

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

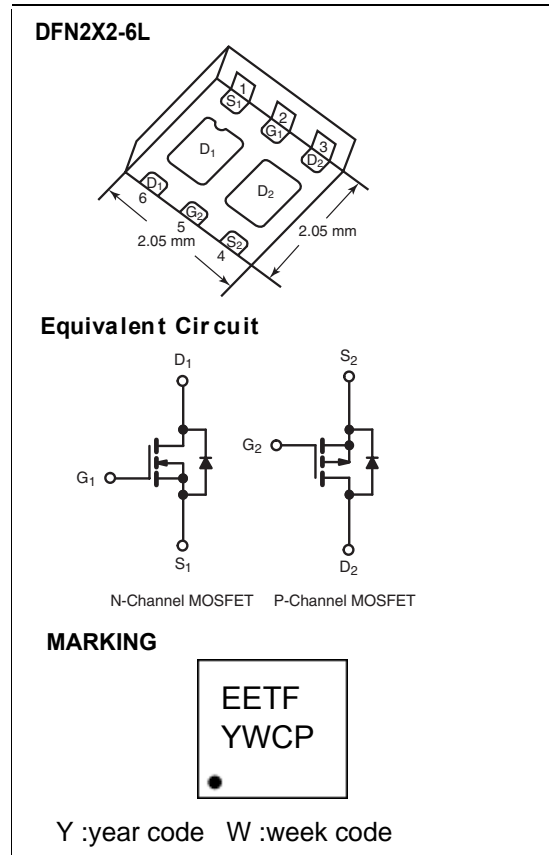
PRODUCT SUMMARY				
	V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)	Q _g (Typ.)
N-Channel	12	0.029 at V _{GS} = 4.5 V	4.5 ^a	5.6 nC
		0.034 at V _{GS} = 2.5 V	4.5 ^a	
		0.044 at V _{GS} = 1.8 V	4.5 ^a	
		0.065 at V _{GS} = 1.5 V	4.5 ^a	
P-Channel	- 12	0.061 at V _{GS} = - 4.5 V	- 4.5 ^a	8.2 nC
		0.081 at V _{GS}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

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET[®] 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	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	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	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}	R _{thJA}	52	65	52	65	°C/W	
Maximum Junction-to-Case (Drain)	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.



SHENZHEN TUOFENG SEMICONDUCTOR TECHNOLOGY CO.,LTD

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

SiA517

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	ΔV _{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	ΔV _{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} ≥ 5 V, V _{GS} = 4.5 V	N-Ch	15			A
		V _{DS} ≤ - 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
Output Capacitance	C _{oss}		P-Ch		590		
Reverse Transfer Capacitance	C _{rss}	P-Channel V _{DS} = - 6 V, V _{GS} = 0 V, f = 1 MHz	N-Ch		160		
			P-Ch		280		
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}	P-Channel V _{DS} = - 6 V, V _{GS} = - 4.5 V, I _D = - 4.3 A	N-Ch		0.72		
	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:

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



SHENZHEN TUOFENG SEMICONDUCTOR TECHNOLOGY CO.,LTD
N- and P-Channel 12-V (D-S) MOSFET

SiA517

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

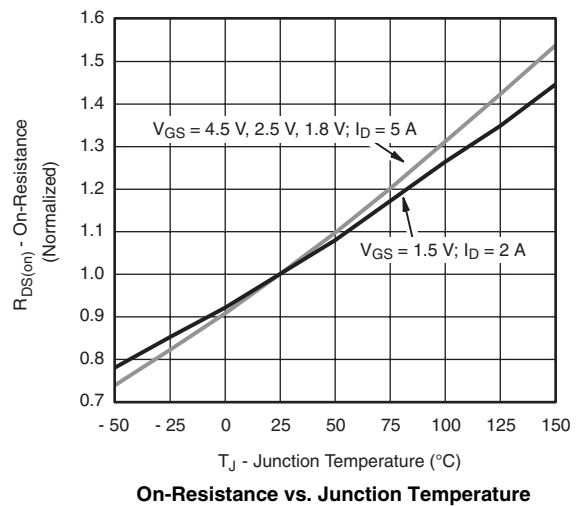
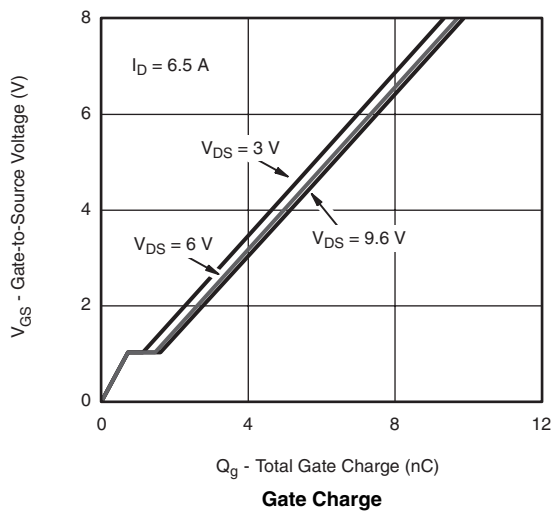
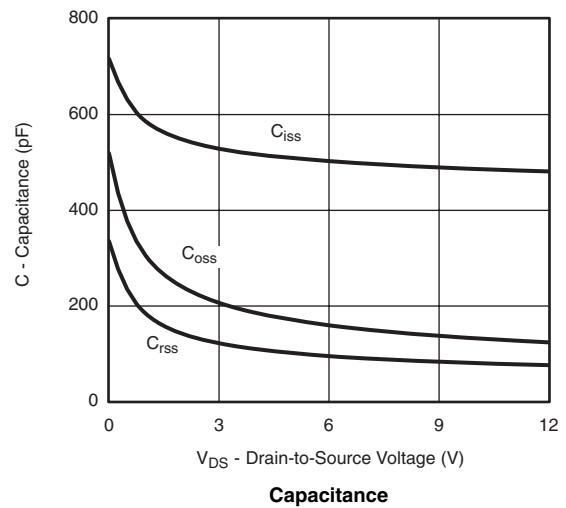
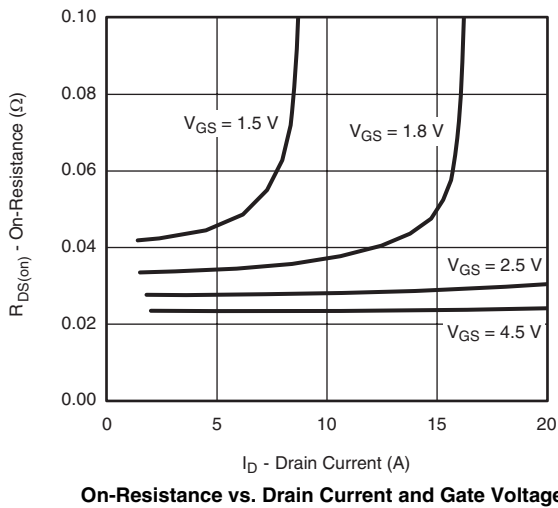
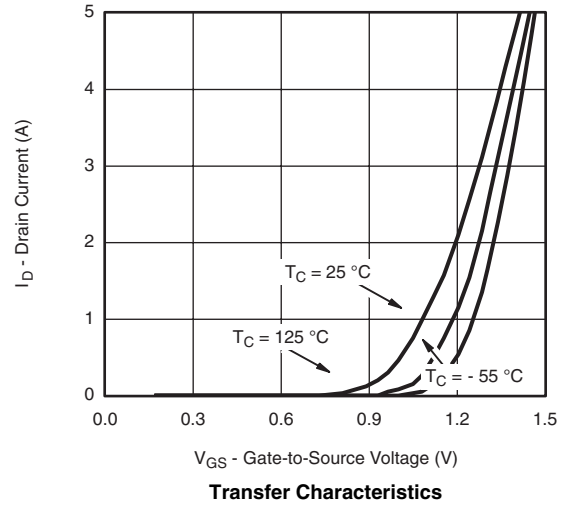
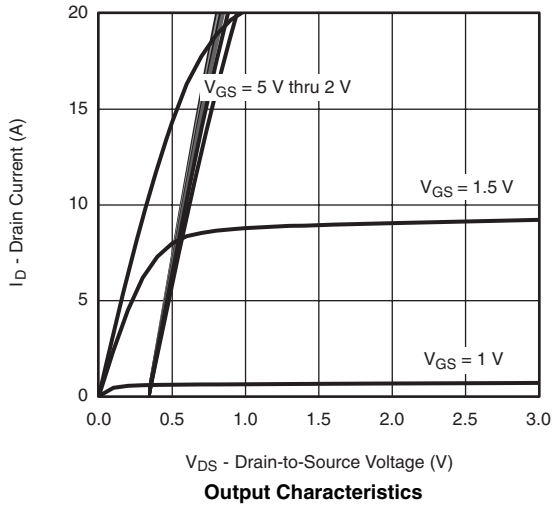
SPECIFICATIONS $T_J = 25^\circ\text{C}$, unless otherwise noted							
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
Dynamic^a							
Turn-On Delay Time	$t_{d(on)}$	N-Channel $V_{DD} = 6\text{ V}, R_L = 1.2\ \Omega$ $I_D \cong 5.2\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\ \Omega$	N-Ch		10	15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

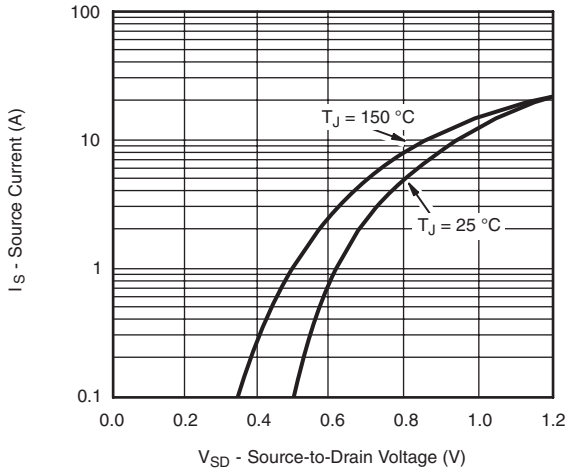




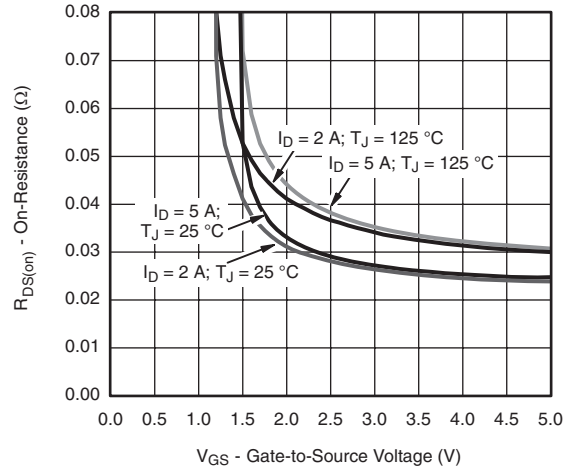
SHENZHEN TUOFENG SEMICONDUCTOR TECHNOLOGY CO.,LTD
N- and P-Channel 12-V (D-S) MOSFET

SiA517

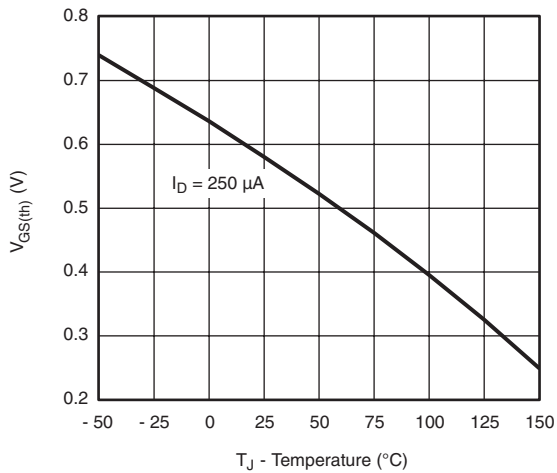
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



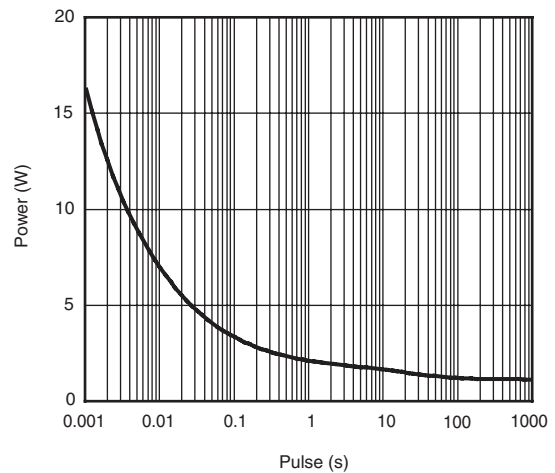
Source-Drain Diode Forward Voltage



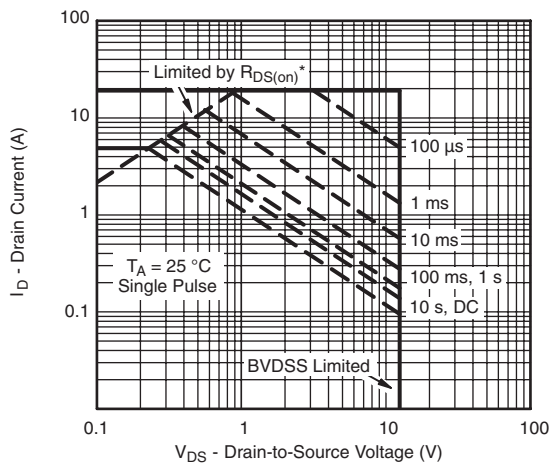
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power (Junction-to-Ambient)



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

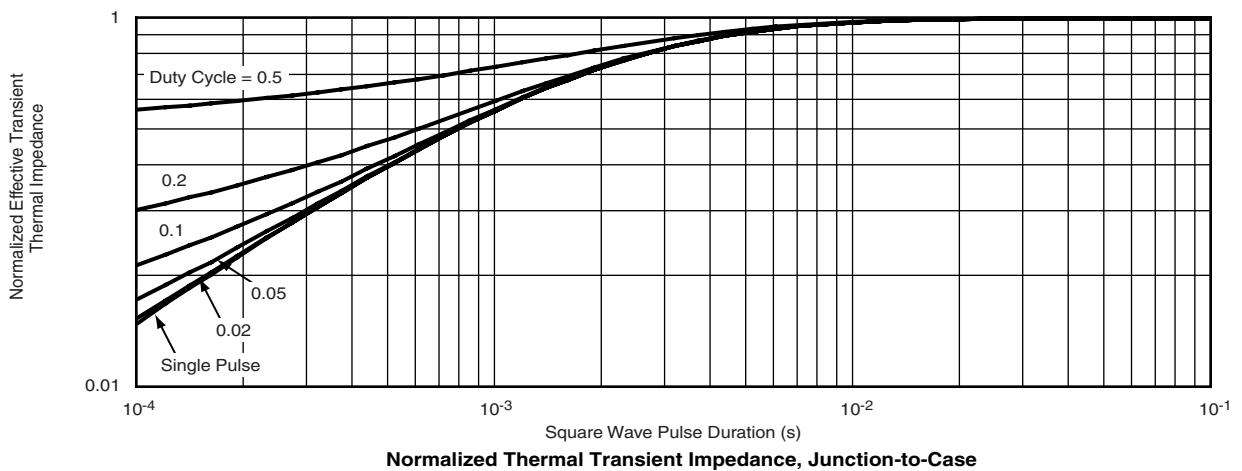
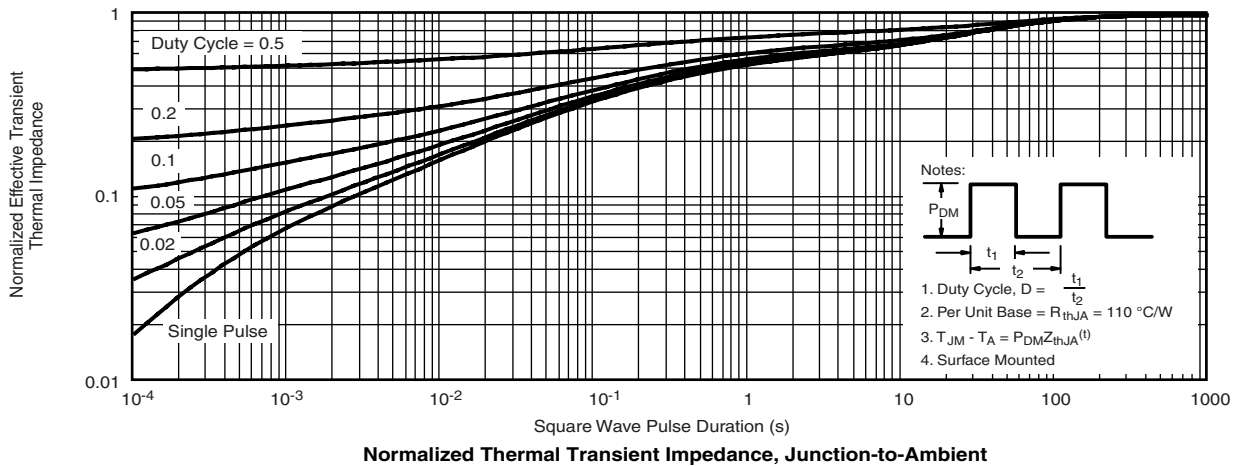
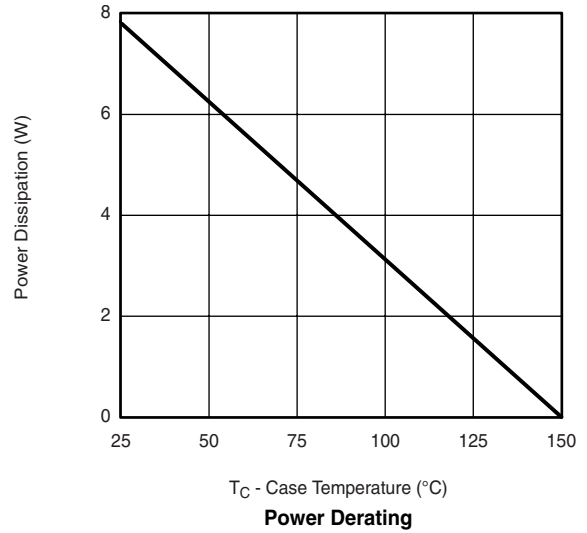
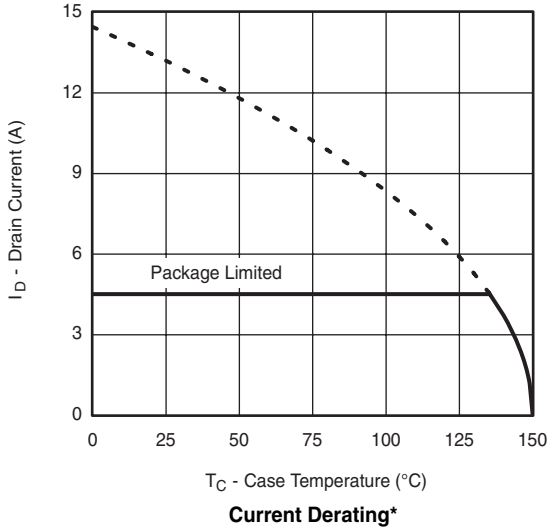
Safe Operating Area, Junction-to-Ambient



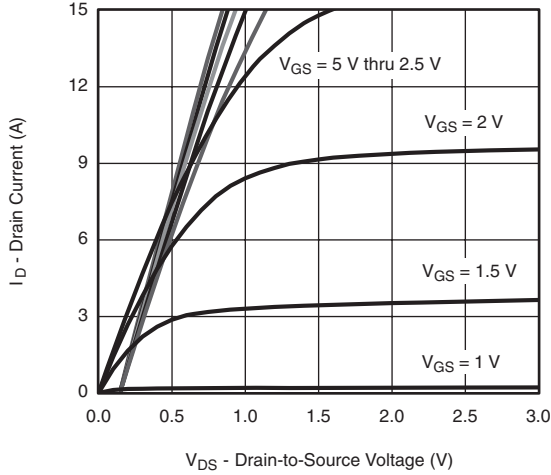
SHENZHEN TUOFENG SEMICONDUCTOR TECHNOLOGY CO.,LTD
N- and P-Channel 12-V (D-S) MOSFET

SiA517

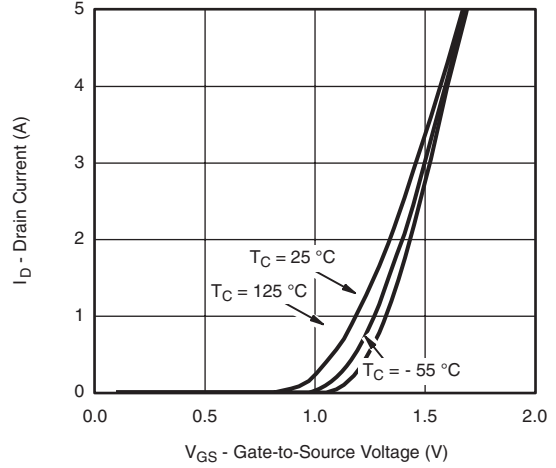
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



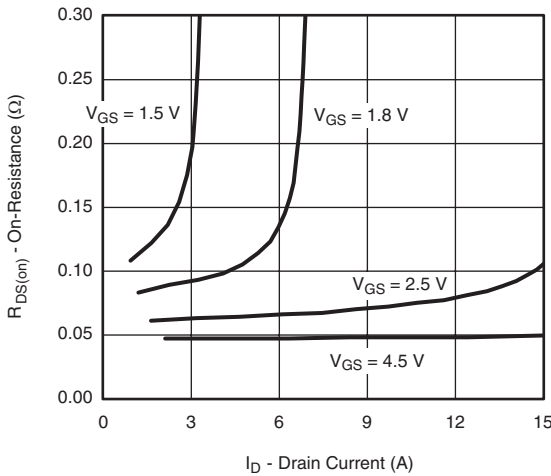
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



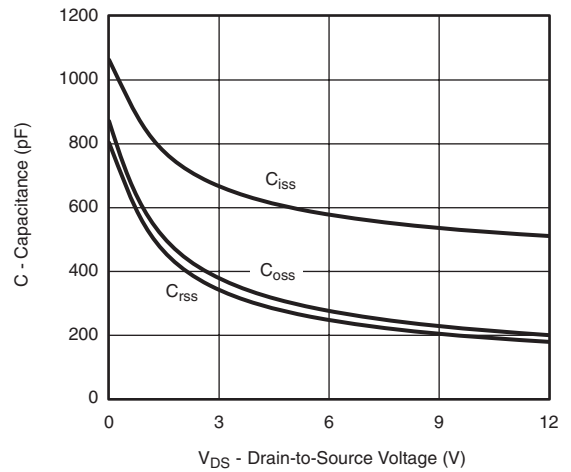
Output Characteristics



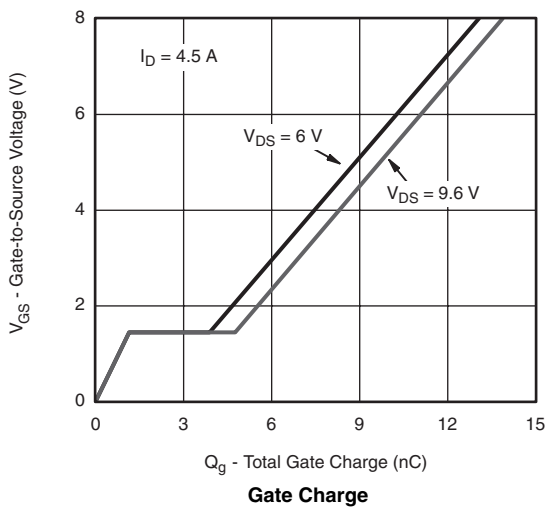
Transfer Characteristics



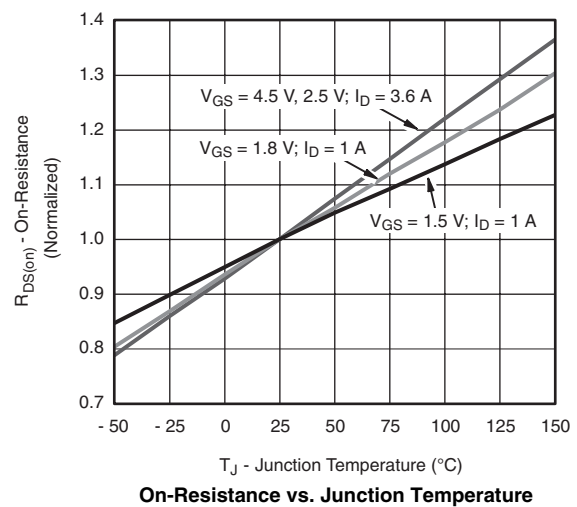
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

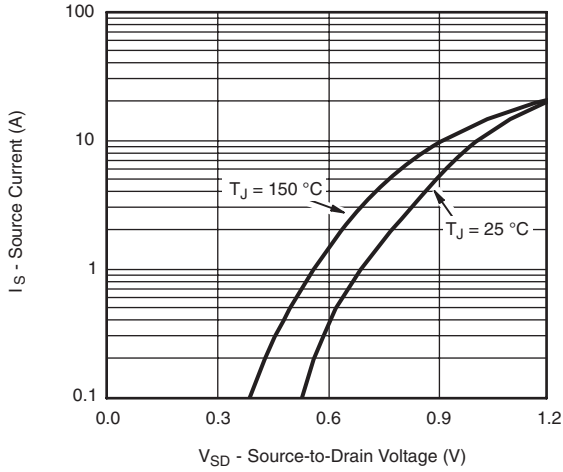


Gate Charge

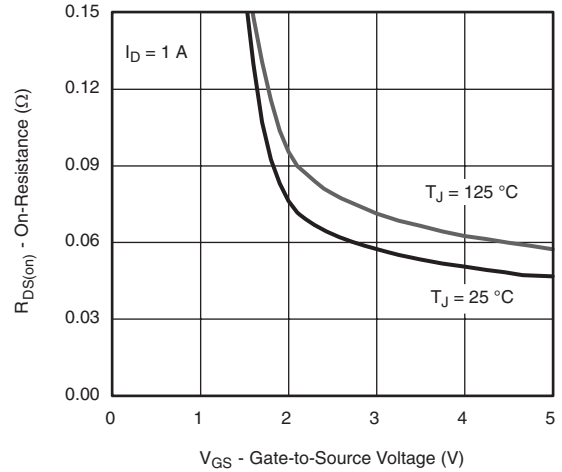


On-Resistance vs. Junction Temperature

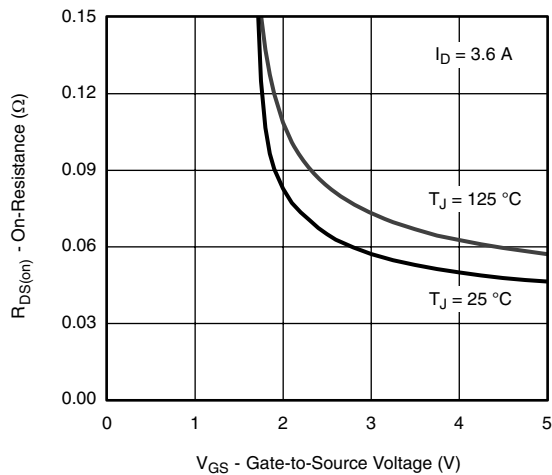
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



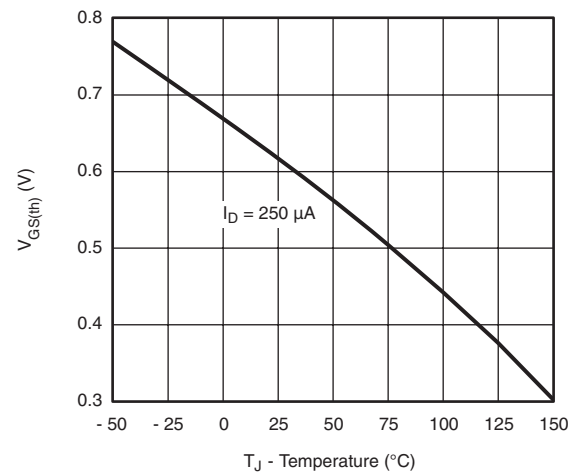
Source-Drain Diode Forward Voltage



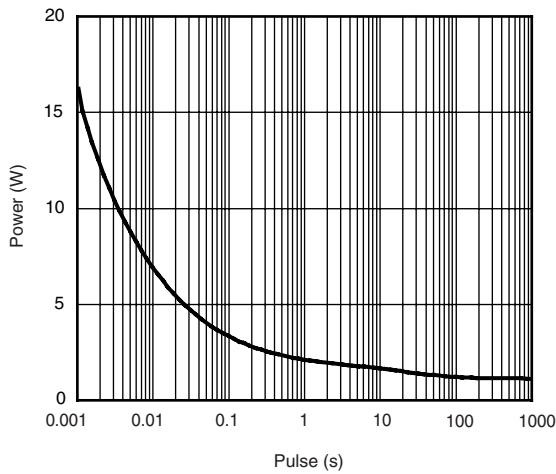
On-Resistance vs. Gate-to-Source Voltage



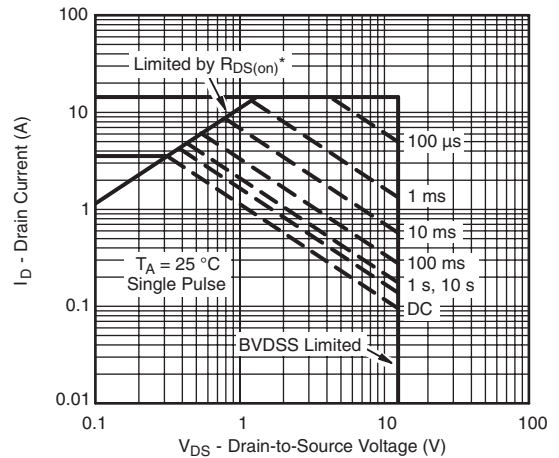
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Ambient



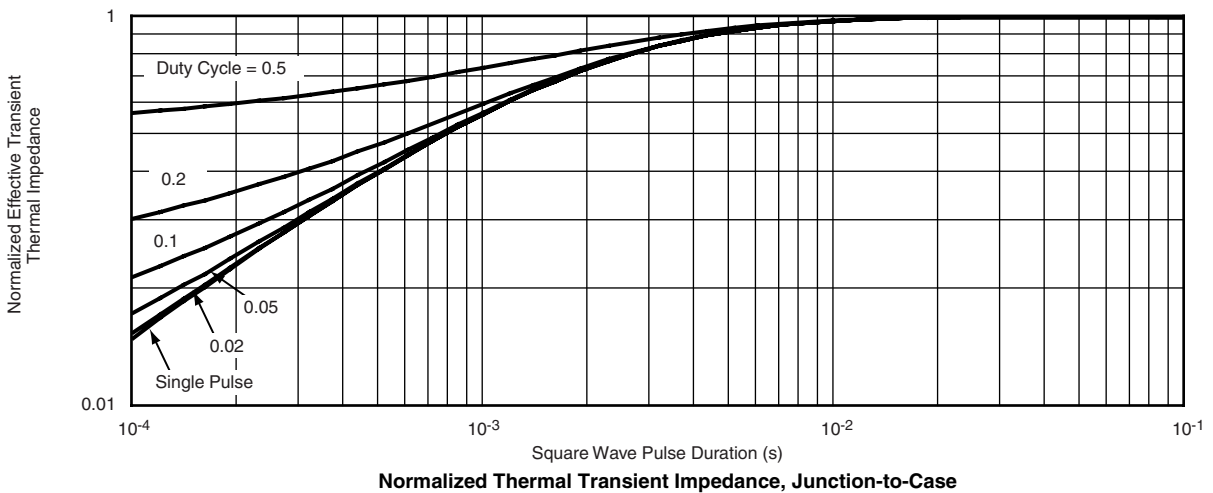
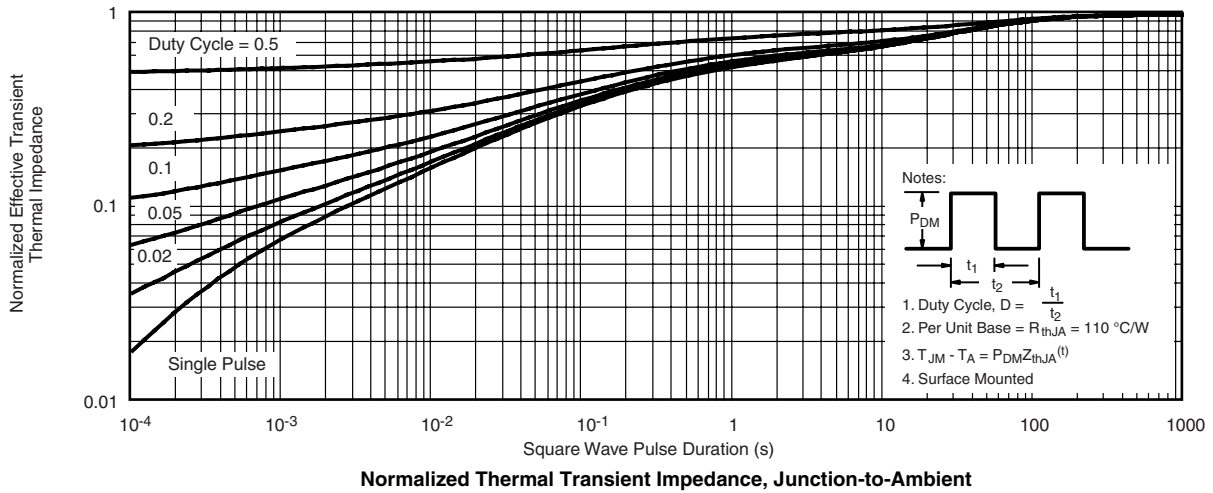
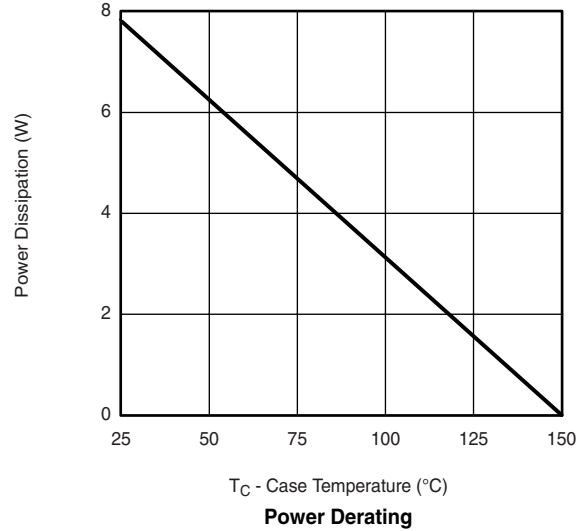
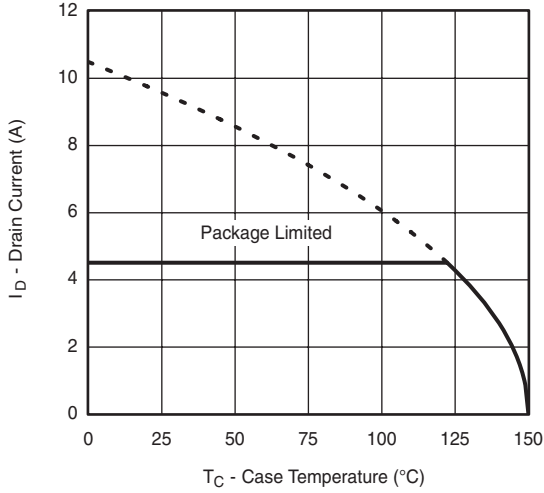
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Ambient

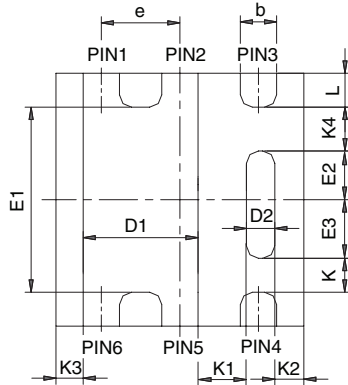


SHENZHEN TUOFENG SEMICONDUCTOR TECHNOLOGY CO.,LTD
N- and P-Channel 12-V (D-S) MOSFET

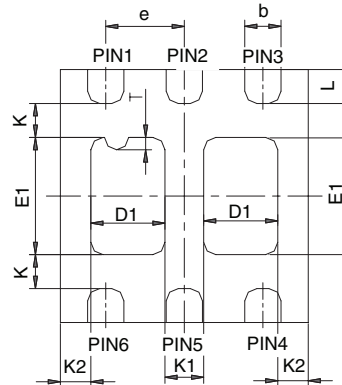
SiA517

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

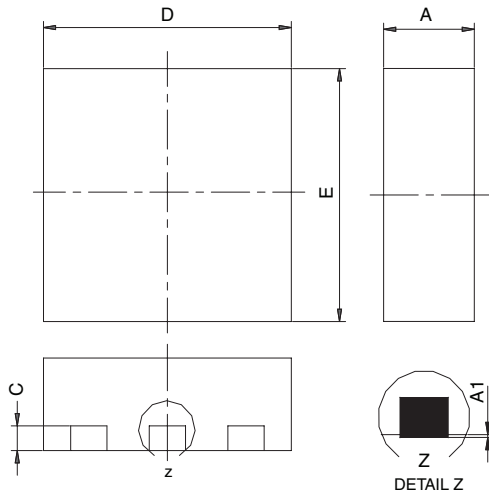




BACKSIDE VIEW OF SINGLE



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