

SC040N120QDQ

Silicon Carbide MOSFET 1200V, 40mΩ, 58A



重庆平伟实业股份有限公司

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 AEC-Q101 criteria

Applications

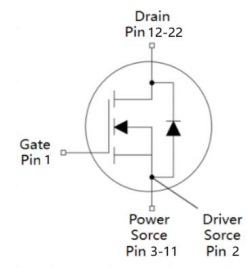
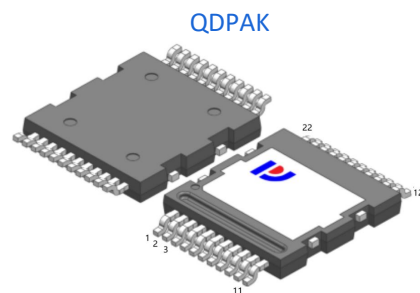
- On-board charger
- DC/DC converter
- Auxiliary inverters



100% DVDS Tested
100% Avalanche Tested

Product Summary

V_{DS}	1200V
$R_{DS(on)}$ typ.	40mΩ
I_D	58A



Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
SC040N120QDQ	SC040N120QDQ	QDPAK	Tape&Reel	13 inches	32mm	1000pcs

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	1200	V
Continuous drain current $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	I_D	58 41	A
Pulsed drain current ($T_C = 25^\circ\text{C}$)	$I_{D \text{ pulse}}$	232	A
Avalanche energy, single pulse ($L=5\text{mH}$)	E_{AS}	345	mJ
Gate-Source voltage,max.transient voltage	V_{GSmax}	-8/+22	V
Gate-Source voltage,max.static voltage	V_{GSsop}	-5/+18	V
Power dissipation $T_C = 25^\circ\text{C}$	P_{tot}	263	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}	-	0.38	0.6	°C/W	-
Thermal resistance, junction - ambient(min. footprint)	R_{thJA}	-	-	66	°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}	1200	-	-	V	$V_{GS}=0V, I_D=100\mu A$
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	μA	$V_{DS}=1200V, V_{GS}=0V$ $T_j=25^{\circ}C$ $T_j=175^{\circ}C$
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	$R_{DS(on)}$	-	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	$V_{GS}=-5/18V,$ $V_{DD}=800V,$ $R_G=5\Omega, I_D=33A$
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	$V_{GS} = -5V, I_{SD} = 20A$ $T_j = 25^\circ C$ $T_j = 175^\circ C$
Body Diode Continuous Forward Current	I_S	-	-	58	A	$T_C = 25^\circ C$
		-	-	41	A	$T_C = 100^\circ C$
Body Diode Reverse Recovery Time	t_{rr}	-	16	-	ns	$V_{GS} = -5V, I_{SD} = 33A,$ $V_R = 800V$ $di/dt = 1200A/\mu s$
Body Diode Reverse Recovery Charge	Q_{rr}	-	121	-	nC	
Peak Reverse Recovery Current	I_{RRM}	-	13	-	A	

Typical Performance Characteristics

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

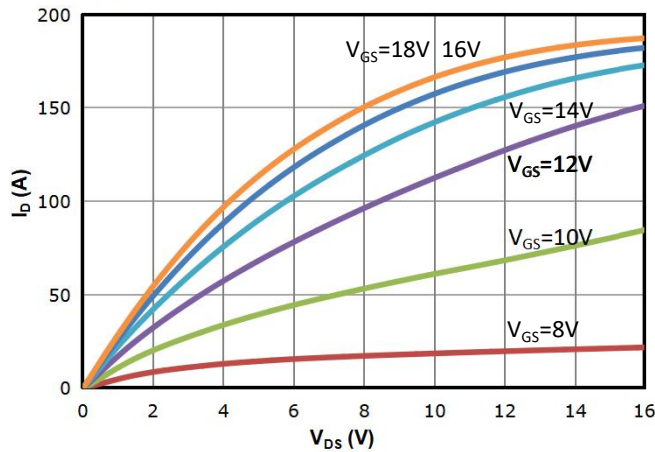


Fig 2: Output Characteristics $T_j=175^\circ\text{C}$

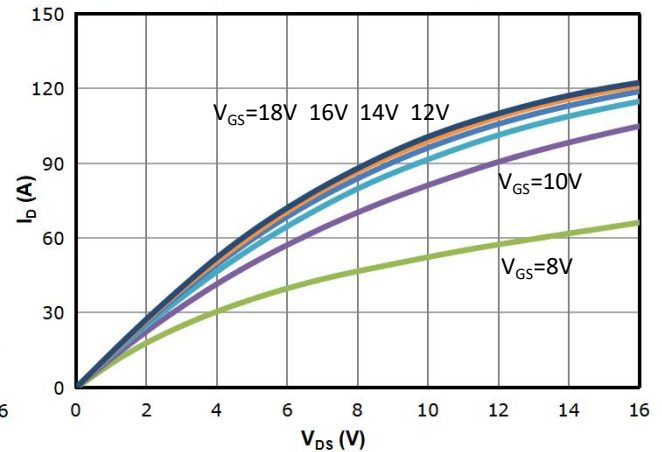


Fig 3: Transfer Characteristics

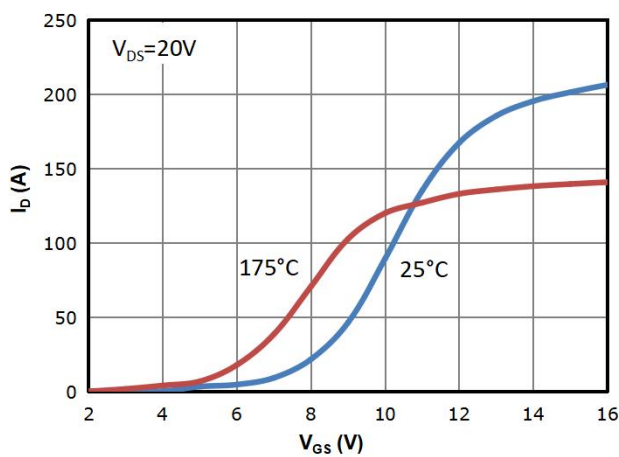


Fig 4: $R_{DS(on)}$ vs Drain Current and Gate Voltage

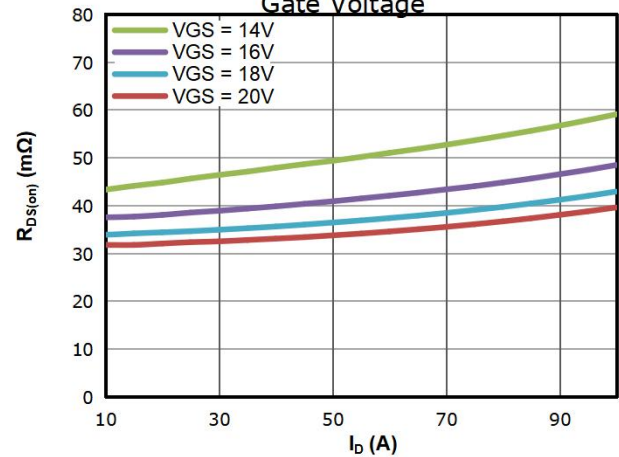


Fig 5: $R_{DS(on)}$ vs. Temperature

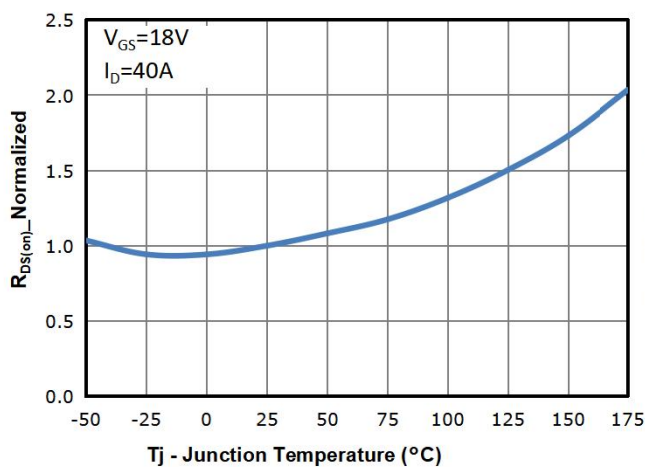


Fig 6: $V_{GS(th)}$ vs. Temperature

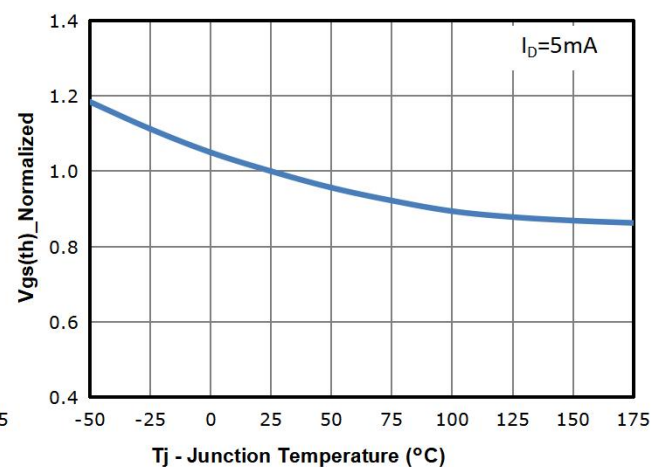


Fig 7: BVdss vs. Temperature

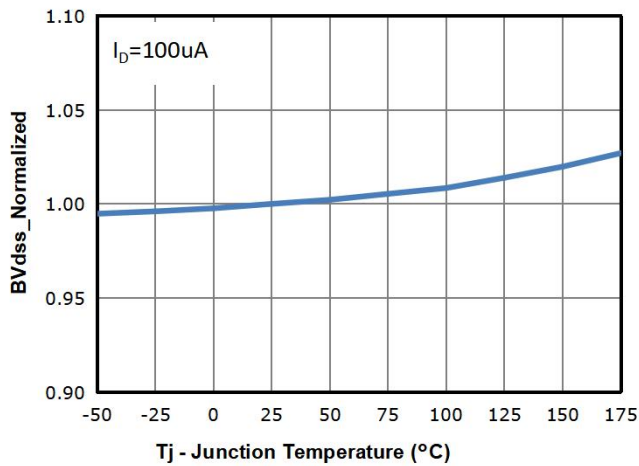


Fig 8: Capacitance Characteristics

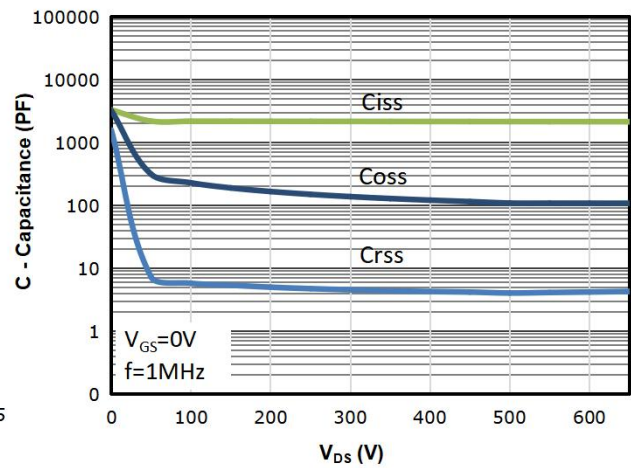


Fig 9: Gate Charge Characteristics

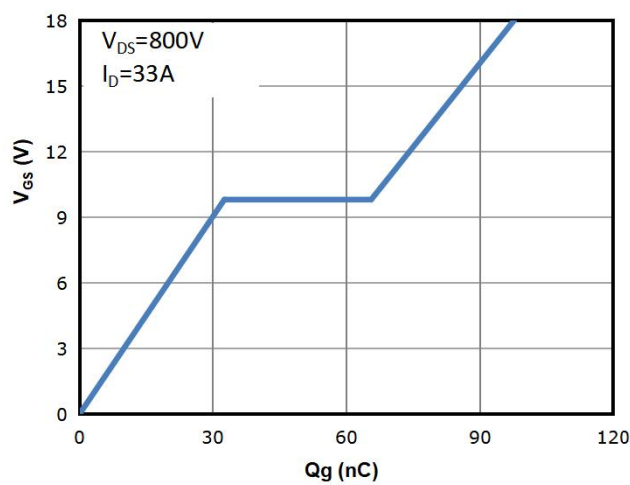


Fig 10: Body-diode Forward Characteristics

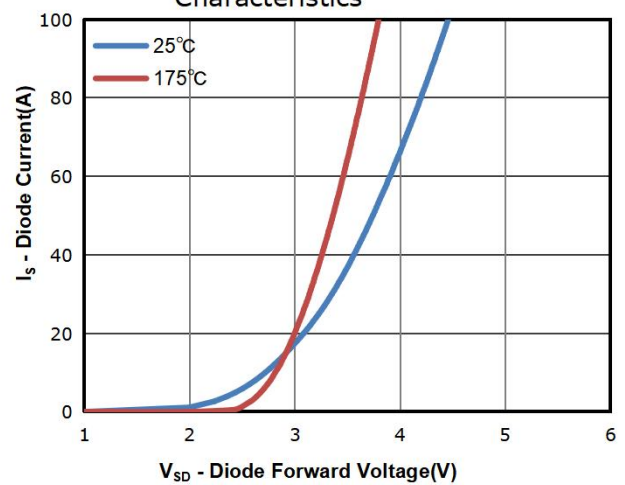


Fig 11: Power Dissipation

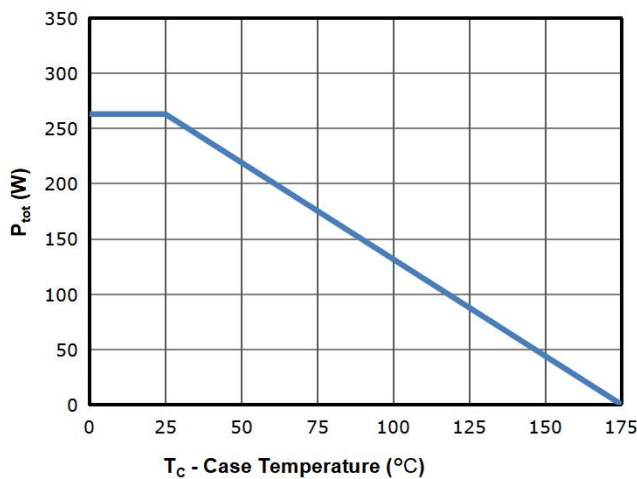


Fig 12: Drain Current Derating

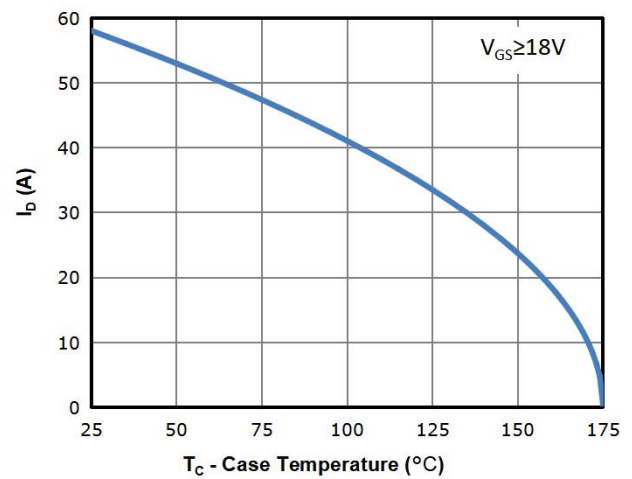


Fig 13: Safe Operating Area

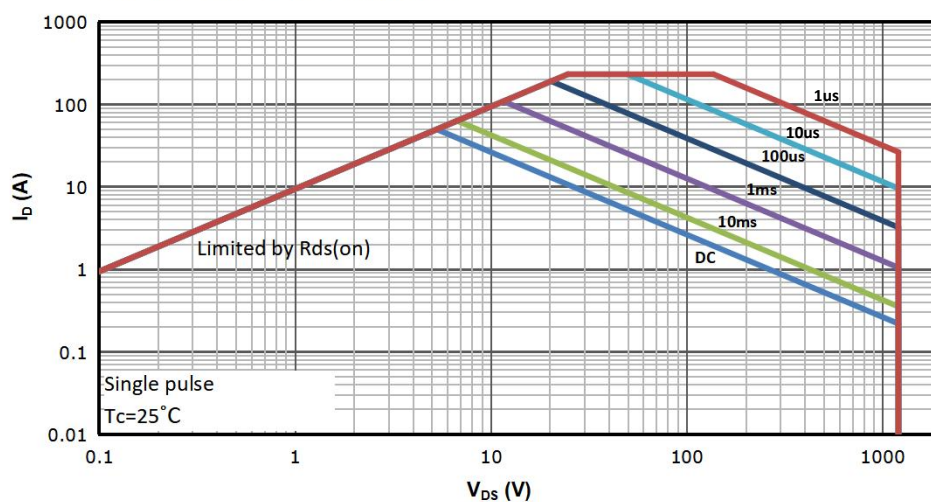
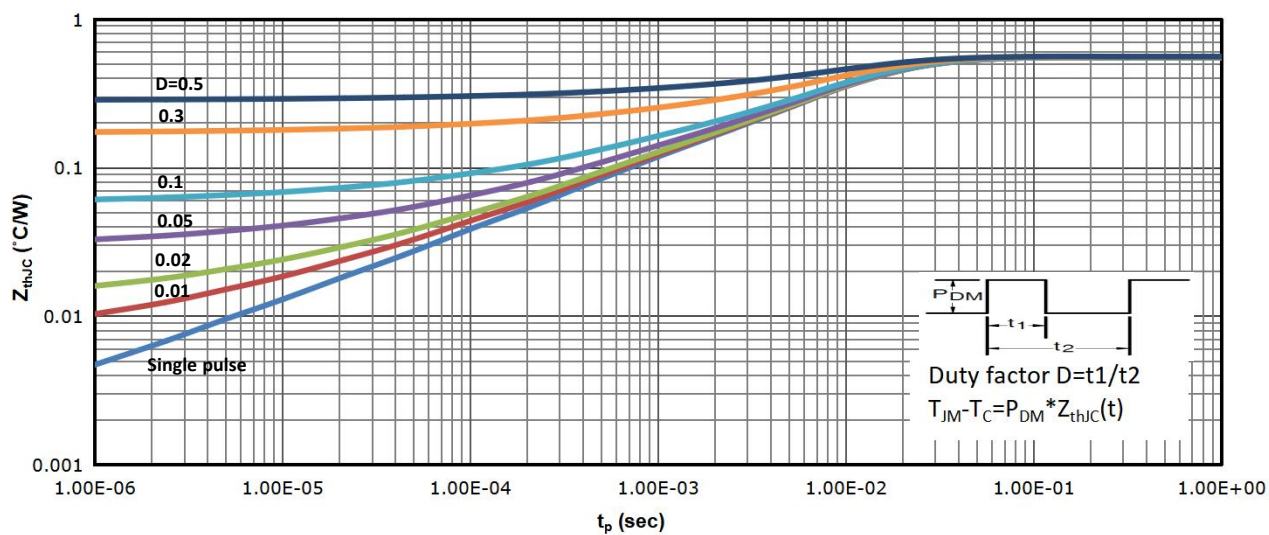
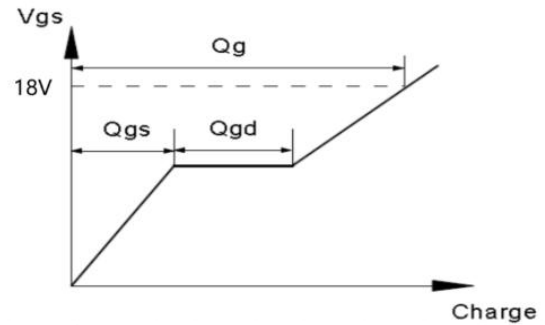
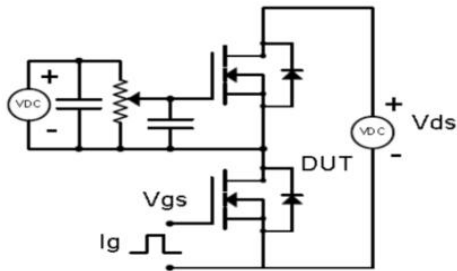


Fig 14: Max. Transient Thermal Impedance

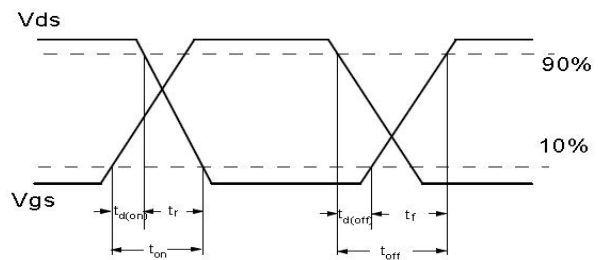
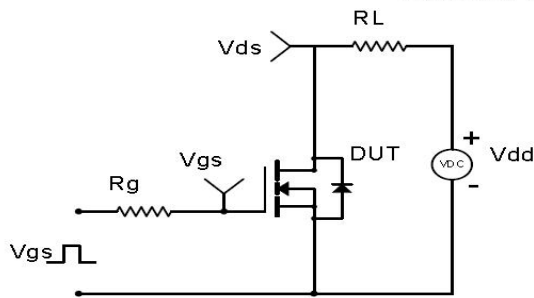


Test Circuit & Waveform

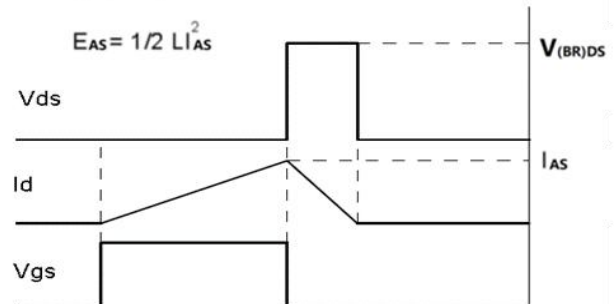
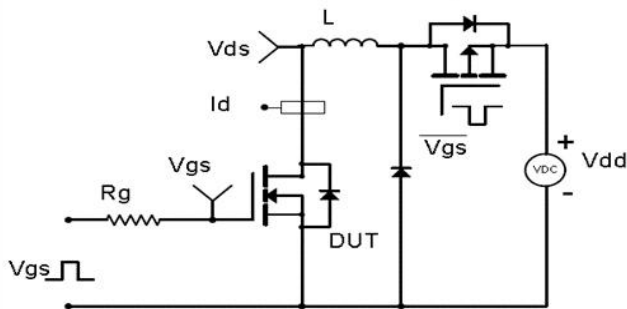
Gate Charge Test Circuit & Waveform



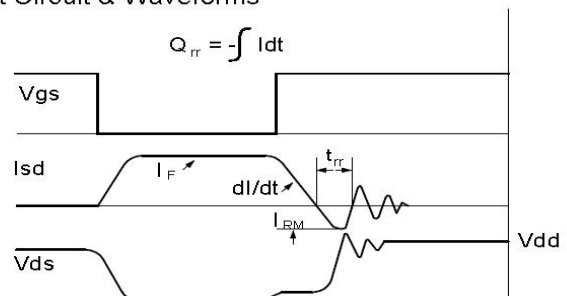
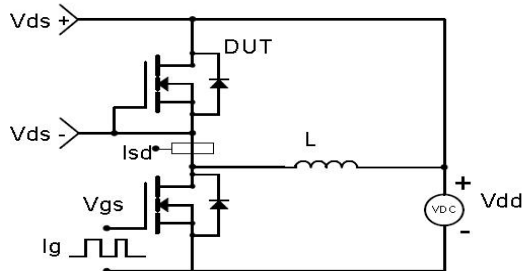
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



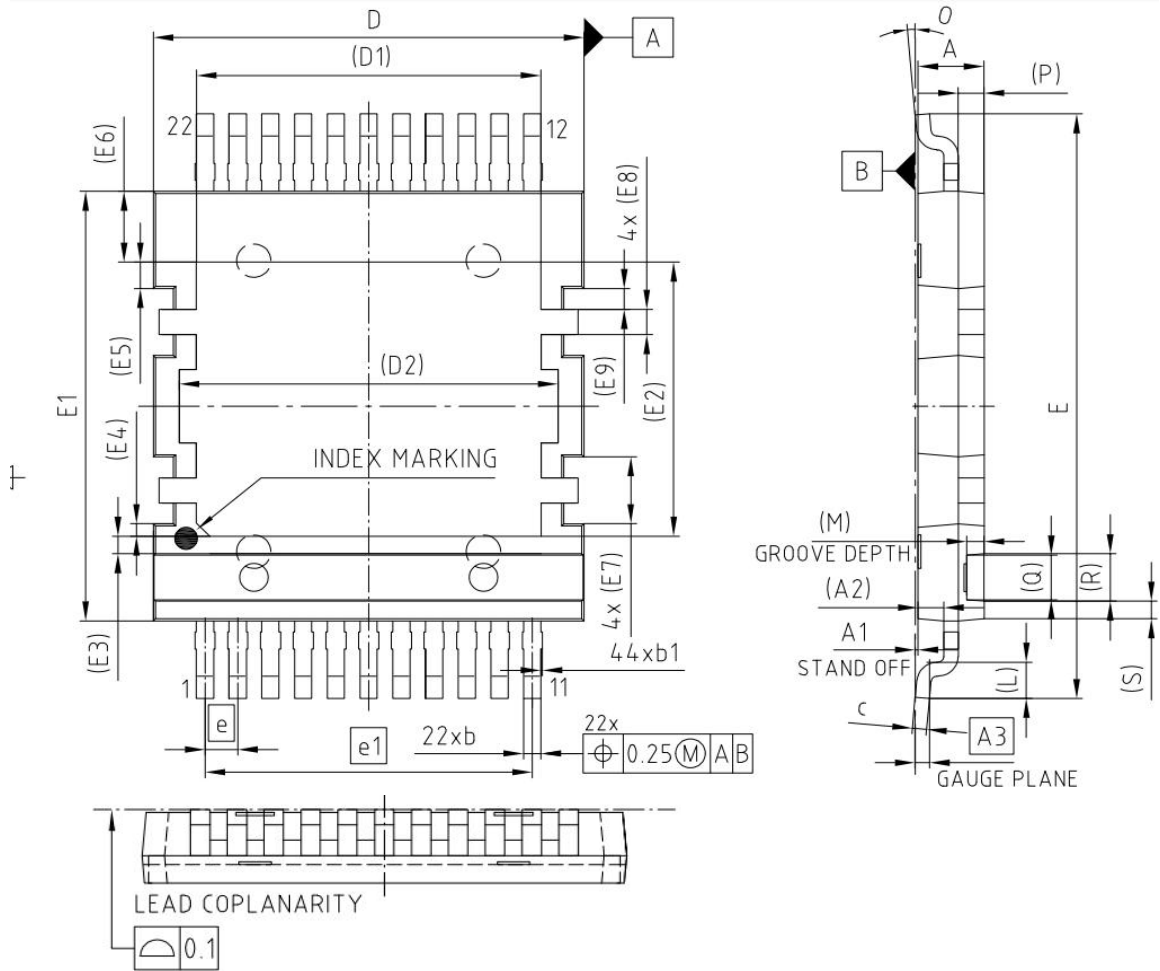
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Package Outline: QDPAK



			DIMENSIONS	MILLIMETERS	
				MIN.	MAX.
PACKAGE-GROUP PG-HDSOP-22-U03 NUMBER:			E3	0.625	
			E4	0.45	
DIMENSIONS	MILLIMETERS		E5	0.95	
	MIN.	MAX.	E6	2.53	
A	2.25	2.35	E7	2.40	
A1	0.00	0.15	E8	0.90	
A2	0.90		E9	0.75	
A3	0.90		e	1.14	
b	0.50	0.70	e1	11.40	
b1	---	0.15	L	1.30	
C	0.46	0.58	M	0.60	
D	14.90	15.10	N	22	
D1	12.00		O	0°	8°
D2	13.00		Q	0.90	
E	20.81	21.11		1.60	
E1	15.30	15.50	R	1.70	
E2	9.83		S	0.631	

Disclaimer

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