

SC020N65DT-R

Silicon Carbide MOSFET 650V, 20mΩ, 91A



重庆平伟半导体股份有限公司

Features

- Low switching losses
- Extremely low on-resistance $R_{DS(on)}$
- Robust body diode operation under hard commutation events
- Easy to Parallel and Simple to Drive
- Qualified according to JEDEC criteria

Applications

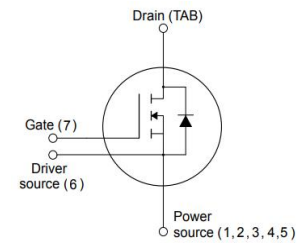
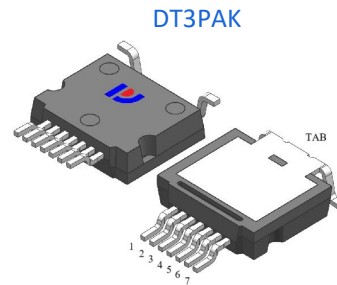
- On-board charger
- DC/DC converter
- Auxiliary inverters



100% DVDS Tested
100% Avalanche Tested

Product Summary

V_{DS}	650V
$R_{DS(on)}$ typ.	20mΩ
I_D	91A



Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
SC020N65DT-R	SC020N65DT	DT3PAK	Tape&Reel	13 inches	32mm	550

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	650	V
Continuous drain current $T_C = 25^\circ\text{C}$	I_D	91	A
Pulsed drain current ($T_C = 25^\circ\text{C}$)	$I_{D \text{ pulse}}$	272	A
Avalanche energy, single pulse ($L=5\text{mH}$)	E_{AS}	423	mJ
Gate-Source voltage,max.transient voltage	V_{GSmax}	-10/+22	V
Gate-Source voltage,Recommended operating values	V_{GSsop}	-5/+18	V
Power dissipation $T_C = 25^\circ\text{C}$	P_{tot}	238	W
Operating junction and storage temperature	T_j, T_{stg}	-55...+175	$^\circ\text{C}$

Thermal Resistance

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction – case.	R_{thJC}	-	0.42	0.63	°C/W	-
Thermal resistance, junction - ambient(min. footprint)	R_{thJA}	-	-	56	°C/W	-

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	$V_{GS(th)}$	2.2	3.0	4.2	V	$V_{DS}=V_{GS}, I_D=10mA$
Zero gate voltage drain current	I_{DSS}	-	1	10	μA	$V_{DS}=650V, V_{GS}=0V$ $T_j=25^{\circ}C$ $T_j=175^{\circ}C$
Gate-source leakage current	I_{GSS}	-	-	100	nA	$V_{GS}=22V, V_{DS}=0V$
		-	-	-100	nA	$V_{GS}=-13V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	20	28	mΩ	$V_{GS}=18V, I_D=20A$
Transconductance	g_{fs}	-	10	-	S	$V_{DS}=18V, I_D=10A$

Dynamic Characteristic

Input Capacitance	C_{iss}	-	2977	-	pF	$V_{GS}=0V, V_{DS}=400V,$ $f=1MHz$
Output Capacitance	C_{oss}	-	186	-		
Reverse Transfer Capacitance	C_{rss}	-	9	-		
Gate Total Charge	Q_G	-	131	-	nC	$V_{DS}=400V, I_D=20A$ $V_{GS}=-5V/18V$
Gate-Source charge	Q_{gs}	-	49	-		
Gate-Drain charge	Q_{gd}	-	28	-		
Turn-on delay time	$t_{d(on)}$	-	15	-	ns	$V_{GS}=-5/18V,$ $V_{DD}=400V,$ $R_G=5\Omega, I_D=20A$
Rise time	t_r	-	45	-		
Turn-off delay time	$t_{d(off)}$	-	13	-		
Fall time	t_f	-	10	-		
Gate resistance	R_G	-	1.5	-	Ω	$V_{GS}=0V, f=1MHz$

SC020N65DT-R

Silicon Carbide MOSFET 650V, 20mΩ, 91A



重庆平伟半导体股份有限公司

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	-	3.4	-	V	$V_{GS} = -5V, I_{SD} = 20A$ $T_j = 25^{\circ}C$
		-	3.1	-		$T_j = 175^{\circ}C$
Body Diode Continuous Forward Current	I_S	-	-	86	A	$T_C = 25^{\circ}C$
		-	-	48	A	$T_C = 100^{\circ}C$
Body Diode Reverse Recovery Time	t_{rr}	-	17	-	ns	$V_{GS} = -5V, I_{SD} = 20A,$ $V_R = 400V$ $di/dt = 1200A/us$
Body Diode Reverse Recovery Charge	Q_{rr}	-	112	-	nC	
Peak Reverse Recovery Current	I_{RRM}	-	11	-	A	

Typical Performance Characteristics

Fig 1: Output Characteristics $T_j=25^\circ\text{C}$

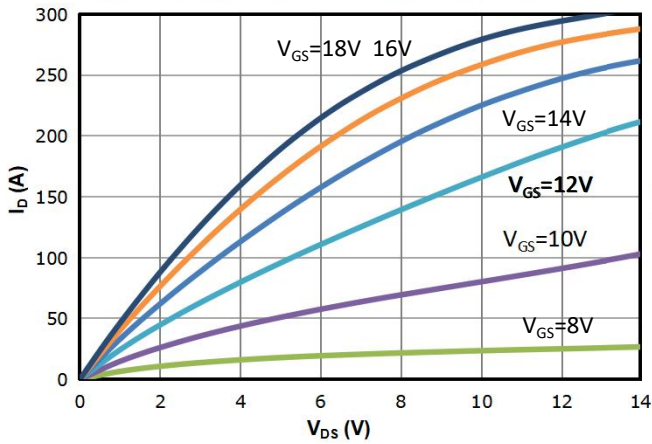


Fig 2: Output Characteristics $T_j=175^\circ\text{C}$

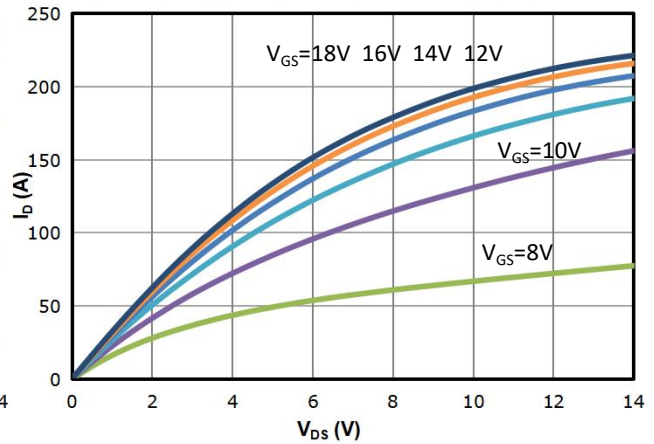


Fig 3: Transfer Characteristics

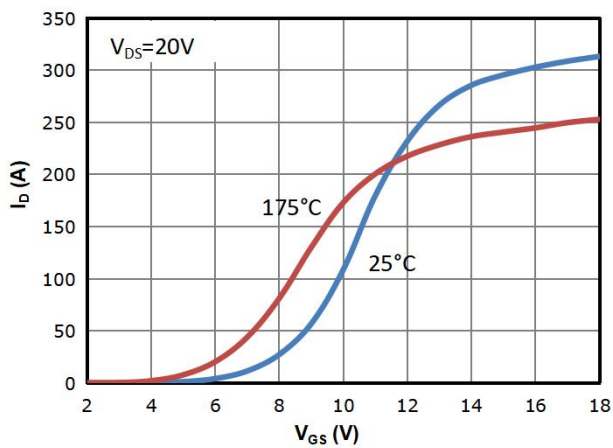


Fig 4: $R_{ds(on)}$ vs Drain Current and Gate Voltage

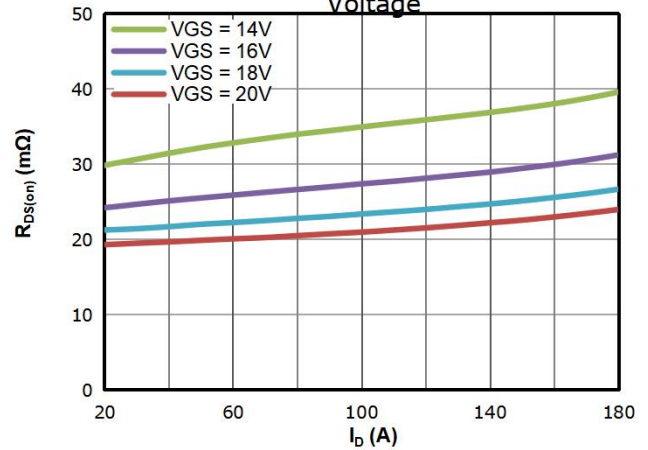


Fig 5: $R_{ds(on)}$ vs. Temperature

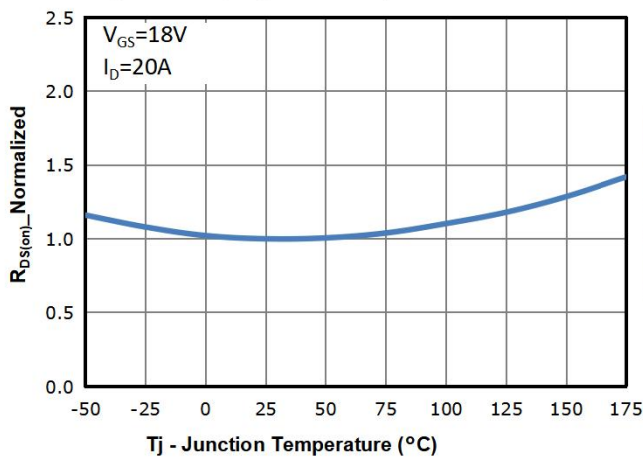


Fig 6: $V_{gs(th)}$ vs. Temperature

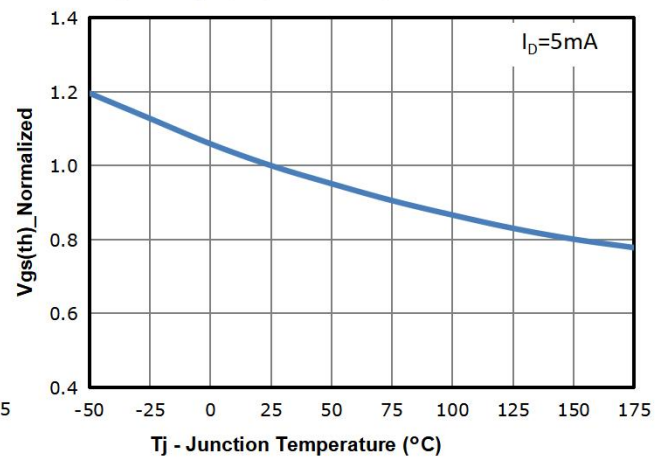


Fig 7: BVdss vs. Temperature

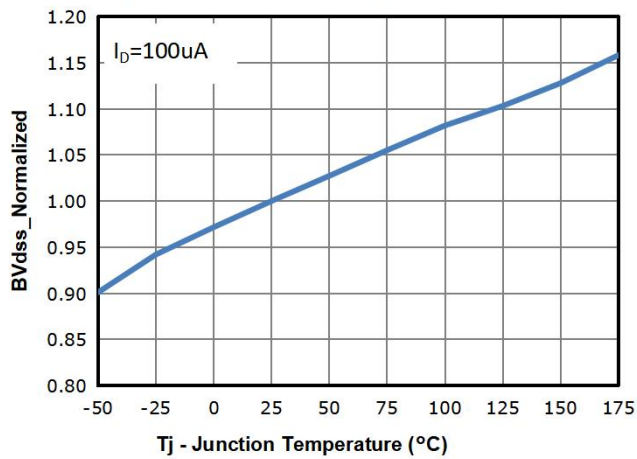


Fig 8: Capacitance Characteristics

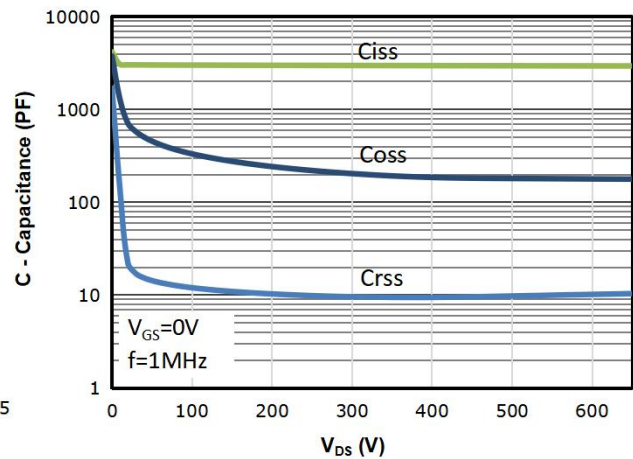


Fig 9: Gate Charge Characteristics

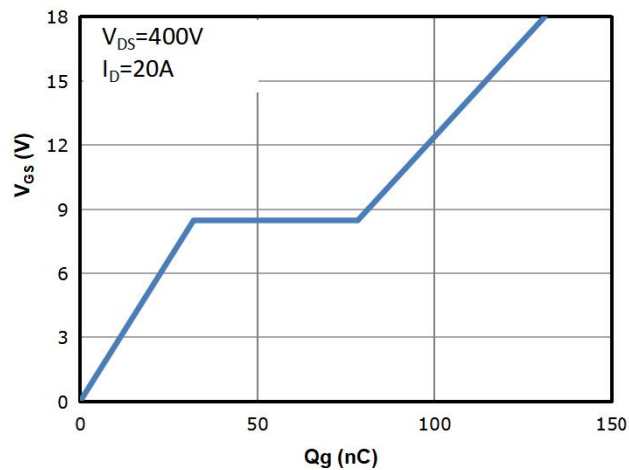


Fig 10: Body-diode Forward Characteristics

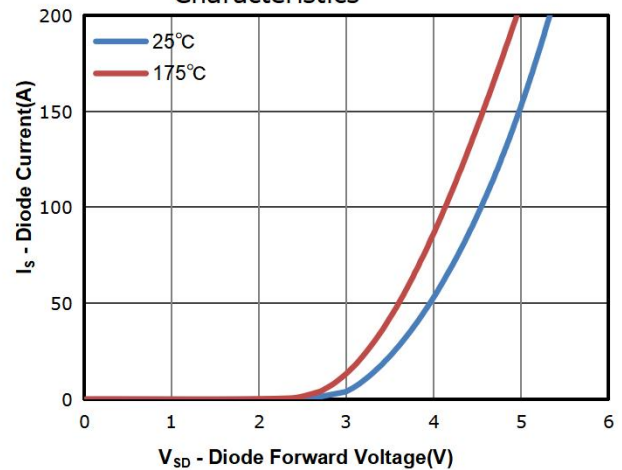


Fig 11: Power Dissipation

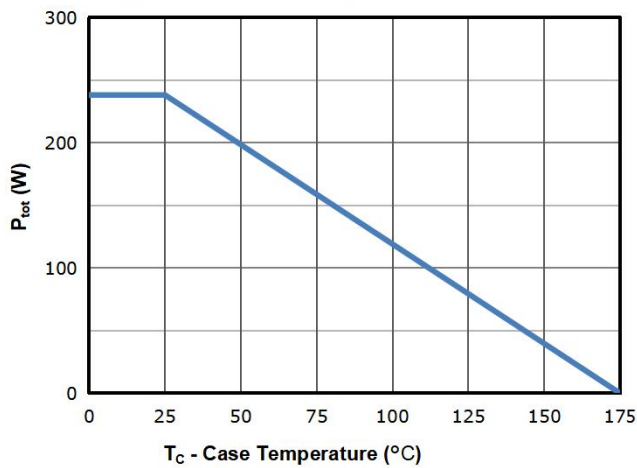


Fig 12: Drain Current Derating

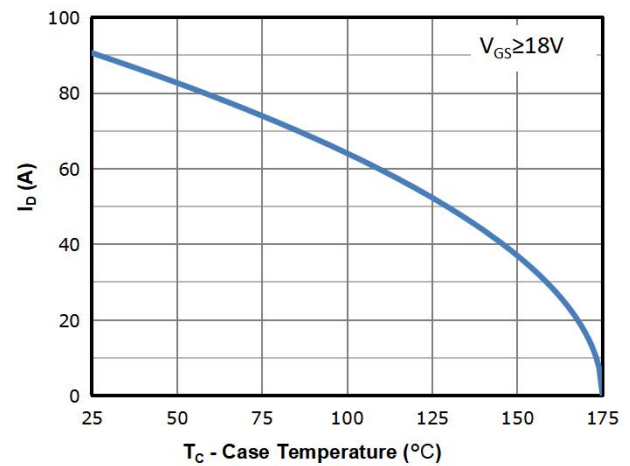




Fig 13: Safe Operating Area

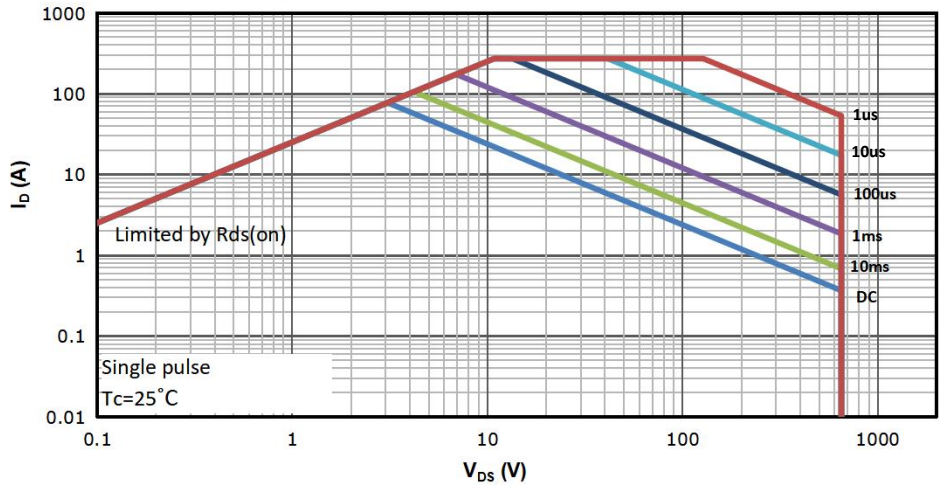
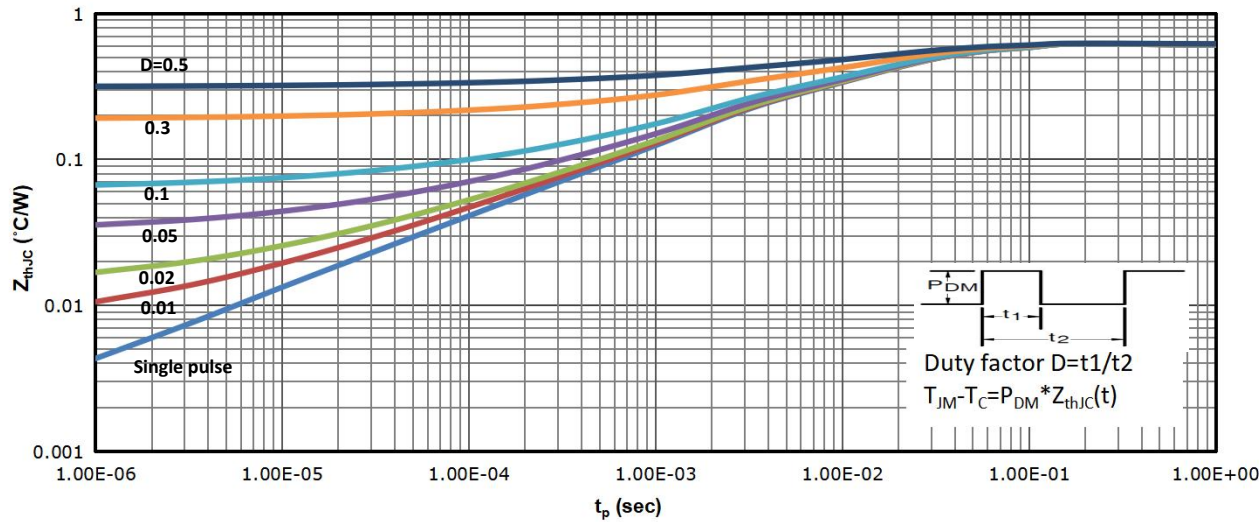
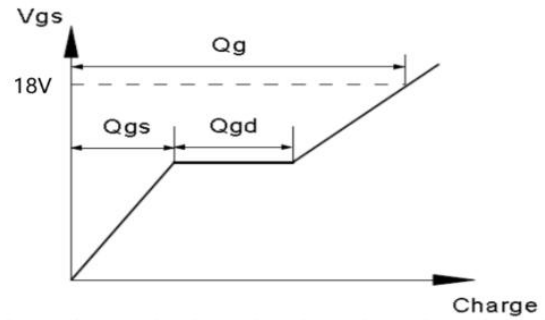
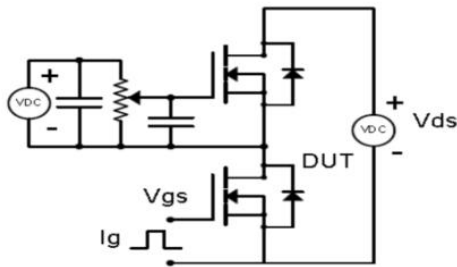


Fig 14: Max. Transient Thermal Impedance

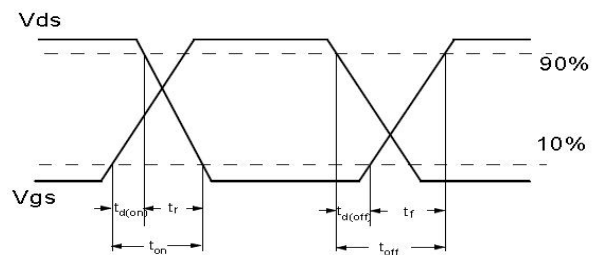
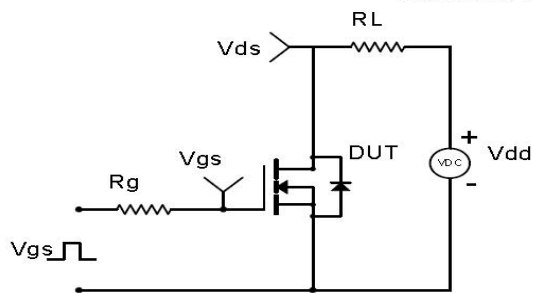


Test Circuit & Waveform

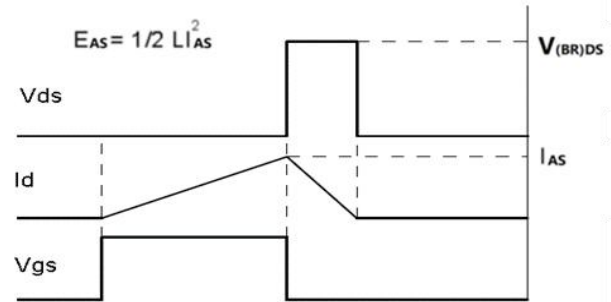
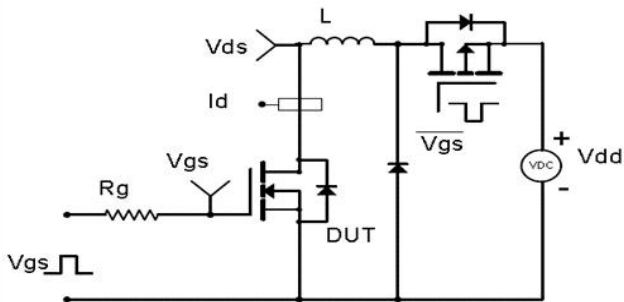
Gate Charge Test Circuit & Waveform



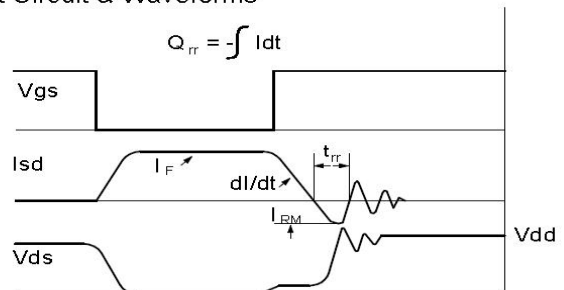
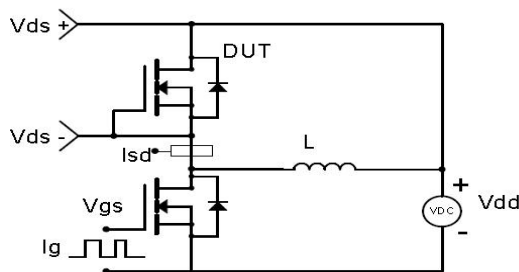
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



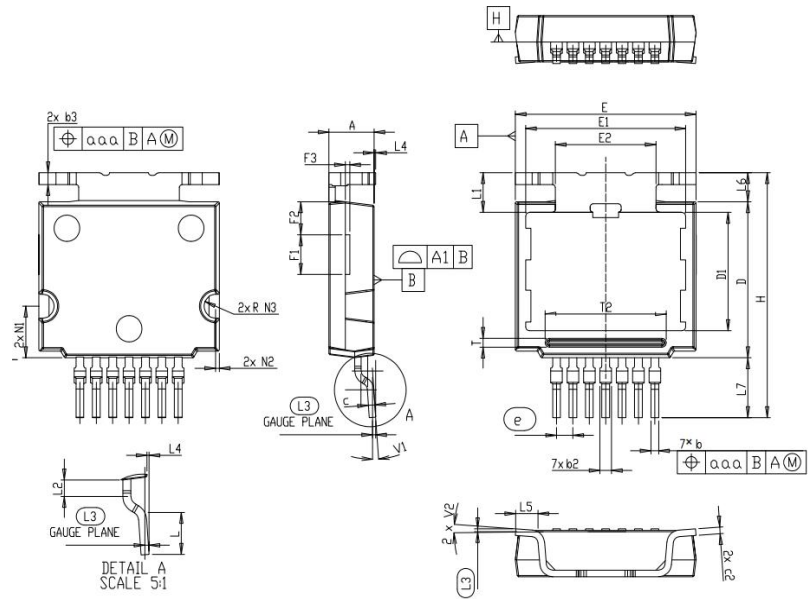
SC020N65DT-R

Silicon Carbide MOSFET 650V, 20mΩ, 91A



重庆平伟半导体股份有限公司

Package Outline: DT3PAK



DIMENSIONS	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	3.40	3.60	0.134	0.142
A1	0.50		0.020	
b	0.50	0.70	0.020	0.028
b2	0.50	1.00	0.020	0.039
b3	0.80	1.00	0.031	0.039
C	0.40	0.60	0.016	0.024
C2	0.40	0.60	0.016	0.024
D	11.70	11.90	0.461	0.469
D1	8.80	9.10	0.346	0.358
E	13.90	14.10	0.547	0.555
E1	12.30	12.50	0.484	0.492
E2	7.75	7.85	0.305	0.309
e	1.27		0.050	
H	18.00	19.00	0.709	0.748
L	2.40	2.60	0.094	0.102
L1	3.05		0.120	
L2	0.90	1.10	0.035	0.043
L3	0.26		0.010	
L4	0.075	0.175	0.003	0.007
L5	1.83	2.03	0.072	0.080
L6	2.14	2.34	0.084	0.092
L7	4.44	4.64	0.175	0.183
F1	2.90	3.10	0.114	0.122
F2	2.40	2.60	0.094	0.102
F3	0.25	0.45	0.010	0.018
N1	3.80	4.00	0.150	0.157
N2	0.25	0.45	0.010	0.018
N3	0.80	1.00	0.031	0.039
T	0.50	0.70	0.020	0.028
T2	9.18	9.43	0.361	0.371
V1	0°	8°	0°	8°
V2	0°	8°	0°	8°

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.

Unless otherwise specified in the datasheet, the product is designed and qualified as a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability, such as automotive, aviation/aerospace and life-support devices or systems.

Buyer is responsible for its products and applications using PingWei products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by PingWei.

"Typical" parameters which may be provided in PingWei data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE