

# SC020N65ZTK-R

Silicon Carbide MOSFET 650V, 20mΩ, 90A



重庆平伟半导体股份有限公司

## Features

- 0 V turn-off gate voltage can be applied
- High Blocking Voltage with Low RDS(on)
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Qualified according to JEDEC criteria

## Applications

- On-board charger
- DC/DC converter
- Auxiliary inverters

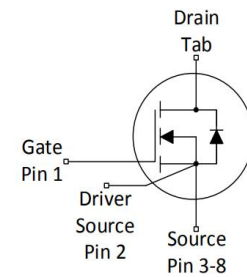
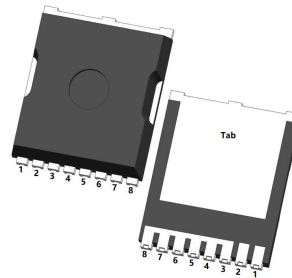


**100% DVDS Tested**  
**100%**  
**Avalanche Tested**

## Product Summary

$V_{DS}$	650V
$R_{DS(on)}$ typ.	20mΩ
$I_D$	90A

TOLL-2L



## Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
SC020N65ZTK-R	SC020N65ZTK	TOLL-2L	Tape&Reel	13 inches	24mm	1500

## Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	650	V
Continuous drain current	$I_D$	90	A
$T_C = 25^\circ\text{C}$		63	
$T_C = 100^\circ\text{C}$			
Pulsed drain current ( $T_C = 25^\circ\text{C}$ )	$I_{D \text{ pulse}}$	269	A
Avalanche energy, single pulse (L=5mH)	$E_{AS}$	423	mJ
Gate-Source voltage,max.transient voltage	$V_{GSmax}$	-8/+22	V
Recommended operating values	$V_{GSsop}$	0/+18	V
Power dissipation	$P_{tot}$	182	W
$T_C = 25^\circ\text{C}$			
Operating junction and storage temperature	$T_j, T_{stg}$	-55...+175	°C

## Thermal Resistance

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction - case.	$R_{thJC}$	-	0.55	0.83	°C/W	-
Thermal resistance, junction - ambient(min. footprint)	$R_{thJA}$	-	-	40	°C/W	1 inch <sup>2</sup> , 2oz single copper FR-4 PCB

## Electrical Characteristic (at $T_j = 25\text{ }^\circ\text{C}$ , unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		

## Static Characteristic

Drain-source breakdown voltage	$BV_{DSS}$	650	-	-	V	$V_{GS}=0V, I_D=100\mu A$
Gate threshold voltage	$V_{GS(th)}$	2.5	3.2	4.5	V	$V_{DS}=V_{GS}, I_D=6mA$
Zero gate voltage drain current	$I_{DSS}$	-	1	10	$\mu A$	$V_{DS}=650V, V_{GS}=0V$ $T_j=25^\circ C$ $T_j=175^\circ C$
Gate-source leakage current	$I_{GSS}$	-	-	100	nA	$V_{GS}=22V, V_{DS}=0V$
		-	-	-100	nA	$V_{GS}=-8V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	25	33	mΩ	$V_{GS}=15V, I_D=20A$
Drain-source on-state resistance	$R_{DS(on)}$	-	20	28	mΩ	$V_{GS}=18V, I_D=20A$
Transconductance	$g_{fs}$	-	18.0	-	S	$V_{DS}=18V, I_D=25A$

## Dynamic Characteristic

Input Capacitance	$C_{iss}$	-	3423	-	pF	$V_{GS}=0V, V_{DS}=400V,$ $f=100KHz$
Output Capacitance	$C_{oss}$	-	236	-		
Reverse Transfer Capacitance	$C_{rss}$	-	17	-		
Gate Total Charge	$Q_G$	-	114	-	nC	$V_{DS}=400V, I_D=20A$ $, V_{GS}=0V/15V$
Gate-Source charge	$Q_{gs}$	-	32	-		
Gate-Drain charge	$Q_{gd}$	-	36	-		
Turn-on delay time	$t_{d(on)}$	-	13	-	ns	$V_{GS}=0/18V, V_{DD}=400V,$ $R_G=5\Omega, I_D=20A$
Rise time	$t_r$	-	17	-		
Turn-off delay time	$t_{d(off)}$	-	37	-		
Fall time	$t_f$	-	12	-		
Gate resistance	$R_G$	-	0.6	-	Ω	$V_{GS}=0V, f=1MHz$

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## Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	$V_{SD}$	-	3.5	-	V	$V_{GS}=0V, I_{SD}=20A$ $T_j=25^{\circ}C$
		-	3.3	-		$T_j=175^{\circ}C$
Body Diode Continuous Forward Current	$I_S$	-	-	75	A	$T_C = 25^{\circ}C$
		-	-	66	A	$T_C = 100^{\circ}C$
Body Diode Reverse Recovery Time	$t_{rr}$	-	25	-	ns	$V_{GS}=-5V, I_{SD}=20A,$ $V_R=400V$ $di/dt=1000A/us$
Body Diode Reverse Recovery Charge	$Q_{rr}$	-	103	-	nC	
Peak Reverse Recovery Current	$I_{RRM}$	-	11	-	A	



## Typical Performance Characteristics

Fig 1: Output Characteristics Tj=25°C

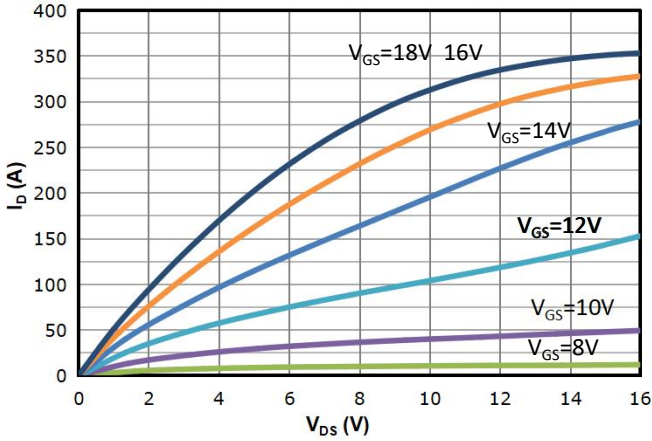


Fig 2: Output Characteristics Tj=175°C

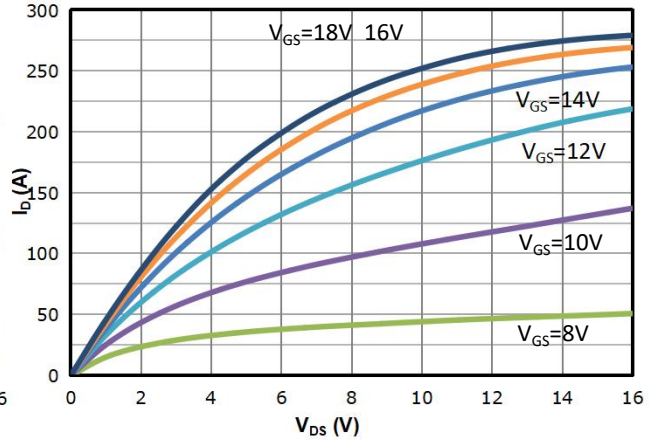


Fig 3: Transfer Characteristics

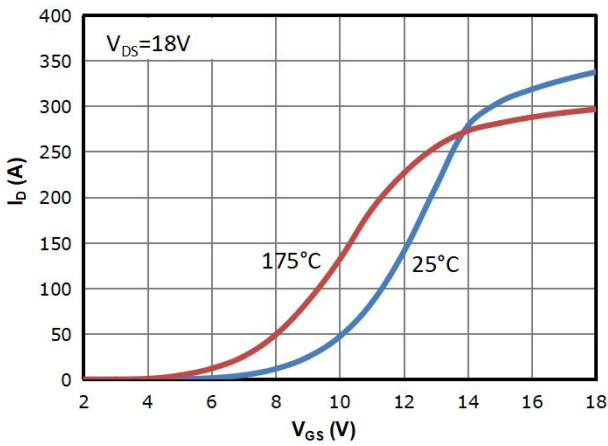


Fig 4: Rds(on) vs Drain Current and Gate Voltage

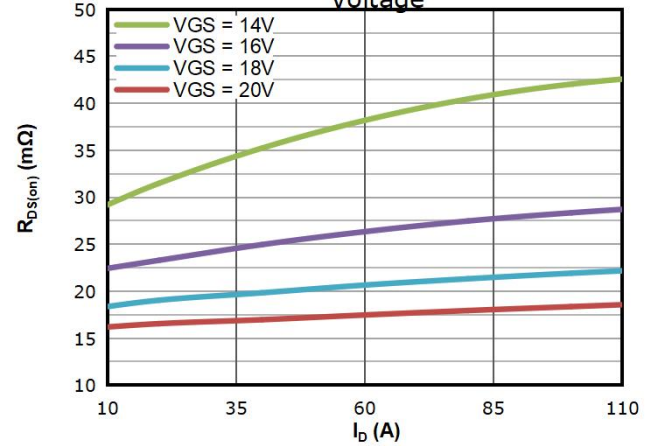


Fig 5: Rds(on) vs. Temperature

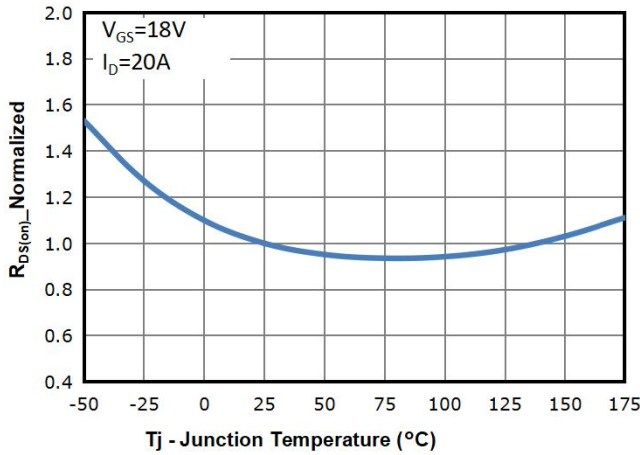


Fig 6: Vgs(th) vs. Temperature

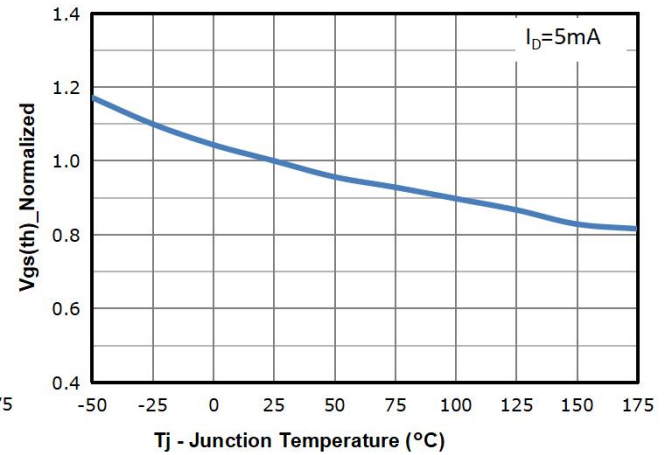


Fig 7: BVdss vs. Temperature

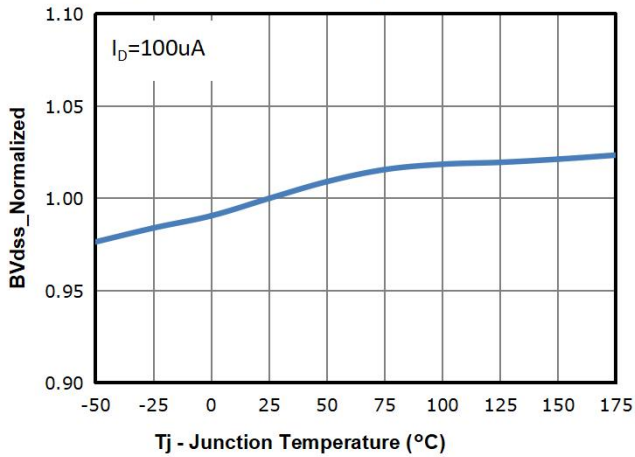


Fig 8: Capacitance Characteristics

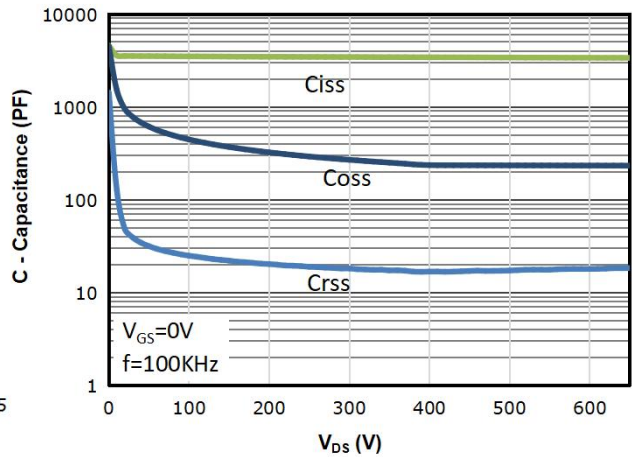


Fig 9: Gate Charge Characteristics

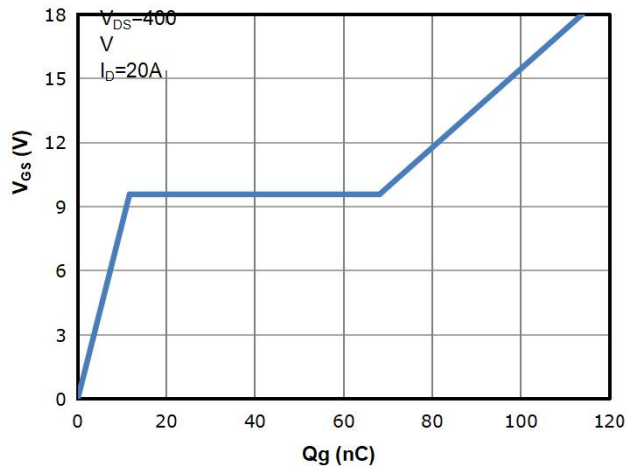


Fig 10: Body-diode Forward Characteristics

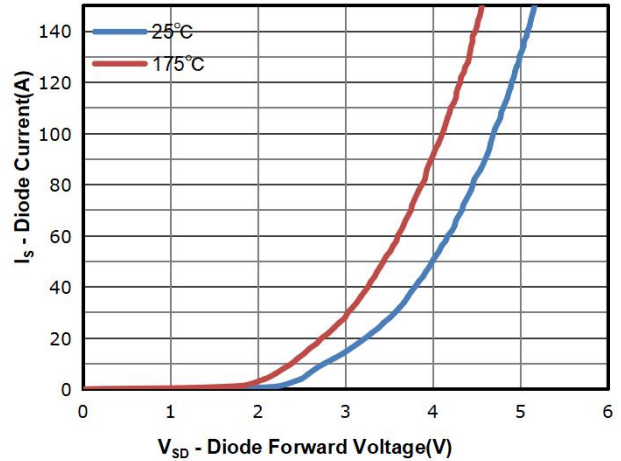


Fig 11: Power Dissipation

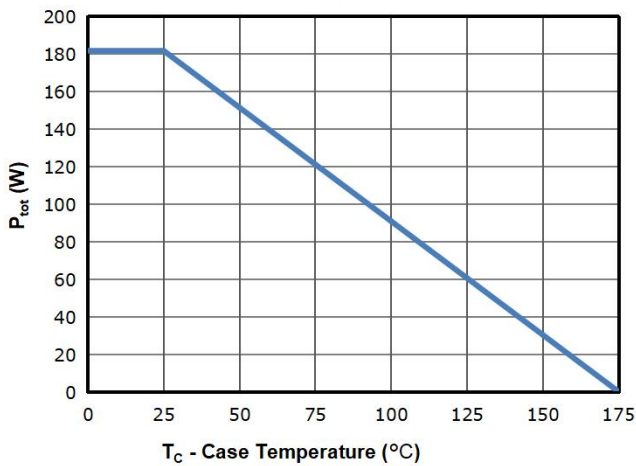


Fig 12: Drain Current Derating

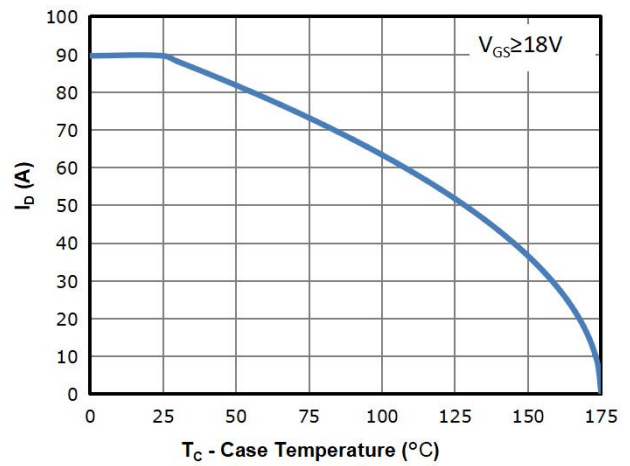




Fig 13: Safe Operating Area

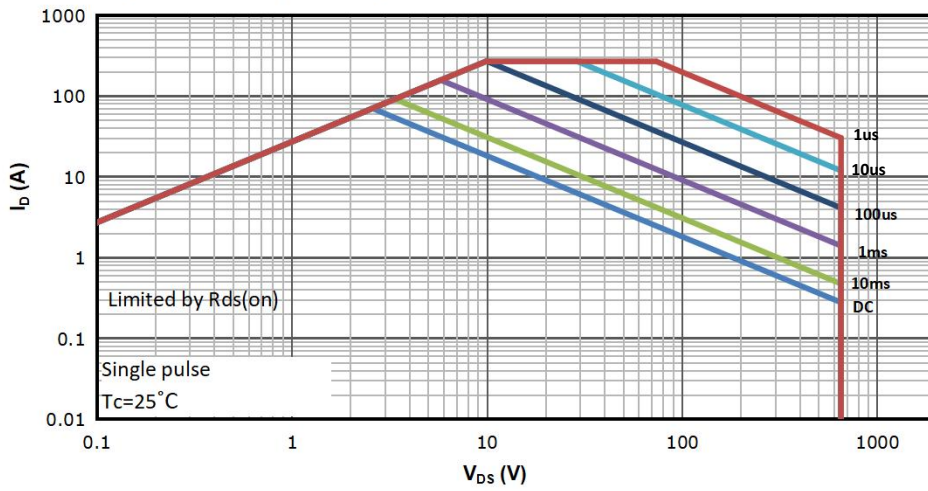
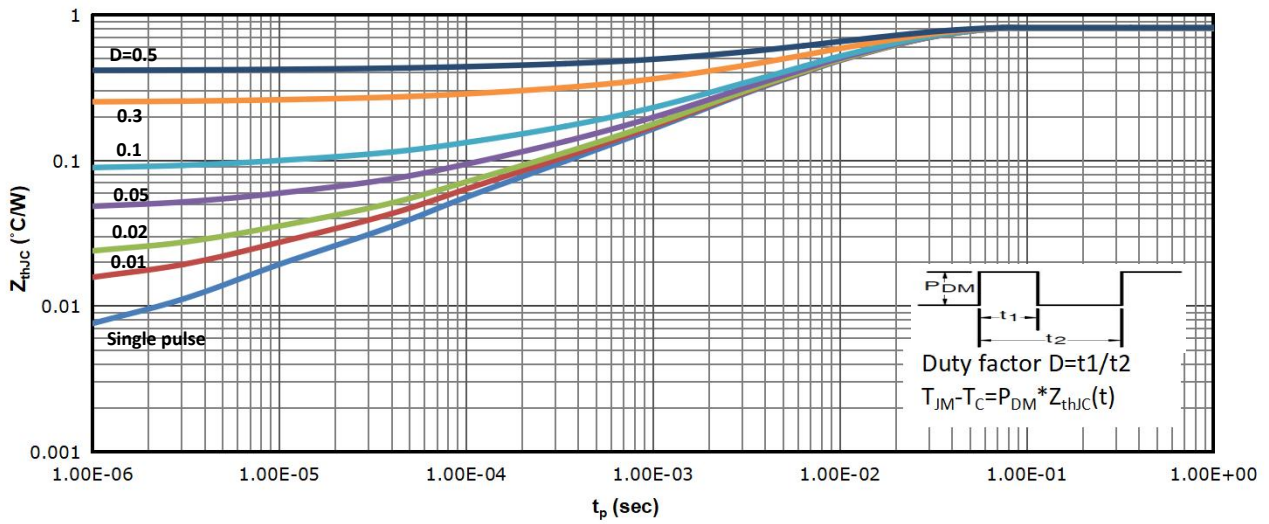
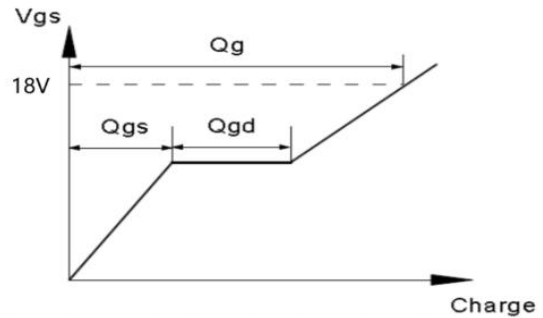
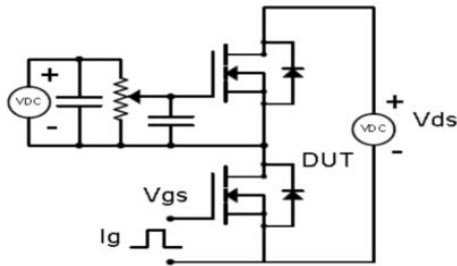


Fig 14: Max. Transient Thermal Impedance

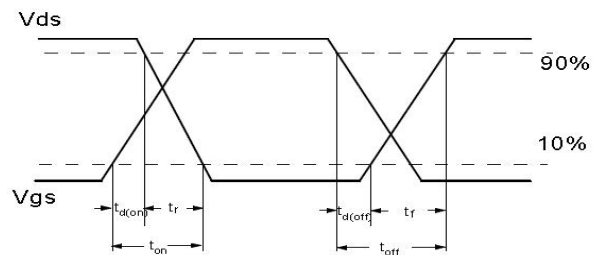
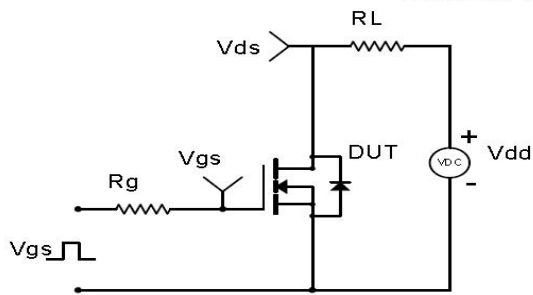


## Test Circuit & Waveform

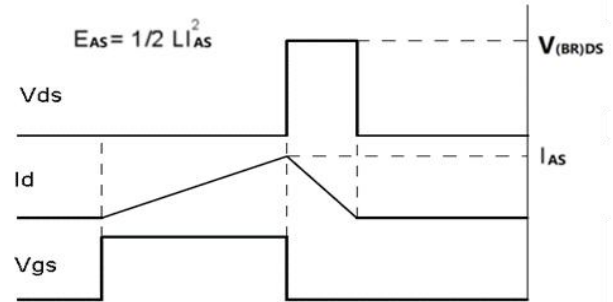
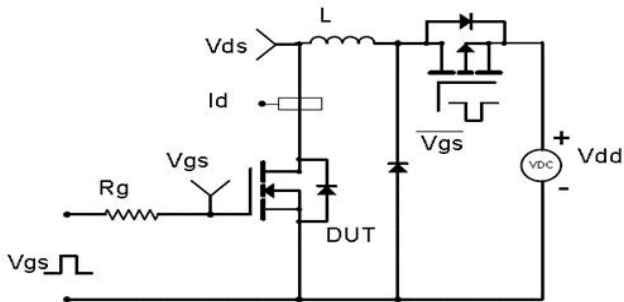
Gate Charge Test Circuit & Waveform



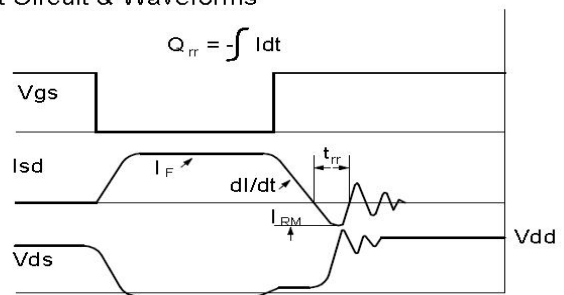
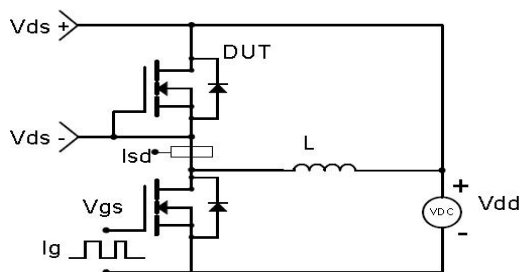
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



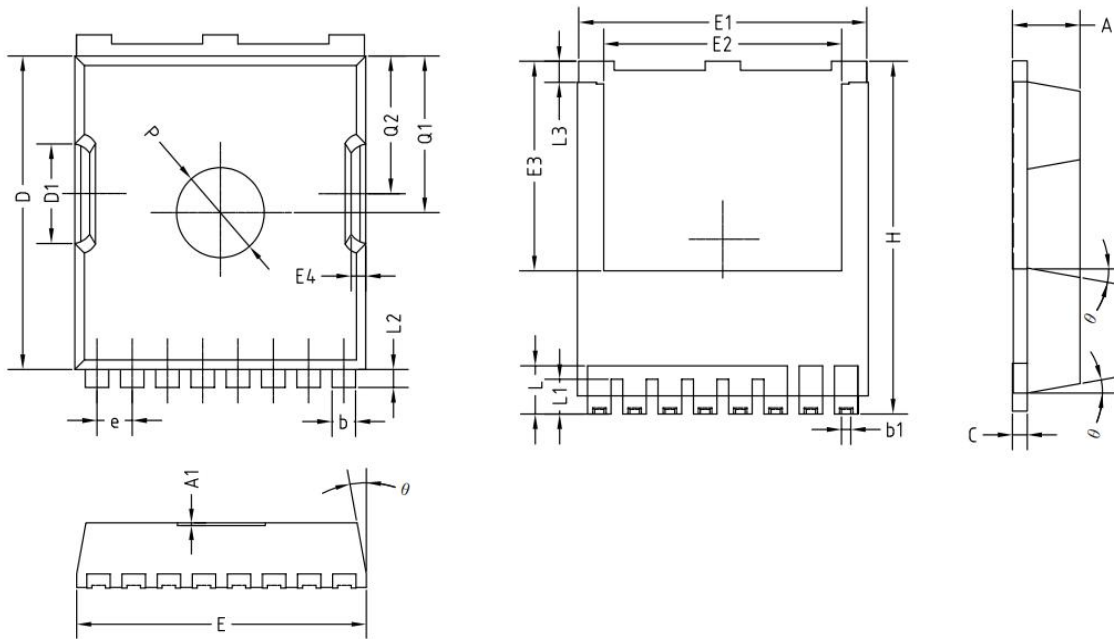
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## Package Outline: TOLL-2L



SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.20	2.40	0.087	0.094
A1	0.05	0.20	0.002	0.008
b	0.65	0.85	0.026	0.033
b1	0.30	0.50	0.012	0.020
C	0.35	0.65	0.014	0.026
D	10.35	10.70	0.407	0.421
D1	3.15	3.45	0.124	0.136
E	9.80	10.00	0.386	0.394
E1	9.65	9.95	0.380	0.392
E2	7.90	8.30	0.311	0.327
E3	6.80	7.20	0.268	0.283
E4	0.30	0.75	0.012	0.030
e	1.15	1.25	0.045	0.049
L	1.35	1.85	0.053	0.073
L1	0.95	1.35	0.037	0.053
L2	0.40	0.80	0.016	0.031
L3	0.60	0.85	0.024	0.033
θ	7°	12°	7°	12°
P	2.90	3.10	0.114	0.122
Q	4.50	4.70	0.177	0.185
Q1	5.10	5.30	0.201	0.209
H	11.55	11.95	0.455	0.470



## Disclaimer

Any and all semiconductor products have certain probability to fail or malfunction, which may result in personal injury, death or property damage. Customer are solely responsible for providing adequate safe measures when design their systems.

The product is not intended for use in applications that require extraordinary levels of quality and reliability, such as aviation/aerospace and life-support devices or systems.

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