AT050NP040MQPF-Q1

N and P-Channel Enhancement Mode MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)MAX}$	I_D
40V	14mΩ@10V	50A
	20mΩ@4.5V	

$V_{(BR)DSS}$	$R_{DS(on)MAX}$	I_D
-40V	19mΩ@-10V	-27A
	24mΩ@-4.5V	

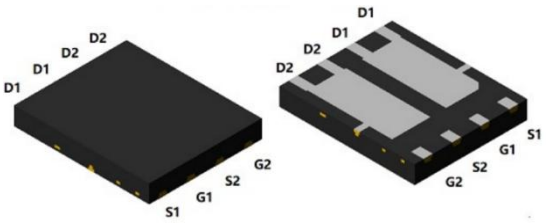
Feature

- Fast switching speed
- Surface mount package
- Suffix “-Q1” for AEC-Q101

Application

- DC-DC Converters
- Motor control

Package



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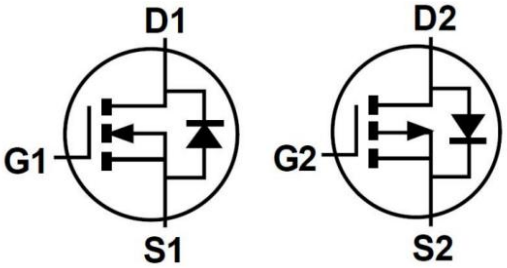
Circuit diagram



Marking

Absolute maximum ratings (T_A=25℃ unless otherwise noted)

Parameter	Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage	V_{DS}	40	-40	V
Gate-Source Voltage	V_{GS}	±20	±20	V
Continuous Drain Current (T_C=25℃)	I_D	50	-27	A
Pulsed Drain Current	I_{DM}	200	-108	A
Single Pulse Avalanche Energy[1)]	E_{AS}	72	90	mJ
Power Dissipation (T_C=25℃)	P_D	42	42	W
Thermal Resistance from Junction-to-Case	$R_{\theta JC}$	2.9	2.9	℃/W
Operating Junction Temperature	T_J	-55 ~ +150	-55 ~ +150	℃
Storage Temperature	T_{STG}	-55 ~ +150	-55 ~ +150	℃

N-CH Electrical characteristics (T_A=25℃ unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS} =0V, I_D =250μA	40			V
Zero gate voltage drain current	I_{DSS}	V_{DS} =32V, V_{GS} =0V, T_J=25℃			1	μA
Gate-body leakage current	I_{GSS}	V_{DS} =0V, V_{GS} =±20V			±100	nA
Gate threshold voltage	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =250μA	1	1.5	2.5	V
Drain-source on-resistance	$R_{DS(on)}$	V_{GS} =10V, I_D =7A		10	14	mΩ
		V_{GS} =4.5V, I_D =6A		13	20	
Dynamic characteristics[2)]						
Input Capacitance	C_{iss}	V_{DS} =15V, V_{GS} =0V, f =1MHz		1434		pF
Output Capacitance	C_{oss}			91		
Reverse Transfer Capacitance	C_{rss}			75		
Total Gate Charge	Q_g	V_{DS} =32V, V_{GS} =4.5V, I_D =7A		25		nC
Gate-Source Charge	Q_{gs}			6.3		
Gate-Drain Charge	Q_{gd}			4.6		
Turn-on delay time	$t_{d(on)}$	V_{DS} =20V, V_{GS} =10V, I_D =7A R_G =3Ω		7.8		nS
Turn-on rise time	t_r			10.7		
Turn-off delay time	$t_{d(off)}$			25.8		
Turn-off fall time	t_f			4.6		
Source-Drain Diode characteristics						
Diode Forward Current	I_S				50	A
Diode Forward voltage	V_{SD}	V_{GS} =0V, I_S =1A, T_J =25℃			1.2	V
Reverse Recovery Time	t_{rr}	I_S =20A , di/dt =100A/μs T_J =25℃		12.5		nS
Reverse Recovery Charge	Q_{rr}			9		nC

P-CH Electrical characteristics (T_A=25℃ unless otherwise noted)

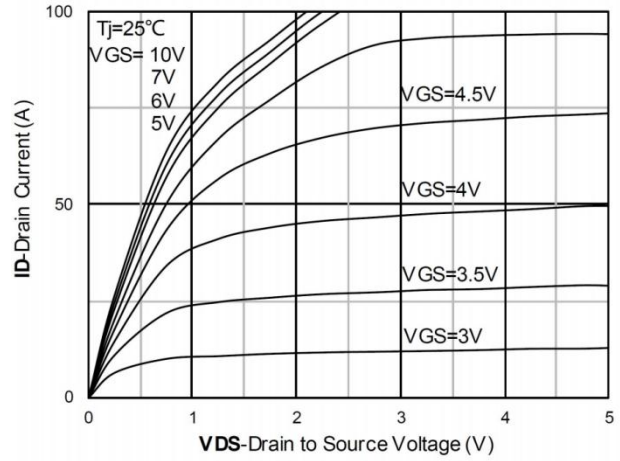
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS} =0V, I_D =-250μA	-40			V
Zero gate voltage drain current	I_{DSS}	V_{DS} =-32V, V_{GS} =0V, T_J=25℃			-1	μA
Gate-body leakage current	I_{GSS}	V_{DS} =0V, V_{GS} =±20V			±100	nA
Gate threshold voltage	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =-250μA	-1.0	-1.5	-2.5	V
Drain-source on-resistance	$R_{DS(on)}$	V_{GS} =-10V, I_D =-5A		15	19	mΩ
		V_{GS} =-4.5V, I_D =-4A		18	24	
Dynamic characteristics[2)]						
Input Capacitance	C_{iss}	V_{DS} =-15V, V_{GS} =0V, f =1MHz		1415		pF
Output Capacitance	C_{oss}			204		
Reverse Transfer Capacitance	C_{rss}			112		
Total Gate Charge	Q_g	V_{DS} =-30V, V_{GS} =-10V I_D =-6A		23.5		nC
Gate-Source Charge	Q_{gs}			3.4		
Gate-Drain Charge	Q_{gd}			4.3		
Turn-on delay time	$t_{d(on)}$	V_{DS} =-15V, V_{GS} =-10V I_D =-1A, R_G =3Ω		11		nS
Turn-on rise time	t_r			16.7		
Turn-off delay time	$t_{d(off)}$			35		
Turn-off fall time	t_f			19		
Source-Drain Diode characteristics						
Diode Forward Current	I_S				-27	A
Diode Forward voltage	V_{SD}	V_{GS} =0V, I_S =-1A, T_J =25℃			-1.2	V
Reverse Recovery Time	t_{rr}	I_S =-20A , di/dt =-100A/μs T_J =25℃		28		nS
Reverse Recovery Charge	Q_{rr}			36		nC

Notes:

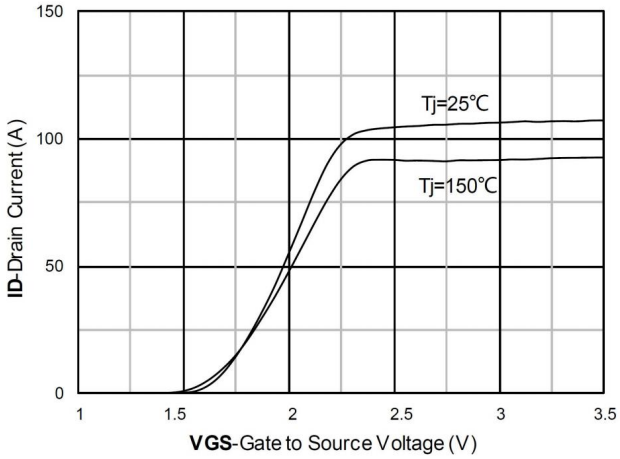
1) The EAS Test condition is V_{DD}=-20V, V_{GS} =-10V, L = 0.5mH, R_G=25Ω.

2) Guaranteed by design, not subject to production.

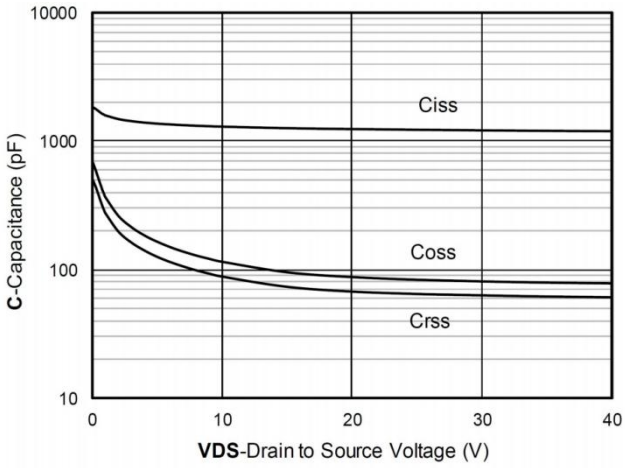
N-Channel Typical Characteristics



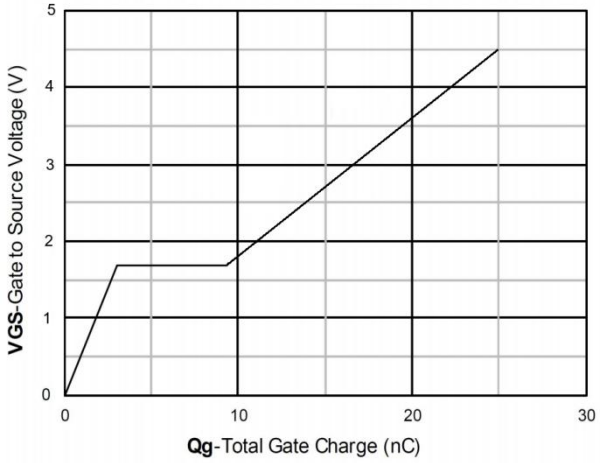
Output Characteristics



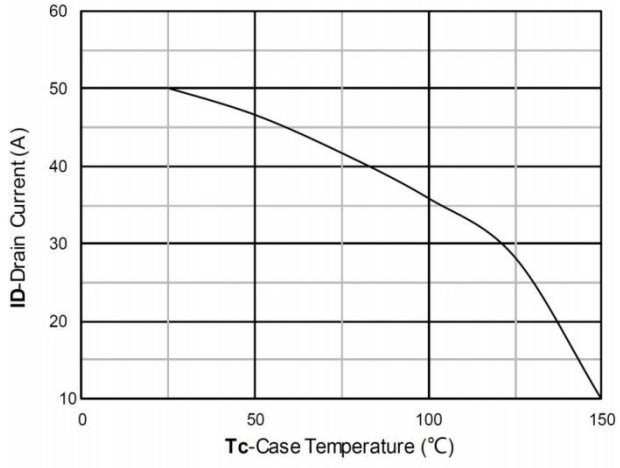
Transfer Characteristics



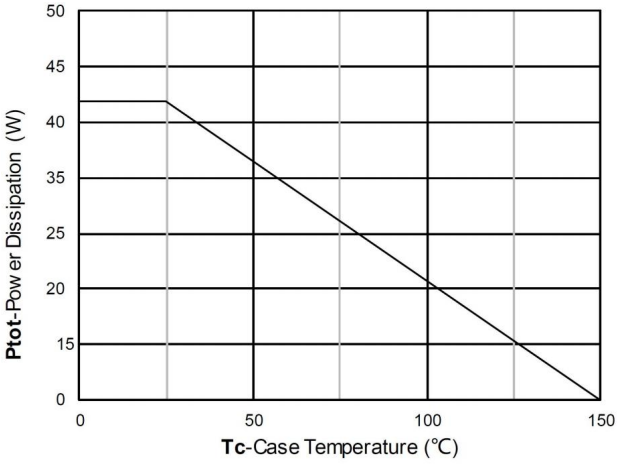
Capacitance Characteristics



Gate Charge

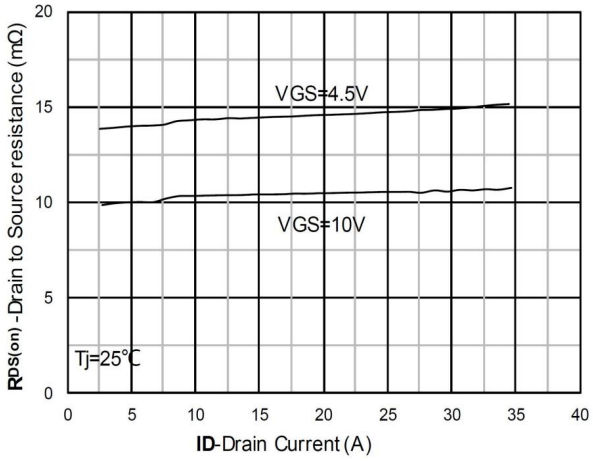


Current dissipation

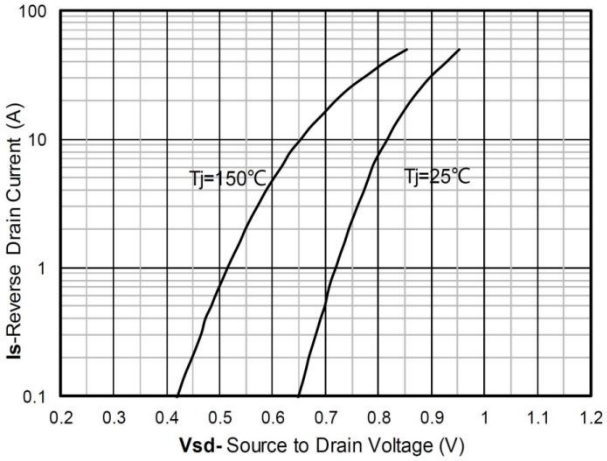


Power dissipation

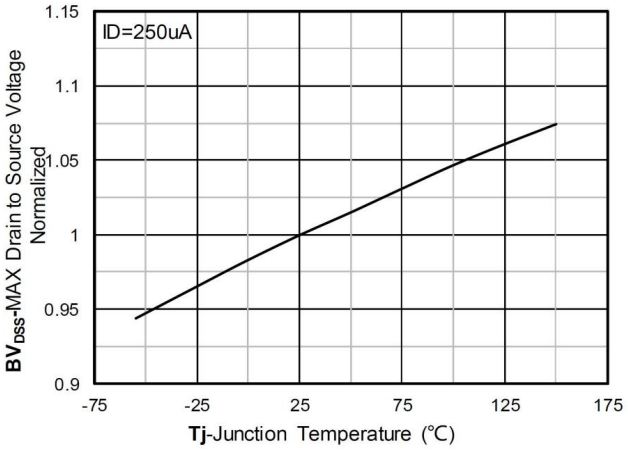
N-Channel Typical Characteristics



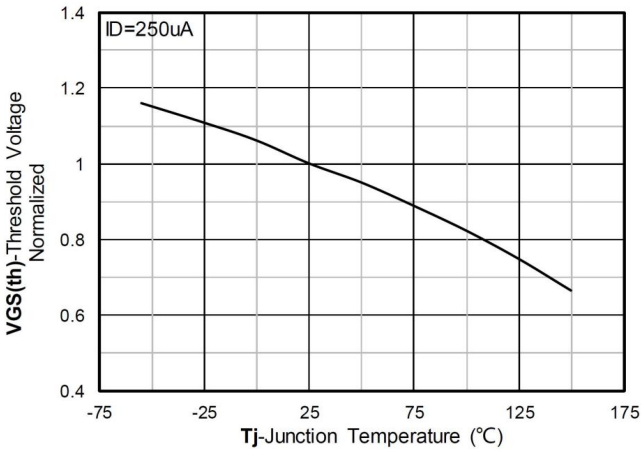
RDS(on) VS Drain Current



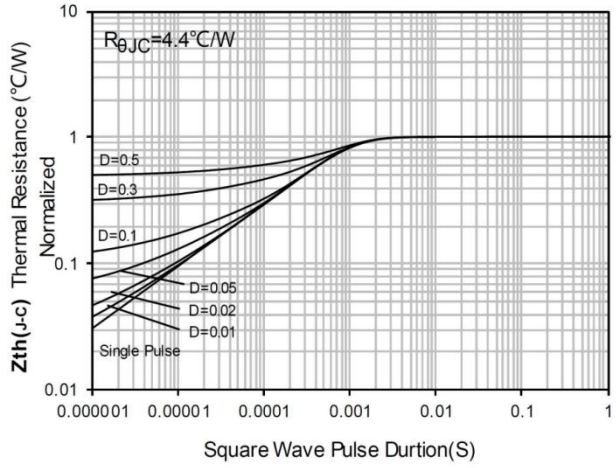
Forward characteristics of reverse diode



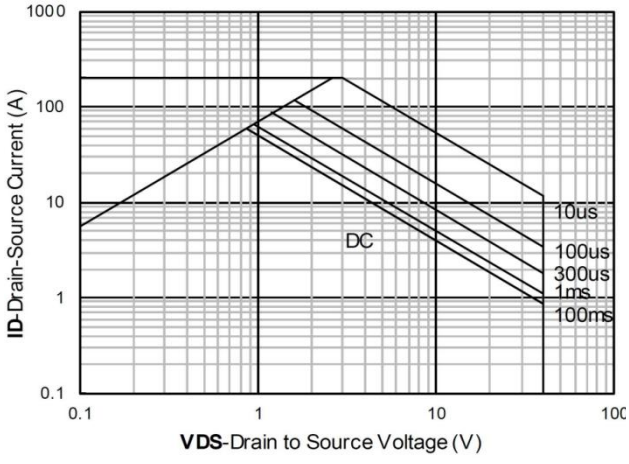
Normalized breakdown voltage



Normalized Threshold voltage

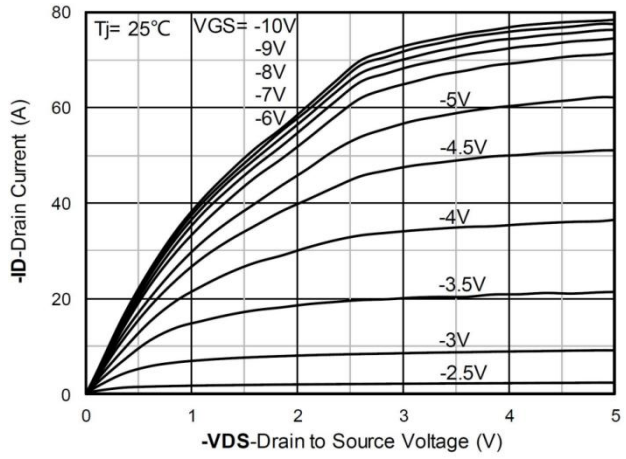


Maximum Transient Thermal Impedance

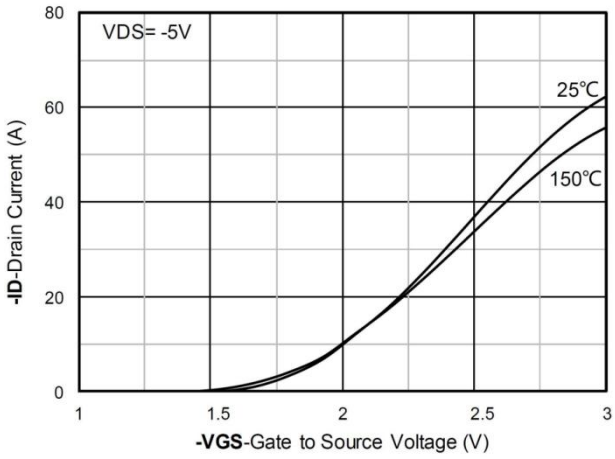


Safe Operation Area

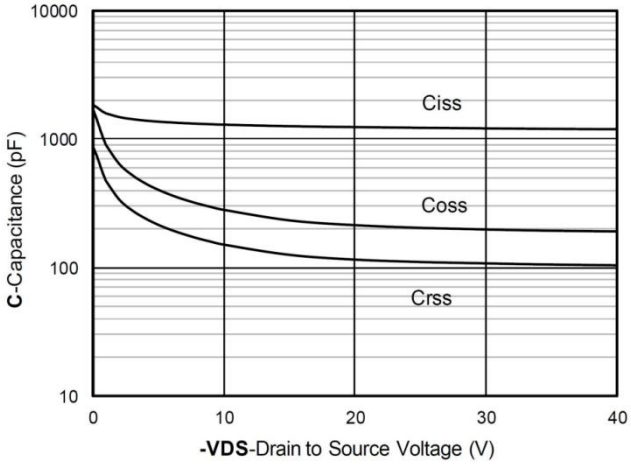
P Channel Typical Characteristics



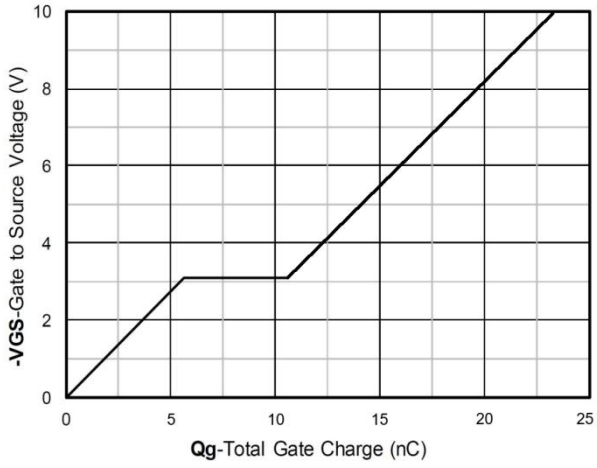
Output Characteristics



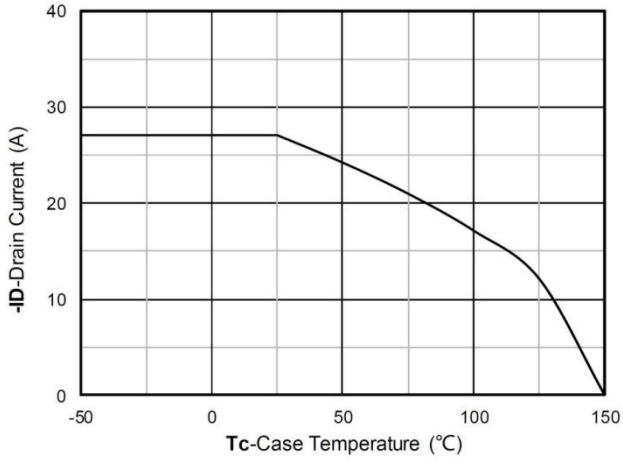
Transfer Characteristics



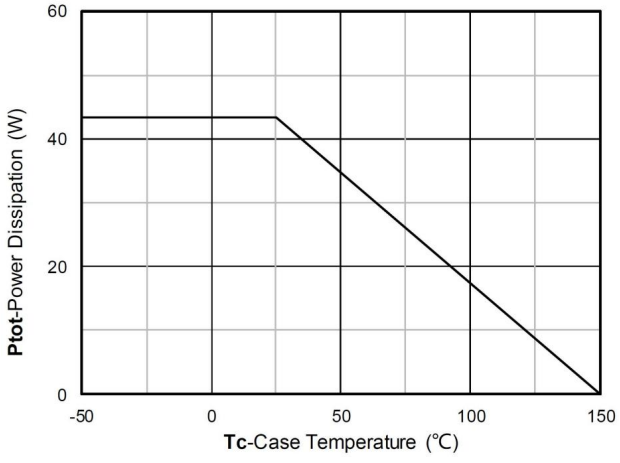
Capacitance Characteristics



Gate Charge



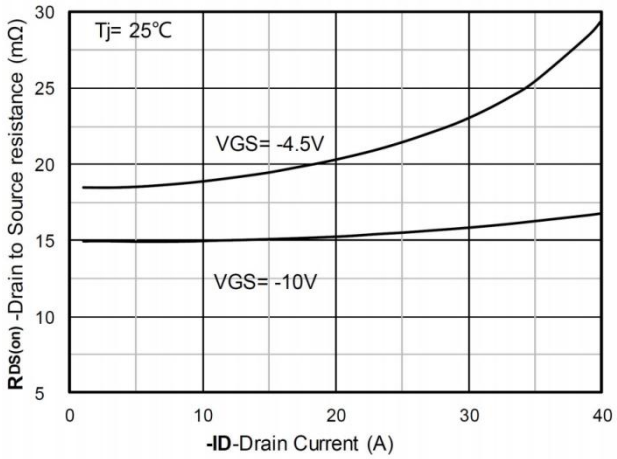
Current dissipation



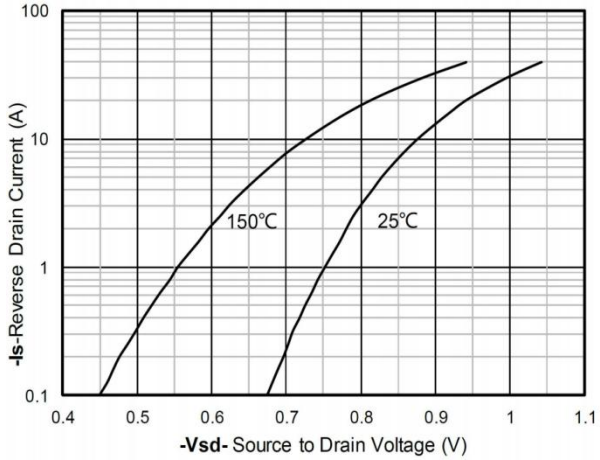
Power dissipation

Document ID	Issued Date	Revised Date	Revision	Page.
AS-1150876	2023/10/21	2025/08/07	B	8

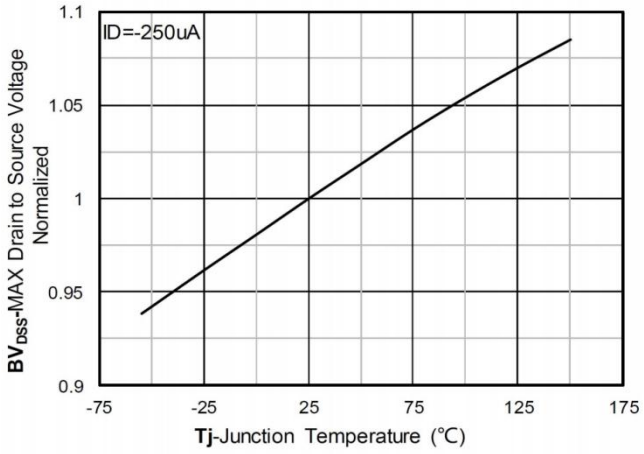
P- Channel Typical Characteristics



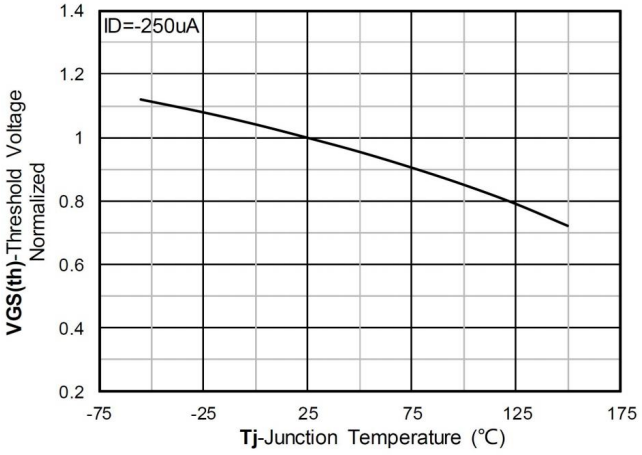
RDS(on) VS Drain Current



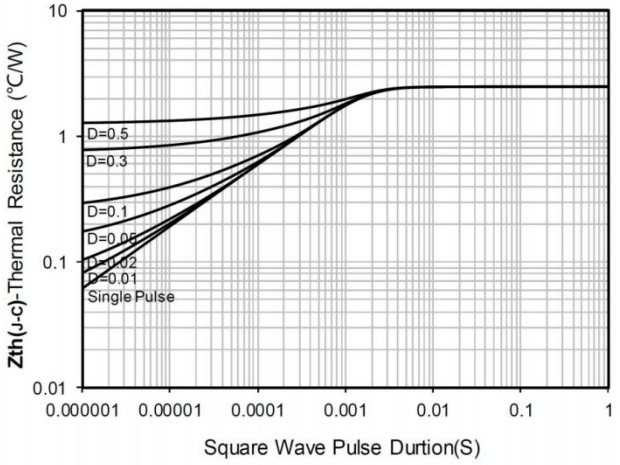
Forward characteristics of reverse diode



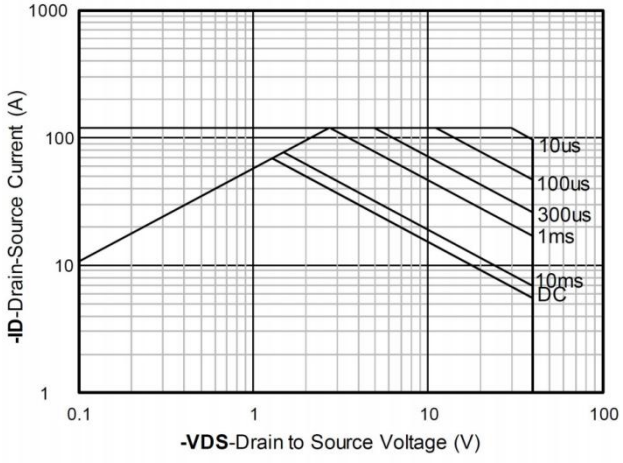
Normalized breakdown voltage



Normalized Threshold voltage

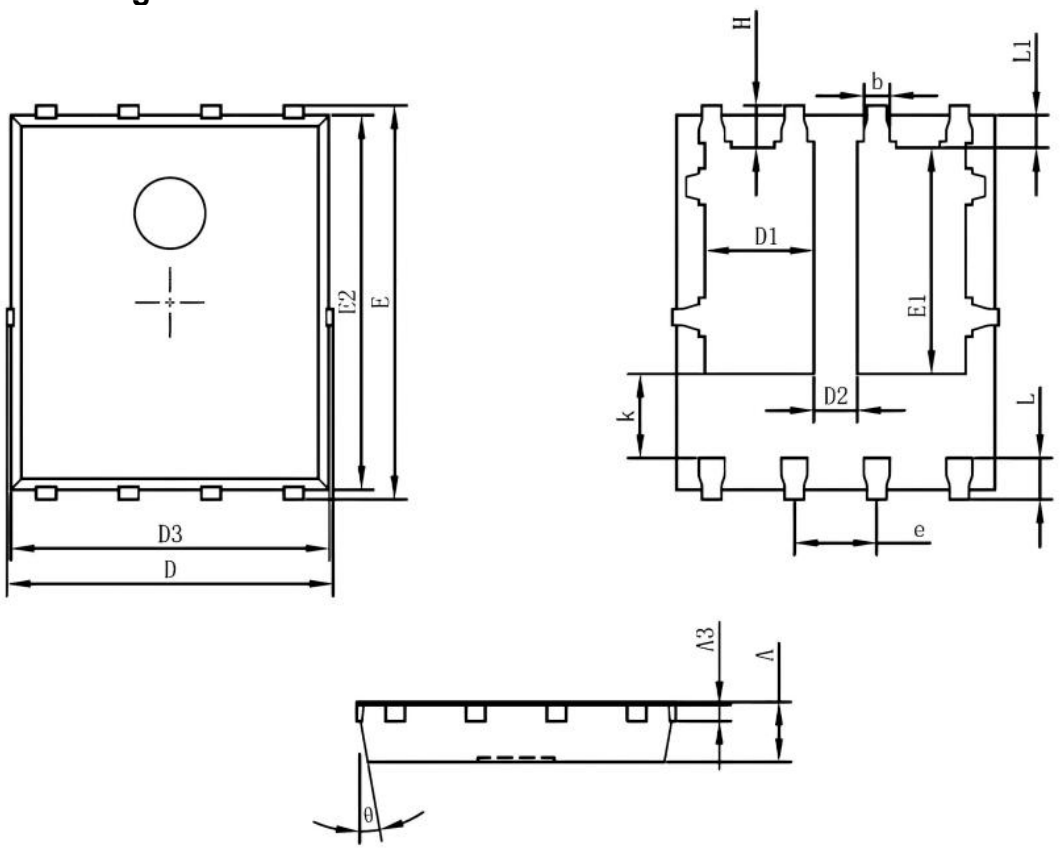


Maximum Transient Thermal Impedance



Safe Operation Area

PDFN5*6-8L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.254 REF.		0.010 REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	1.470	1.870	0.058	0.074
D2	0.470	0.870	0.019	0.034
E1	3.375	3.575	0.133	0.141
D3	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
k	1.190	1.390	0.047	0.055
b	0.350	0.450	0.014	0.018
e	1.270 TYP.		0.050 TYP.	
L	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
θ	10°	12°	10°	12°