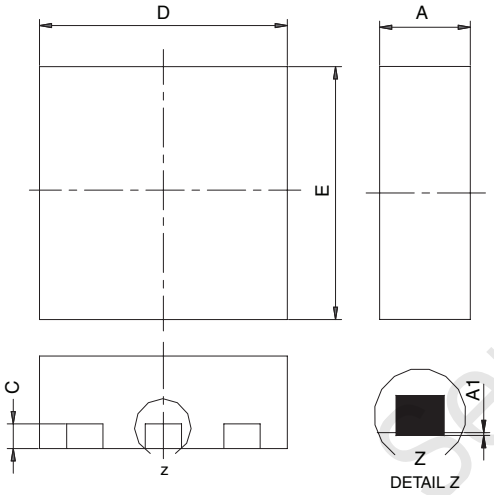
Normalized Thermal Transient Impedance, Junction-to-Case



BACKSIDE VIEW OF SINGLE



BACKSIDE VIEW OF DUAL



DETAIL Z

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

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