40V N-ch Power MOSFET, Logic Drive

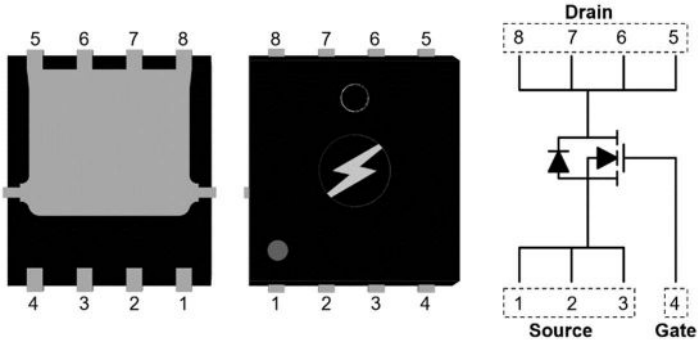
General Features

- Proprietary Advanced Trench Technology
- $R_{DS(ON),typ.}$=6.3mΩ@V_{GS}=10V
- Ultra-low Gate Charge Minimize Switching Loss
- Optimized Breakdown Ruggedness

BV_{DSS}	$R_{DS(ON),max.}$	I_D
40V	7.5mΩ	54A

Applications

- High efficiency DC/DC Converters



Ordering Information

Part Number	Package	Marking
MXP40F7P5UGL	MaxPAK(5x6)	MXP40F7P5UGL

Absolute Maximum Ratings

T_C=25℃ unless otherwise specified

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-to-Source Voltage[1]	40	V
V_{GSS}	Gate-to-Source Voltage	±16	
I_D	Continuous Drain Current	54	A
	Continuous Drain Current at T_C=100℃	34	
I_{DM}	Pulsed Drain Current at V_{GS}=10V [2]	218	
E_{AS}	Single Pulse Avalanche Energy (V_{DD}=20V,V_{GS}=10V,L=1mH,R_G=25Ω)	57	mJ
P_D	Power Dissipation	42	W
P_D	Derating Factor above 25℃	0.34	W/℃
T_J & T_{STG}	Operating and Storage Temperature Range	-55 to 150	℃

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

Thermal Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit
$R_{\theta JC}$	Thermal Resistance , Junction-to-Case			3.0	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient			63	

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Electrical Characteristics

OFF Characteristics

T_J=25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	40			V	V_{GS}=0V, I_D=250uA
I_{DSS}	Drain-to-Source Leakage Current			1	uA	V_{DS}=32V, V_{GS}=0V
I_{GSS}	Gate-to-Source Leakage Current			±100	nA	V_{GS}=±16V, V_{DS}=0V

ON Characteristics

T_J=25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance		6.3	7.5	mΩ	V_{GS}=10V, I_D=24A[3]
			7.7	11		V_{GS}=4.5V, I_D=24A[3]
$V_{GS(TH)}$	Gate Threshold Voltage	1.0		3.0	V	V_{DS}=V_{GS}, I_D=250uA

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input Capacitance		966		pF	V_{GS}=0V, V_{DS}=25V, f=1.0MHz
C_{rss}	Reverse Transfer Capacitance		64			
C_{oss}	Output Capacitance		183			
R_g	Gate Series Resistance		1.2		Ω	f=1.0MHz
Q_g	Total Gate Charge		9.2		nC	V_{DD}=20V, I_D=10A, V_{GS}=4.5V
			17			V_{DD}=20V, I_D=10A, V_{GS}=10V
Q_{gs}	Gate-to-Source Charge		3.2			
Q_{gd}	Gate-to-Drain (Miller) Charge		3.1			

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(on)}$	Turn-on Delay Time		11		ns	V_{DD}=20V I_D=10A V_{GS}=10V R_G=6.0Ω
t_{rise}	Rise Time		4.0			
$t_{d(off)}$	Turn-off Delay Time		23			
t_{fall}	Fall Time		4.8			

Source-Drain Body Diode Characteristics

T_J=25℃ unless otherwise specified

Symbol	Parameter	Min	Typ.	Max.	Unit	Test Conditions
I_{SD}	Continuous Source Current			54	A	Maximum Ratings
V_{SD}	Diode Forward Voltage			1.2	V	I_S=24A, V_{GS}=0V
t_{rr}	Reverse Recovery Time		20		ns	V_{GS}=0V I_S=10A,di/dt=100A/μs
Q_{rr}	Reverse Recovery Charge		13		nC	

Note:

[1] T_J=25℃ to 150℃
[2] Repetitive rating, pulse width limited by maximum junction temperature
[3] Pulse width≤380μs; duty cycle≤2%

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Typical Characteristics

Figure 1. Maximum Effective Thermal Impedance, Junction-to-Case

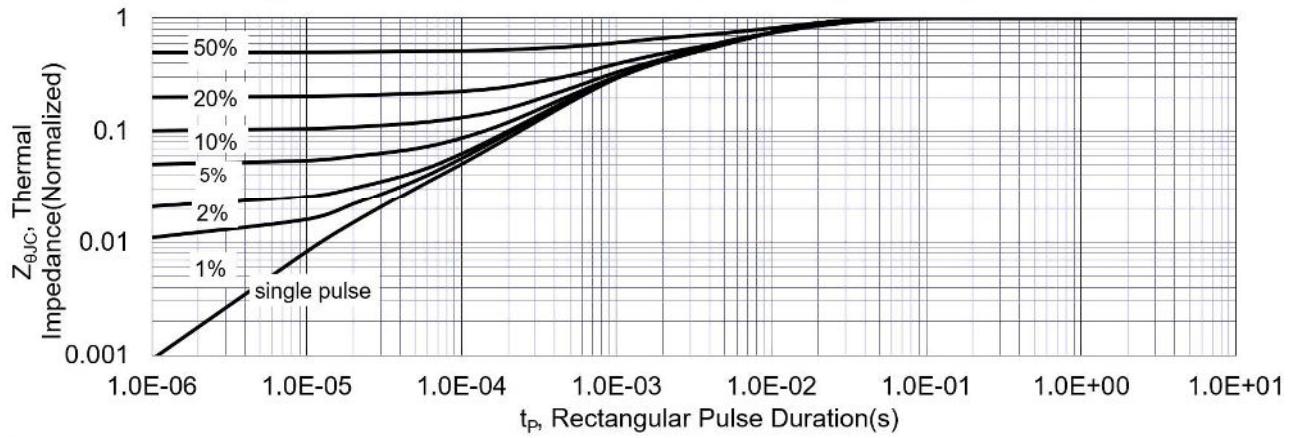

Figure 2. Maximum Power Dissipation vs. Case Temperature

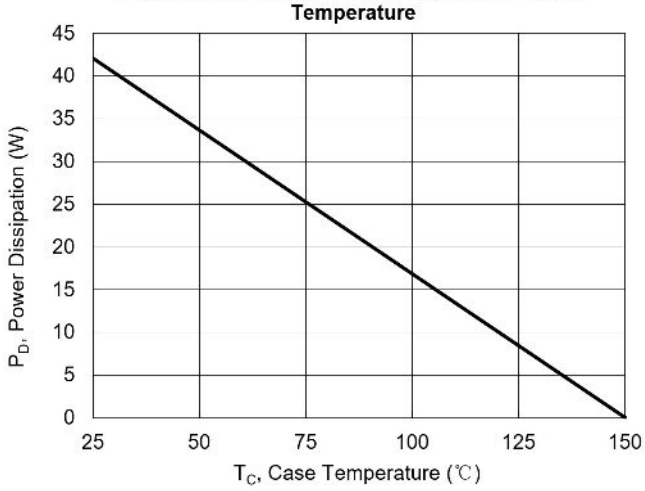

Figure 3. Maximum Continuous Drain Current vs Case Temperature

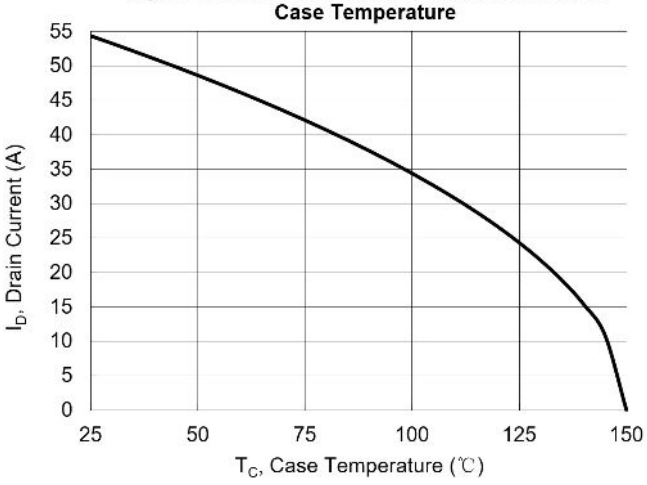

Figure 4. Typical Output Characteristics

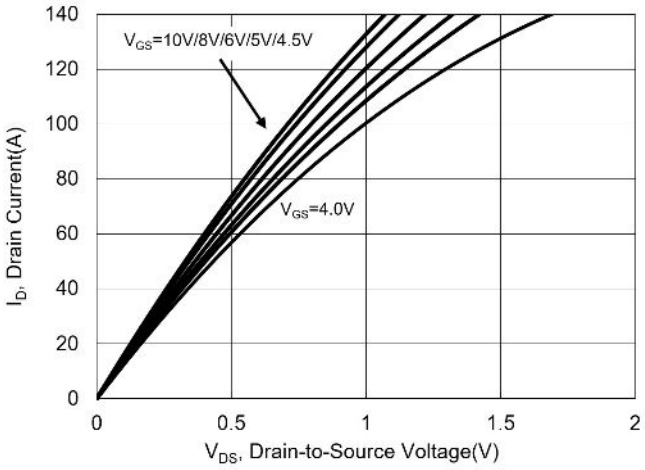

Figure 5. Typical Drain-to-Source ON Resistance vs. Gate Voltage

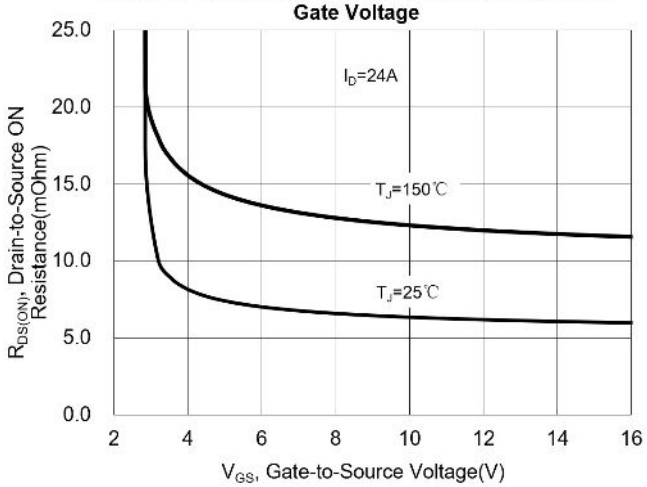

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Figure 6. Maximum Peak Current Capability

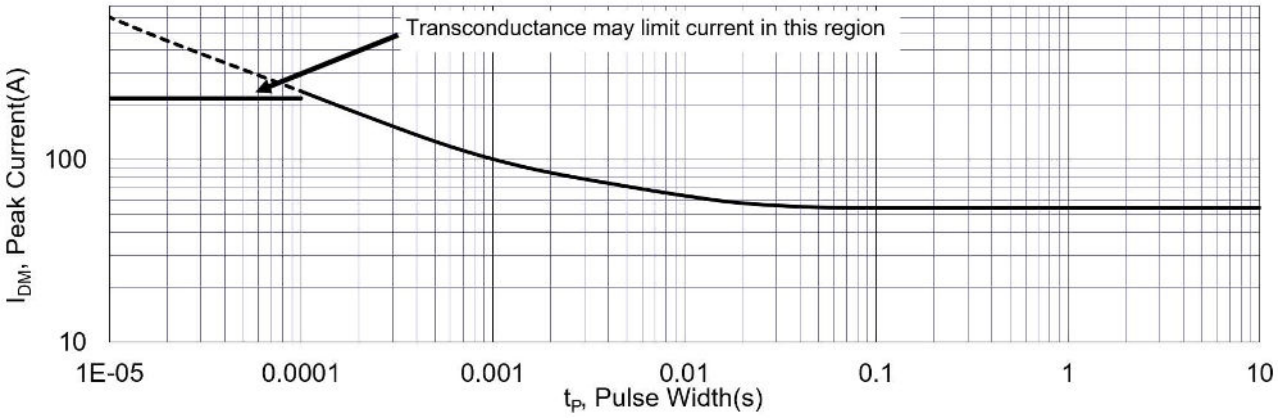

Figure 7. Typical Transfer Characteristics

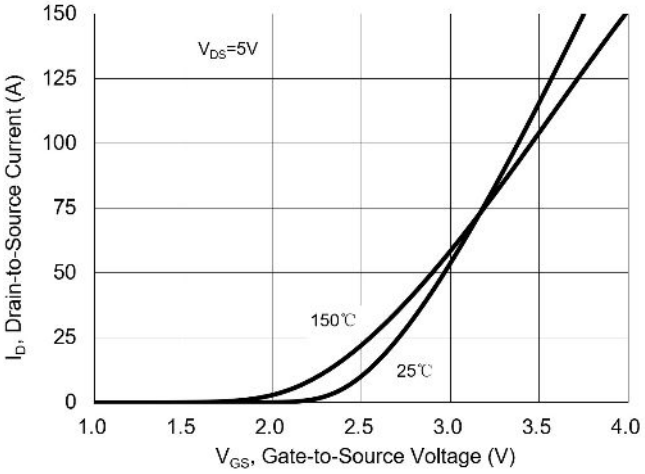

Figure 8. Unclamped Inductive Switching Capability

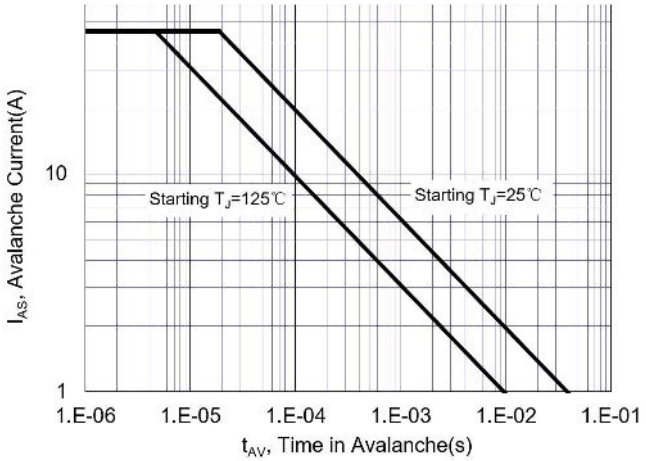

Figure 9. Typical Drain-to-Source ON Resistance

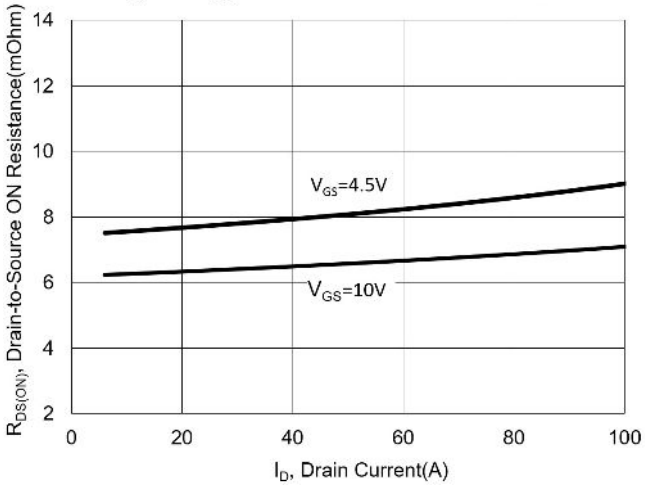

Figure 10. Typical Drain-to-Source On Resistance vs. Junction Temperature

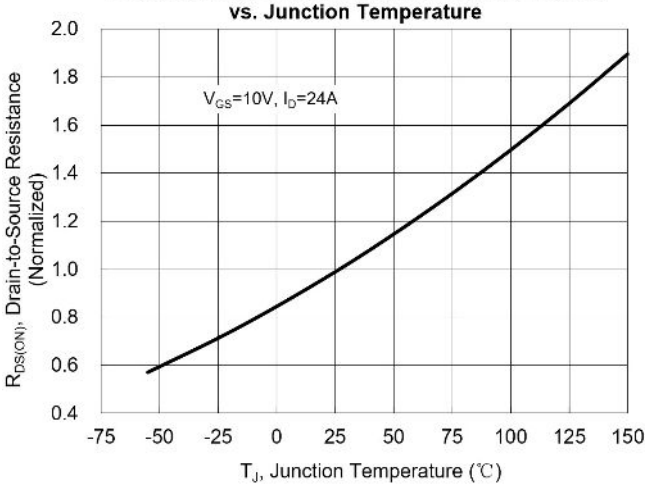

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Figure 11.Typical Breakdown Voltage vs. Junction Temperature

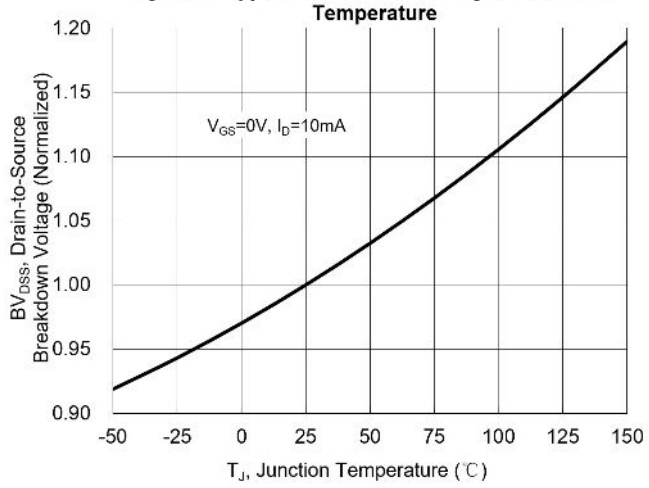


Figure 12.Typical Threshold Voltage vs. Junction Temperature

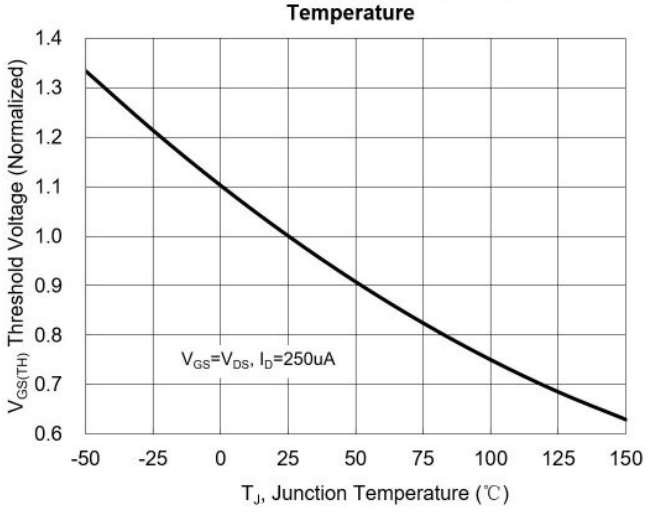


Figure 13. Maximum Forward Safe Operation Area

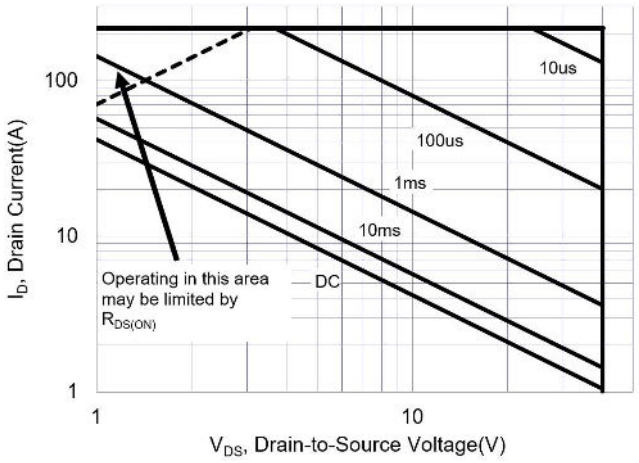


Figure 14. Typical Capacitance vs. Drain-to-Source Voltage

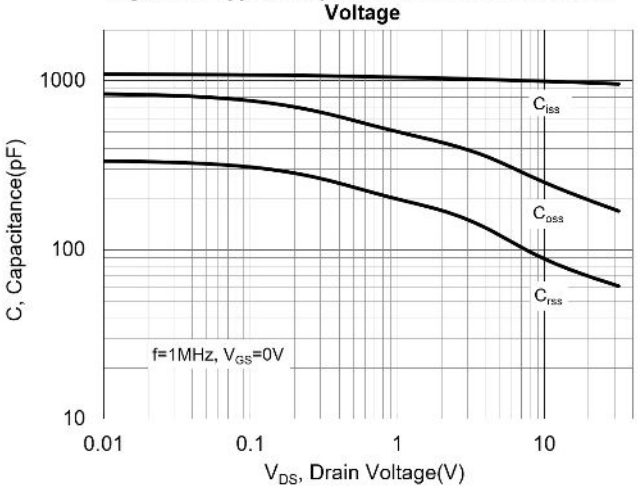


Figure 15. Typical Gate Charge vs. Gate-to-Source Voltage

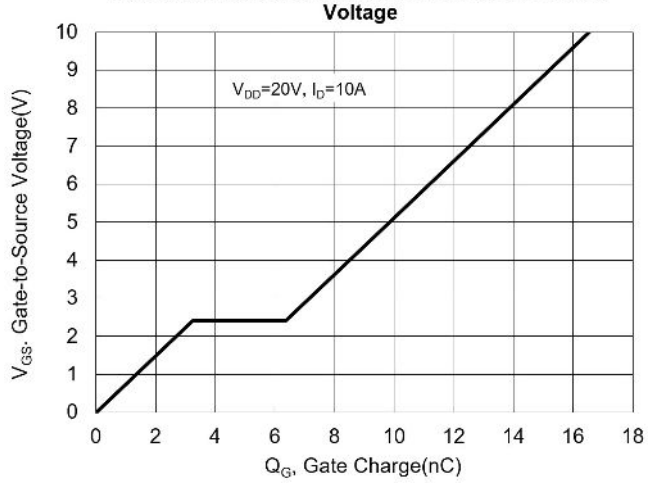
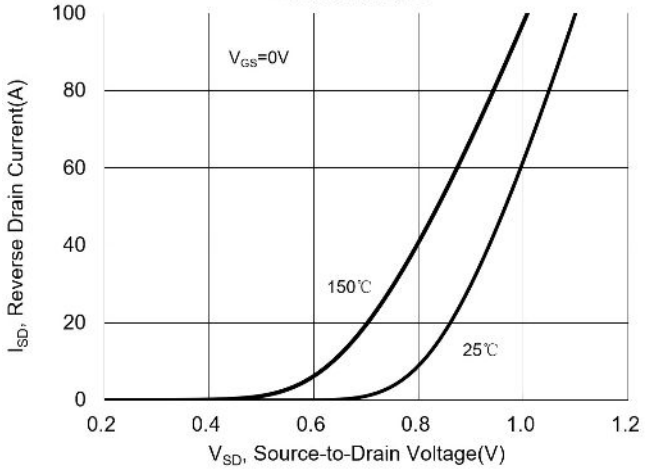


Figure 16. Typical Body Diode Transfer Characteristics



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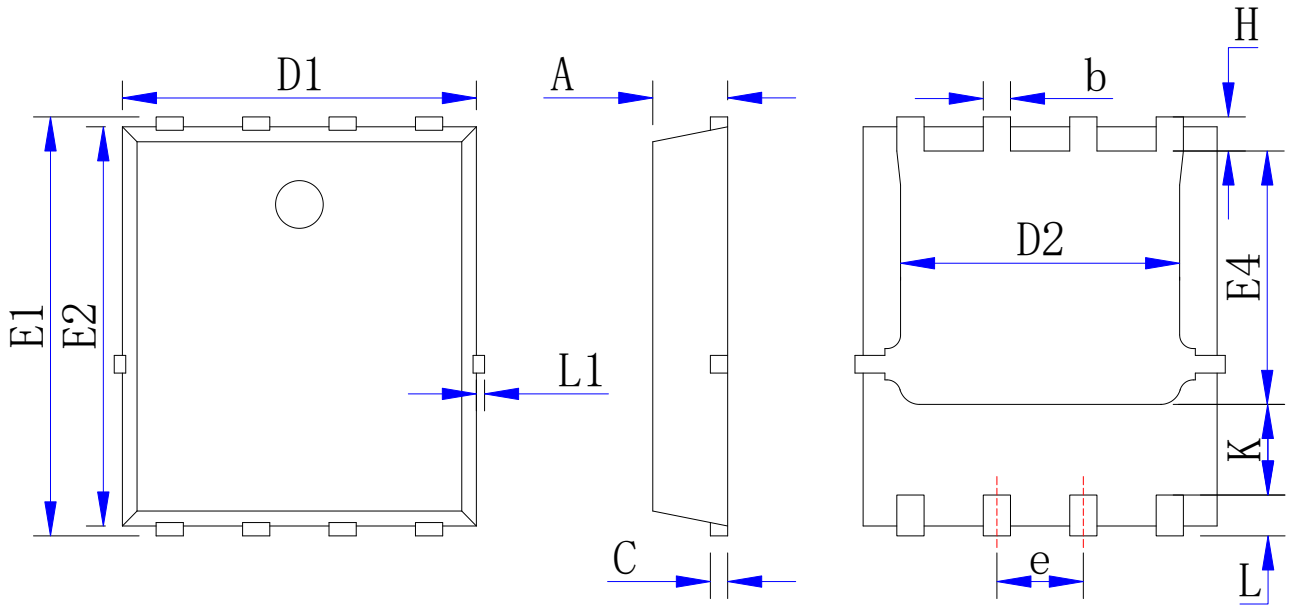
Package Dimensions

MaxPAK 5x6



SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.00	1.10	1.20	0.039	0.043	0.047
b	0.30	0.40	0.50	0.012	0.016	0.020
C	0.154	0.254	0.354	0.006	0.010	0.014
D1	5.00	5.20	5.40	0.197	0.205	0.213
D2	3.80	4.10	4.25	0.150	0.161	0.167
E1	5.95	6.15	6.35	0.234	0.242	0.250
E2	5.66	5.86	6.06	0.223	0.231	0.239
E4	3.52	3.72	3.92	0.139	0.146	0.154
e	1.17	1.27	1.37	0.046	0.050	0.054
H	0.40	0.50	0.60	0.016	0.020	0.024
K	1.15	1.30	1.45	0.045	0.051	0.057
L	0.30	0.60	0.70	0.012	0.024	0.028
L1	—	—	0.12	—	—	0.005

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