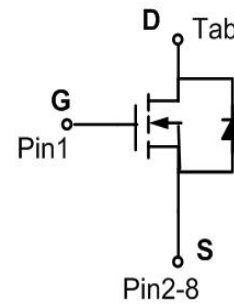




Description

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

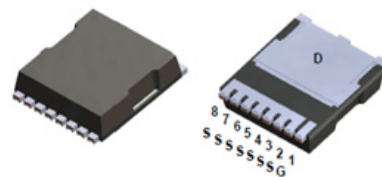
Features

- N-channel Power MOSFET
- Extremely low on-resistance $R_{DS(on)}$
- Excellent $Q_g \times R_{DS(on)}$ product(FOM)
- Qualified according to JEDEC criteria

Applications

- Motor control and drive
- Battery management
- UPS (Uninterruptible Power Supplies)
- DC-DC Converter

Pin Configuration



TOLL

Product Summary

V_{DSS}	100V
$R_{DS(on),typ} @V_{GS}=10V$	3.4m Ω
I_D	200A

Absolute Maximum Ratings $T_c = 25^\circ C$ unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	100	V
Continuous drain current ($T_c = 25^\circ C$) ($T_c = 100^\circ C$)	I_D	200 126	A A
Pulsed drain current ¹⁾	I_{DM}	796	A
Gate-Source voltage	V_{GSS}	± 20	V
Avalanche energy ²⁾	E_{AS}	702	mJ
Power Dissipation	P_D	278	W
Storage Temperature Range	T_{STG}	-55 to +150	$^\circ C$
Operating Junction Temperature Range	T_J	-55 to +150	$^\circ C$

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.45	$^\circ C/W$
Thermal Resistance, Junction-to-Ambient ³⁾	$R_{\theta JA}$	50	$^\circ C/W$
Soldering temperature, wavesoldering only allowed at leads. (1.6mm from case for 10s)	T_{sold}	260	$^\circ C$



Package Marking and Ordering Information

Device	Device Package	Marking
WLE042R10	TOLL	WLE042R10

Electrical Characteristics

$T_J = 25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0\text{ V}, I_D=250\mu\text{A}$	100	---	---	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	2.0	---	4.0	V
Drain-source leakage current	I_{DSS}	$V_{DS}=100\text{ V}, V_{GS}=0\text{ V}, T_J = 25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=100\text{ V}, V_{GS}=0\text{ V}, T_J = 150^\circ\text{C}$	---	---	10	mA
Gate leakage current, Forward	I_{GSSF}	$V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$	---	---	100	nA
Gate leakage current, Reverse	I_{GSSR}	$V_{GS}=-20\text{ V}, V_{DS}=0\text{ V}$	---	---	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=50\text{ A},$ $T_J = 25^\circ\text{C}$	---	3.4	4.2	m Ω
		$T_J = 150^\circ\text{C}$	---	5.9	---	
Forward transconductance	g_{fs}	$V_{DS} = 5\text{ V}, I_D=50\text{ A}$	---	94	---	S
Dynamic characteristics						
Input capacitance	C_{iss}	$V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V},$ $f = 250\text{kHz}$	---	7116	---	pF
Output capacitance	C_{oss}		---	1067	---	
Reverse transfer capacitance	C_{rss}		---	24	---	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 50\text{ V}, V_{GS}=10\text{V}, I_D = 50\text{ A}$	---	75	---	ns
Rise time	t_r		---	176	---	
Turn-off delay time	$t_{d(off)}$		---	110	---	
Fall time	t_f		---	66.7	---	
Gate resistance	R_g	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$	---	2.4	---	Ω
Gate charge characteristics						
Gate to source charge	Q_{gs}	$V_{DS}=80\text{V}, I_D = 50\text{A},$ $V_{GS}= 10\text{ V}$	---	28	---	nC
Gate to drain charge	Q_{gd}		---	33	---	
Gate charge total	Q_g		---	115	---	
Gate plateau voltage	$V_{plateau}$		---	5	---	V
Output Charge	Q_{oss}	$V_{DS}=80\text{ V}, V_{GS}= 0\text{V}$	---	160	---	nC
Drain-Source diode characteristics and Maximum Ratings						
Continuous Source Current	I_S		---	---	199	A
Pulsed Source Current	I_{SM}		---	---	796	A
Diode Forward Voltage	V_{SD}	$V_{GS}=0\text{V}, I_S=50\text{A}, T_J=25^\circ\text{C}$	---	---	1.1	V
Reverse Recovery Time	t_{rr}	$I_S=50\text{A}, di/dt=100\text{A}/\mu\text{s}, T_J=25^\circ\text{C}$	---	51	---	ns
Reverse Recovery Charge	Q_{rr}		---	56.8	---	nC

Notes:

- 1: Repetitive Rating: Pulse width limited by maximum junction temperature.
- 2: $V_{DD}=90\text{V}, V_{GS}=10\text{V}, L=0.5\text{mH}, I_{AS}=53\text{A}$, Starting $T_J=25^\circ\text{C}$.
- 3: The value of R_{thJA} is measured by placing the device in a still air box which is one cubic foot.



Electrical Characteristics Diagrams

Figure 1. Typ. Output Characteristics

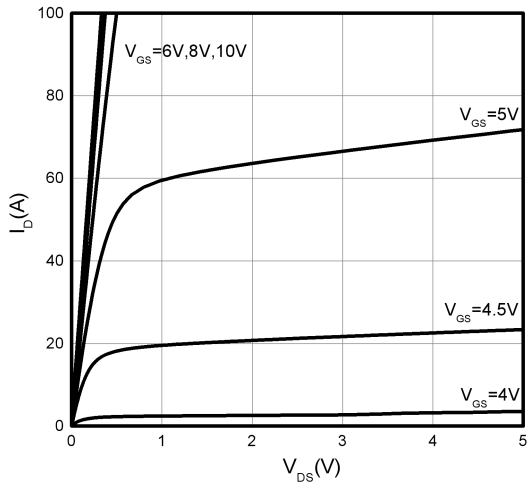


Figure 2. Transfer Characteristics

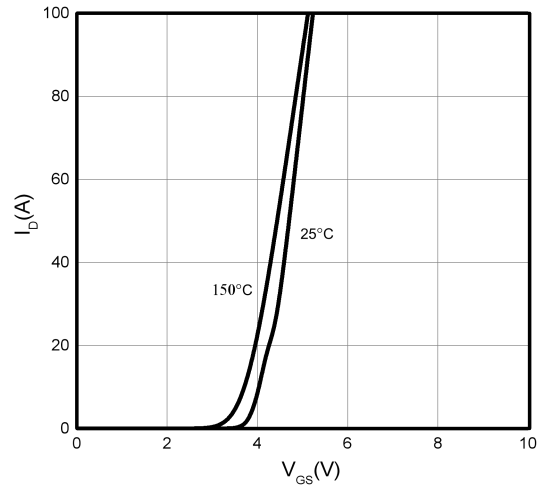


Figure 3. On-Resistance vs. Drain Current

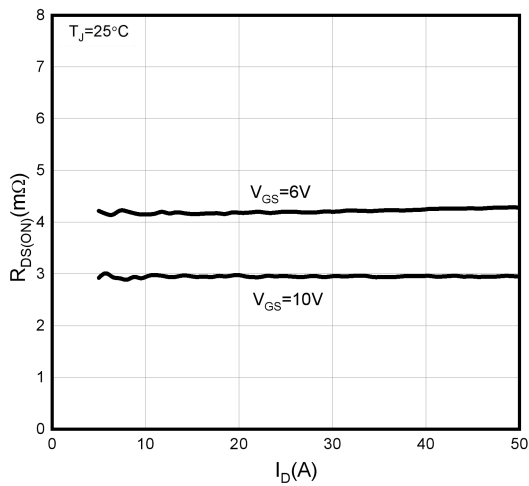


Figure 4. On-Resistance vs. Temperature

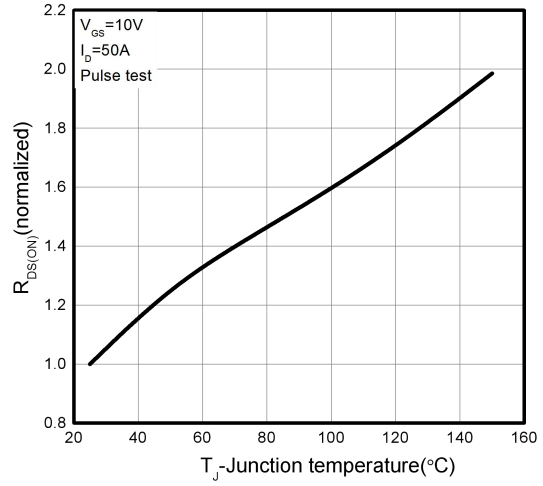


Figure 5. Breakdown Voltage vs. Temperature

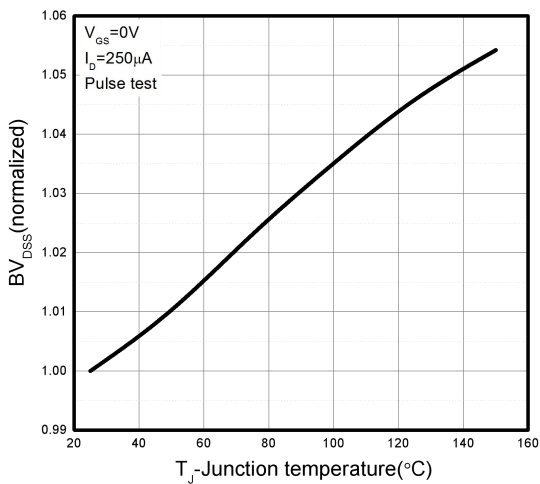


Figure 6. Threshold Voltage vs. Temperature

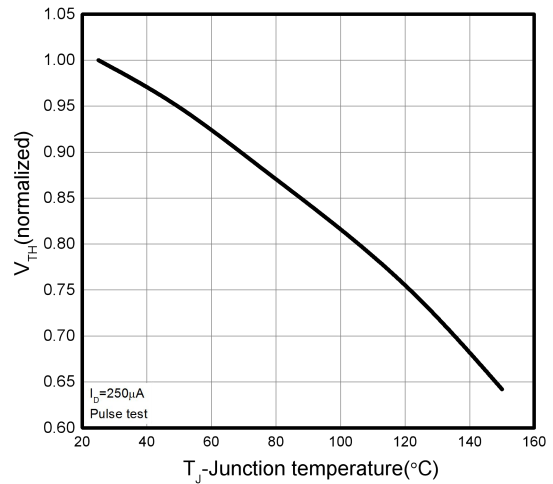




Figure 7. R_{DS(on)} vs. Gate Voltage

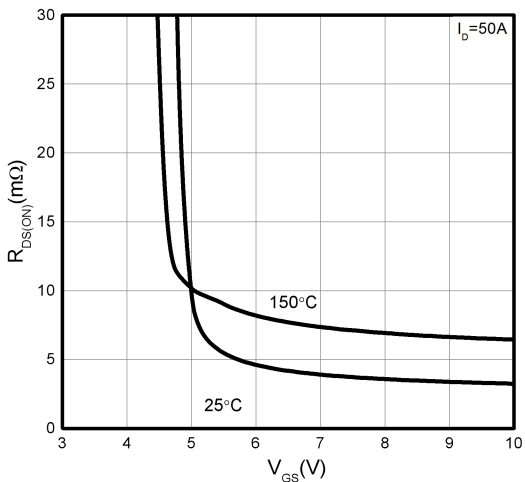


Figure 8. Body-Diode Characteristics

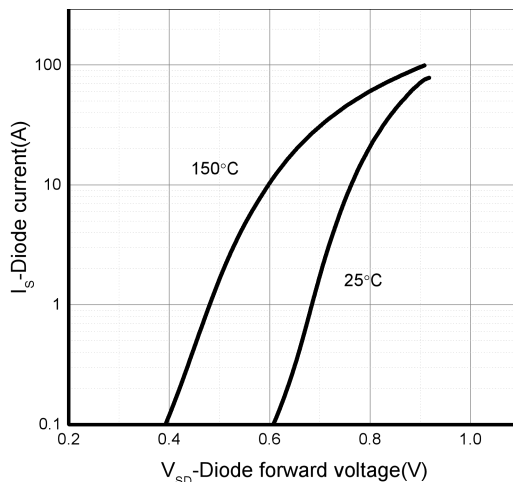


Figure 9. Capacitance Characteristics

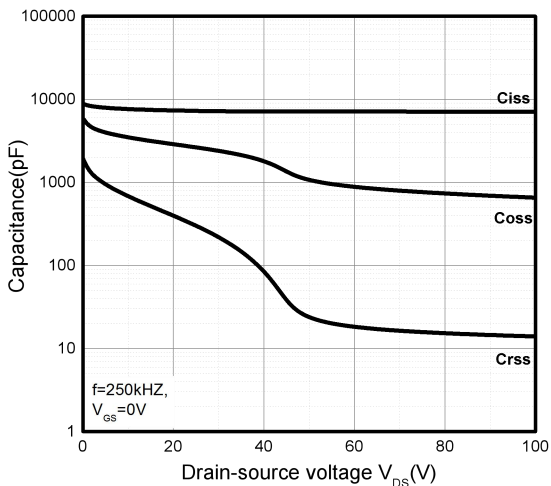


Figure 10. Gate Charge Characteristics

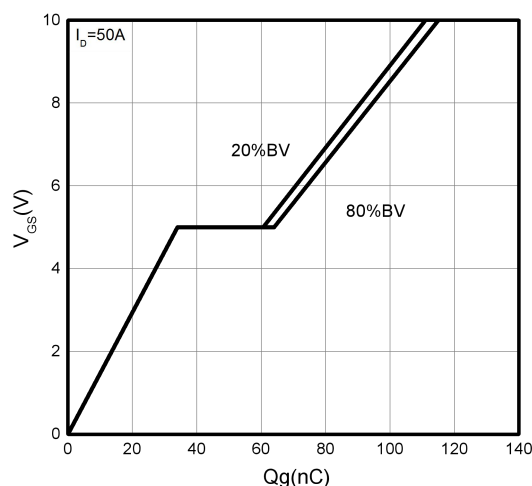


Figure 11. Drain Current Derating

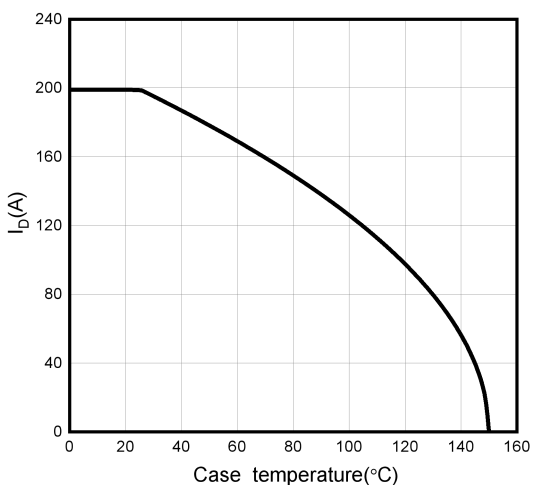


Figure 12. Power Dissipation vs. Temperature

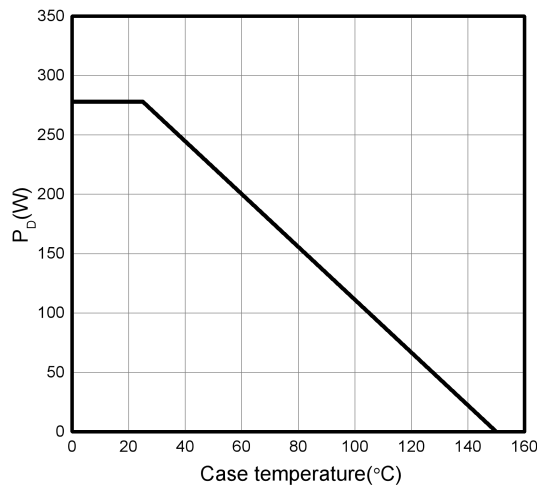




Figure 13. Safe Operating Area

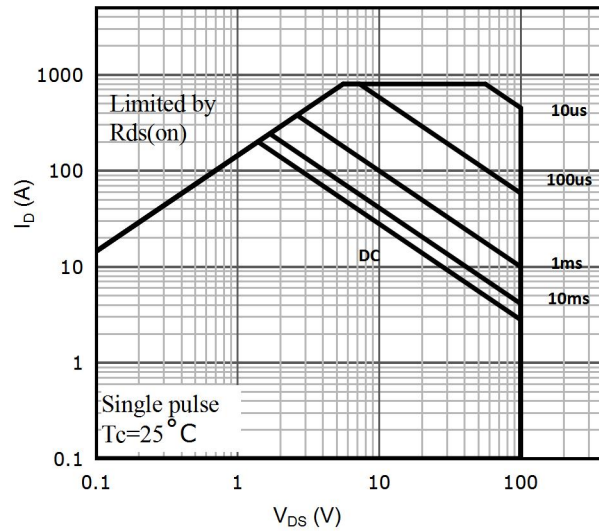
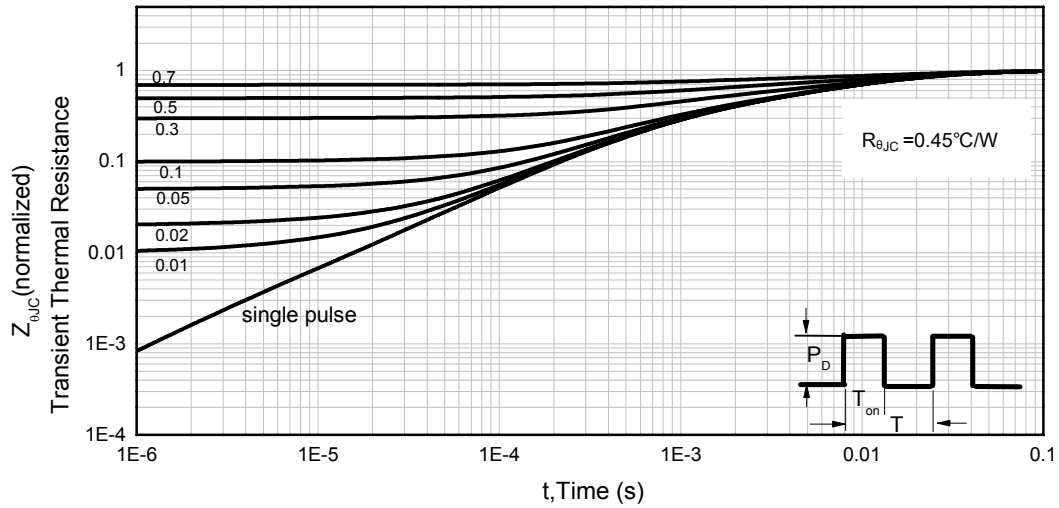


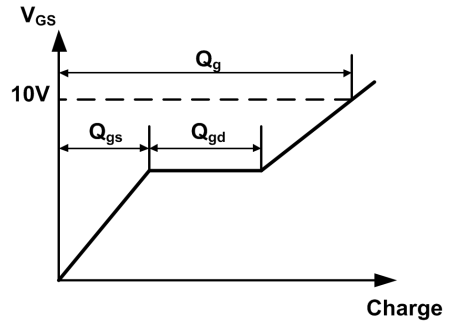
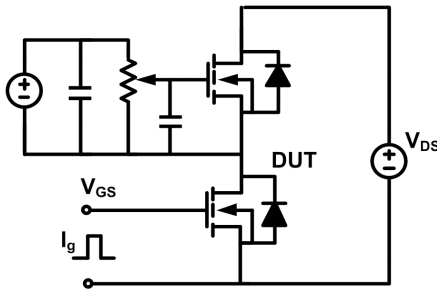
Figure 14. Normalized Maximum Transient Thermal Impedance (RthJC)



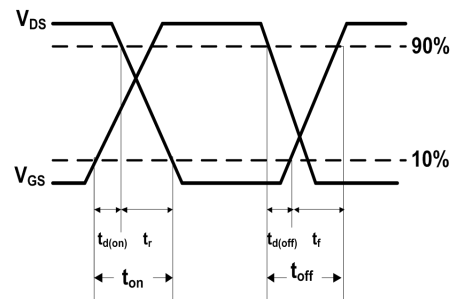
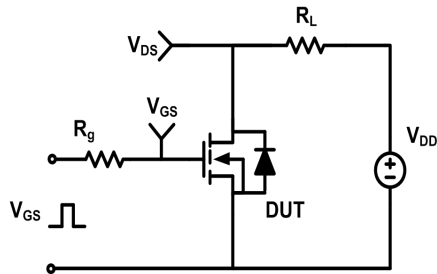


Test Circuit & Waveforms

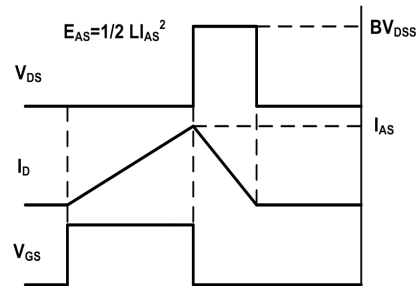
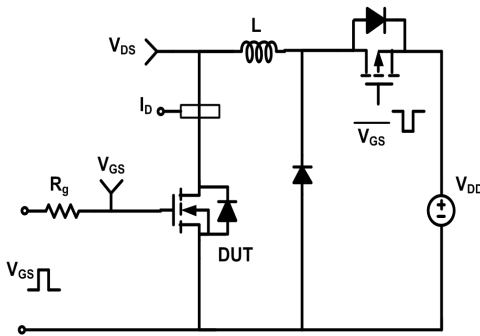
Gate Charge Test Circuit & Waveform



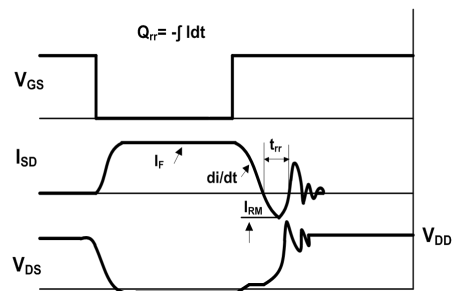
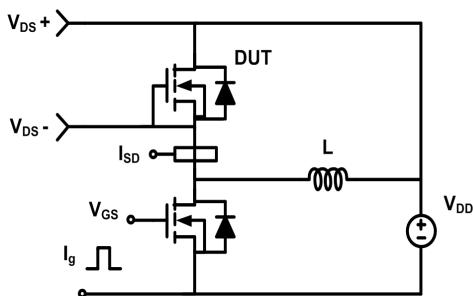
Resistive Switching Test Circuit & Waveform



Unclamped Inductive Switching (UIS) Test Circuit & Waveform

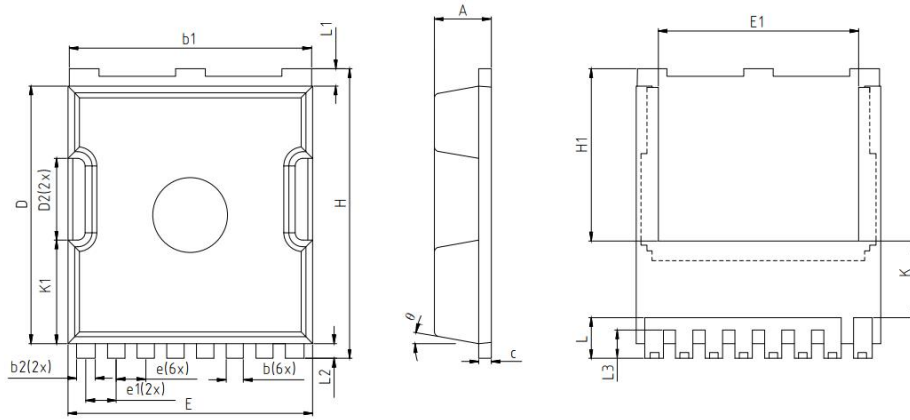


Diode Recovery Test Circuit & Waveform





Mechanical Dimensions for TOLL



DIMENSIONS IN MILLIMETERS		
SYMBOL	MIN	MAX
A	2.20	2.40
b	0.60	0.80
b1	9.70	9.90
b2	0.65	0.85
c	0.40	0.60
D	10.28	10.58
D2	3.15	3.45
E	9.70	10.10
E1	7.90	8.30
e	1.20 BSC	
e1	1.225 BSC	
H	11.48	11.88
H1	6.95 BSC	
K	3.10 BSC	
K1	4.08	4.28
L	1.40	1.80
L1	0.60	0.80
L2	0.50	0.70
L3	1.00	1.30
θ	10° REF	



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