SC040N120QD-R

Silicon Carbide MOSFET 1200V, 40mΩ, 58A

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
- PFC stages, hard switching PWM stages and resonant switching

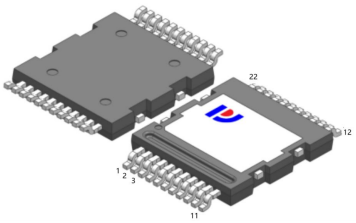
100% DVDS Tested

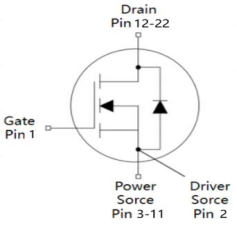
100% AvalancheTested

Product Summary

V_{DS}	1200V
$R_{DS(on)\ typ.}$	40mΩ
$I_{D\ (Silicon\ limit)}$	58A

QDPAK





Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
SC040N120QD-R	SC040N120QD	QDPAK	Tape&Reel	13 inches	32mm	1000pcs

Absolute Maximum Ratings

Parameter	**Symbol**	**Value**	**Unit**
Drain-source voltage	V_{DS}	1200	V
Continuous drain current T_C = 25°C T_C = 100°C	I_D	 58 41	A
Pulsed drain current (T_C = 25°C)	$I_{D\ pulse}$	232	A
Avalanche energy, single pulse (L=5mH)	E_{AS}	345	mJ
Gate-Source voltage,max.transient voltage	V_{GSmax}	-8/+22	V
Recommended operating values	V_{GSsop}	-5/+18	V
Power dissipation T_C = 25°C	P_{tot}	 263	W
Operating junction and storage temperature	T_j , T_{stg}	-55...+175	°C

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Thermal Resistance

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction – case.	R_{thJC}	-	0.38	0.6	°C/W	-
Thermal resistance, junction - ambient(min. footprint)	R_{thJA}	-	-	66	°C/W	-

Electrical Characteristic (at Tj = 25 °C, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Static Characteristic						
Drain-source breakdown voltage	BV_{DSS}	1200	-	-	V	V_{GS}=0V, I_D=100uA
Gate threshold voltage	$V_{GS(th)}$	2.2	3.4	4.2	V	V_{DS}=V_{GS}, I_D=10mA
Zero gate voltage drain current	I_{DSS}	- -	1 -	10 100	μA	V_{DS}=1200V,V_{GS}=0V T_j=25°C T_j=175°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	$R_{DS(on)}$	-	40	52	mΩ	V_{GS}=18V,I_D=40A
Transconductance	g_{fs}	-	18	-	S	V_{DS}=20V,I_D=20A
Dynamic Characteristic						
Input Capacitance	C_{iss}	-	2132	-	pF	V_{GS}=0V, V_{DS}=800V, f=1MHz
Output Capacitance	C_{oss}	-	108	-		
Reverse Transfer Capacitance	C_{rss}	-	5	-		
Gate Total Charge	Q_G	-	98	-	nC	V_{DS}=800V,I_D=33A ,V_{GS}=-5V/18V
Gate-Source charge	Q_{gs}	-	33	-		
Gate-Drain charge	Q_{gd}	-	33	-		
Turn-on delay time	$t_{d(on)}$	-	11	-	ns	V_{GS}=-5/18V, V_{DD}=800V, R_G=5Ω,I_D=33A
Rise time	t_r	-	13	-		
Turn-off delay time	$t_{d(off)}$	-	25	-		
Fall time	t_f	-	9	-		
Gate resistance	R_G	-	1.4	-	Ω	V_{GS}=0V, f=1MHz

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	- -	3.3 3.0	- -	V	V_{GS}=-5V, I_{SD}=20A T_j=25°C T_j=175°C
Body Diode Continuous Forward Current	I_S	-	-	58	A	T_C = 25°C
		-	-	41	A	T_C = 100°C
Body Diode Reverse Recovery Time	t_{rr}	-	16	-	ns	V_{GS}=-5V,I_{SD}=33A, V_R=800V di/dt=1200A/us
Body Diode Reverse Recovery Charge	Q_{rr}	-	121	-	nC	
Peak Reverse Recovery Current	I_{RRM}	-	13	-	A	

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Typical Performance Characteristics

Fig 1: Output Characteristics Tj=25°C

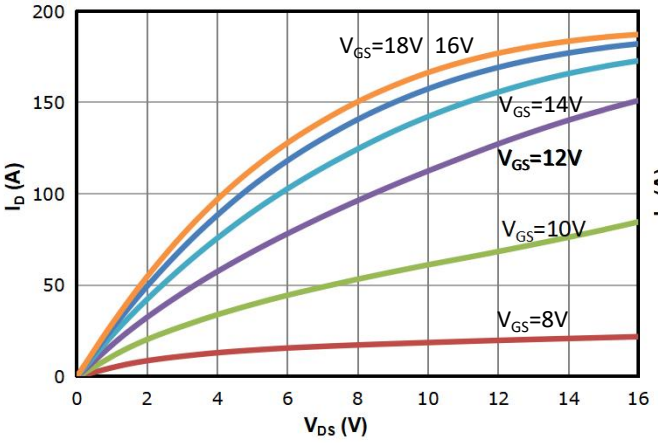


Fig 2: Output Characteristics Tj=175°C

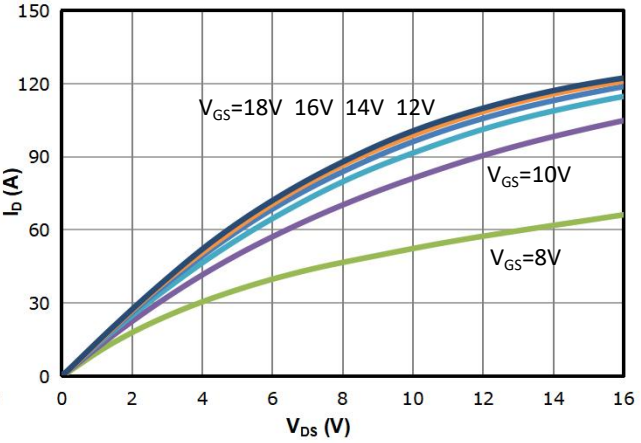


Fig 3: Transfer Characteristics

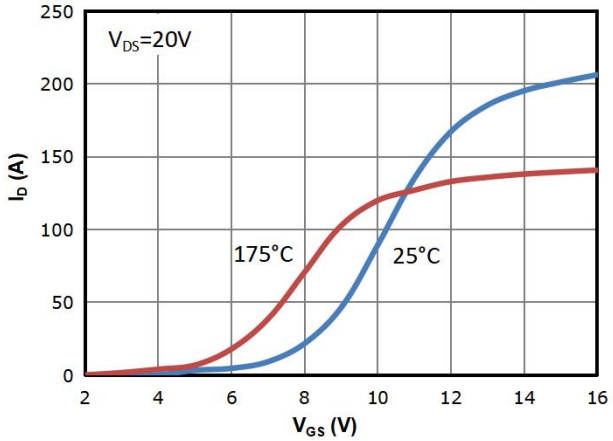


Fig 4: Rds(on) vs Drain Current and Gate Voltage

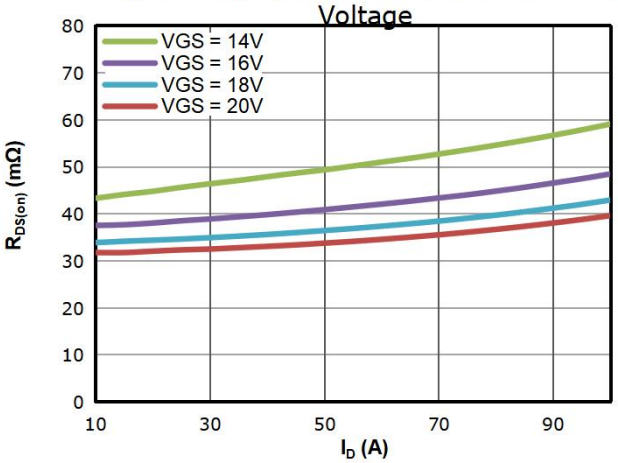


Fig 5: Rds(on) vs. Temperature

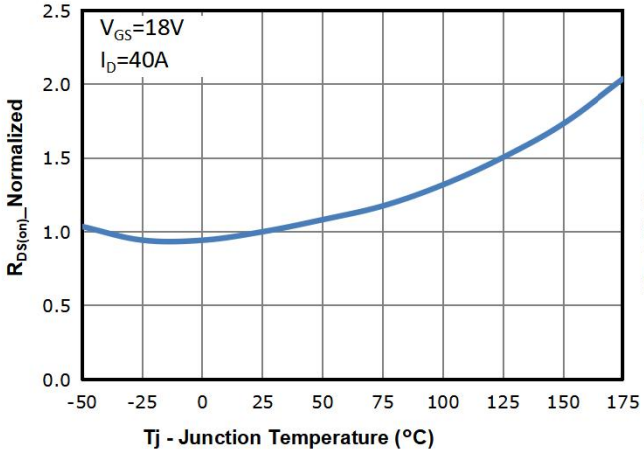
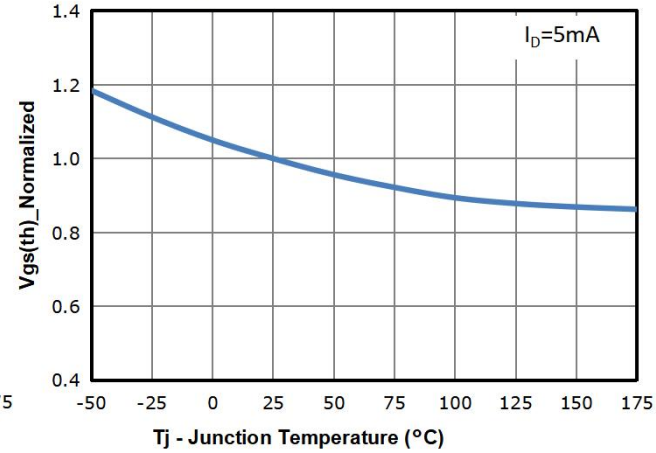


Fig 6: Vgs(th) vs. Temperature



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Fig 7: BVdss vs. Temperature

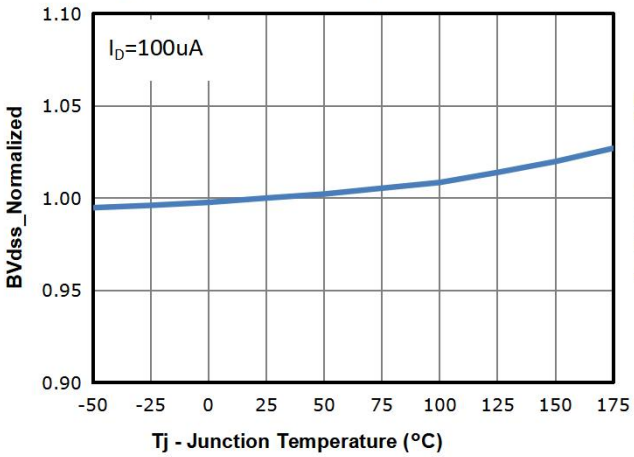


Fig 8: Capacitance Characteristics

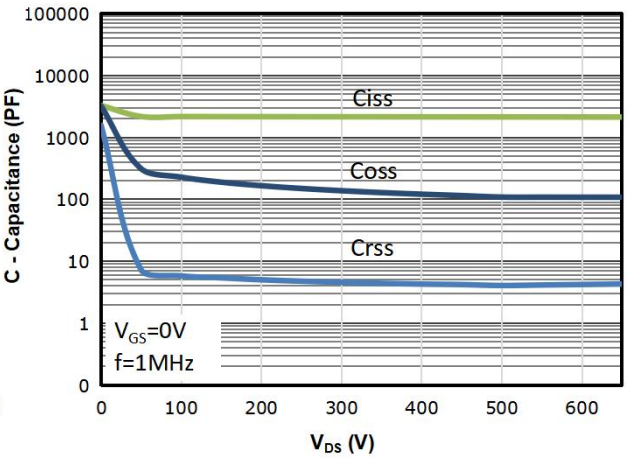


Fig 9: Gate ChargeCharacteristics

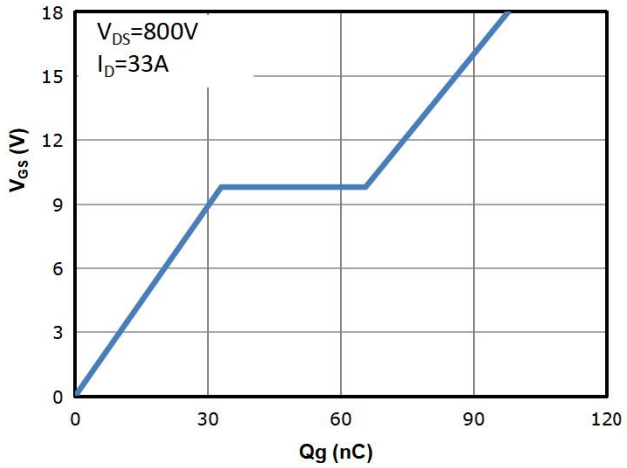


Fig 10: Body-diode Forward Characteristics

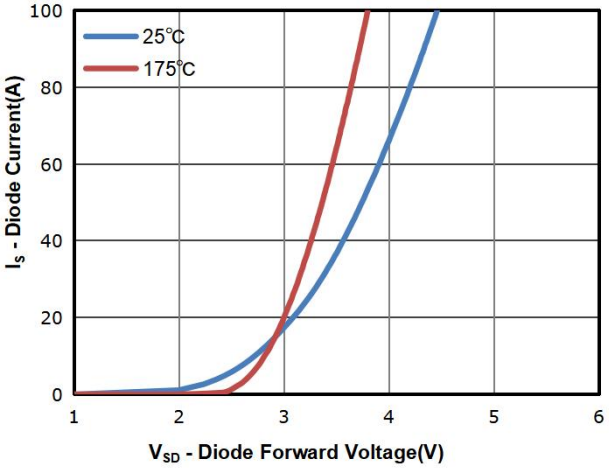


Fig 11: Power Dissipation

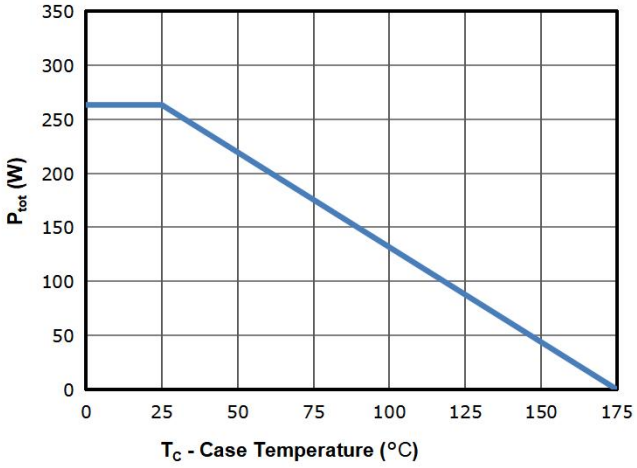
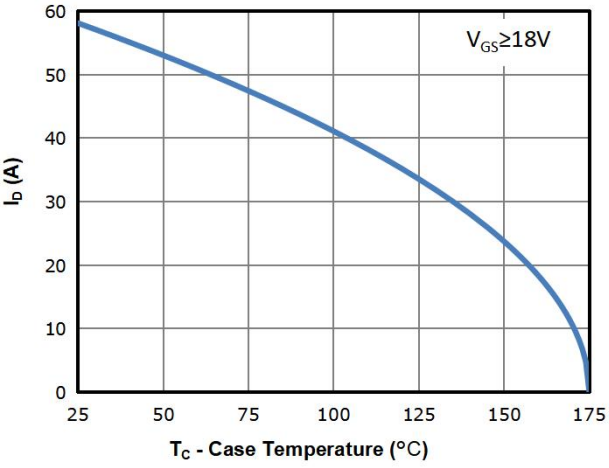


Fig 12: Drain Current Derating



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Fig 13: Safe Operating Area

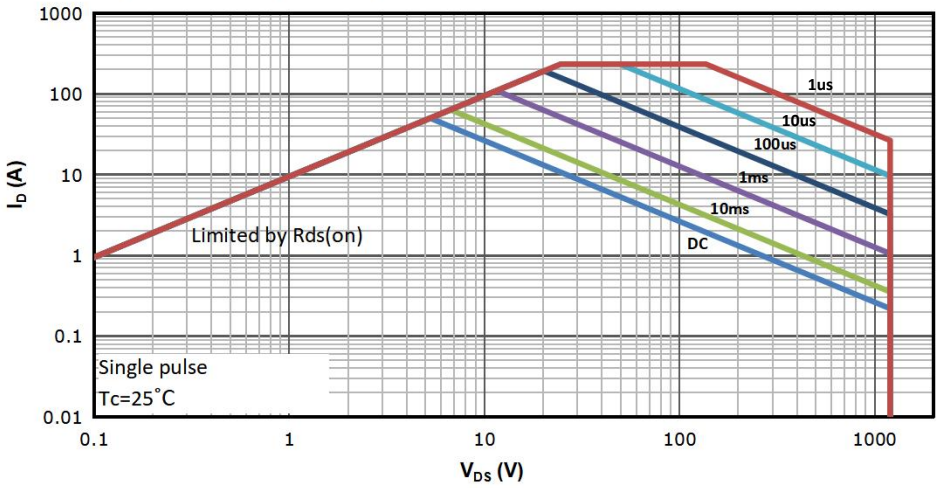
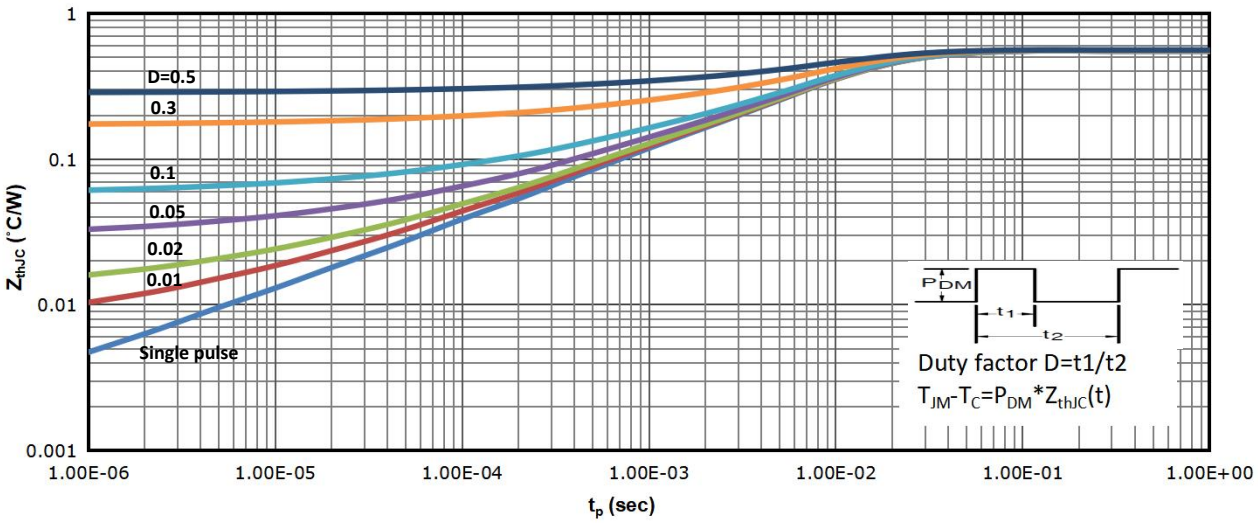


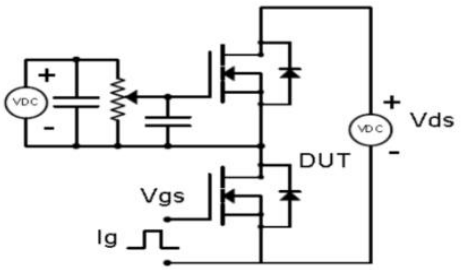
Fig 14: Max. Transient Thermal Impedance

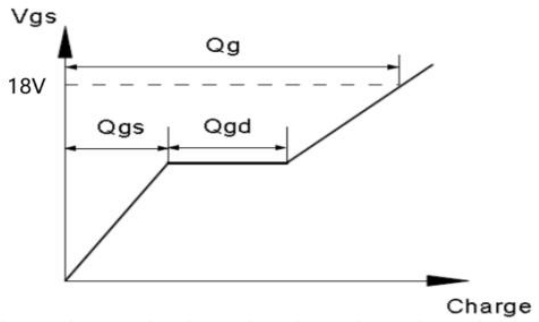


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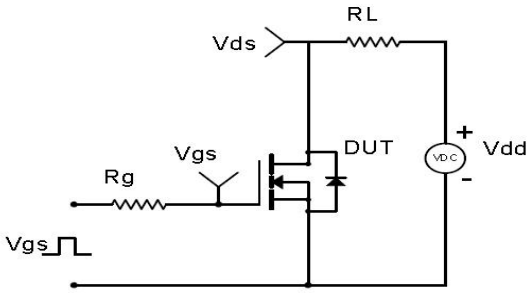
Test Circuit & Waveform

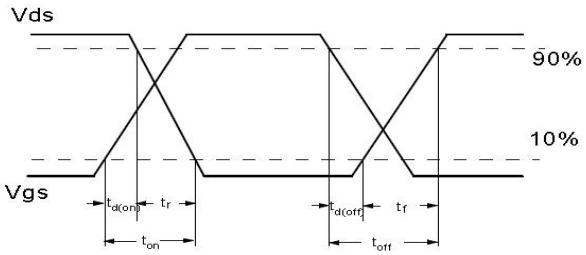
Gate Charge Test Circuit & Waveform



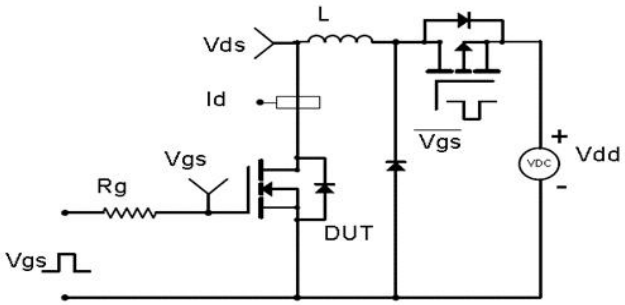


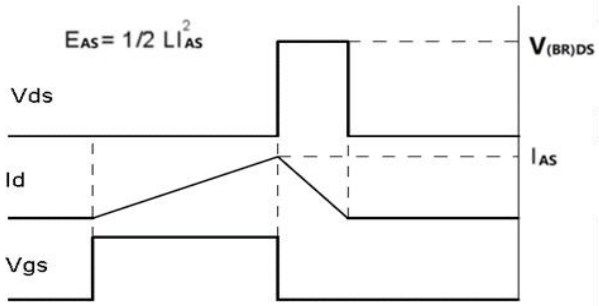
Resistive Switching Test Circuit & Waveforms



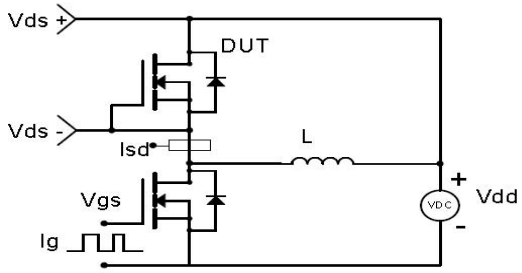


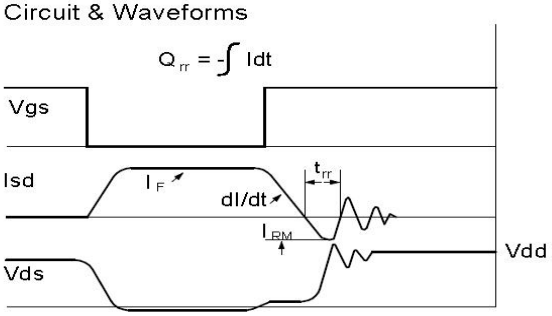
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms





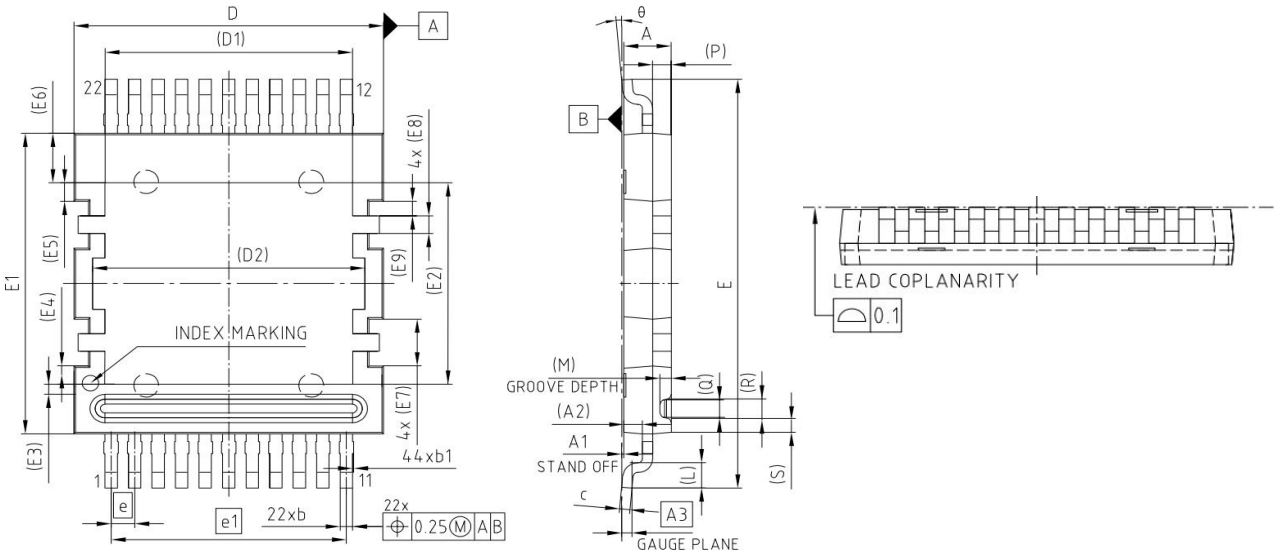
Diode Recovery Test Circuit & Waveforms





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Package Outline: QDPAK



DIMENSIONS	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.25	2.35	0.089	0.093
A1	0.00	0.15	0.000	0.006
A2	0.90		0.035	
A3	0.50		0.020	
b	0.50	0.70	0.020	0.028
b1	---	0.15	---	0.006
c	0.46	0.58	0.018	0.023
D	14.90	15.10	0.587	0.594
D1	12.00		0.472	
D2	13.20		0.520	
E	20.81	21.11	0.819	0.831
E1	15.30	15.50	0.602	0.610
E2	10.32		0.406	
E3	0.625		0.025	
E4	0.45		0.018	
E5	0.95		0.037	
E6	2.53		0.100	
E7	2.40		0.094	
E8	0.90		0.035	
E9	0.75		0.030	
e	1.14		0.045	
e1	11.4		0.449	
L	1.30		0.051	
M	0.55		0.022	
θ	0°	8°	0°	8°
P	0.90		0.035	
Q	0.94		0.037	
R	1.12		0.044	
S	0.66		0.026	

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