BCQ65N25W1

N-Channel Silicon Carbide Power MOSFET

650 V, 88 A, 25 mΩ

bestirpower

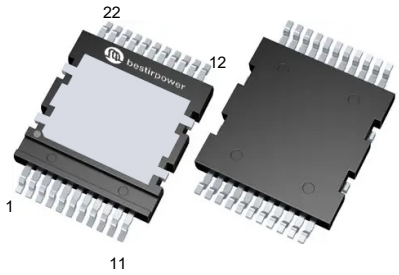
Features

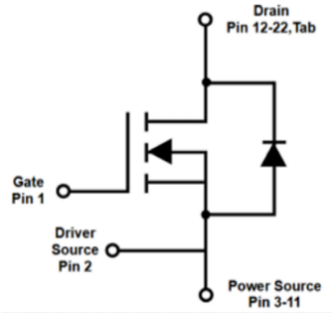
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness
- Halogen Free, RoHS Compliant

BV_{DSS}	$I_{D,\ Tc=25℃}$	$R_{DS(on),typ}$	$Q_{g,typ}$
650 V	88A	25 mΩ	124 nC

Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency





Applications

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- Battery Chargers
- Motor Drives
- Pulsed Power applications

Absolute Maximum Ratings (T_J = 25℃ unless otherwise noted)

Symbol	Parameter		Value	Unit
V_{DSS}	Drain to Source Voltage		650	V
V_{GS}	Gate to Source Voltage (DC)		-13 / +22	V
V_{GSop}	Recommended Operation Value		-5 / +18	V
I_D	Drain Current (1)	T_C = 25℃	88	A
		T_C = 110℃	58	
I_{DM}	Drain Current	Pulsed	370	A
P_D	Power Dissipation	(T_C = 25℃)	354	W
		Derate Above 25℃	2.36	W/℃
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to 175	℃

[1] ID is limited by package.

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.42	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	27.55	
Tsold	Soldering temperature, wave soldering only allowed at leads	260	℃

Electrical Characteristics (T_J = 25℃ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	V_{GS} = 0 V, I_D = 100 uA	650	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 650 V, V_{GS} = 0 V	-	2	100	μA
I_{GSS+}	Gate-Source Leakage Current	V_{GS} = +20 V, V_{DS} = 0 V	-	-	+200	nA
I_{GSS-}		V_{GS} = -10 V, V_{DS} = 0 V	-	-	-200	
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 10 mA	1.6	2.6	3.6	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 18 V, I_D = 20 A	-	25	30	mΩ
		V_{GS} = 18 V, I_D = 20 A, T_J = 175℃	-	45		
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 400 V, V_{GS} = 0V, f = 1 MHz	-	2900	-	pF
C_{oss}	Output Capacitance		-	185	-	
C_{rss}	Reverse Capacitance		-	10.1	-	
$Q_{g(tot)}$	Total Gate Charge	V_{DS} = 400 V, I_D = 20 A, V_{GS} = -5 V / 18 V, Inductive load	-	124	-	nC
Q_{gs}	Gate to Source Charge		-	30	-	
Q_{gd}	Gate to Drain “Miller” Charge		-	20	-	
R_G	Internal Gate Resistance	f = 1MHz	-	1.5	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DS} = 400 V, I_D = 20 A, V_{GS} = -5 V / 18 V, R_G = 5 Ω	-	20	-	ns
t_r	Turn-On Rise Time		-	45	-	
$t_{d(off)}$	Turn-Off Delay Time		-	18	-	
t_f	Turn-Off Fall Time		-	10	-	
E_{on}	Turn-on Switching Energy		-	170	-	uJ
E_{off}	Turn-off Switching Energy		-	90	-	
Source-Drain Diode Characteristics						
I_{SD}	Continuous Diode Forward Current(1)		-	-	88	A
V_{SD}	Diode Forward Voltage	V_{GS} = -5 V, I_{SD} = 15 A	-	3.2	-	V
t_{rr}	Reverse Recovery Time	V_{DD} = 400 V, I_{SD} = 15 A, dI_F/dt = 1200 A/μs	-	32	-	ns
Q_{rr}	Reverse Recovery Charge		-	123	-	nC
I_{rrm}	Peak Reverse Recovery Current		-	10	-	A

[1] ISD is limited by bonding wires.

Typical Performance Characteristics

Figure 1. On-Region Characteristics T_J = -55℃

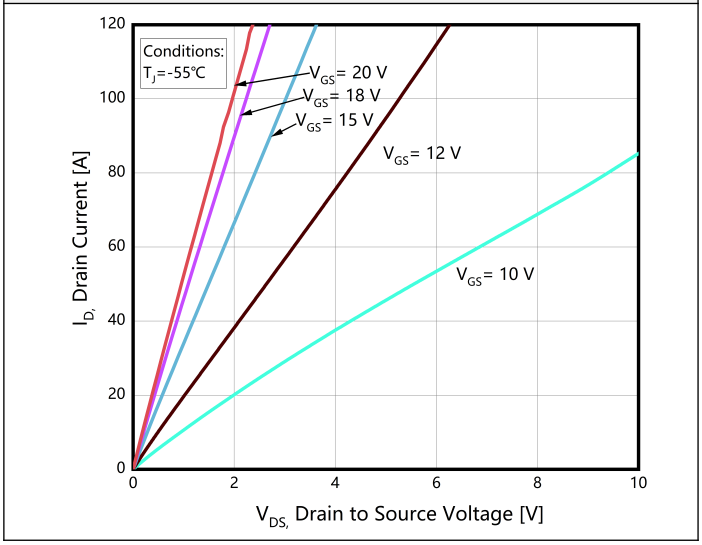


Figure 2. On-Region Characteristics T_J = 25℃

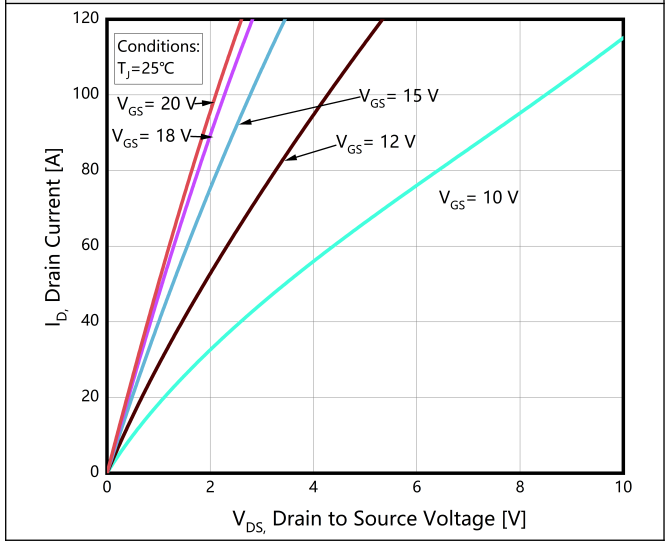


Figure 3. On-Region Characteristics T_J = 175℃

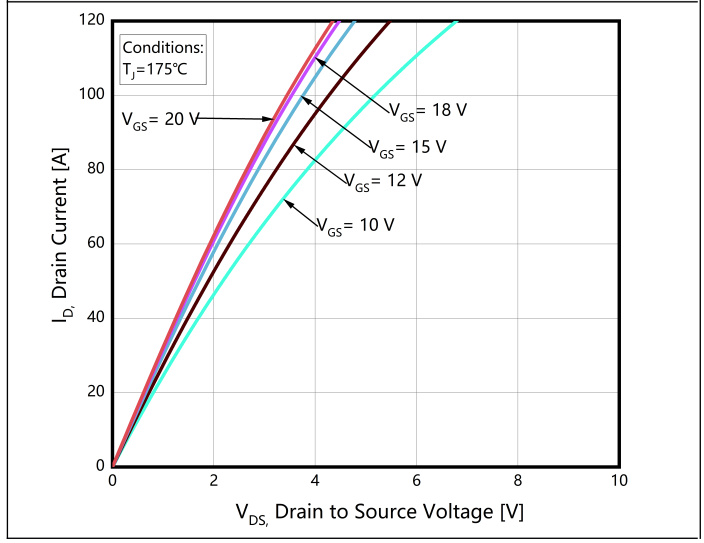


Figure 4. On-Resistance Characteristics vs. Temperature

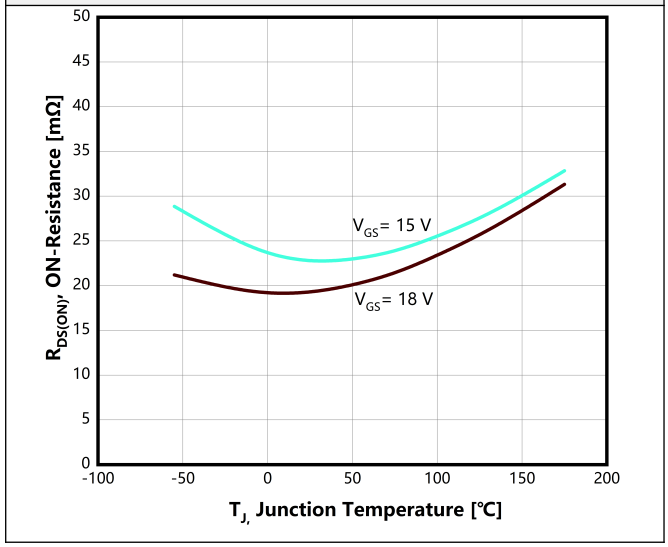


Figure 5. Transfer Characteristics

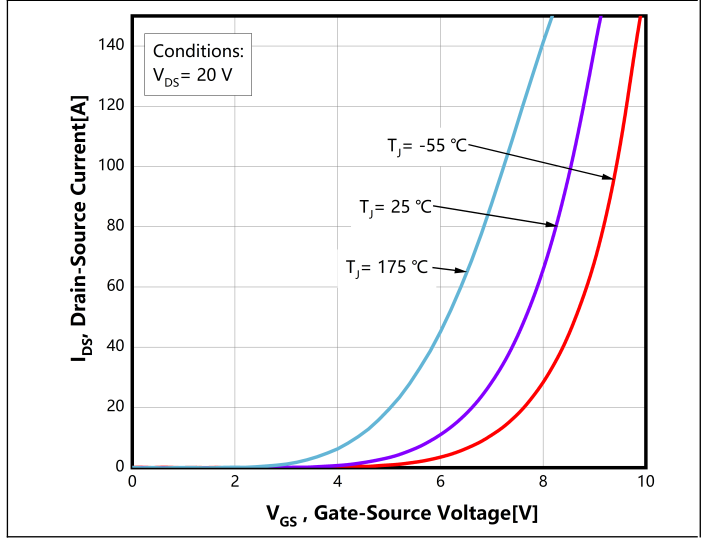
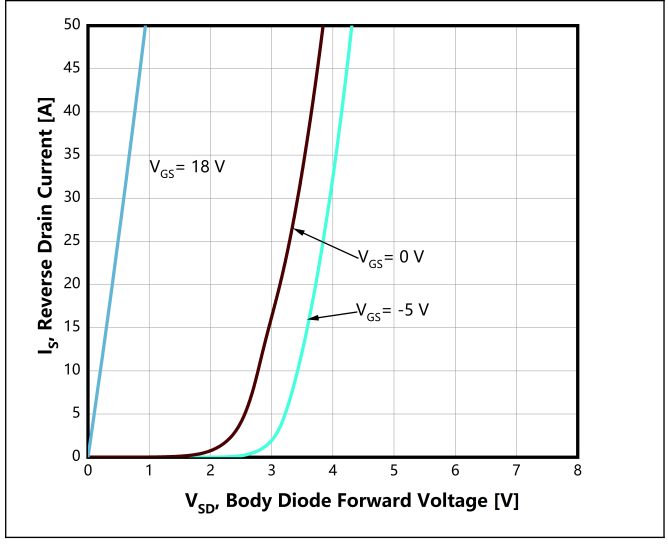


Figure 6. Diode Forward Voltage Characteristics vs. Source-Drain Current T_J = -55℃



Typical Performance Characteristics

Figure 7. Diode Forward Voltage Characteristics vs. Source-Drain Current T_J = 25℃

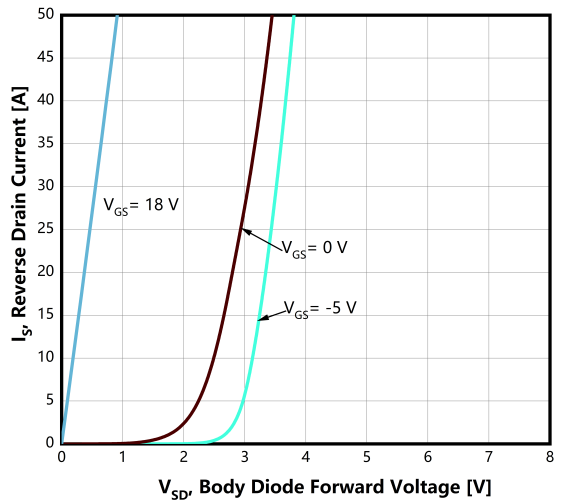


Figure 8. Diode Forward Voltage Characteristics vs. Source-Drain Current T_J = 175℃

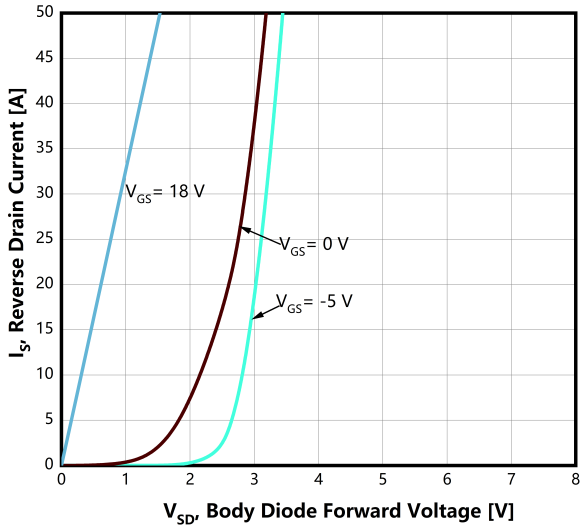


Figure 9. Threshold Voltage vs. Temperature

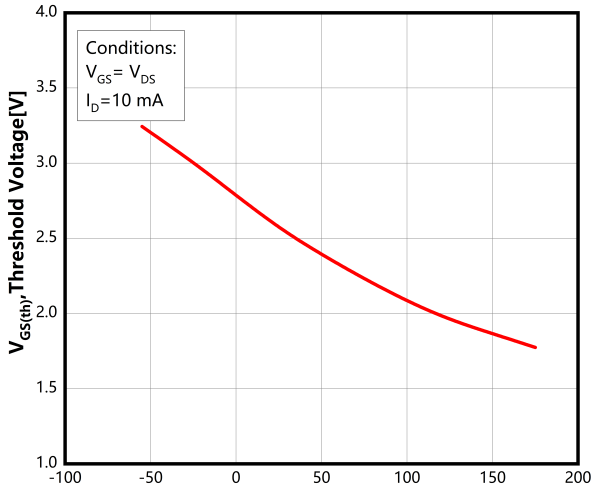


Figure 10. Gate Charge Characteristics

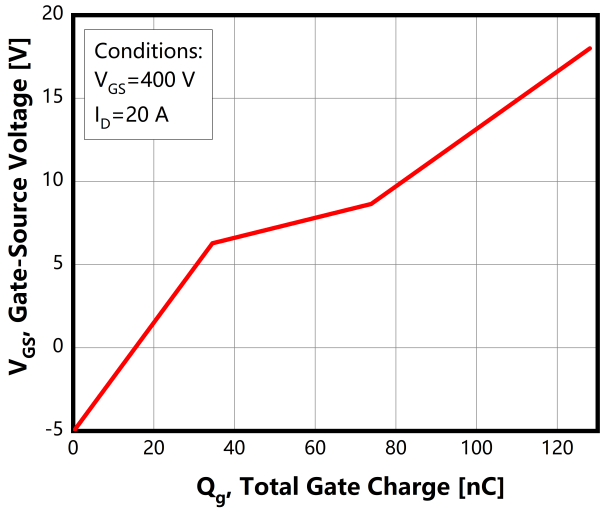


Figure 11. Stored Energy in Output Capacitance

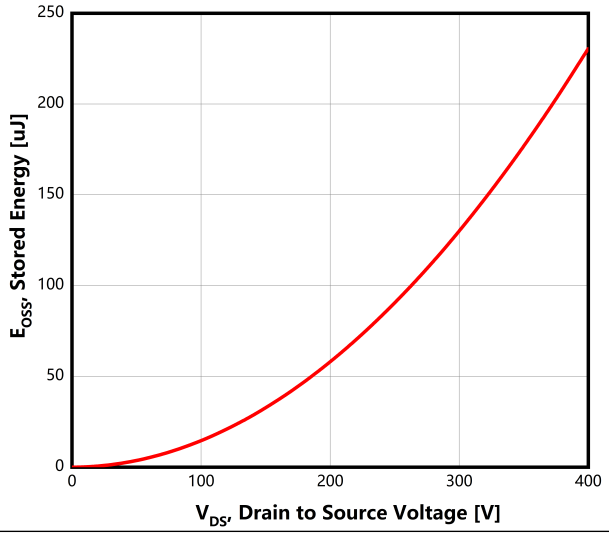
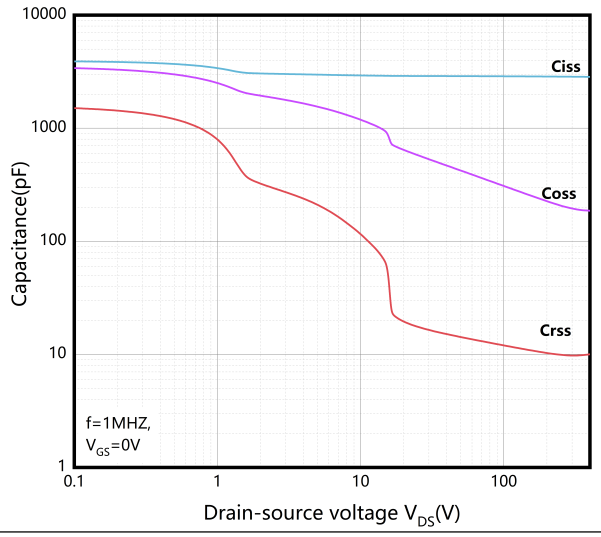


Figure 12. Capacitance Characteristics



Typical Performance Characteristics

Figure 13. Maximum Power Dissipation Derating vs. Case Temperature

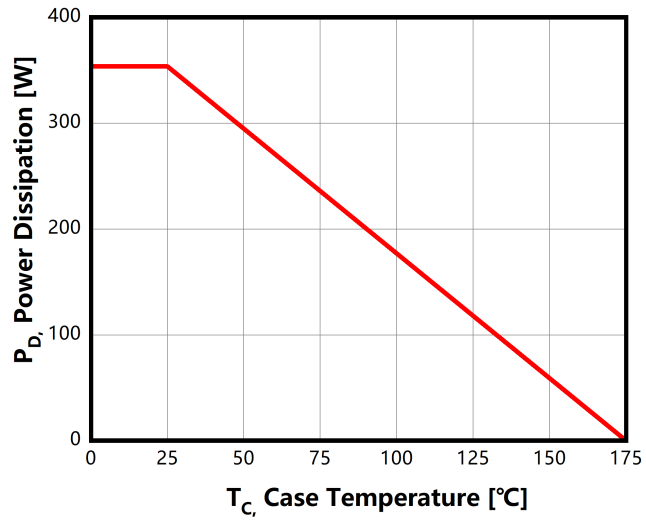


Figure 14. Maximum Safe Operating Area

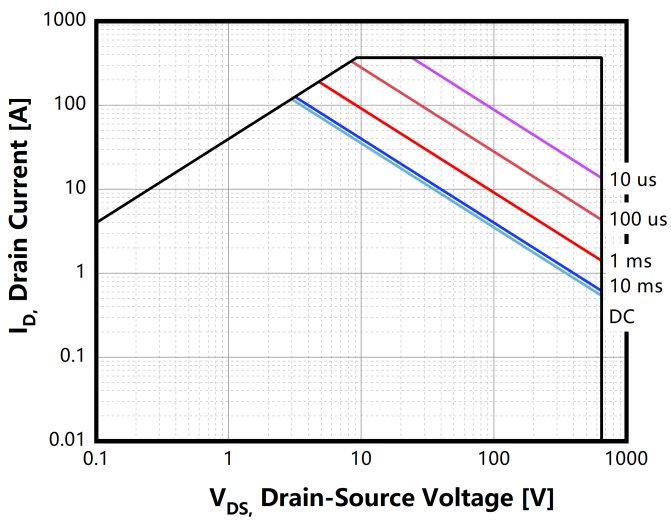
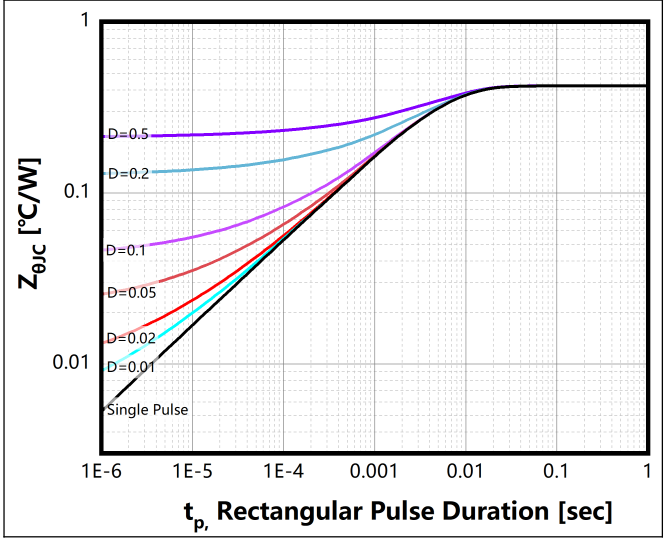


Figure 15. Transient Thermal Response Curve



Typical Performance Characteristics

Figure 16. Inductive Load Switching Test Circuit and Waveforms

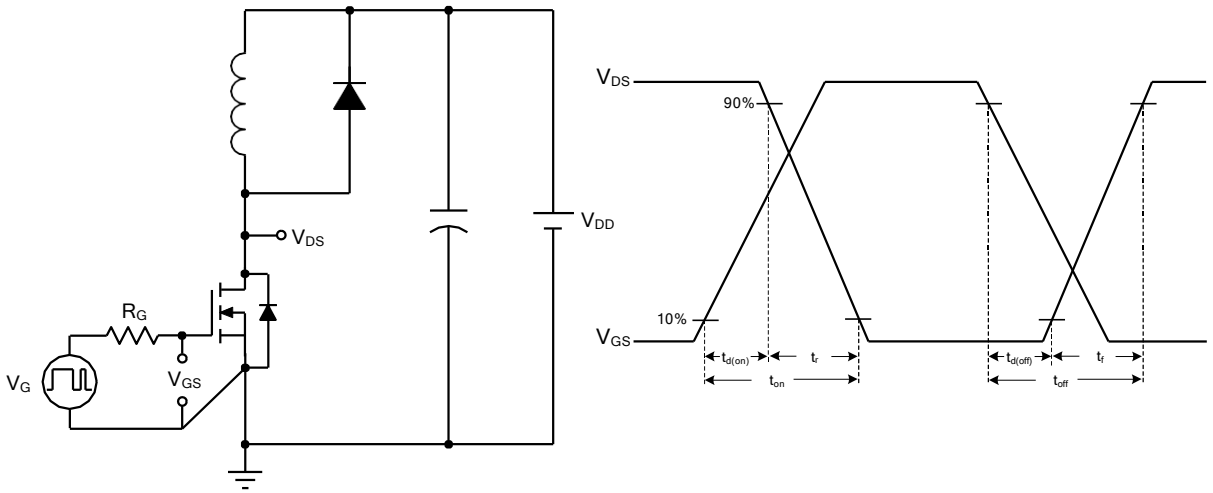
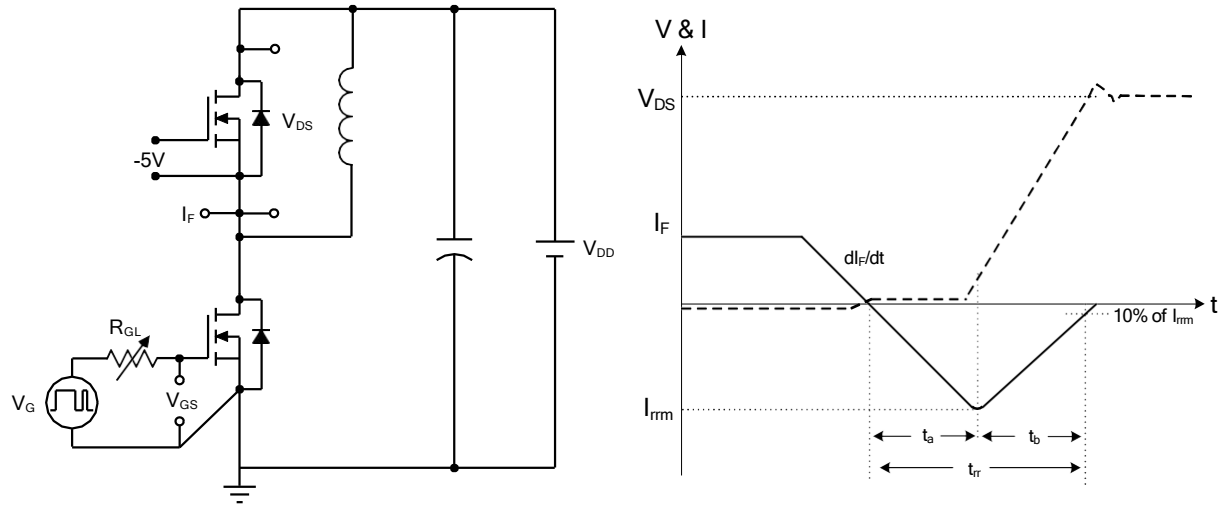
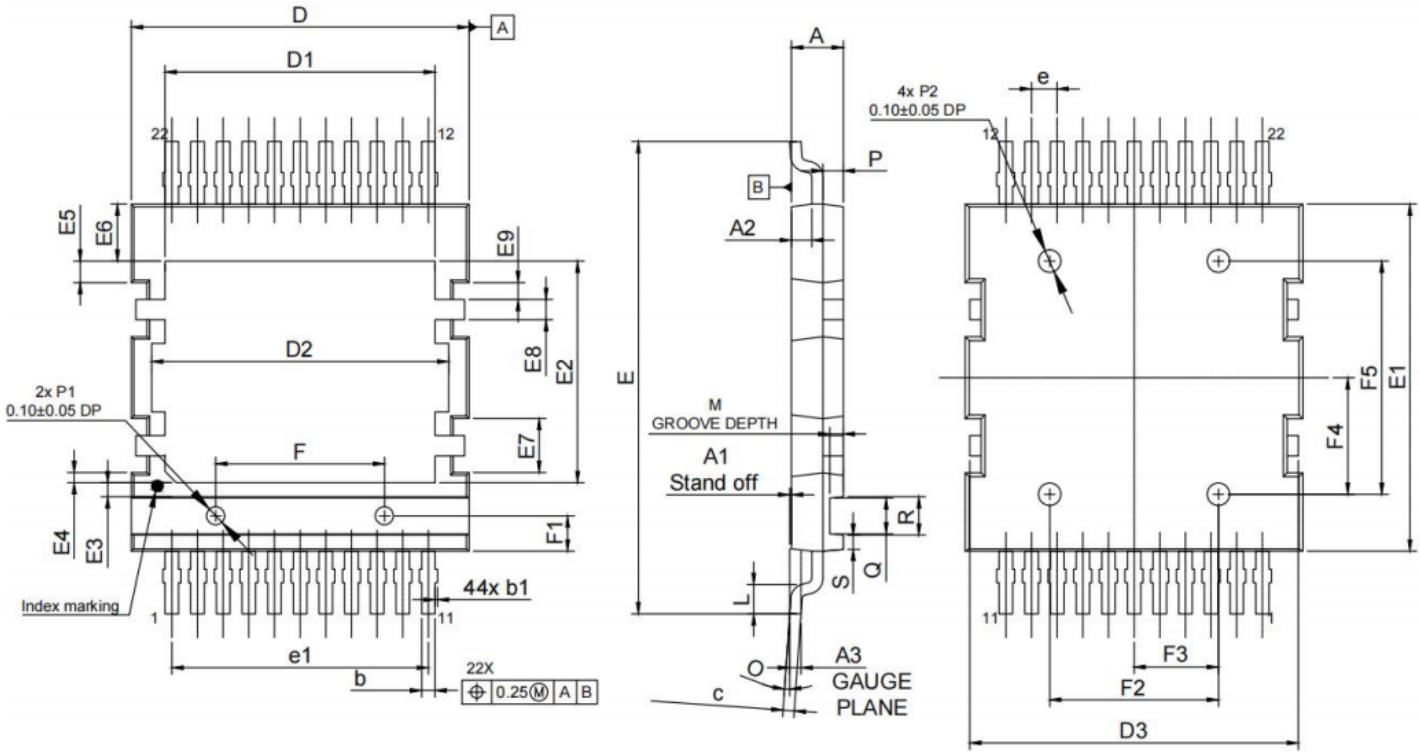


Figure 17. Peak Diode Recovery dv/dt Test Circuit and Waveforms



Package Outlines

QDPAK



SYMBOL	MIN	MAX	SYMBOL	MIN	MAX
A	2.25	2.35	E9	0.75	
A1	0.00	0.15	e	1.14	
A2	0.90		e1	11.4	
A3	0.50		F	7.40	7.60
b	0.50	0.70	F1	1.47	1.67
b1	-	0.15	F2	7.40	7.60
c	0.46	0.58	F3	3.65	3.85
D	14.90	15.10	F4	5.07	5.27
D1	12.00		F5	10.24	10.44
D2	13.20		L	1.30	
D3	14.50	14.70	M	0.60	
E	20.81	21.11	N	22	
E1	15.30	15.50	O	0°	8°
E2	9.83		P	0.90	
E3	0.625		P1	0.70	0.90
E4	0.45		P2	0.90	1.10
E5	0.95		Q	1.60	
E6	2.53		R	1.70	
E7	2.40		S	0.631	
E8	0.90				

* Dimensions in millimeters

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BCQ65N25W1	BCQ65N25W1	QDPAK	Tape & Reel	750 units

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