N-Channel 30V (D-S) MOSFET

Features

- Very Low RDS(on) at 4.5V Vgs
- Low Gate Charge
- High Current Capability
- 100% Rg and UIS Tested
- RoHS and Halogen-Free Compliant

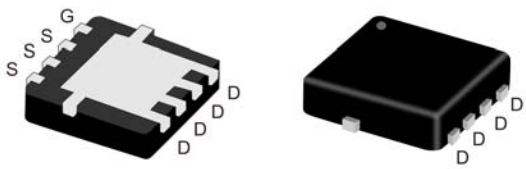
Applications

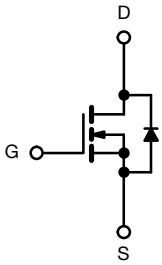
- Notebook Vcore
- DC/DC

Product Summary		
V_{DS}(V)	$R_{DS(on)}$ (mΩ) (Max.)	I_D (A)
30	4.7 at V_{GS} = 10 V	40
	6.1 at V_{GS} = 4.5 V	40

Pin Configuration

Power5x6





N-Channel MOSFET

Absolute Maximum Ratings

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	30	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current[G]	T_C=25℃	I_D	40	A
	T_C=70°C		40	
Pulsed Drain Current [C]		I_{DM}	70	
Continuous Drain Current	T_A=25℃	I_{DSM}	24.3	A
	T_A=70℃		19.4	
Avalanche Current [C]		I_{AS}, I_{AR}	30	A
Avalanche energy L=0.1mH [C]		E_{AS}, E_{AR}	45	mJ
Power Dissipation [B]	T_C=25℃	P_D	48	W
	T_C=70°C		31	
Power Dissipation [A]	T_A=25℃	P_{DSM}	5	W
	T_A=70℃		3.2	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	℃

Thermal Data

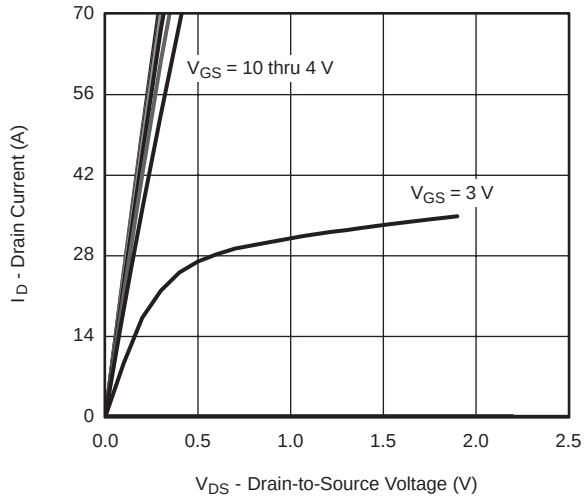
Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	20	25	℃/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	2.1	2.6	℃/W

Electrical Characteristics (T_J =25℃ Unless Otherwise Specified)

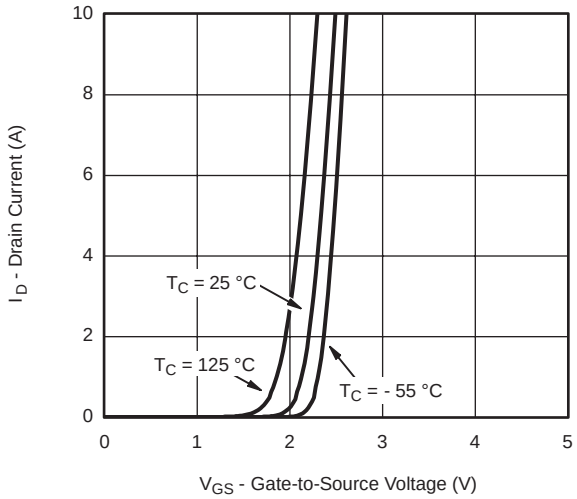
Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=250μA, V_{GS}=0V	30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=30V, V_{GS}=0V			1	μA
		T_J=55℃			10	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±20V			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250μA	1.0		2.4	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V	30			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=15A		3.8	4.7	mΩ
		V_{GS}=4.5V, I_D=10A		4.9	6.1	mΩ
g_{FS}	Forward Transconductance	V_{DS}=15V, I_D=15A		60		S
V_{SD}	Diode Forward Voltage	I_S=3A,V_{GS}=0V		0.73	1.1	V
I_S	Maximum Body-Diode Continuous Current[G]				40	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz		2071		pF
C_{oss}	Output Capacitance			406		pF
C_{rss}	Reverse Transfer Capacitance			168		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz	0.2	0.85	1.7	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=10A		36	54	nC
Q_g(4.5V)	Total Gate Charge	V_{GS}=10V, V_{DS}=4.5V, I_D=10A		16.8	25.5	
Q_{gs}	Gate Source Charge			5.1		nC
Q_{gd}	Gate Drain Charge			5.2		nC
$t_{D(on)}$	Turn-On DelayTime	V_{DD}=15V, R_L=1.5 Ω, I_D ≅10A,V_{GEN} =4.5V, R_g =1Ω		10	20	ns
t_r	Turn-On Rise Time			9	18	ns
$t_{D(off)}$	Turn-Off DelayTime			25	45	ns
t_f	Turn-Off Fall Time			9	18	ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=10A, dI/dt=100A/μs		19	38	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=10A, dI/dt=100A/μs		10	20	nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A =25° C. The Power dissipation P_{DSM} is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design, and the maximum temperature of 150° C may be used if the PCB allows it.
B. The power dissipation P_D is based on $T_{J(MAX)}$=150° C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.
C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150° C. Ratings are based on low frequency and duty cycles to keep initial T_J=25° C.
D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to case $R_{\theta JC}$ and case to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-case thermal impedence which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.
G. The maximum current rating is package limited.
H. These tests are performed with the device mounted on 1 in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C.

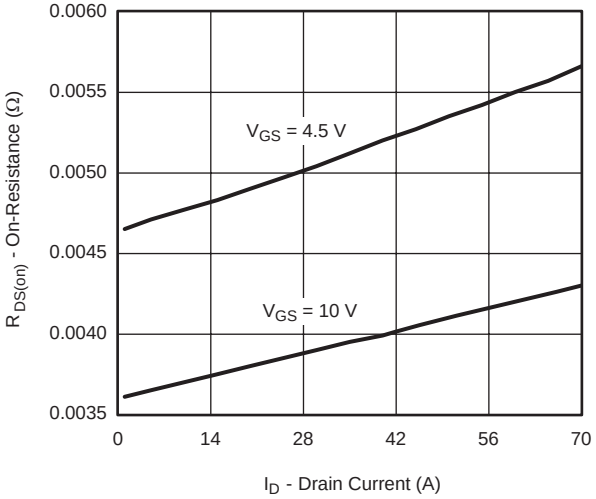
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



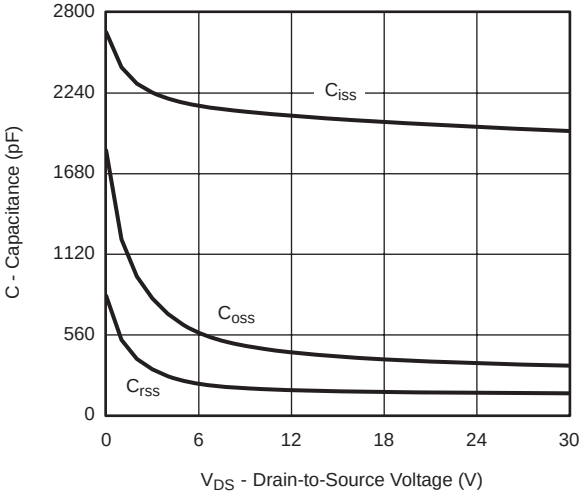
Output Characteristics



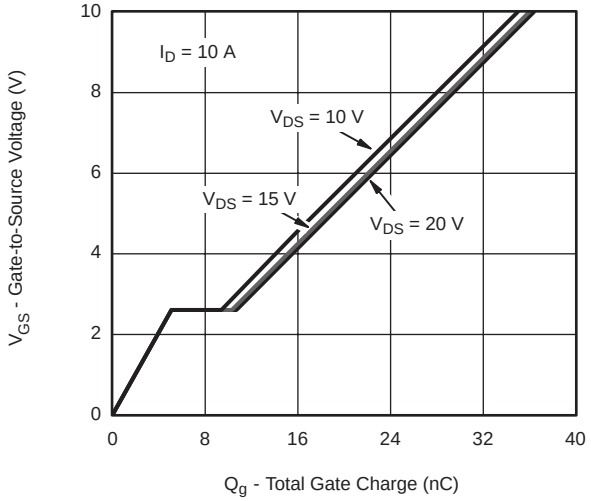
Transfer Characteristics



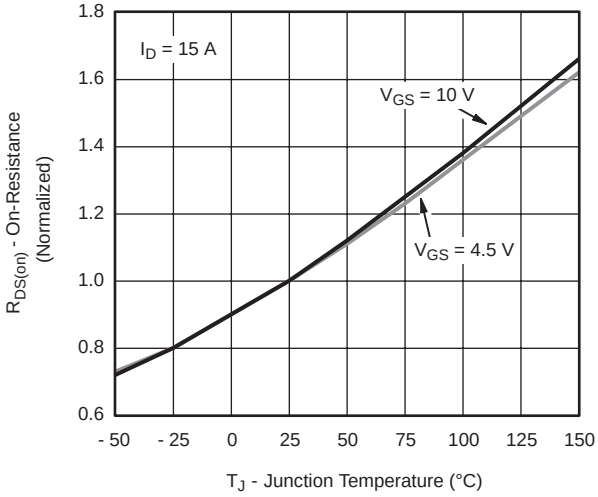
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

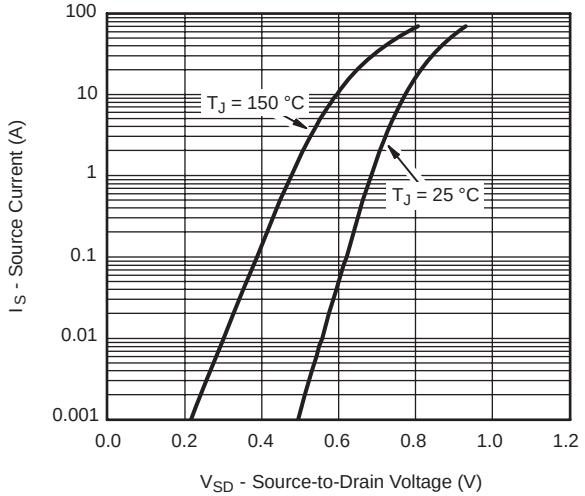


Gate Charge

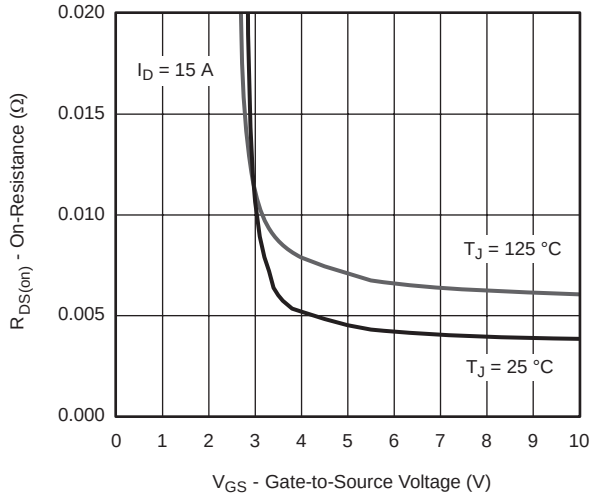


On-Resistance vs. Junction Temperature

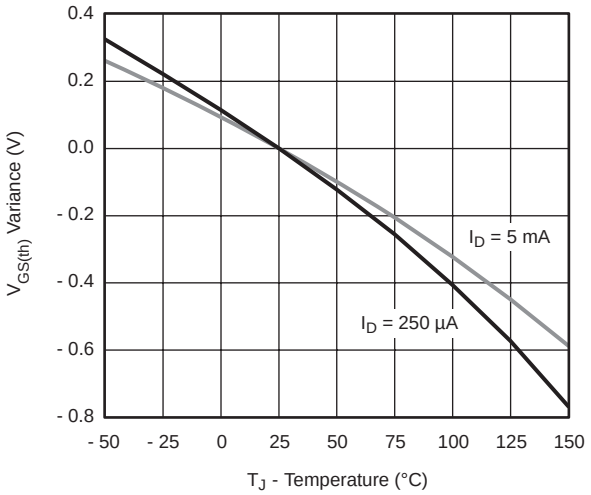
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



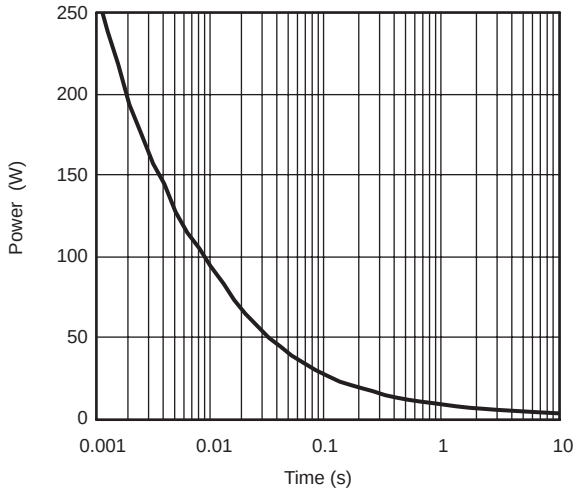
Source-Drain Diode Forward Voltage



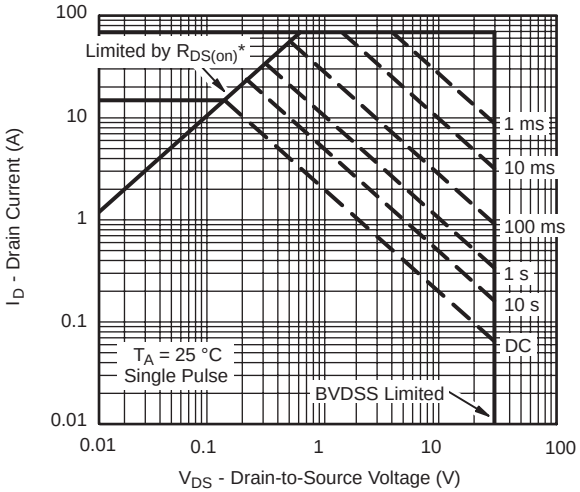
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



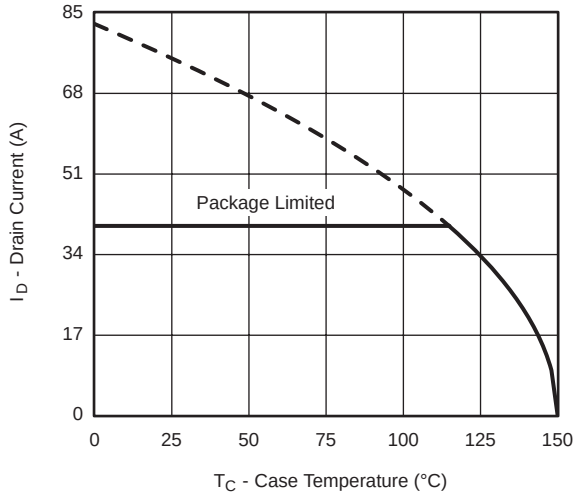
Single Pulse Power, Junction-to-Ambient



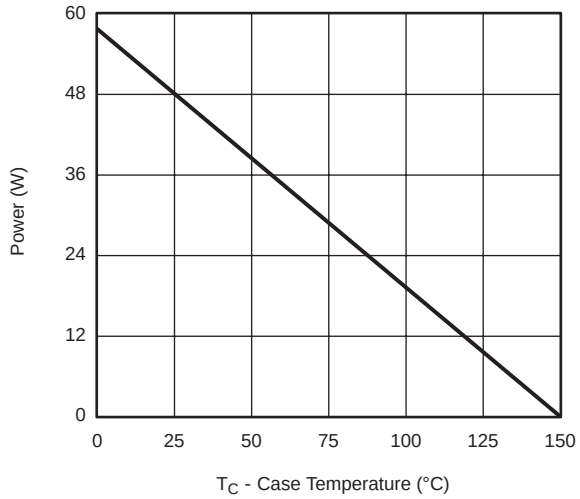
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

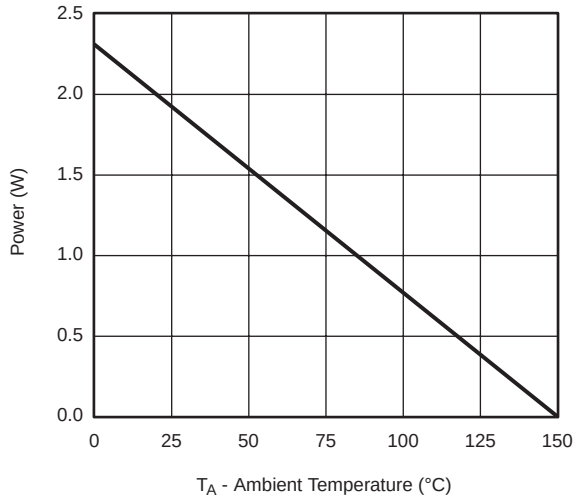
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



Current Derating*



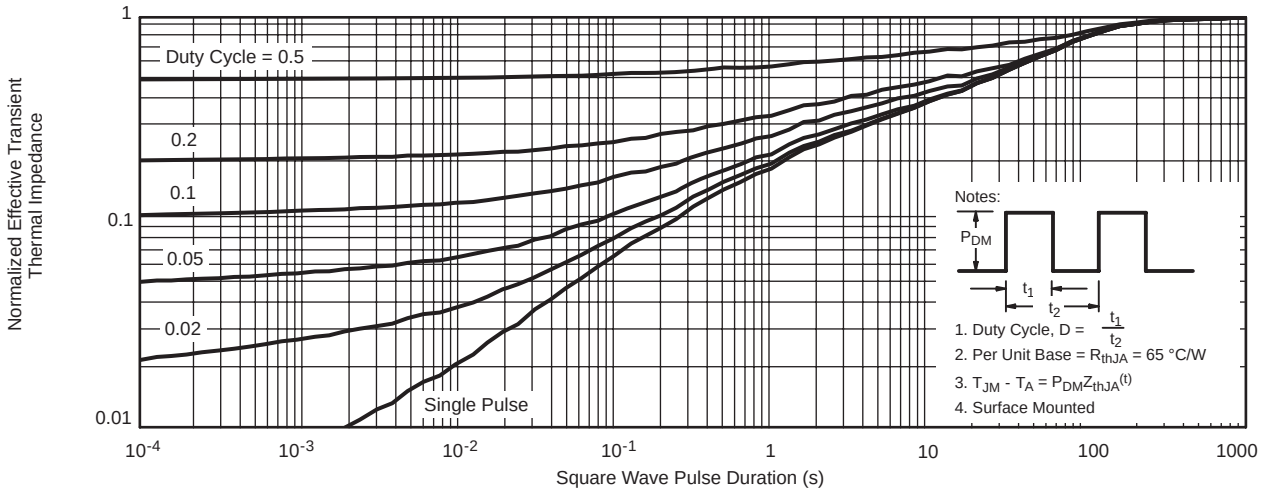
Power, Junction-to-Case



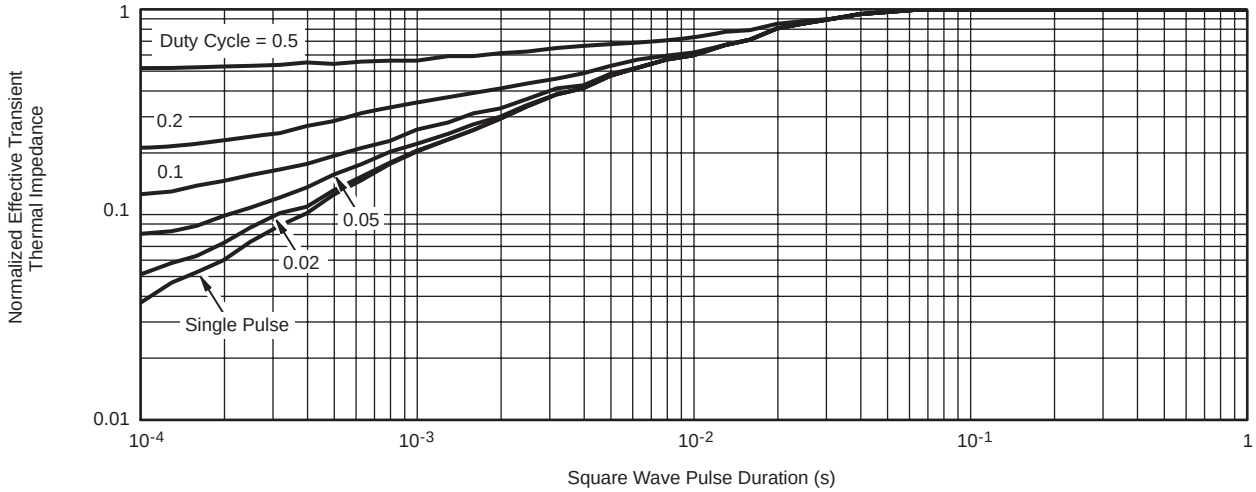
Power, Junction-to-Ambient

* The power dissipation P_D is based on $T_{J(max)}$ = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

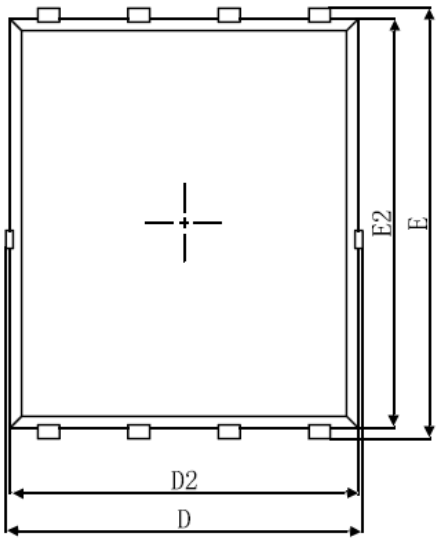


Normalized Thermal Transient Impedance, Junction-to-Ambient

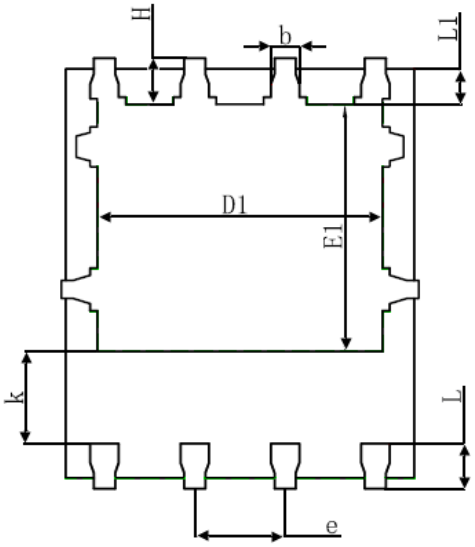


Normalized Thermal Transient Impedance, Junction-to-Case

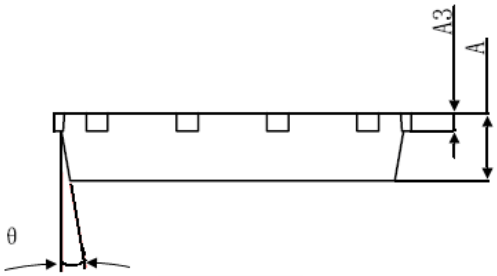
Power5x6 Package Information



Top View



Bottom View



Side View

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.254REF.		0.010REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	3.910	4.110	0.154	0.162
E1	3.375	3.575	0.133	0.141
D2	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
k	1.190	1.390	0.047	0.055
b	0.350	0.450	0.014	0.018
e	1.270TYP.		0.050TYP.	
L	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
θ	8°	12°	8°	12°