



Complementary Enhancement Mode MOSFET

1. Product Information

1.1 Features

- ☒ Surface-mounted package
- ☒ Advanced trench cell design

1.2 Applications

- ☒ MB and NB
- ☒ Half – bridge Drivers
- ☒ Motor drivers

1.3 Quick reference

N-channel

- ☒ $BV \leq 30\text{ V}$
- ☒ $P_{\text{tot}} \leq 20.8\text{ W}$
- ☒ $I_D \leq 20\text{ A}$
- ☒ $R_{\text{DS(ON)}} \leq 14.5\text{ m}\Omega @ V_{\text{GS}} = 10\text{ V}$
- $R_{\text{DS(ON)}} \leq 22\text{ m}\Omega @ V_{\text{GS}} = 4.5\text{ V}$

P-channel

- ☒ $BV \leq -30\text{ V}$
- ☒ $P_{\text{tot}} \leq 20.8\text{ W}$
- ☒ $I_D \leq -20\text{ A}$
- ☒ $R_{\text{DS(ON)}} \leq 30\text{ m}\Omega @ V_{\text{GS}} = -10\text{ V}$
- $R_{\text{DS(ON)}} \leq 50\text{ m}\Omega @ V_{\text{GS}} = -4.5\text{ V}$

2. Pin Description

Pin	Description	Simplified Outline	Symbol
1	Source(S1)	Top View PDFN3x3-8L(Dual)	
2	Gate(G1)		
3	Source(S2)		
4	Gate(G2)		
5,6	Drain(D2)		
7,8	Drain(D1)		



3. Limiting Values

Symbol	Parameter	Conditions	Min	Max	Unit
N-channel					
V_{DS}	Drain-Source Voltage	$T_C = 25\text{ }^{\circ}\text{C}$	-	30	V
V_{GS}	Gate-Source Voltage	$T_C = 25\text{ }^{\circ}\text{C}$	-	± 20	V
$I_{D^{****}}$	Drain Current	$T_C = 25\text{ }^{\circ}\text{C}, V_{GS} = 10\text{ V}$	-	20	A
		$T_C = 100\text{ }^{\circ}\text{C}, V_{GS} = 10\text{ V}$	-	19.5	A
		$T_A = 25\text{ }^{\circ}\text{C}, V_{GS} = 10\text{ V}$	-	9.5	A
		$T_A = 100\text{ }^{\circ}\text{C}, V_{GS} = 10\text{ V}$	-	6.0	A
I_{DM}^{*****}	Pulsed Drain Current	$T_C = 25\text{ }^{\circ}\text{C}, V_{GS} = 10\text{ V}$	-	40	A
P-channel					
V_{DS}	Drain-Source Voltage	$T_C = 25\text{ }^{\circ}\text{C}$	-	- 30	V
V_{GS}	Gate-Source Voltage	$T_C = 25\text{ }^{\circ}\text{C}$	-	± 20	V
$I_{D^{****}}$	Drain Current	$T_C = 25\text{ }^{\circ}\text{C}, V_{GS} = - 10\text{ V}$	-	20	A
		$T_C = 100\text{ }^{\circ}\text{C}, V_{GS} = - 10\text{ V}$	-	13.5	A
		$T_A = 25\text{ }^{\circ}\text{C}, V_{GS} = - 10\text{ V}$	-	6.6	A
		$T_A = 100\text{ }^{\circ}\text{C}, V_{GS} = - 10\text{ V}$	-	4.2	A
I_{DM}^{*****}	Pulsed Drain Current	$T_C = 25\text{ }^{\circ}\text{C}, V_{GS} = - 10\text{ V}$	-	40	A
P_{tot}	Total Power Dissipation	$T_C = 25\text{ }^{\circ}\text{C}$	-	20.8	W
T_{stg}	Storage Temperature		- 55	150	$^{\circ}\text{C}$
T_J	Junction Temperature		- 55	150	$^{\circ}\text{C}$
$R_{\theta JA}^*$	Thermal Resistance- Junction to Ambient		-	62.5	$^{\circ}\text{C} / \text{W}$
$R_{\theta JC}^*$	Thermal Resistance- Junction to Case		-	6	$^{\circ}\text{C} / \text{W}$

Notes :

- * Surface Mounted on 1 in² pad area, $t \leq 10\text{ sec}$
- ** Pulse width $\leq 10\text{ }\mu\text{s}$, duty cycle $\leq 1\%$
- *** limited by bonding wire

4. Marking Information

Product Name	Marking
iM1709	iM1709 XXXXX X : Date Code

iM1709



5. Ordering Code

iM1709 □ └─ Assembly Material	Assembly Material G: Halogen and Lead Free Device
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Note: inenergy defines “ Green ” as lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900 ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500 ppm by weight; Follow IEC 61249-2-21 and IPC / JEDEC J-STD-020C)



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6. Electrical Characteristics (T_A = 25 °C Unless Otherwise Noted)

N-channel:

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 250 μA	30	-	-	V
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _{DS} = 250 μA	1	-	2	V
I _{DSS}	Zero Gate Voltage Source Current	V _{DS} = 24 V, V _{GS} = 0 V	-	-	1	μA
		T _J = 85 °C	-	-	30	μA
I _{GSS}	Gate Leakage Current	V _{GS} = ± 20 V, V _{DS} = 0 V	-	-	± 100	nA
R _{DS(ON)} ^a	Drain-Source On-State Resistance	V _{GS} = 10 V, I _D = 10 A	-	11.5	14.5	mΩ
		V _{GS} = 4.5 V, I _D = 5 A	-	17	22	
Diode Characteristics						
V _{SD} ^a	Diode Forward Voltage	I _{SD} = 10 A, V _{GS} = 0 V	-	-	1.3	V
t _{rr}	Reverse Recovery Time	I _{SD} = 10 A, dI _{SD} /dt = 100 A/μs	-	8	-	nS
Q _{rr}	Reverse Recovery Charge		-	3	-	nC
Dynamic Characteristics ^b						
C _{iss}	Input Capacitance	V _{GS} = 0 V, V _{DS} = 15 V Frequency = 1 MHz	-	1179	-	pF
C _{oss}	Output Capacitance		-	107	-	
C _{rss}	Reverse Transfer Capacitance		-	95	-	
t _{d(on)}	Turn-on Delay Time	V _{DS} = 15 V, V _{GEN} = 10 V, R _G = 4.5 Ω, R _L = 1.5 Ω, I _D = 10 A	-	6.2	-	nS
t _r	Turn-on Rise Time		-	29	-	
t _{d(off)}	Turn-off Delay Time		-	17	-	
t _f	Turn-off Fall Time		-	18	-	
Gate Charge Characteristics ^b						
Q _g	Total Gate Charge	V _{GS} = 10 V, V _{DS} = 15 V, I _{DS} = 10 A	-	22	-	nC
Q _{gs}	Gate-Source Charge		-	4.7	-	
Q _{gd}	Gate-Drain Charge		-	3.5	-	

Notes :

a : Pulse test ; pulse width ≤ 300 μs, duty cycle ≤ 2 %

b : Guaranteed by design, not subject to production testing



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7. Electrical Characteristics (T_A = 25 °C Unless Otherwise Noted)

P-channel:

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = -250 μA	-30	-	-	V
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _{DS} = -250 μA	-1	-	-2	V
I _{DSS}	Zero Gate Voltage Source Current	V _{DS} = -24 V, V _{GS} = 0 V	-	-	-1	μA
		T _J = 85 °C	-	-	-30	μA
I _{GSS}	Gate Leakage Current	V _{GS} = ± 20 V, V _{DS} = 0 V	-	-	± 100	nA
R _{DS(ON)} ^a	Drain-Source On-State Resistance	V _{GS} = -10 V, I _D = -8 A	-	24	30	mΩ
		V _{GS} = -4.5 V, I _D = -6 A	-	38	50	
Diode Characteristics						
V _{SD} ^a	Diode Forward Voltage	I _{SD} = -8 A, V _{GS} = 0 V	-	-	-1.3	V
t _{rr}	Reverse Recovery Time	I _{SD} = -8 A, dI _{SD} /dt = 100 A/μs	-	12	-	ns
Q _{rr}	Reverse Recovery Charge		-	1.3	-	nC
Dynamic Characteristics ^b						
C _{iss}	Input Capacitance	V _{GS} = 0 V, V _{DS} = -15 V Frequency = 1 MHz	-	1231	-	pF
C _{oss}	Output Capacitance		-	121	-	
C _{rss}	Reverse Transfer Capacitance		-	107	-	
t _{d(on)}	Turn-on Delay Time	V _{DS} = -15 V, V _{GEN} = -10 V, R _G = 4.5 Ω, R _L = 1.87 Ω, I _D = -8 A	-	12	-	ns
t _r	Turn-on Rise Time		-	39	-	
t _{d(off)}	Turn-off Delay Time		-	150	-	
t _f	Turn-off Fall Time		-	68	-	
Gate Charge Characteristics ^b						
Q _g	Total Gate Charge	V _{GS} = -10 V, V _{DS} = -15 V, I _{DS} = -8 A	-	22	-	nC
Q _{gs}	Gate-Source Charge		-	5	-	
Q _{gd}	Gate-Drain Charge		-	3	-	

Notes :

a : Pulse test ; pulse width ≤ 300 μs, duty cycle ≤ 2 %

b : Guaranteed by design, not subject to production testing

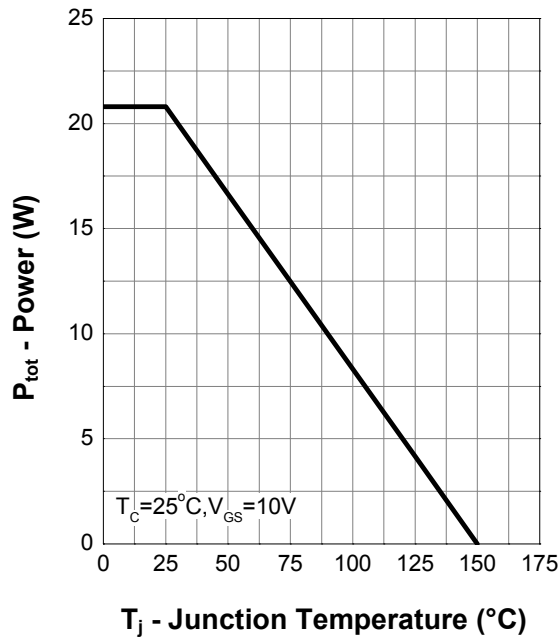


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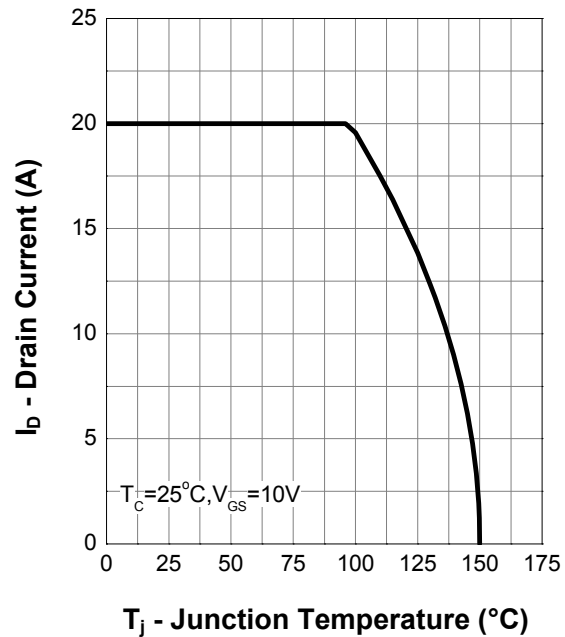
8. Typical Characteristics (Cont.)

N-channel:

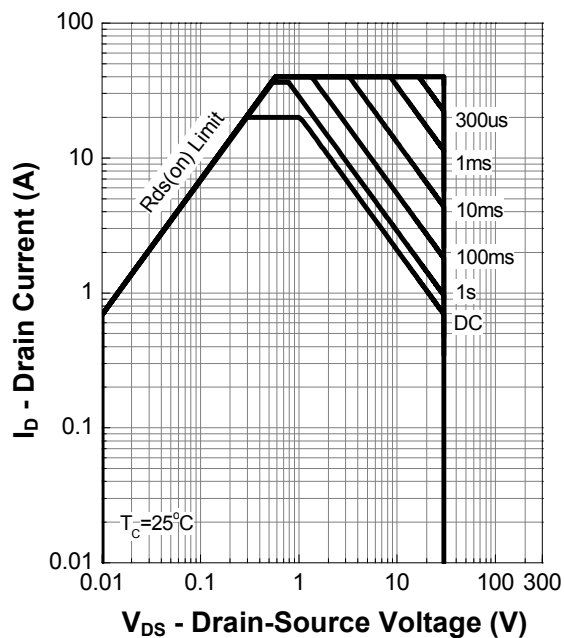
Power Capability



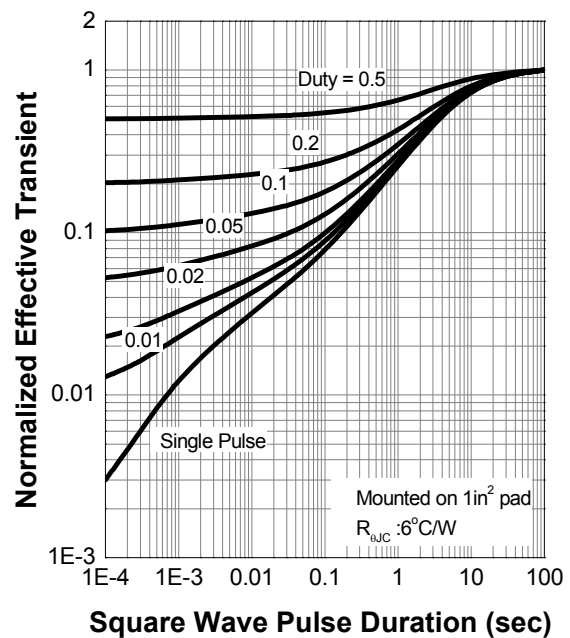
Current Capability



Safe Operation Area



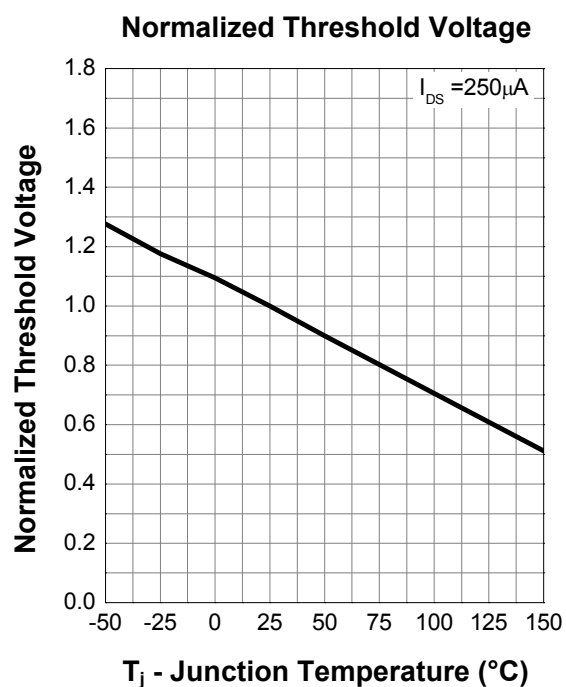
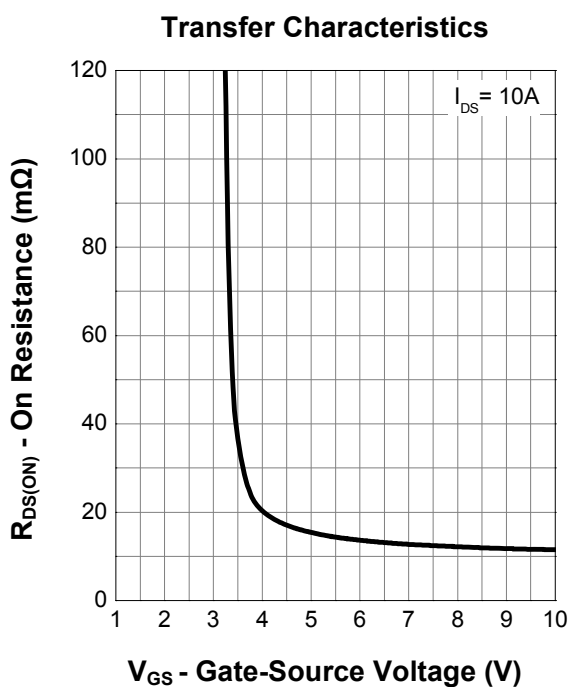
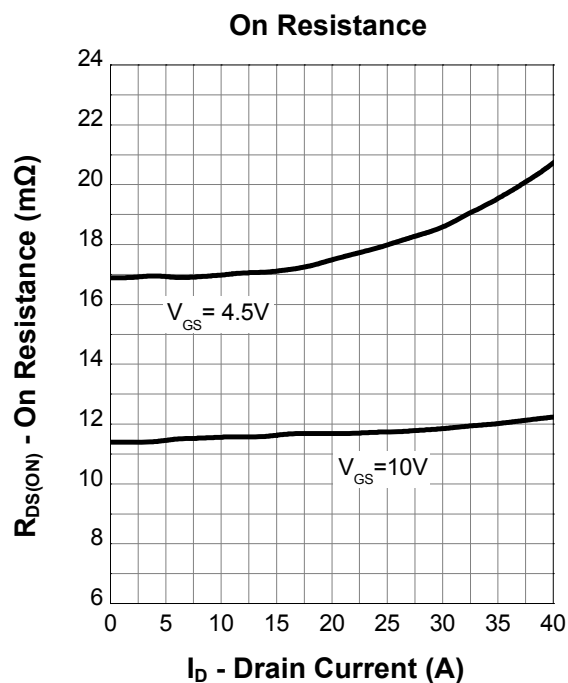
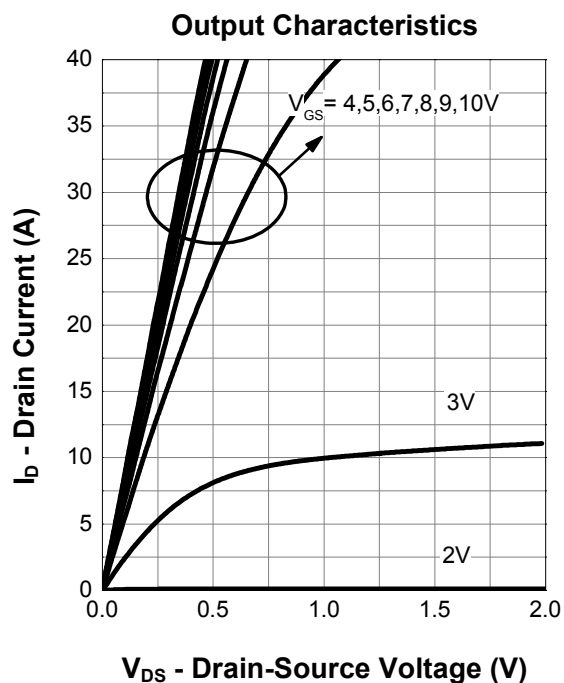
Transient Thermal Impedance





8. Typical Characteristics (Cont.)

N-channel:



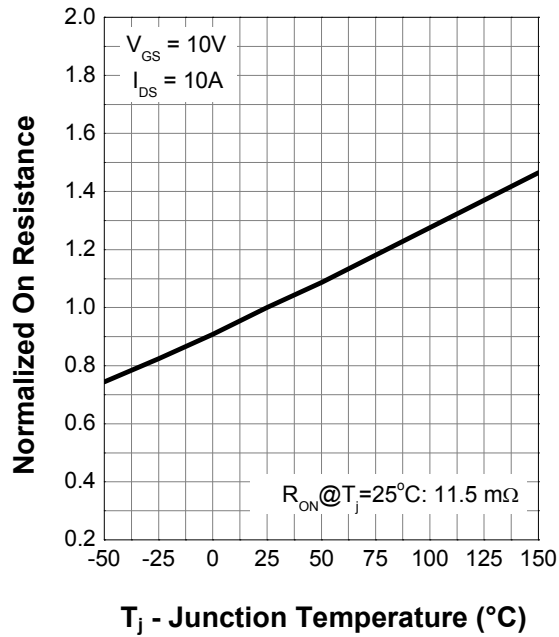


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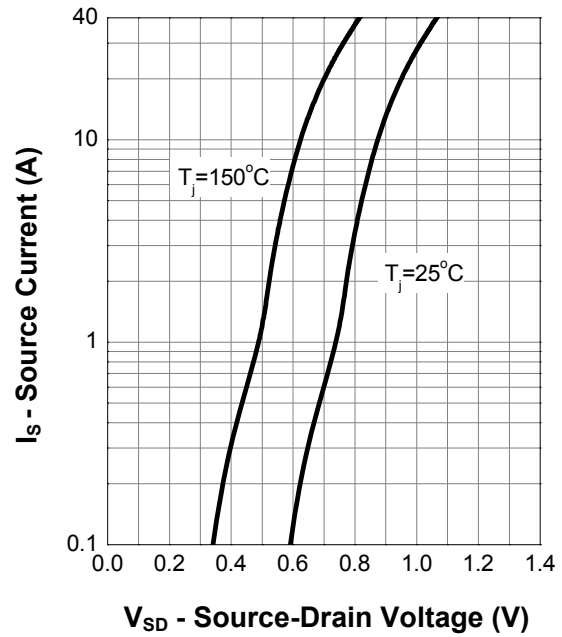
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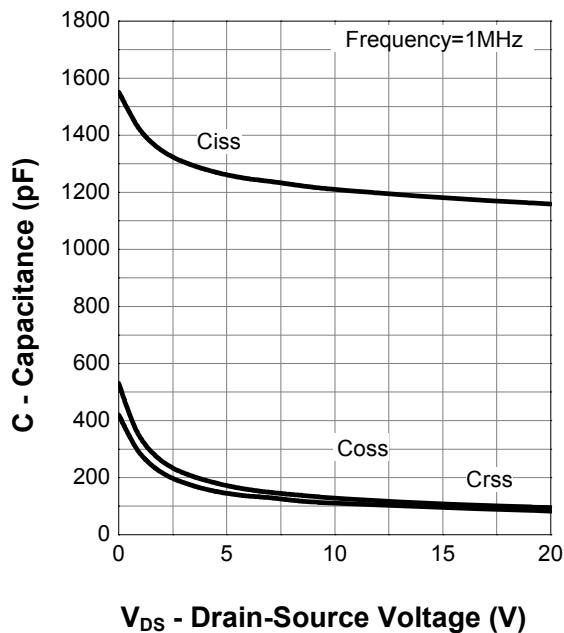
Normalized On Resistance



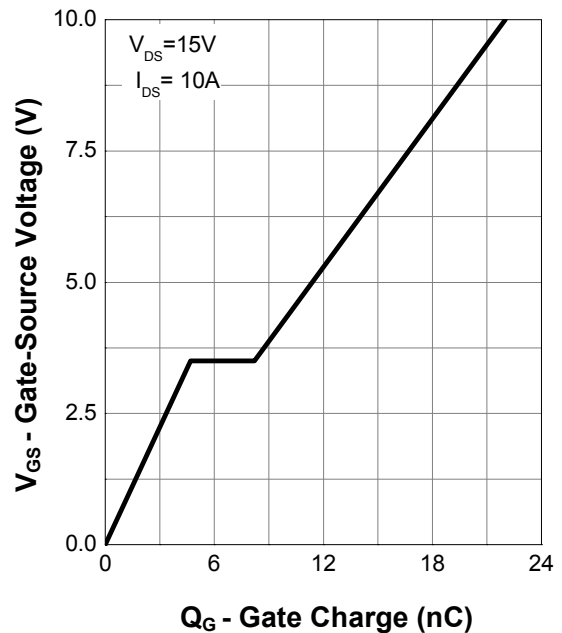
Diode Forward Current



Capacitance



Gate Charge

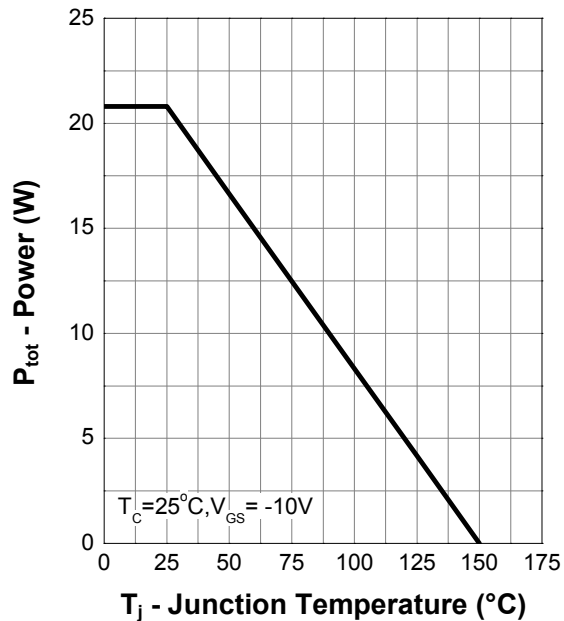




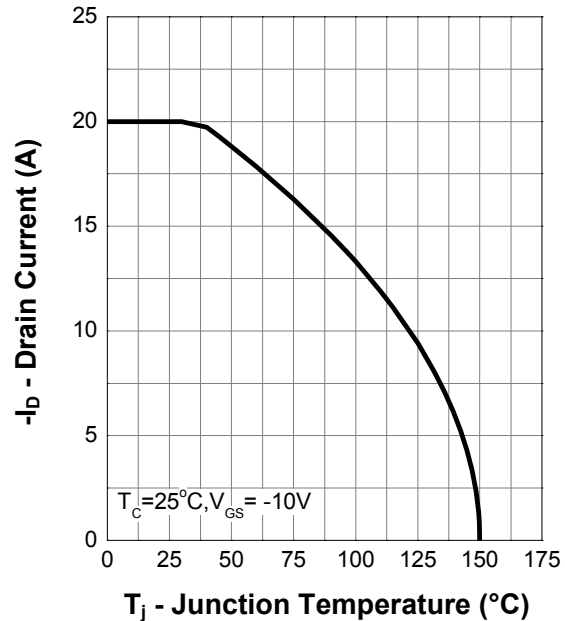
8. Typical Characteristics (Cont.)

P-channel:

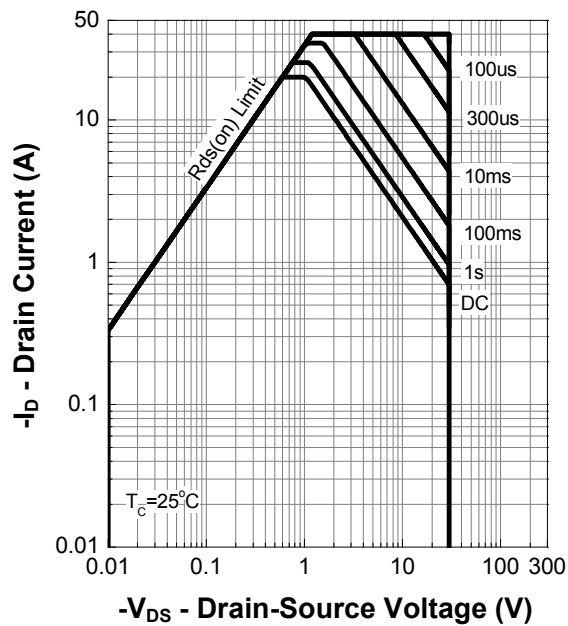
Power Capability



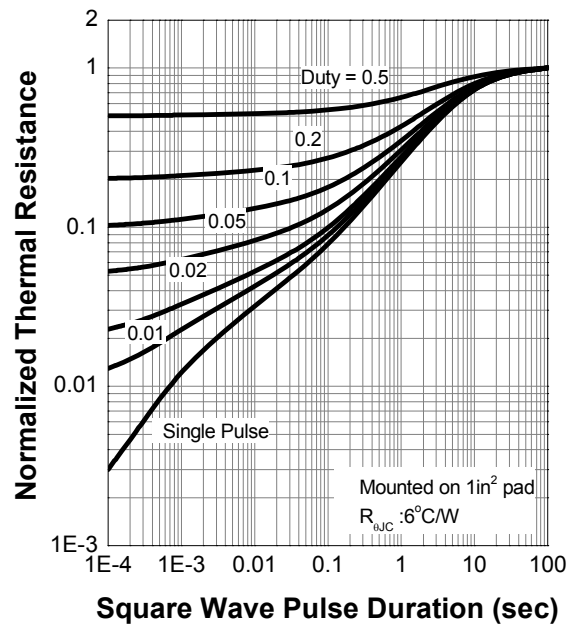
Current Capability



Safe Operation Area



Transient Thermal Impedance

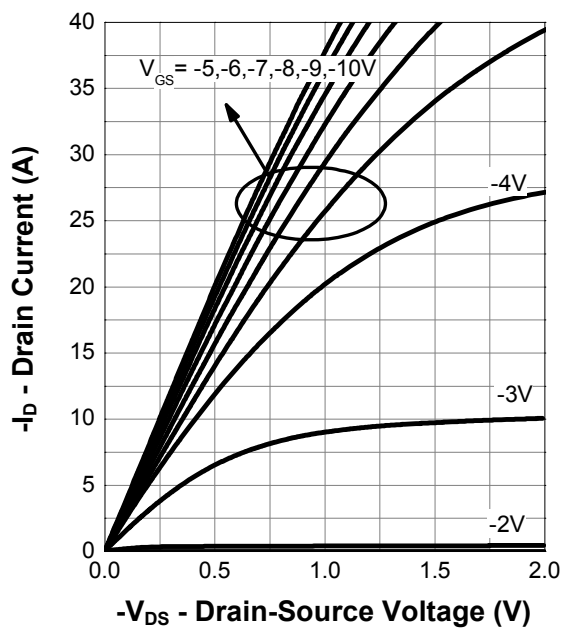




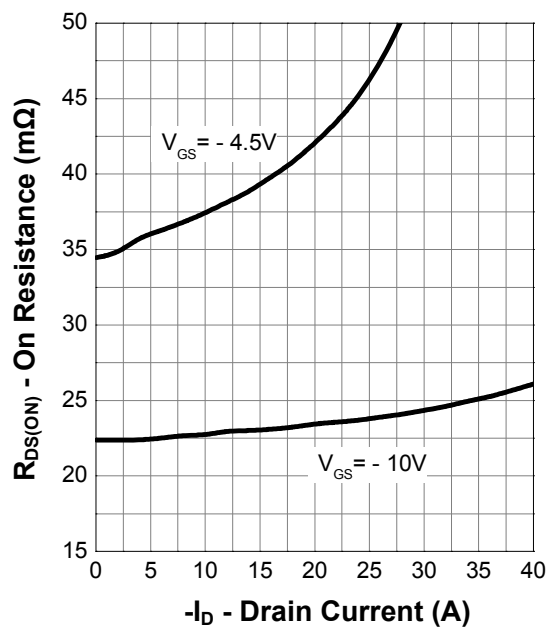
8. Typical Characteristics (Cont.)

P-channel:

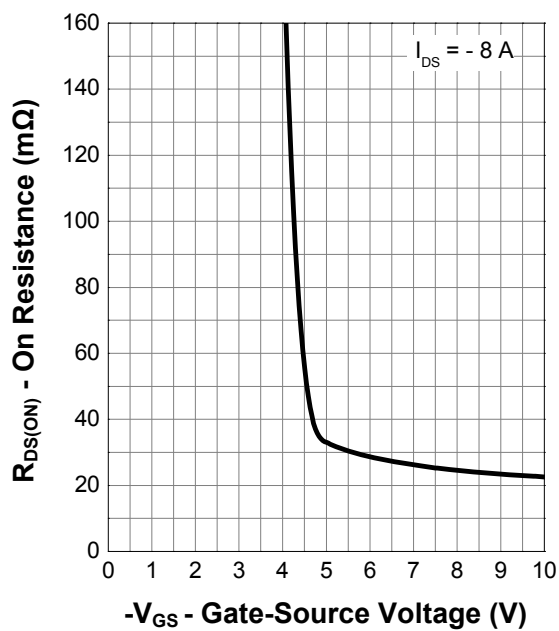
Output Characteristics



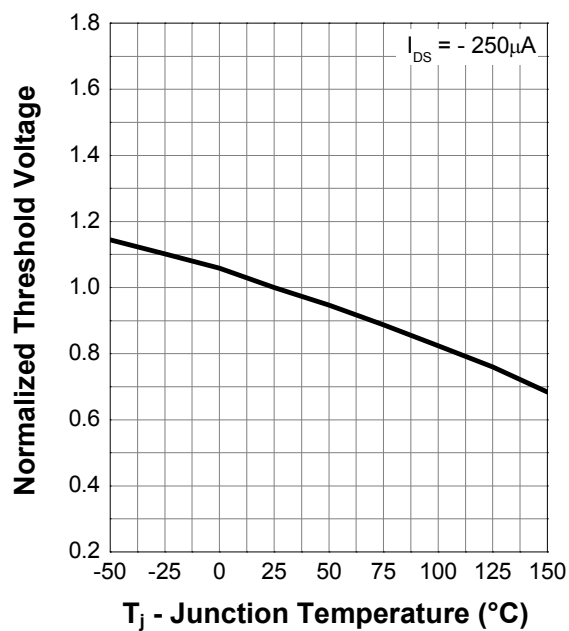
Drain-Source On Resistance



Transfer Characteristics



Normalized Threshold Voltage

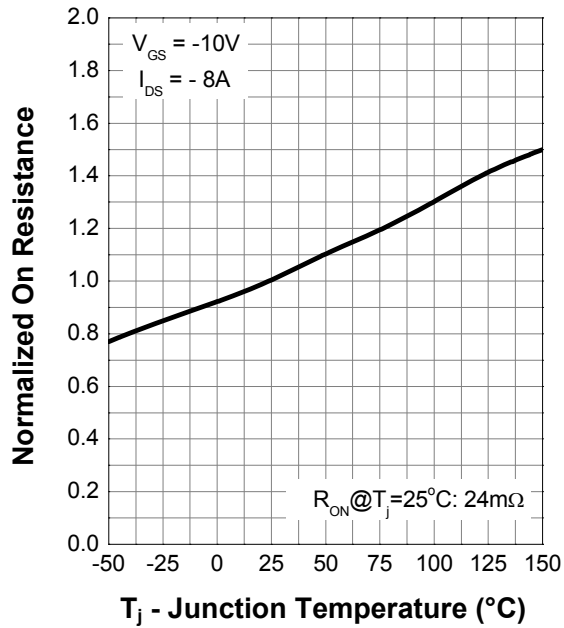




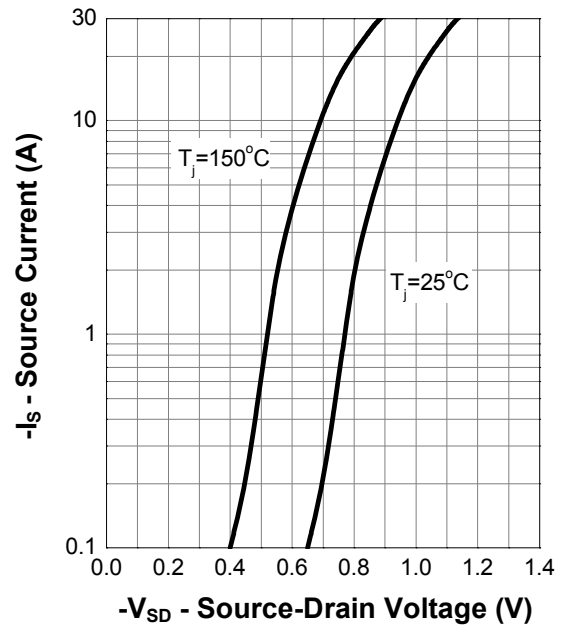
8. Typical Characteristics (Cont.)

P-channel:

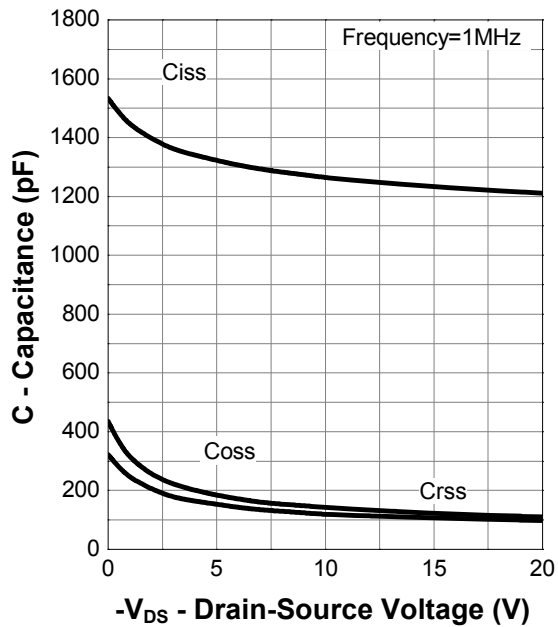
Normalized On Resistance



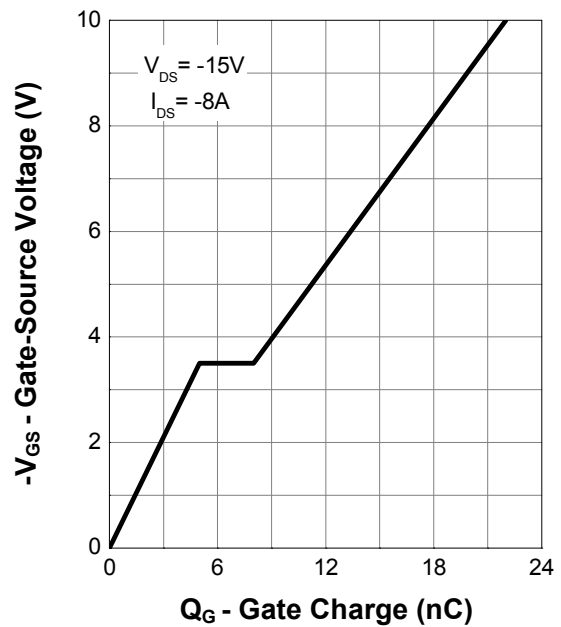
Diode Forward Current



Capacitance



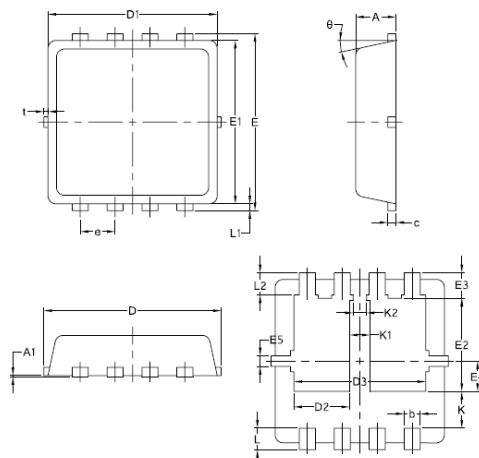
Gate Charge





9. Package Dimensions

PDFN 3x3-8L (Dual) Package



Symbol	Dimensions In Millimeters	
	MIN.	MAX.
A	0.70	0.85
A1	/	0.05
b	0.25	0.39
c	0.14	0.20
D	3.20	3.45
D1	3.05	3.25
D2	0.84	1.24
D3	2.30	2.60
E	3.20	3.40
E1	2.95	3.15
E2	1.60	1.90
E3	0.28	0.65
E4	0.37	0.77
E5	0.10	0.30
e	0.60	0.70
K	0.50	0.80
K1	0.30	0.53
K2	0.15	0.35
L	0.30	0.50
L1	0.06	0.20
L2	0.27	0.57
t	0	0.13
θ	10°	14°