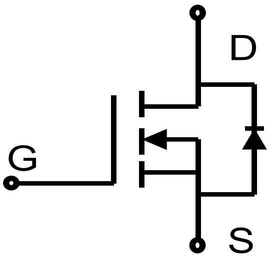
WLQ013R04

N-Ch 40V 160A 1.35mΩ Power MOSFETs

Description

These N-Channel enhancement mode power field effect transistors are using **shielded gate trench** DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance,provide superior switching performance, and with stand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.



N-Channel MOSFET

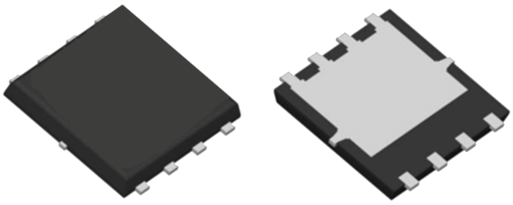
Features

- 40V,160A,$R_{DS(on).max}$=1.35mΩ@V_{GS} = 10V
- Improved dv/dt capability
- Fast switching
- 100% EAS Guaranteed
- Green device available

Applications

- DC-DC Converter
- Hard switchiing and high speed circuit

Pin Configuration



DFN5×6

Product Summary

V_{DSS}	40V
$R_{DS(on).max}$@ V_{GS}=10V	1.35mΩ
I_D	160A

Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DSS}	40	V
Continuous drain current	(T_C = 25°C)	I_D	160	A
	(T_C = 100°C)		101	A
Pulsed drain current$^{1)}$		I_{DM}	480	A
Gate-Source voltage		V_{GSS}	±20	V
Avalanche energy$^{2)}$		E_{AS}	676	mJ
Power Dissipation		P_D	69	W
Storage Temperature Range		T_{STG}	-55 to +150	°C
Operating Junction Temperature Range		T_J	-55 to +150	°C

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.8	°C/W
Thermal Resistance, Junction-to-Ambient$^{3)}$	$R_{\theta JA}$	65	°C/W

Package Marking and Ordering Information

Device	Device Package	Marking	Units/Reel
WLQ013R04	DFN 5×6	WLQ013R04	5000

Electrical Characteristics

T_J = 25°C unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV_{DSS}	V_{GS}=0 V, I_D=250uA	40	---	---	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250uA	1.2	---	2.0	V
Drain-source leakage current	I_{DSS}	V_{DS}=40 V, V_{GS}=0 V, T_J = 25°C	---	---	1	μA
		V_{DS}=40 V, V_{GS}=0 V, T_J = 150°C	---	---	10	mA
Gate leakage current, Forward	I_{GSSF}	V_{GS}=20 V, V_{DS}=0 V	---	---	100	nA
Gate leakage current, Reverse	I_{GSSR}	V_{GS}=-20 V, V_{DS}=0 V	---	---	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10 V, I_D=25 A,T_J = 25°C	---	1.15	1.35	mΩ
		T_J = 150°C	---	2.1	---	
Forward transconductance	g_{fs}	V_{DS} =2V , I_D=25A	---	90	---	S
Dynamic characteristics						
Input capacitance	C_{iss}	V_{DS} = 25 V, V_{GS} = 0 V, f = 250kHz	---	4020	---	pF
Output capacitance	C_{oss}		---	1140	---	
Reverse transfer capacitance	C_{rss}		---	31	---	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 20V,V_{GS}=10V, I_D =50 A	---	12	---	ns
Rise time	t_r		---	30	---	
Turn-off delay time	$t_{d(off)}$		---	79	---	
Fall time	t_f		---	38	---	
Gate charge characteristics						
Gate to source charge	Q_{gs}	V_{DS}=32 V, I_D=50A, V_{GS}= 10 V	---	12.4	---	nC
Gate to drain charge	Q_{gd}		---	14.3	---	
Gate charge total	Q_g		---	67	---	
Gate plateau voltage	$V_{plateau}$		---	3.5	---	V
Drain-Source diode characteristics and Maximum Ratings						
Continuous Source Current	I_S		---	---	57.5	A
Pulsed Source Current	I_{SM}		---	---	230	A
Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_S=50A, T_J=25℃	---	---	1.2	V
Reverse Recovery Time	t_{rr}	I_S=50A, di/dt=100A/us, T_J=25℃	---	50	---	ns
Reverse Recovery Charge	Q_{rr}		---	47	---	nC

Notes:

1: Repetitive Rating: Pulse width limited by maximum junction temperature.

2: V_{DD}=15V, L=0.5mH, I_{AS}=52A, Starting T_J=25℃.

3: Weld the device to a PCB board with the size of 32mm*36mm and then place it in an one-cubic-foot air static box.

Electrical Characteristics Diagrams

Figure 1. Typ. Output Characteristics

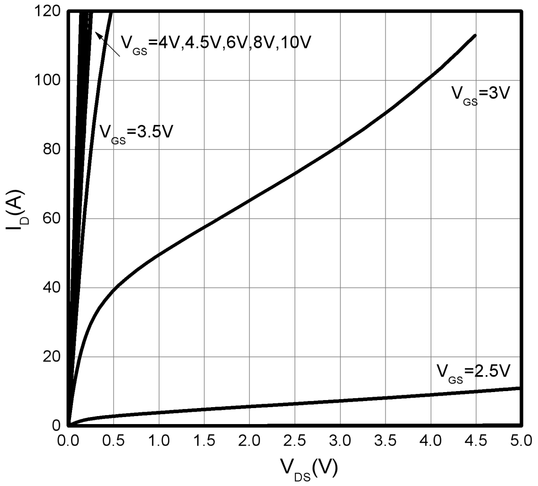


Figure 2. Transfer Characteristics

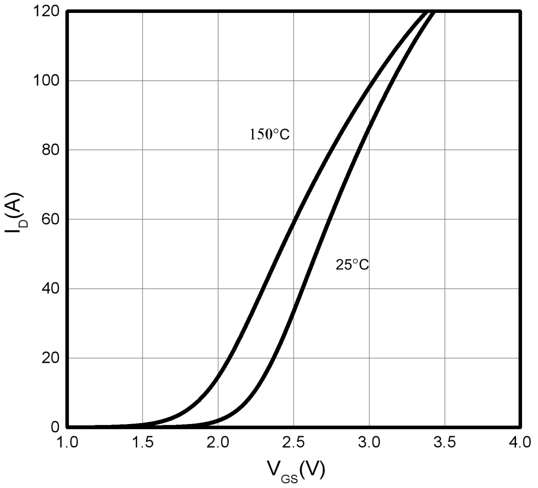


Figure 3. On-Resistance vs. Drain Current

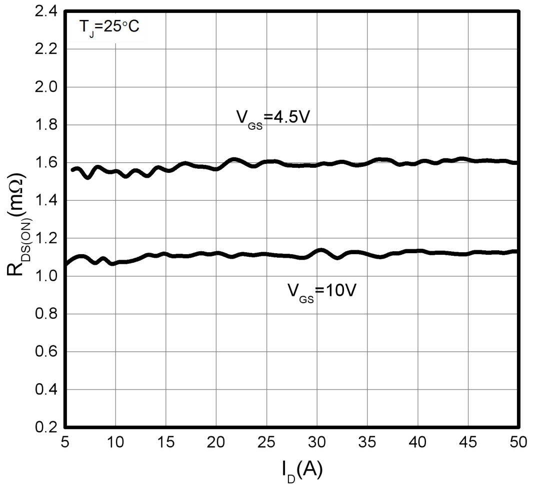


Figure 4.On-Resistance vs.Temperature

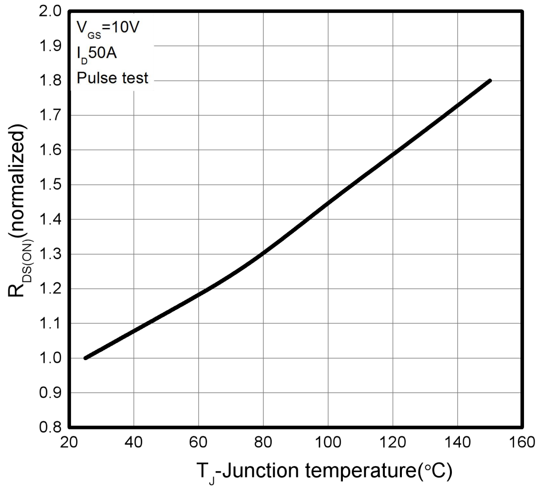


Figure 5.Breakdown Voltage vs.Temperature

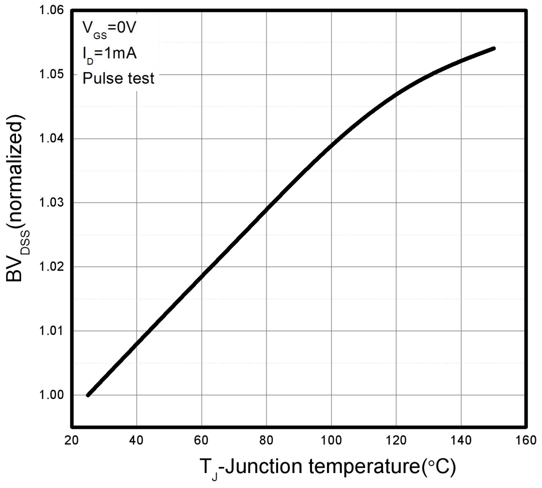


Figure 6.Threshold Voltage vs.Temperature

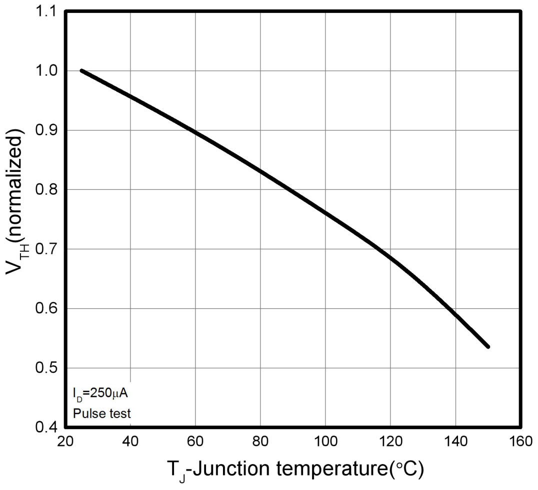


Figure 7.Rds(on) vs. Gate Voltage

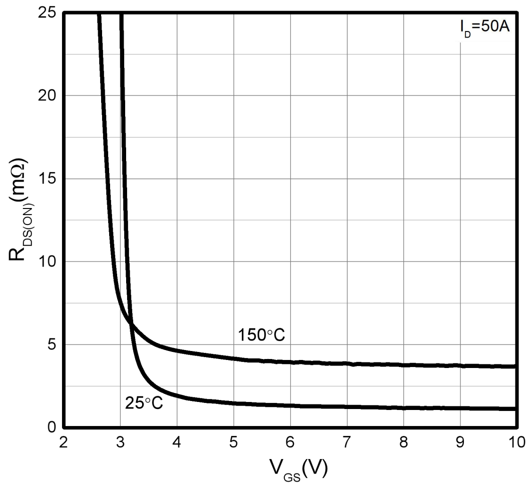


Figure 8.Body-Diode Characteristics

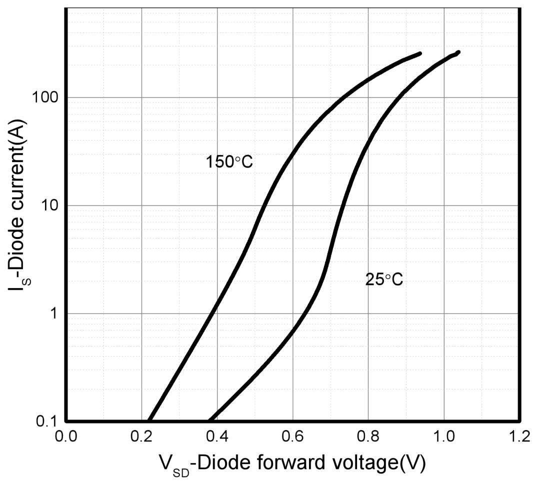


Figure 9.Capacitance Characteristics

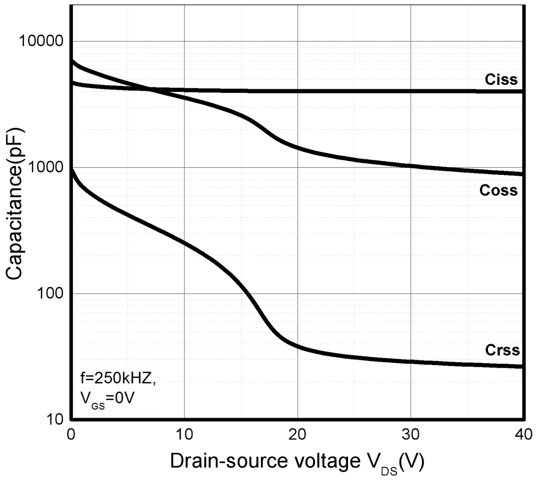


Figure 10.Gate Charge Characteristics

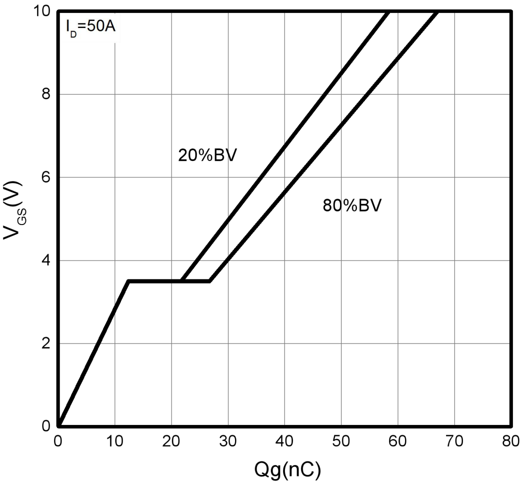


Figure 11.Drain Current Derating

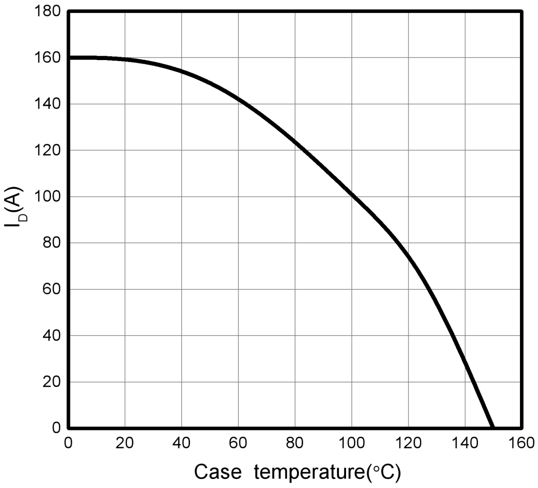


Figure 12.Power Dissipation vs.Temperature

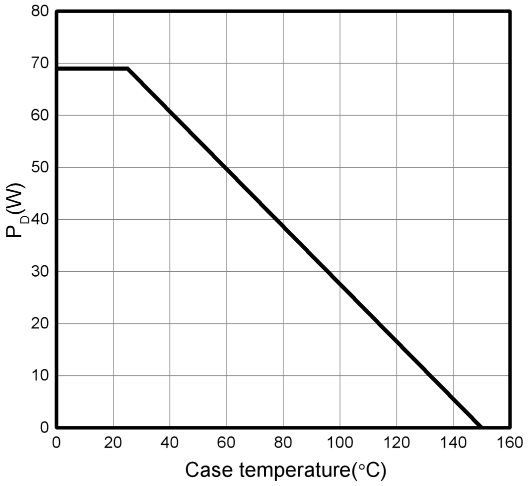


Figure 13: Safe Operating Area

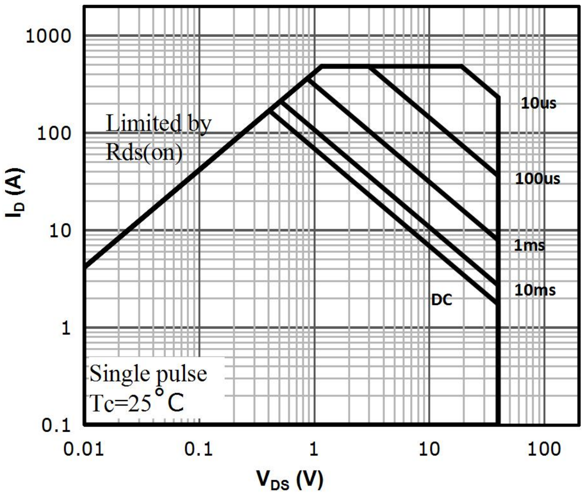
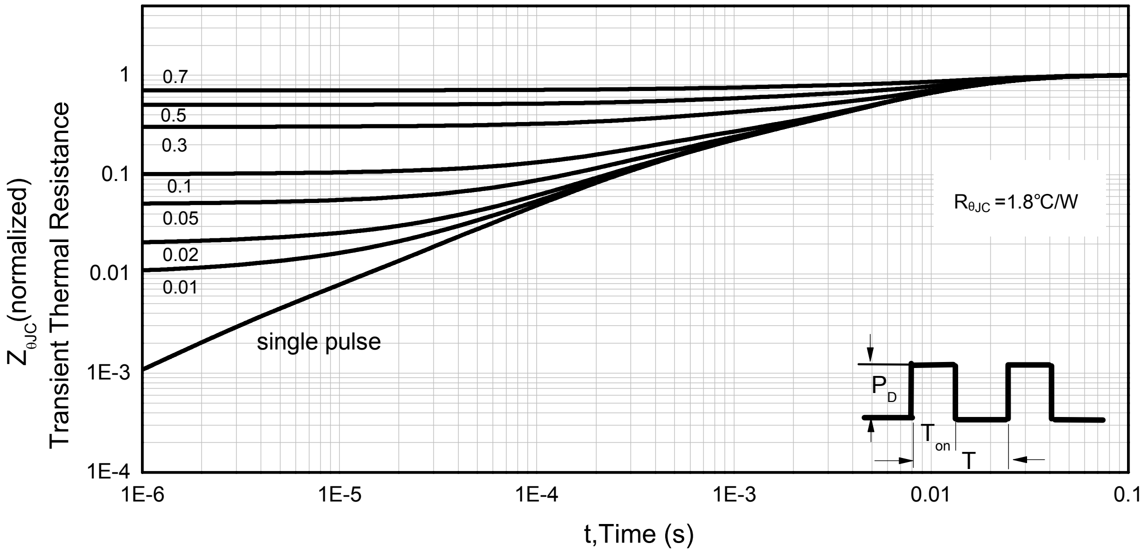
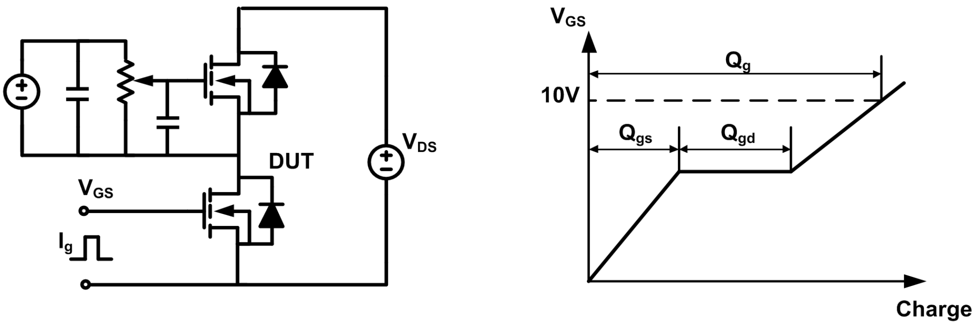


Figure 14. Normalized Maximum Transient Thermal Impedance (RthJC)

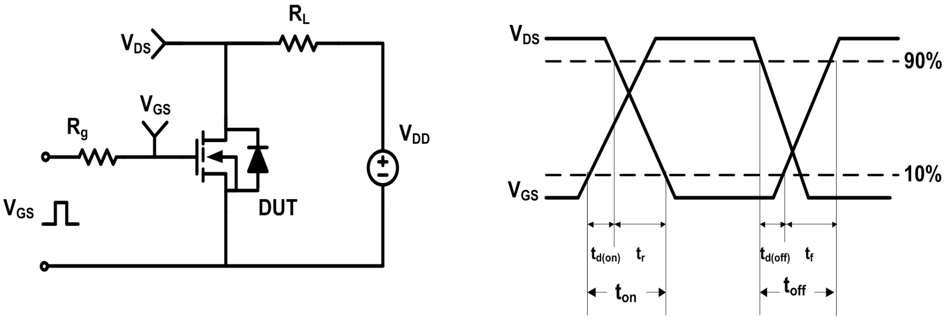


Test Circuit & Waveforms

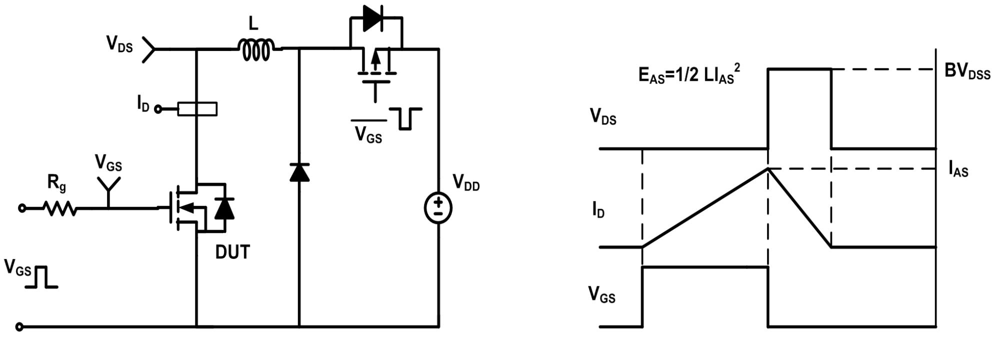
Gate Charge Test Circuit & Waveform



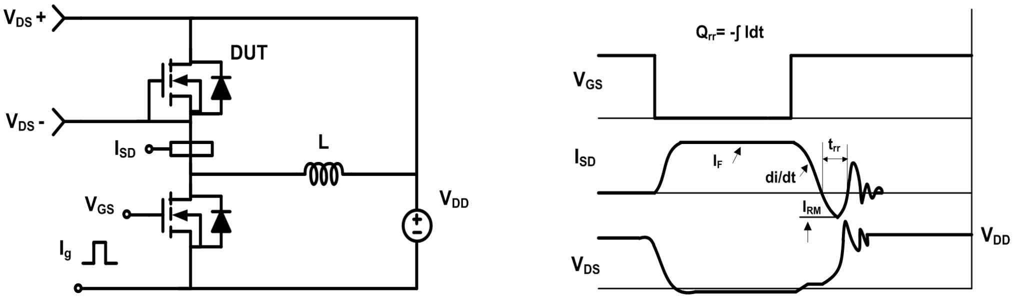
Resistive Switching Test Circuit & Waveform



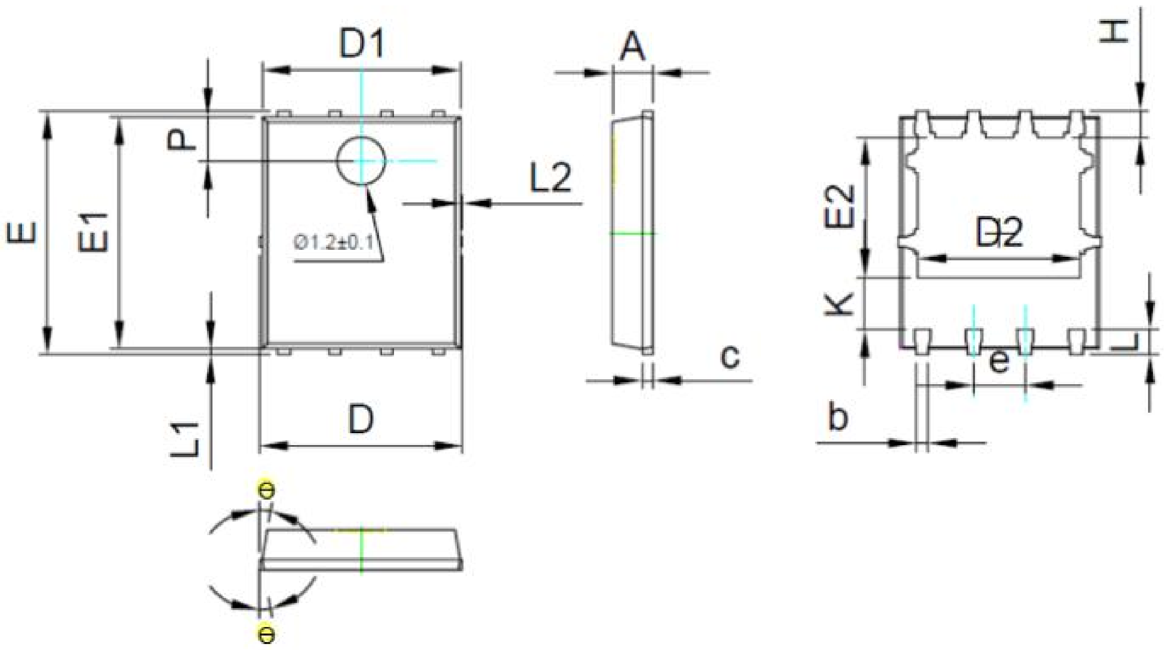
Unclamped Inductive Switching (UIS) Test Circuit & Waveform



Diode Recovery Test Circuit & Waveform



Mechanical Dimensions for DFN 5×6



SYMBOL	MIN	NOM	MAX
A	0.90	1.00	1.10
b	0.35	0.40	0.45
c	0.21	0.25	0.34
D	-	-	5.1
D1	4.85	4.90	4.95
D2	3.96	4.01	4.06
e	1.27 BSC		
E	5.95	6.00	6.05
E1	5.70	5.75	5.80
E2	3.425	3.475	3.525
H	0.60	0.65	0.70
K	1.29	-	-
L	0.60	0.65	0.70
L1	0.05	0.15	0.25
L2	-	-	0.12
θ	8°	10°	12°
P	1.05	1.10	1.15

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