

Complementary Enhancement Mode MOSFET

1. Product Information

1.1 Features

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

1.2 Applications

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

1.3 Quick reference

N-channel

- ☒ $BV \leq 40\text{ V}$
- ☒ $P_{\text{tot}} \leq 35\text{ W}$
- ☒ $I_D \leq 44\text{ A}$
- ☒ $R_{\text{DS(ON)}} \leq 12\text{ m}\Omega @ V_{\text{GS}} = 10\text{ V}$
 $R_{\text{DS(ON)}} \leq 17\text{ m}\Omega @ V_{\text{GS}} = 4.5\text{ V}$

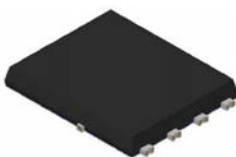
P-channel

- ☒ $BV \leq -40\text{ V}$
- ☒ $P_{\text{tot}} \leq 35\text{ W}$
- ☒ $I_D \leq -27\text{ A}$
- ☒ $R_{\text{DS(ON)}} \leq 32\text{ m}\Omega @ V_{\text{GS}} = -10\text{ V}$
 $R_{\text{DS(ON)}} \leq 45\text{ m}\Omega @ V_{\text{GS}} = -4.5\text{ V}$

2. Pin Description

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

Top View
PDFN5x6-8L



3. Limiting Values

Symbol	Parameter	Conditions	Min	Max	Unit
N-channel					
V_{DS}	Drain-Source Voltage	$T_C = 25\text{ }^{\circ}\text{C}$	40	-	V
V_{GS}	Gate-Source Voltage	$T_C = 25\text{ }^{\circ}\text{C}$	-	± 20	V
I_D^*	Drain Current	$T_C = 25\text{ }^{\circ}\text{C}, V_{GS} = 10\text{ V}$	-	44	A
		$T_C = 100\text{ }^{\circ}\text{C}, V_{GS} = 10\text{ V}$	-	28	A
$I_{DM}^{*,*,*,*}$	Pulsed Drain Current	$T_C = 25\text{ }^{\circ}\text{C}, V_{GS} = 10\text{ V}$	-	120	A
P-channel					
V_{DS}	Drain-Source Voltage	$T_C = 25\text{ }^{\circ}\text{C}$	- 40	-	V
V_{GS}	Gate-Source Voltage	$T_C = 25\text{ }^{\circ}\text{C}$	-	± 20	V
I_D^*	Drain Current	$T_C = 25\text{ }^{\circ}\text{C}, V_{GS} = -10\text{ V}$	-	- 27	A
		$T_C = 100\text{ }^{\circ}\text{C}, V_{GS} = -10\text{ V}$	-	- 17	A
$I_{DM}^{*,*,*}$	Pulsed Drain Current	$T_C = 25\text{ }^{\circ}\text{C}, V_{GS} = -10\text{ V}$	-	- 108	A
P_{tot}	Total Power Dissipation	$T_C = 25\text{ }^{\circ}\text{C}$	-	35	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 Ambient		-	3.5	$^{\circ}\text{C} / \text{W}$

Notes :

* Surface Mounted on 1 in² pad area, $t \leq 10\text{ sec}$

** Pulse width $\leq 10\text{ }\mu\text{s}$, duty cycle $\leq 1\%$

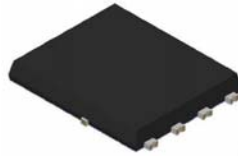
4. Marking Information

Product Name	Marking
iM1704	iM1704 XXXXXX X : Date Code

5. Ordering Code

iM1704 ☐ → Assembly Material	Assembly Material G: Halogen and Lead Free Device
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Note: inergy 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)



6. Electrical Characteristics ($T_A = 25\text{ }^{\circ}\text{C}$ Unless Otherwise Noted)

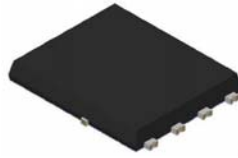
N-channel:

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 250 μA	40	-	-	V
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _{DS} = 250 μA	1.0	-	2.0	V
I _{DSS}	Zero Gate Voltage Source Current	V _{DS} = 32 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 = 20 A	-	9.5	12	mΩ
		V _{GS} = 4.5 V, I _D = 10 A	-	13	17	
Diode Characteristics						
V _{SD} ^a	Diode Forward Voltage	I _{SD} = 20 A, V _{GS} = 0 V	-	0.7	1.3	V
t _{rr}	Reverse Recovery Time	I _{SD} = 20 A, dI _{SD} /dt = 100 A/μs	-	11	-	nS
Q _{rr}	Reverse Recovery Charge		-	5	-	nC
Dynamic Characteristics ^b						
C _{iss}	Input Capacitance	V _{GS} = 0 V, V _{DS} = 20 V Frequency = 1 MHz	-	1586	-	pF
C _{oss}	Output Capacitance		-	112	-	
C _{rss}	Reverse Transfer Capacitance		-	89	-	
t _{d(on)}	Turn-on Delay Time	V _{DS} = 20 V, V _{GEN} = 10 V, R _G = 4.5 Ω, R _L = 1 Ω, I _{DS} = 20 A	-	6.2	-	nS
t _r	Turn-on Rise Time		-	41	-	
t _{d(off)}	Turn-off Delay Time		-	31	-	
t _f	Turn-off Fall Time		-	24	-	
Gate Charge Characteristics ^b						
Q _g	Total Gate Charge	V _{DS} =20 V, V _{GS} = 10 V, I _{DS} = 20 A	-	29	-	nC
Q _{gs}	Gate-Source Charge		-	6	-	
Q _{gd}	Gate-Drain Charge		-	5	-	

Notes :

a : Pulse test ; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$

b : Guaranteed by design, not subject to production testing



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

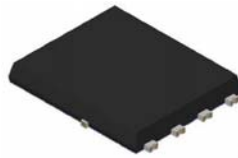
P-channel:

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _{DS} = - 250 μA	- 40	-	-	V
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _{DS} = - 250 μA	- 1.0	-	- 2.0	V
I _{DSS}	Drain Leakage Current	V _{DS} = - 32 V, V _{GS} = 0 V	-	-	- 1.0	μA
I _{GSS}	Gate Leakage Current	V _{GS} = 0 V, V _{GS} = ± 20 V	-	-	±100	nA
R _{DS(ON)} ^a	On-State Resistance	V _{GS} = - 10 V, I _{DS} = - 15 A	-	25	32	mΩ
		V _{GS} = - 4.5 V, I _{DS} = - 10 A	-	35	45	
Diode Characteristics						
V _{SD} ^a	Diode Forward Voltage	I _{SD} = - 15 A, V _{GS} = 0 V	-	- 0.7	- 1.3	V
t _{rr}	Reverse Recovery Time	I _{SD} = - 15 A, dI _{SD} / dt = 100 A / μs	-	16	-	nS
Q _{rr}	Reverse Recovery Charge		-	12	-	nC
Dynamic Characteristics ^b						
C _{iss}	Input Capacitance	V _{GS} = 0 V, V _{DS} = - 20 V Frequency = 1 MHz	-	1632	-	pF
C _{oss}	Output Capacitance		-	117	-	
C _{rss}	Reverse Transfer Capacitance		-	95	-	
t _{d(on)}	Turn-on Delay Time	V _{DS} = - 20 V, V _{GEN} = - 10 V, R _G = 4.5 Ω, R _L = 1.33 Ω, I _{DS} = - 15 A	-	16	-	nS
t _r	Turn-on Rise Time		-	56	-	
t _{d(off)}	Turn-off Delay Time		-	223	-	
t _f	Turn-off Fall Time		-	114	-	
Gate Charge Characteristics ^b						
Q _g	Total Gate Charge	V _{DS} = - 20 V, V _{GS} = - 10 V, I _{DS} = -15 A	-	27	-	nC
Q _{gs}	Gate-Source Charge		-	6.5	-	
Q _{gd}	Gate-Drain Charge		-	3.8	-	

Notes :

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

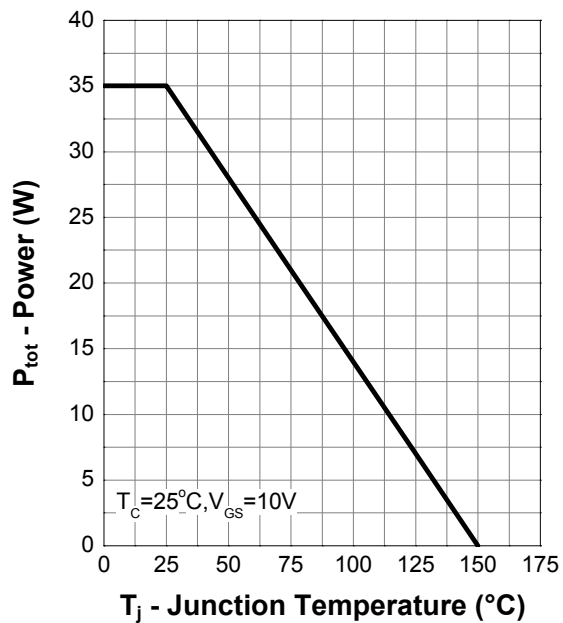
b : Guaranteed by design, not subject to production testing



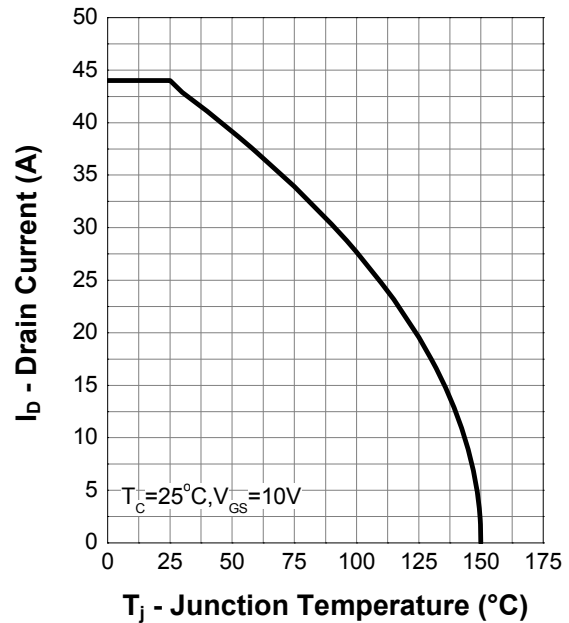
8. Typical Characteristics (Cont.)

N-channel:

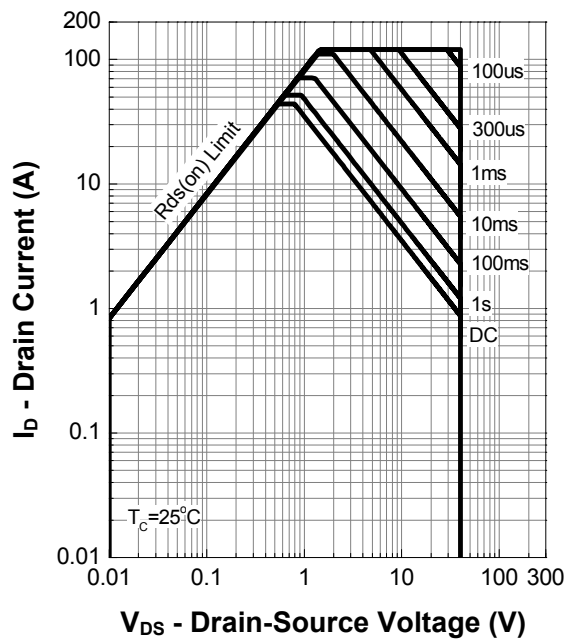
Power Capability



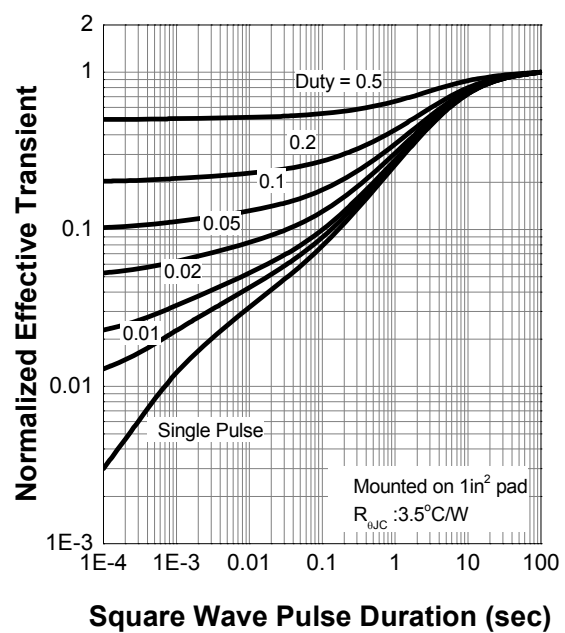
Current Capability

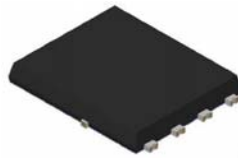


Safe Operation Area



Transient Thermal Impedance

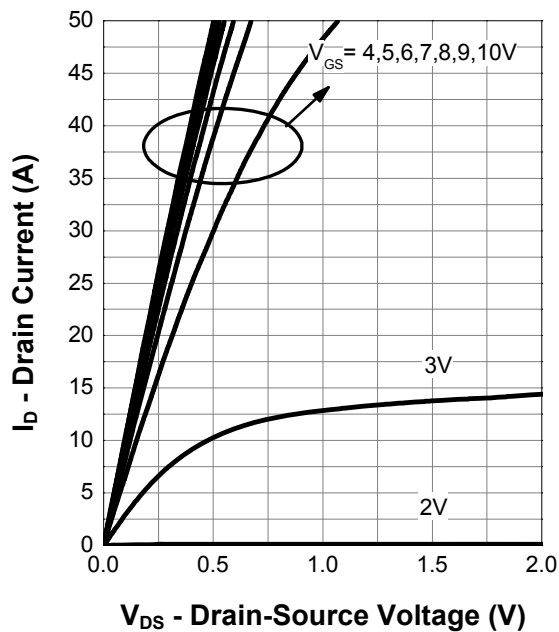




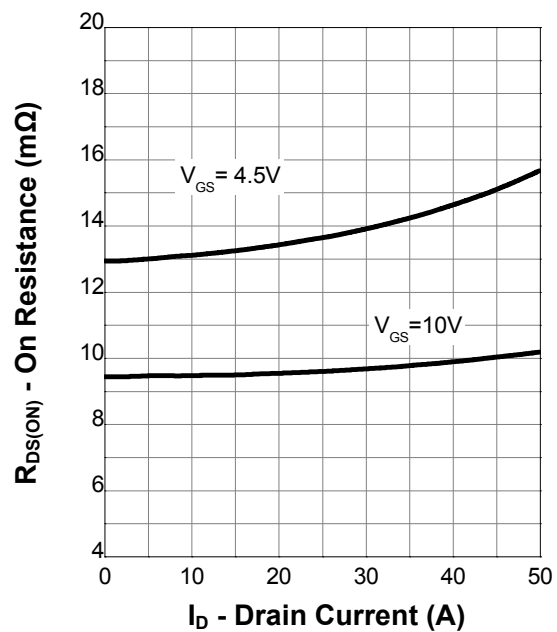
8. Typical Characteristics (Cont.)

N-channel:

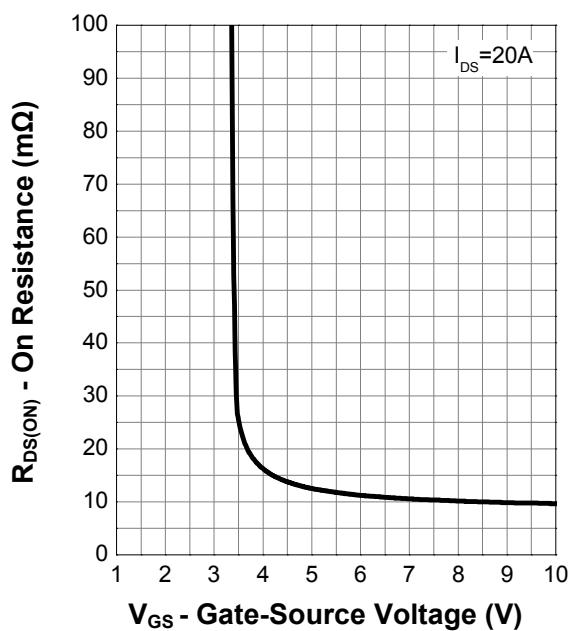
Output Characteristics



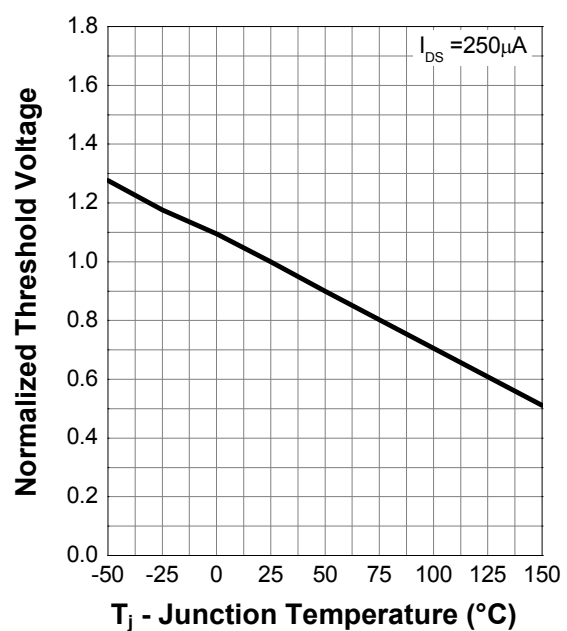
On Resistance

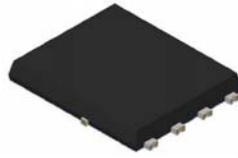


Transfer Characteristics



Normalized Threshold Voltage

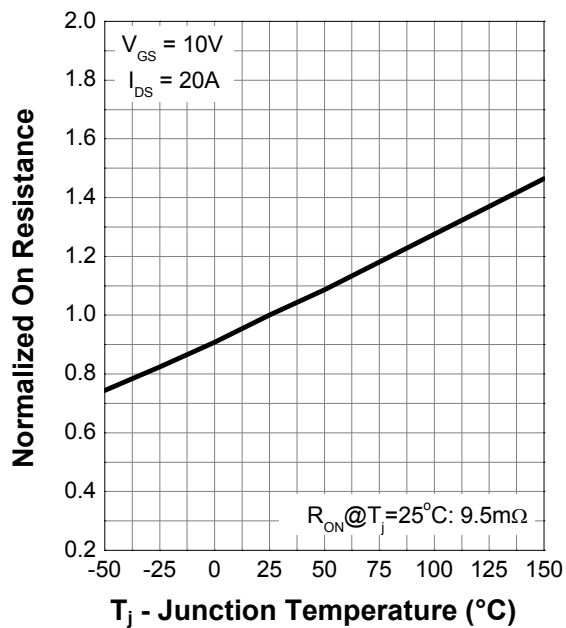




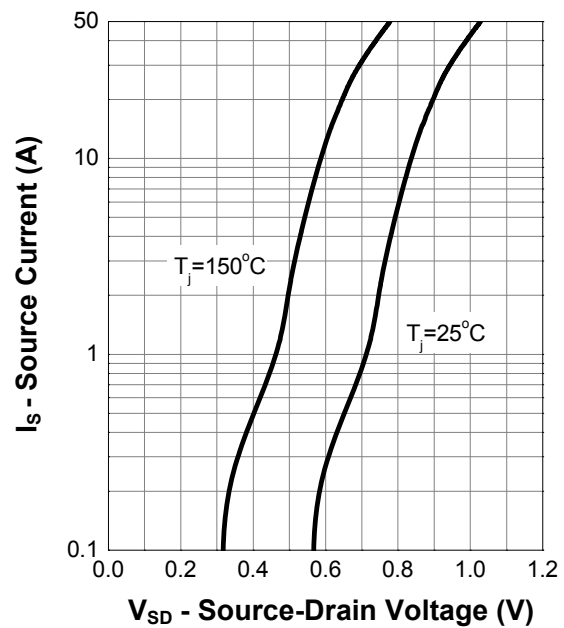
8. Typical Characteristics (Cont.)

N-channel:

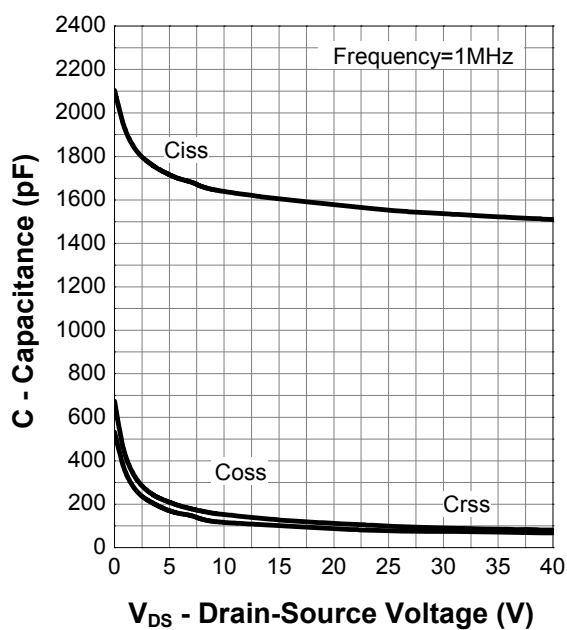
Normalized On Resistance



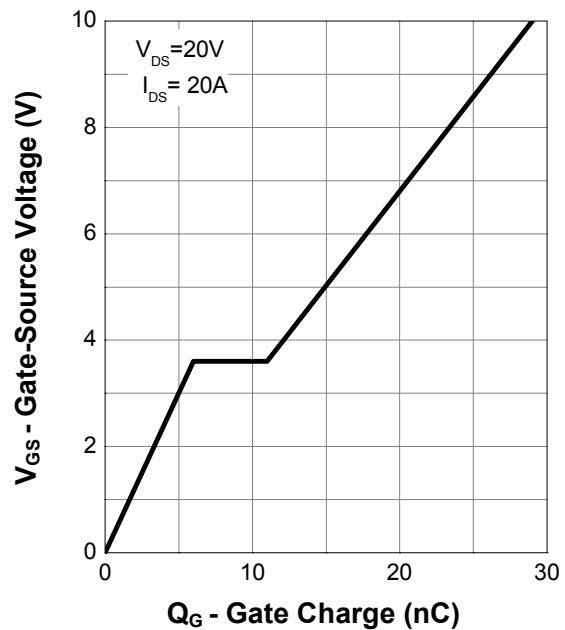
Diode Forward Current

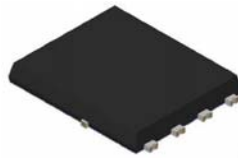


Capacitance



Gate Charge

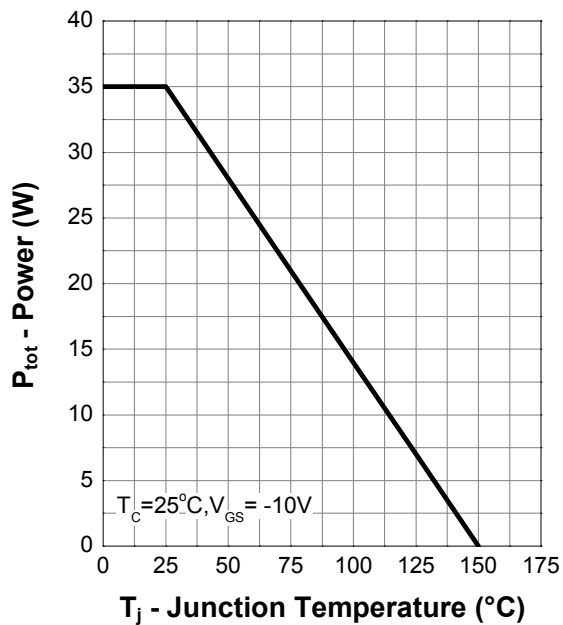




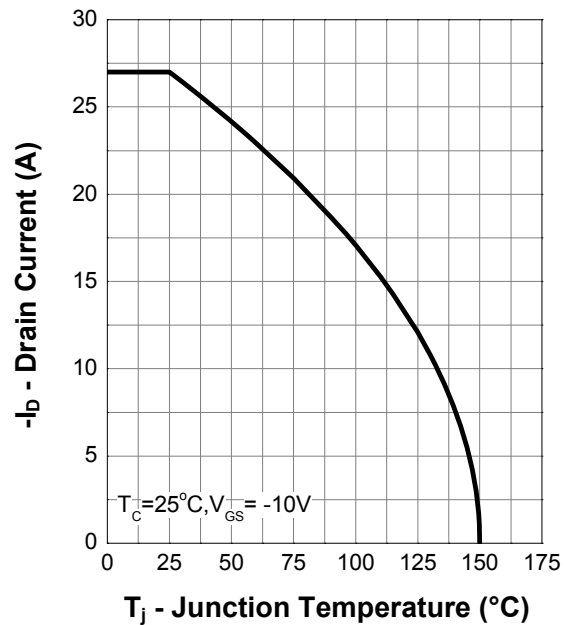
8. Typical Characteristics (Cont.)

P-channel:

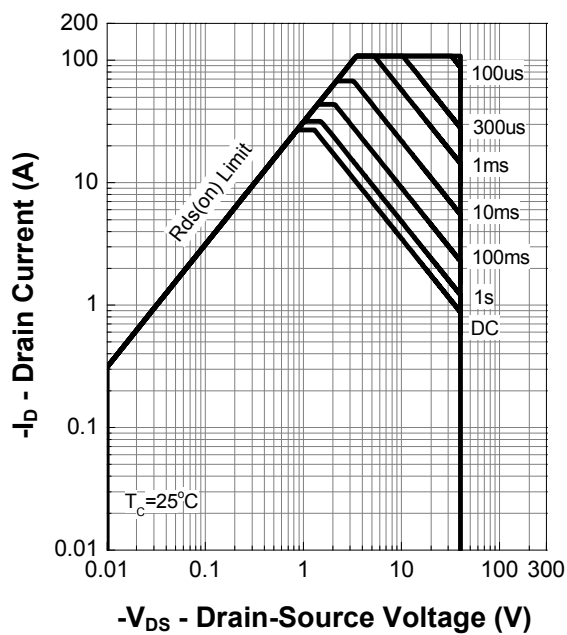
Power Capability



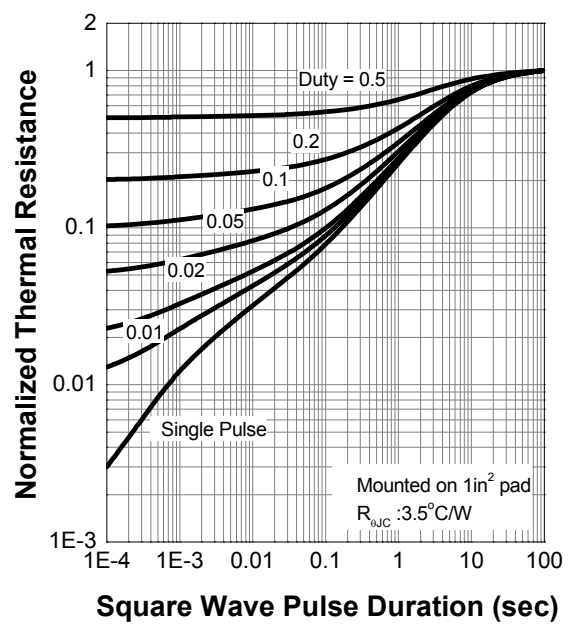
Current Capability

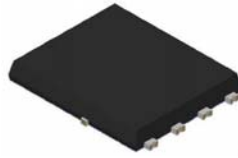


Safe Operation Area



Transient Thermal Impedance

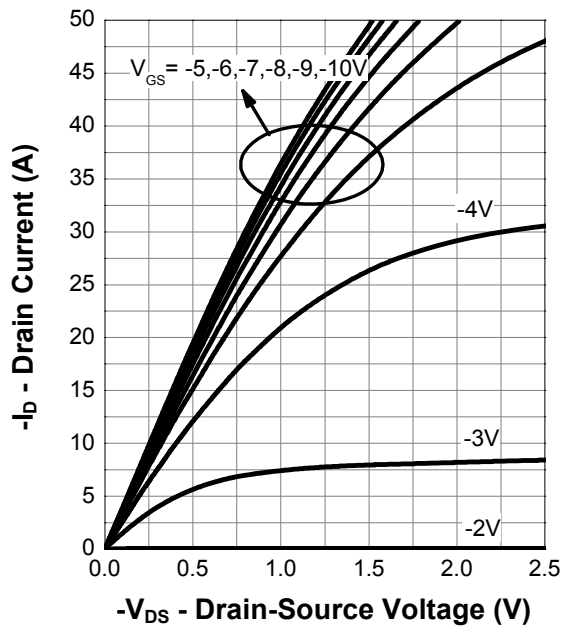




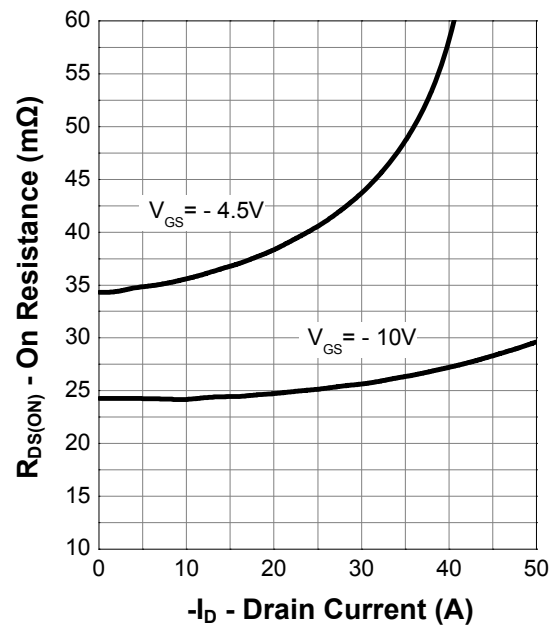
8. Typical Characteristics (Cont.)

P-channel:

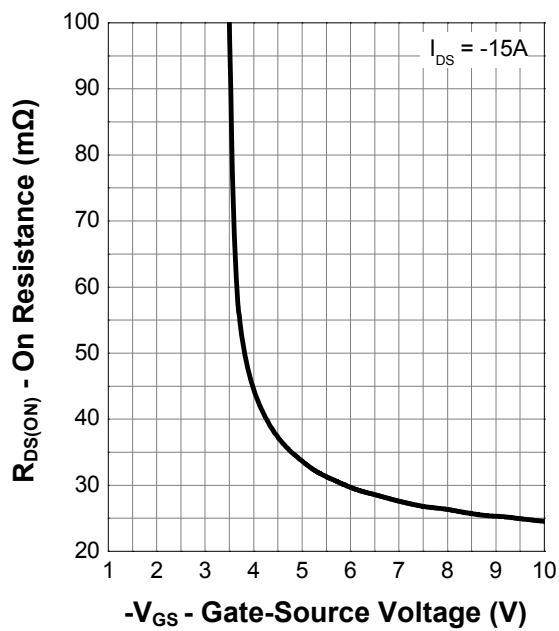
Output Characteristics



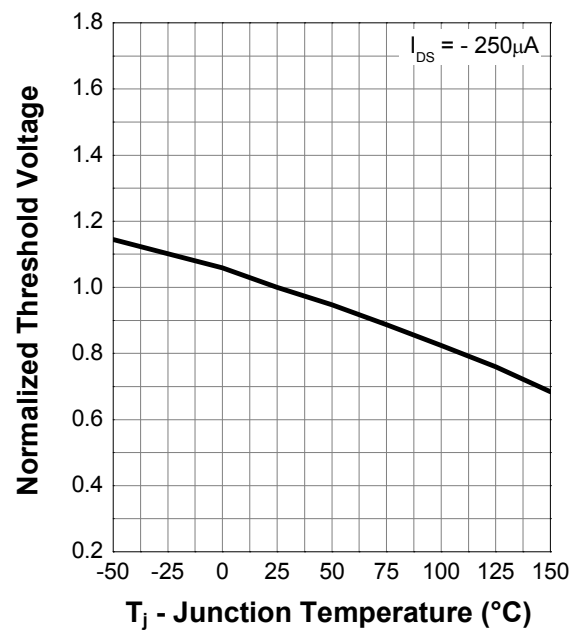
Drain-Source On Resistance

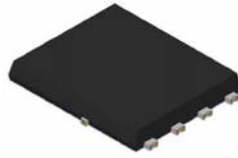


Transfer Characteristics



Normalized Threshold Voltage

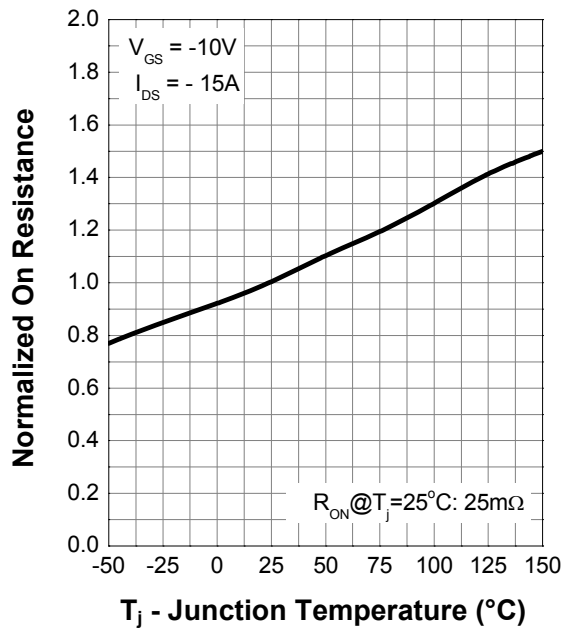




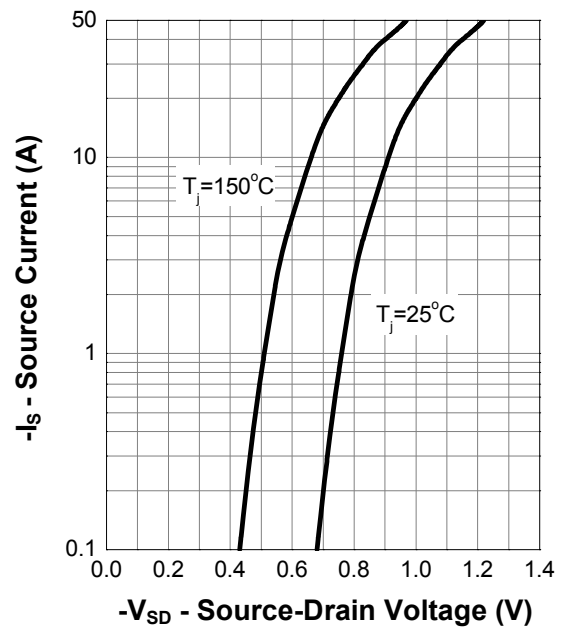
8. Typical Characteristics (Cont.)

P-channel:

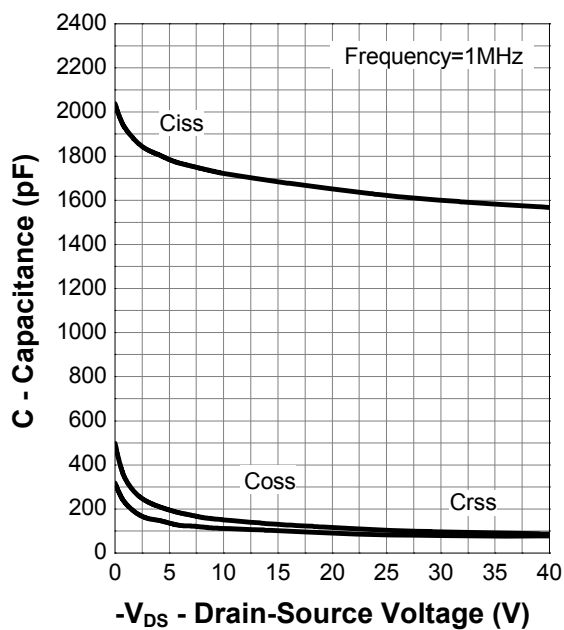
Normalized On Resistance



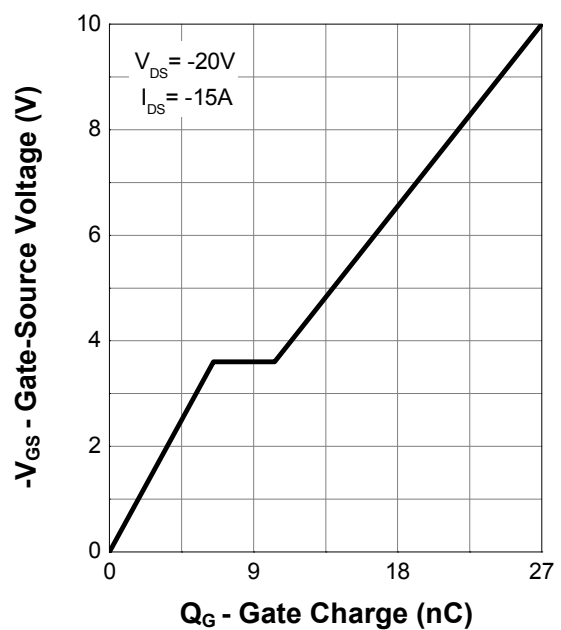
Diode Forward Current

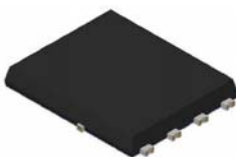


Capacitance



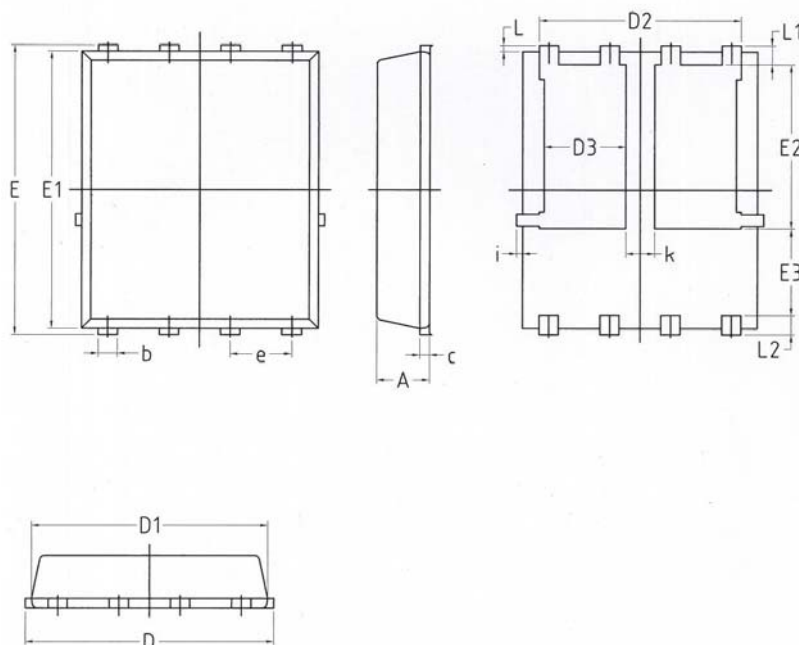
Gate Charge





9. Package Dimensions

PDFN5x6 - 8L (Dual) Package



Symbol	Dimensions In Millimeters	
	MIN.	MAX.
A	1.03	1.17
B	0.34	0.48
c	0.203 BSC	
D	4.8	5.4
D1	4.8	5.0
D2	4.11	4.31
D3	1.6	1.8
E	5.95	6.15
E1	5.65	5.85
E2	3.3	3.5
E3	1.7	-
e	1.27 BSC	
L	0.05	0.25
L1	0.38	0.5
L2	0.38	0.5
i	-	0.18
k	0.5	0.7