

Description

JMT N And P-Channel Enhancement Mode MOSFET

Features

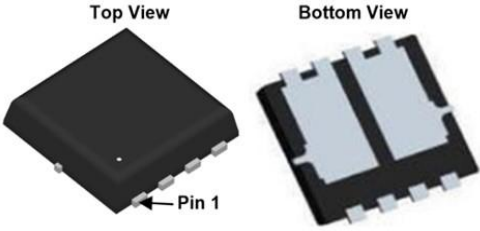
- N-Channel: 40V, 14A
 $R_{DS(ON)} < 22m\Omega @ V_{GS} = -10V$
 $R_{DS(ON)} < 28m\Omega @ V_{GS} = -4.5V$
- P-Channel: -40V, -14A
 $R_{DS(ON)} < 50m\Omega @ V_{GS} = -10V$
 $R_{DS(ON)} < 70m\Omega @ V_{GS} = -4.5V$
- Excellent Gate Charge x $R_{DS(ON)}$ Product(FOM)
- Very Low On-resistance $R_{DS(ON)}$
- Fast Switching Speed

Application

- Battery Protection
- Load Switch
- Power Management

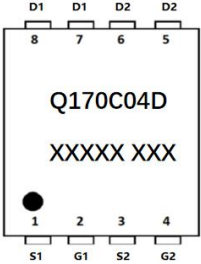


100% UIS TESTED!
100% ΔV_{ds} TESTED!



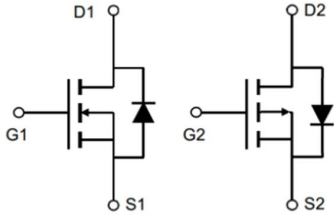
Top View Bottom View

PDFN3x3-8L-D



Q170C04D
XXXXX XXX

Marking and pin Assignment



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	OUTLINE	Device Package	Reel Size	Reel (PCS)	Per Carton (PCS)
Q170C04D	JMTQ170C04D	TAPING	PDFN3x3-8L-D	13inch	5000	50000

Absolute Maximum Ratings ($T_C=25^\circ C$ unless otherwise specified)

Symbol	Parameter	Max. N-Channel	Max. P-Channel	Units
V_{DSS}	Drain-Source Voltage	40	-40	V
V_{GSS}	Gate-Source Voltage	± 20	± 20	V
I_D	Continuous Drain Current	$T_C = 25^\circ C$	-14	A
		$T_C = 100^\circ C$	-9	A
I_{DM}	Pulsed Drain Current ^{note1}	56	-56	A
E_{AS}	Single Pulsed Avalanche Energy ^{note2}	16	25	mJ
P_D	Power Dissipation	$T_C = 25^\circ C$	17	W
$R_{\theta JC}$	Thermal Resistance, Junction to Case	17	7.3	$^\circ C/W$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150		$^\circ C$



N-Channel Electrical Characteristics (T_J=25°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
V _{(BR)DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	40	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =40V, V _{GS} =0V	-	-	1.0	μA
I _{GSS}	Gate to Body Leakage Current	V _{DS} =0V, V _{GS} =±20V	-	-	±100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1.0	1.5	2.5	V
R _{DS(on)}	Static Drain-Source on-Resistance <small>note3</small>	V _{GS} =10V, I _D =14A	-	16	22	mΩ
		V _{GS} =4.5V, I _D =10A	-	20	28	mΩ
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =20V, V _{GS} =0V, f=1.0MHz	-	980	-	pF
C _{oss}	Output Capacitance		-	86.2	-	pF
C _{rss}	Reverse Transfer Capacitance		-	68.5	-	pF
Q _g	Total Gate Charge	V _{DS} =20V, I _D =8A, V _{GS} =10V	-	11	-	nC
Q _{gs}	Gate-Source Charge		-	1.9	-	nC
Q _{gd}	Gate-Drain("Miller") Charge		-	2.2	-	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DS} =20V, I _D =14A, R _L =2.5Ω, R _{REN} =3Ω	-	11	-	ns
t _r	Turn-on Rise Time		-	13	-	ns
t _{d(off)}	Turn-off Delay Time		-	36	-	ns
t _f	Turn-off Fall Time		-	9	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	14	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	56	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} =0V, I _S =14A	-	-	1.2	V
t _{rr}	Body Diode Reverse Recovery Time	T _J =25°C,	-	19	-	ns
Q _{rr}	Body Diode Reverse Recovery	I _F =14A, di/dt=100A/μs	-	11	-	nC

Notes: 1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. EAS condition : T_J=25°C, V_{DD}=20V, V_{GS}=10V, L=0.5mH, R_g=25Ω, I_{AS}=8A

T_J=25°C, V_{DD}=-20V, V_{GS}=-10V, L=0.5mH, R_g=25Ω, I_{AS}=-10A

3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%



P-Channel Electrical Characteristics (T_J=25°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
V _{(BR)DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D = -250μA	-40	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = -40V, V _{GS} =0V	-	-	-1	μA
I _{GSS}	Gate to Body Leakage Current	V _{DS} =0V, V _{GS} = ±20V	-	-	±100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D = -250μA	-1.0	-1.6	-2.5	V
R _{DS(on)}	Static Drain-Source on-Resistance <small>note3</small>	V _{GS} = -10V, I _D = -5A	-	38	50	mΩ
		V _{GS} = -4.5V, I _D = -3A	-	50	70	
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = -20V, V _{GS} =0V, f=1.0MHz	-	1034	-	pF
C _{oss}	Output Capacitance		-	107	-	pF
C _{rss}	Reverse Transfer Capacitance		-	79.5	-	pF
Q _g	Total Gate Charge	V _{DS} = -20V, I _D = -8A, V _{GS} = -10V	-	20	-	nC
Q _{gs}	Gate-Source Charge		-	3.5	-	nC
Q _{gd}	Gate-Drain("Miller") Charge		-	4.2	-	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DD} = -20V, I _D = -14A, V _{GS} = -10V, R _{GEN} =2.5Ω	-	8	-	ns
t _r	Turn-on Rise Time		-	15	-	ns
t _{d(off)}	Turn-off Delay Time		-	23	-	ns
t _f	Turn-off Fall Time		-	9	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	-14	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-56	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} =0V, I _S = -14A	-	-	-1.2	V
trr	Reverse Recovery Time	V _{GS} =0V, I _S =-14A, di/dt=100A/μs	-	29	-	ns
Qrr	Reverse Recovery Charge		-	20	-	nC



Typical Performance Characteristics-N

Figure 1: Output Characteristics

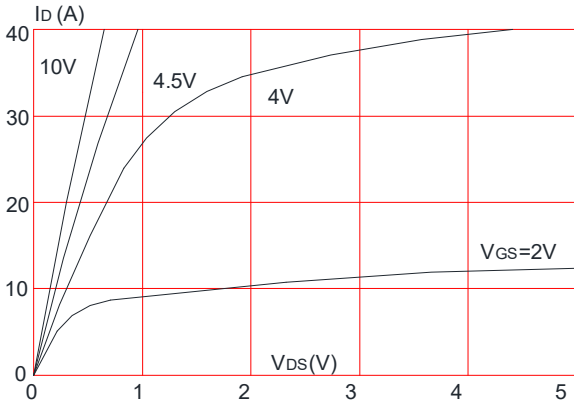


Figure 2: Typical Transfer Characteristics

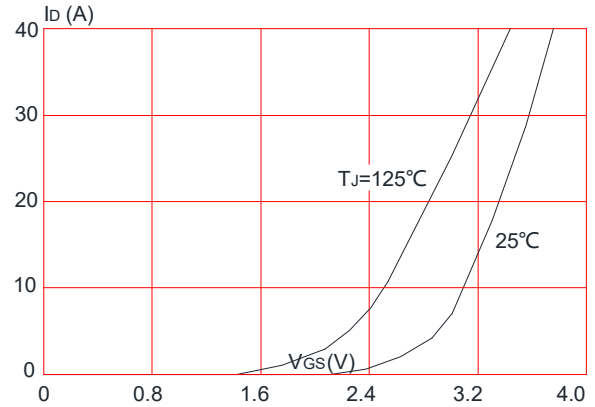


Figure 3: On-resistance vs. Drain Current

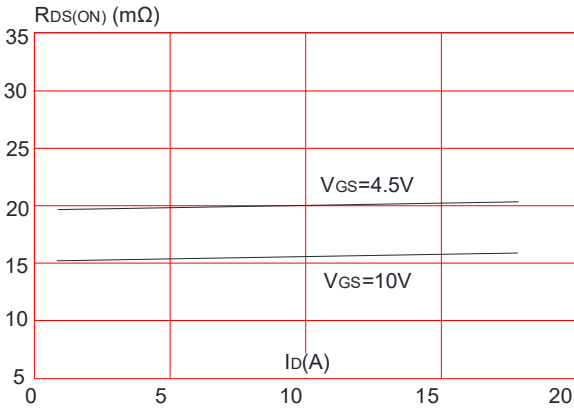


Figure 4: Body Diode Characteristics

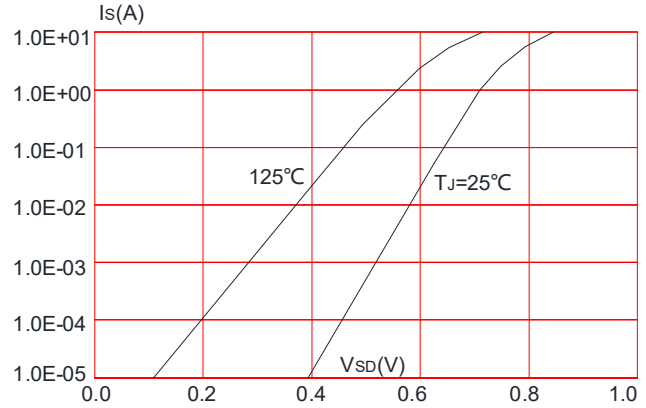


Figure 5: Gate Charge Characteristics

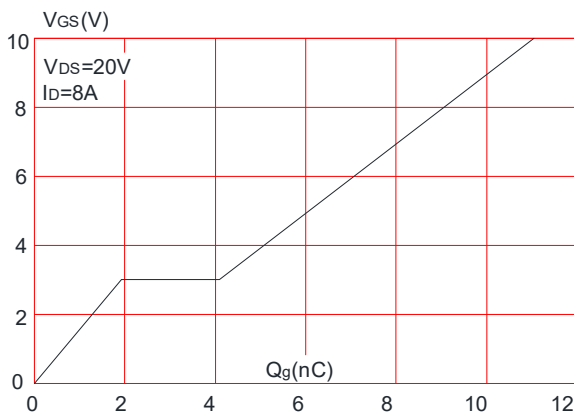


Figure 6: Capacitance Characteristics

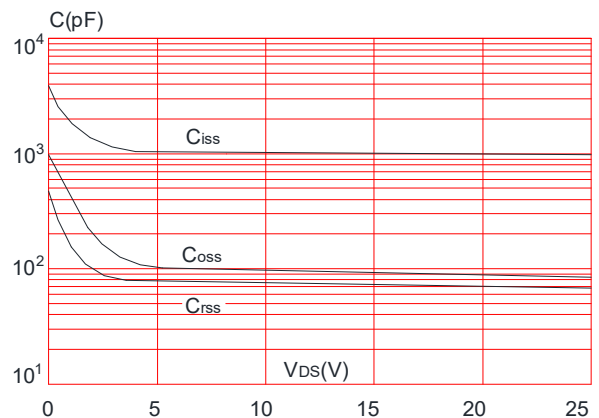




Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

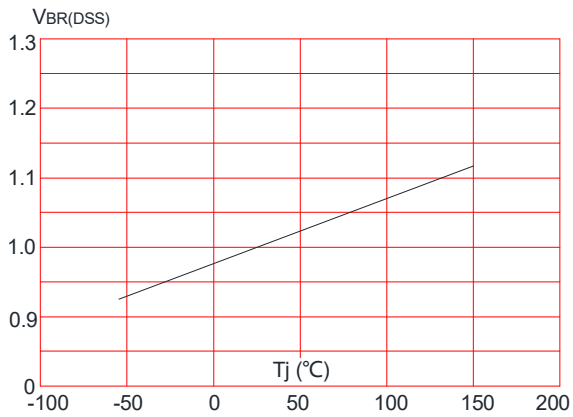


Figure 8: Normalized on Resistance vs. Junction Temperature

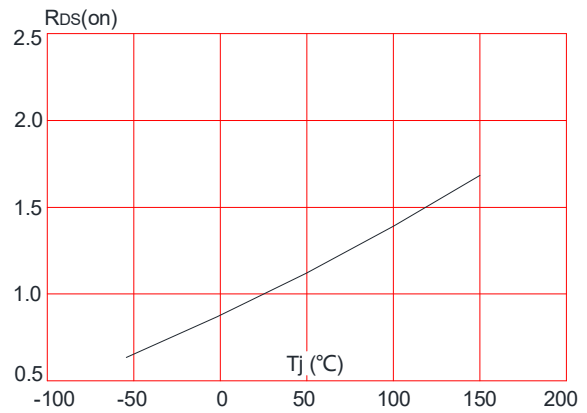


Figure 9: Maximum Safe Operating Area

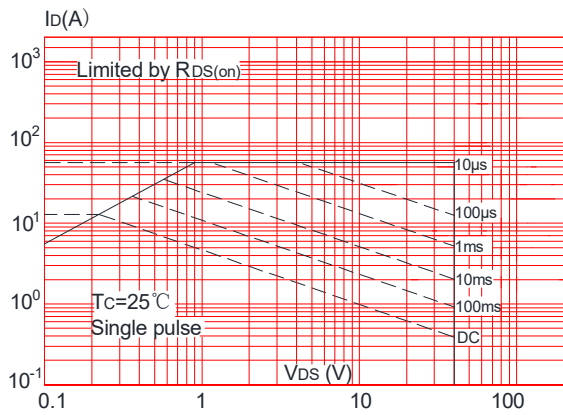


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

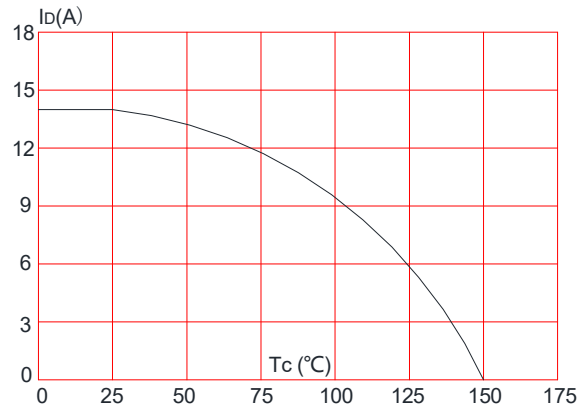
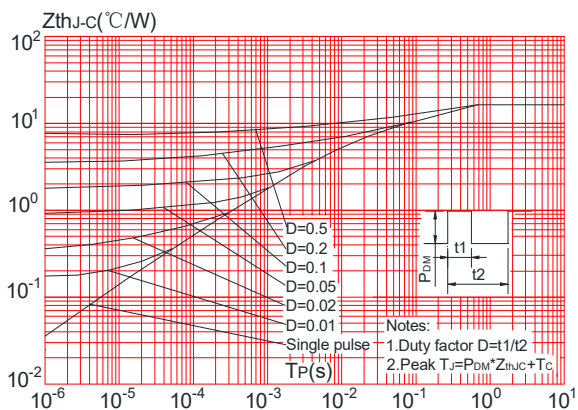


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



Test Circuit-N

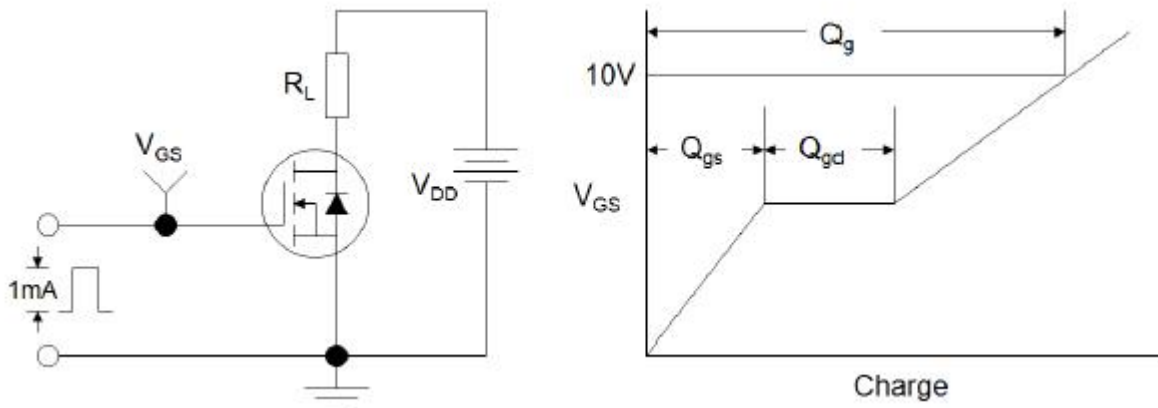


Figure1:Gate Charge Test Circuit & Waveform

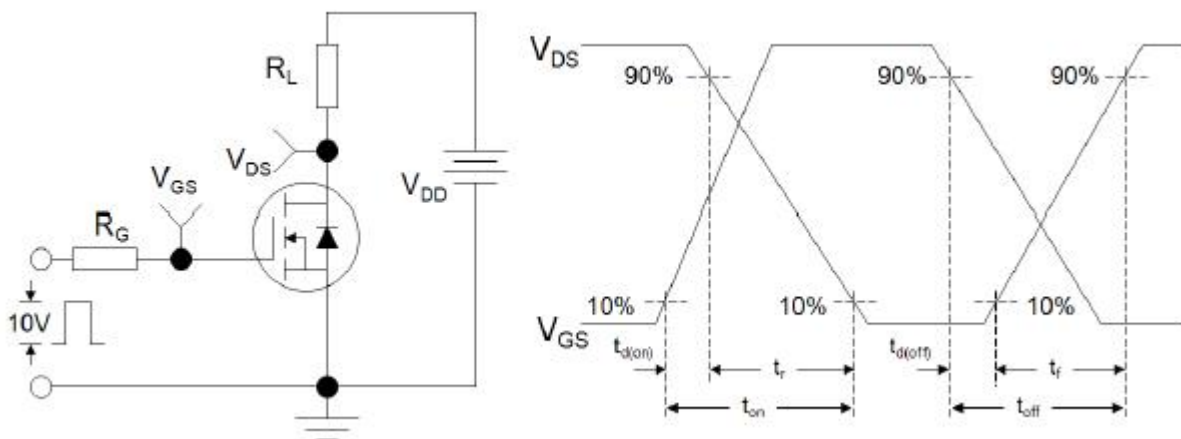


Figure 2: Resistive Switching Test Circuit & Waveforms

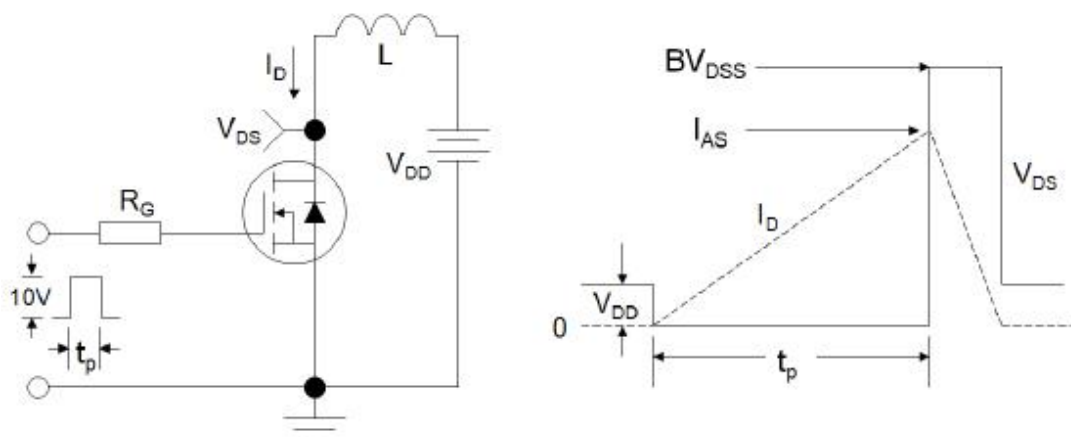


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms



Typical Performance Characteristics-P

Figure 1: Output Characteristics

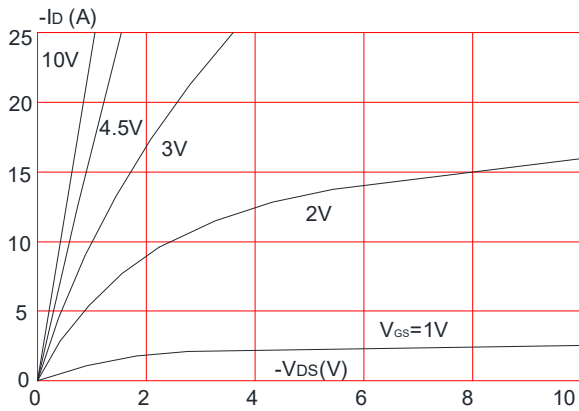


Figure 2: Typical Transfer Characteristics

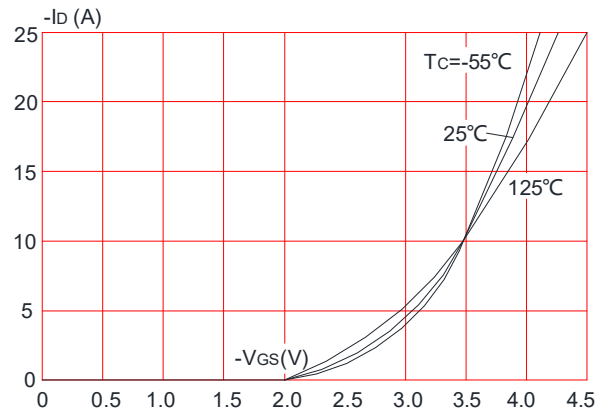


Figure 3: On-resistance vs. Drain Current

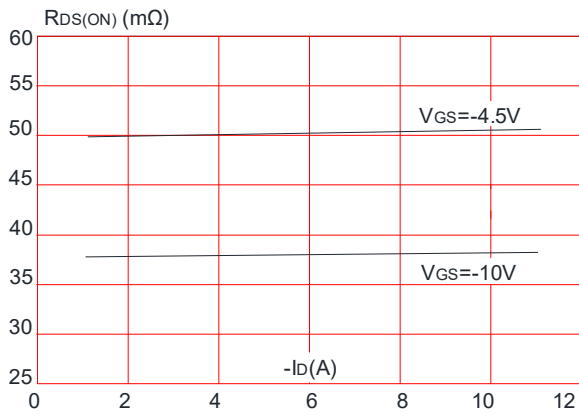


Figure 4: Body Diode Characteristics

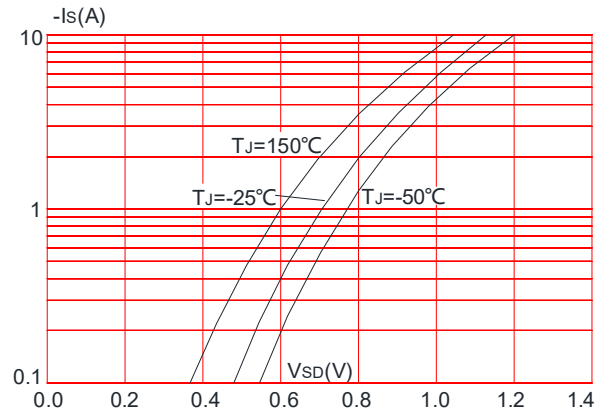


Figure 5: Gate Charge Characteristics

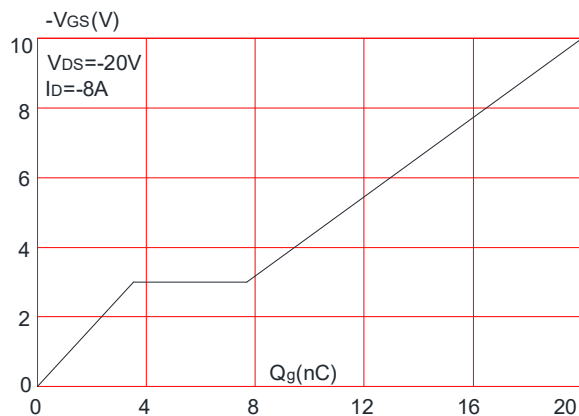


Figure 6: Capacitance Characteristics

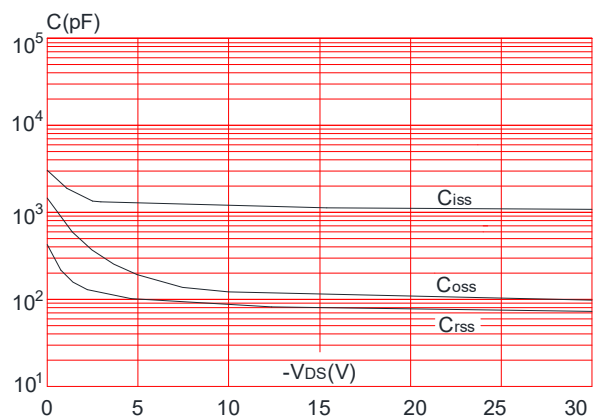




Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

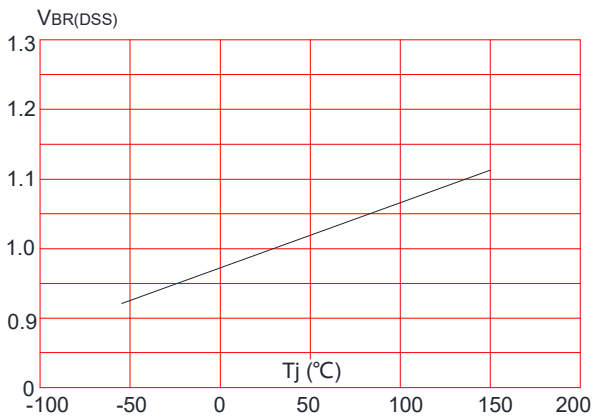


Figure 8: Normalized on Resistance vs. Junction Temperature

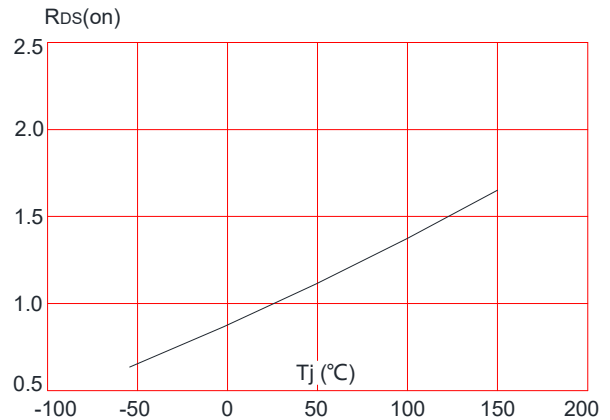


Figure 9: Maximum Safe Operating Area

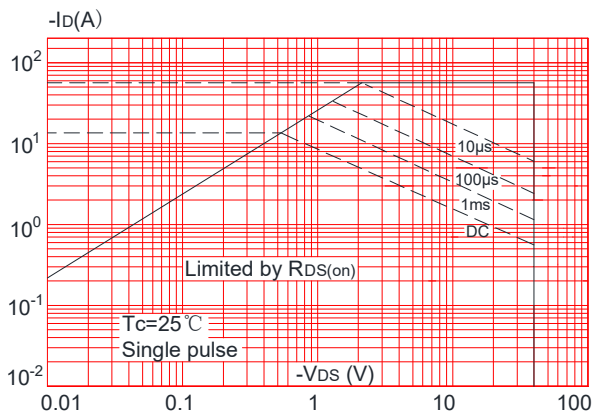


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

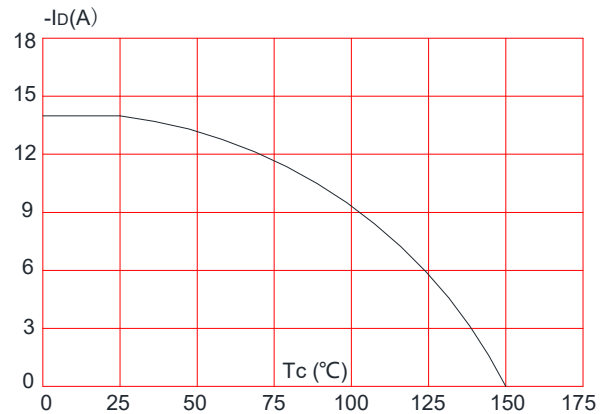
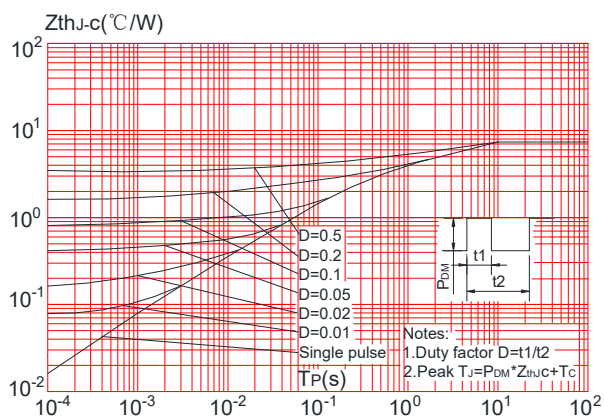
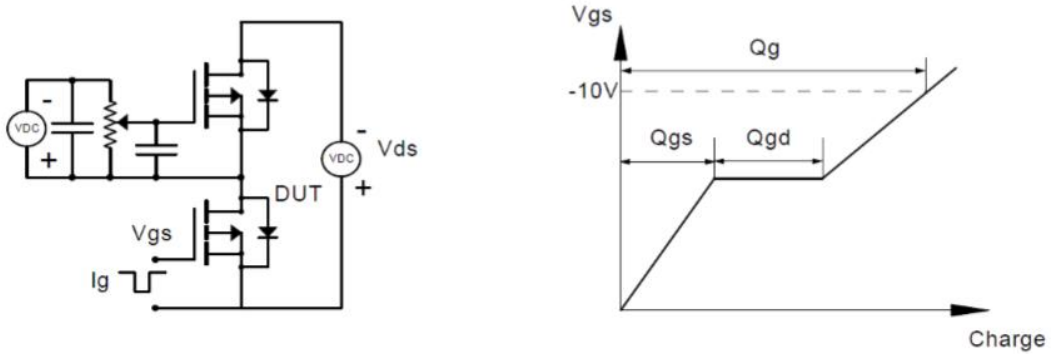


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case

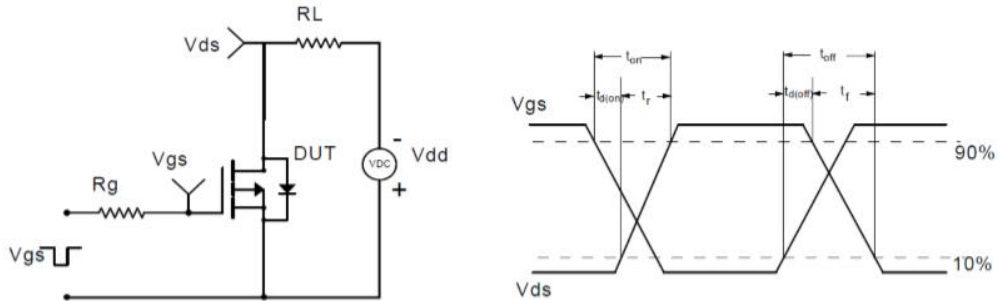


Test Circuit-P

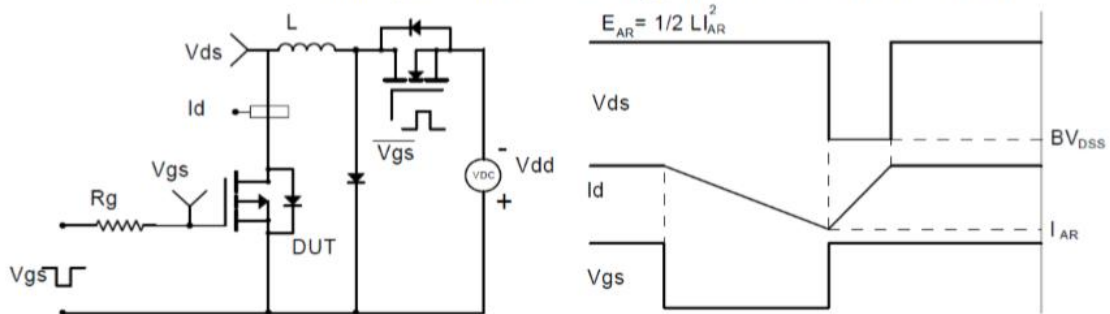
Gate Charge Test Circuit & Waveform



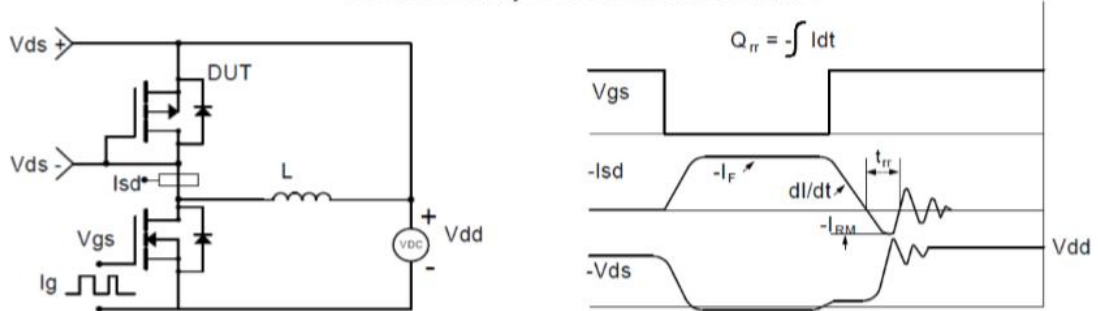
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

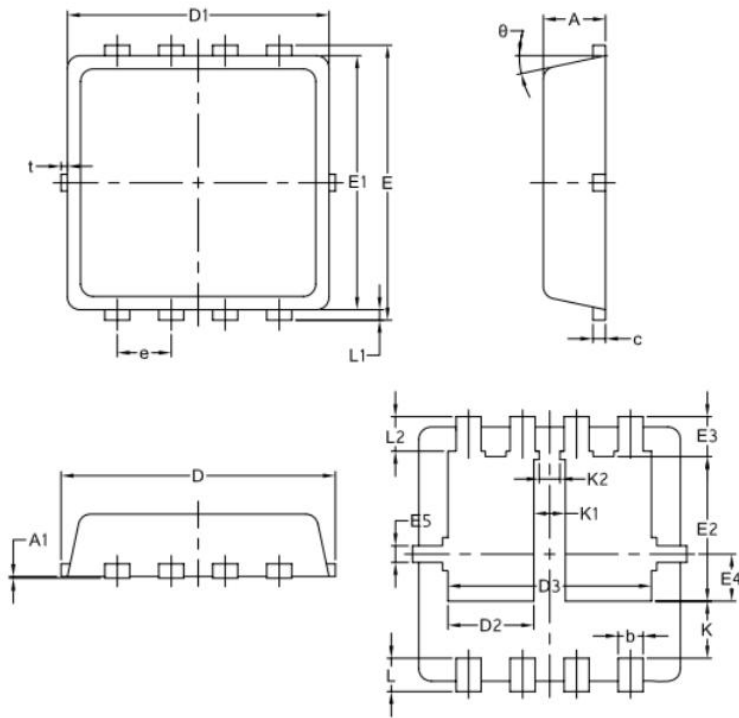


Diode Recovery Test Circuit & Waveforms



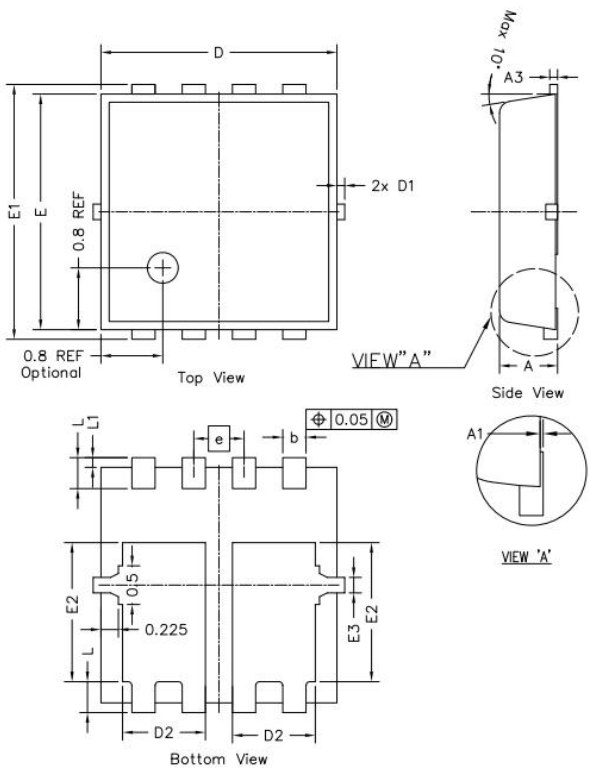


Package Mechanical Data-PDFN3x3-8L-D-Type A



SYMBOL	COMMON		
	MM		
	MIN	NOM	MAX
A	0.70	0.75	0.85
A1	/	/	0.05
b	0.25	0.30	0.39
c	0.14	0.152	0.20
D	3.20	3.30	3.45
D1	3.05	3.15	3.25
D2	0.84	1.04	1.24
D3	2.30	2.45	2.60
E	3.20	3.30	3.40
E1	2.95	3.05	3.15
E2	1.60	1.74	1.90
E3	0.28	0.48	0.65
E4	0.37	0.57	0.77
E5	0.10	0.20	0.30
e	0.60	0.65	0.70
K	0.50	0.69	0.80
K1	0.30	0.38	0.53
K2	0.15	0.25	0.35
L	0.30	0.40	0.50
L1	0.06	0.125	0.20
L2	0.27	0.42	0.57
t	0	0.075	0.13
θ	10°	12°	14°

Package Mechanical Data-PDFN3x3-8L-D-Type B




SYMBOLS	DIMENSION IN MM			DIMENSION IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.700	0.750	0.800	0.028	0.030	0.031
A1	---	---	0.050	----	----	0.002
A3	0.144	0.152	0.202	0.006	0.006	0.008
b	0.250	0.300	0.350	0.010	0.012	0.014
e	0.65 BSC			0.026 BSC		
D	2.950	3.050	3.150	0.116	0.120	0.124
E	2.950	3.050	3.150	0.116	0.120	0.124
D1	---	---	0.125	----	----	0.005
E1	3.200	3.300	3.400	0.126	0.130	0.134
D2	0.970	1.070	1.170	0.038	0.042	0.046
E2	1.700	1.800	1.900	0.067	0.071	0.075
E3	0.150	0.200	0.250	0.006	0.008	0.010
L	0.300	0.400	0.500	0.012	0.016	0.020
L1	0.075	0.125	0.175	0.003	0.005	0.007



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