


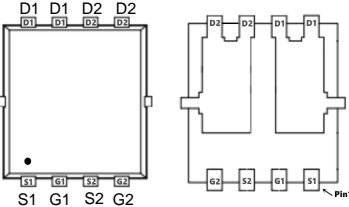
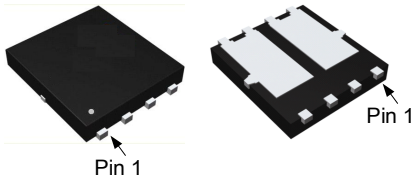
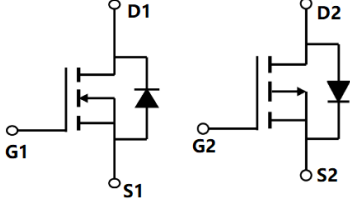


TM50G03NF

N+P-Channel Enhancement Mode Mosfet

<p>General Description</p> <ul style="list-style-type: none"> • Low $R_{DS(ON)}$ • RoHS and Halogen-Free Compliant <p>Applications</p> <ul style="list-style-type: none"> • Load switch • PWM 	<p>General Features</p> <p>N Channel $V_{DS} = 30V, I_D = 50A$ $R_{DS(ON)} = 7m\Omega (typ.) @ V_{GS} = 10V$</p> <p>P Channel $V_{DS} = -30V, I_D = -45A$ $R_{DS(ON)} = 10m\Omega (typ.) @ V_{GS} = -10V$</p> <p>100% UIS Tested 100% R_g Tested</p> 
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NF:DFN5x6-8L

Marking: 50G30 OR 3050

Absolute Maximum Ratings ($T_A = 25^\circ C$ Unless Otherwise Noted)

Symbol	Parameter	Rating		Units
		N-Ch	P-Ch	
V_{DS}	Drain-Source Voltage	30	-30	V
V_{GS}	Gate-Source Voltage	± 20	± 20	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	50	-45	A
$I_D @ T_A = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	32	-29	A
I_{DM}	Pulsed Drain Current ²	185	-166	A
EAS	Single Pulse Avalanche Energy ³	38	76	mJ
$P_D @ T_C = 25^\circ C$	Total Power Dissipation ⁴	15	21.3	W
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	-55 to 150	$^\circ C$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	48	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	5	$^\circ C/W$

N-Channel Electrical Characteristics T =25°C unless otherwise specified

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	30	---	---	V
ΔBV _{DSS} /ΔT _J	BVDSS Temperature Coefficient	Reference to 25°C, I _D =1mA	---	0.027	---	V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =10V, I _D =12A	---	7.0	12	mΩ
		V _{GS} =4.5V, I _D =10A	---	12	14	
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	1.0	---	2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	-5.8	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =24V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =24V, V _{GS} =0V, T _J =55°C	---	---	5	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	---	1.7	---	Ω
Q _g	Total Gate Charge (4.5V)	V _{DS} =20V, V _{GS} =4.5V, I _D =12A	---	12.8	---	nC
Q _{gs}	Gate-Source Charge		---	3.3	---	
Q _{gd}	Gate-Drain Charge		---	6.5	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =12V, V _{GS} =10V, R _G =3.3Ω I _D =5A	---	4.5	---	ns
T _r	Rise Time		---	10.8	---	
T _{d(off)}	Turn-Off Delay Time		---	25.5	---	
T _f	Fall Time		---	9.6	---	
C _{iss}	Input Capacitance	V _{DS} =15V, V _{GS} =0V, f=1MHz	---	1200	---	pF
C _{oss}	Output Capacitance		---	163	---	
C _{rss}	Reverse Transfer Capacitance		---	131	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _S	Continuous Source Current ^{1,6}	V _G =V _D =0V, Force Current	---	---	50	A
I _{SM}	Pulsed Source Current ^{2,6}		---	---	32	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =1A, T _J =25°C	---	---	1.2	V

Note :

1. The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper.
2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
3. The EAS data shows Max. rating. The test condition is V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=34A
4. The power dissipation is limited by 150°C junction temperature
5. The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.

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P-Channel Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D = -250\mu A$	-30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -30V, V_{GS}=0V,$	-	-	-1	μA
I_{GSS}	Gate to Body Leakage Current	$V_{DS}=0V, V_{GS}= \pm 20V$	-	-	± 100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D = -250\mu A$	-1.0	---	-2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance Note3	$V_{GS} = -10V, I_D = -10A$	-	10	16	m Ω
		$V_{GS} = -4.5V, I_D = -5A$	-	15	24	
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = -15V, V_{GS}=0V,$ $f=1.0\text{MHz}$	-	1770	-	pF
C_{oss}	Output Capacitance		-	233	-	pF
C_{rss}	Reverse Transfer Capacitance		-	206	-	pF
Q_g	Total Gate Charge	$V_{DS} = -15V, I_D = -5A,$ $V_{GS} = -10V$	-	22	-	nC
Q_{gs}	Gate-Source Charge		-	1.0	-	nC
Q_{gd}	Gate-Drain("Miller") Charge		-	1.8	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = -15V, I_D = -10A,$ $V_{GS} = -10V, R_{GEN} = 2.5\Omega$	-	9	-	ns
t_r	Turn-on Rise Time		-	13	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	48	-	ns
t_f	Turn-off Fall Time		-	20	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	-45	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-29	A
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS}=0V, I_S = -15A$	-	-0.8	-1.2	V
t_{rr}	Reverse Recovery Time	$T_J=25^{\circ}\text{C},$	-	64	-	ns
Q_{rr}	Reverse Recovery Charge	$V_{DD} = -24V, I_F = -2.8A,$ $dI/dt = -100A/\mu s$	-	25	-	nC

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

2. EAS condition: $T_J=25^{\circ}\text{C}, V_{GS}=10V, R_G=25\Omega, L=0.5\text{mH}, I_{AS}=-12.7A$

3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 0.5\%$



Typical Performance Characteristics-N

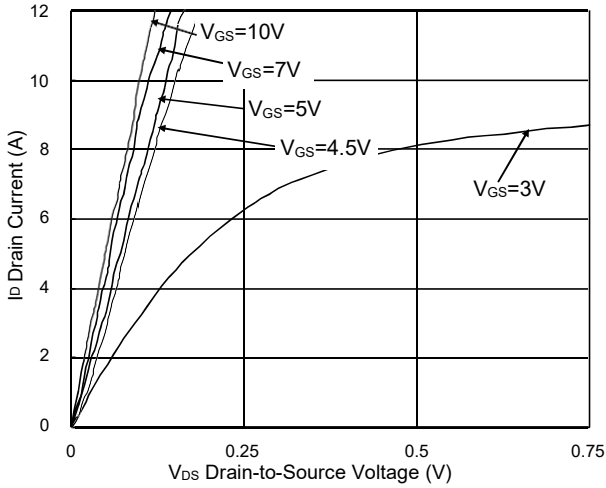


Fig.1 Typical Output Characteristics

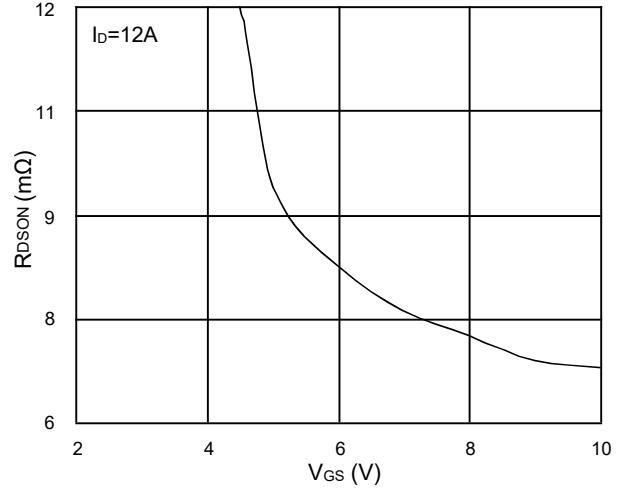


Fig.2 On-Resistance vs. G-S Voltage

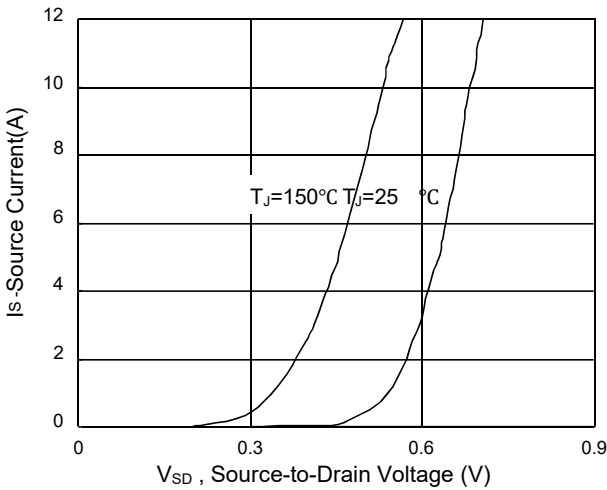


Fig.3 Forward Characteristics of Reverse

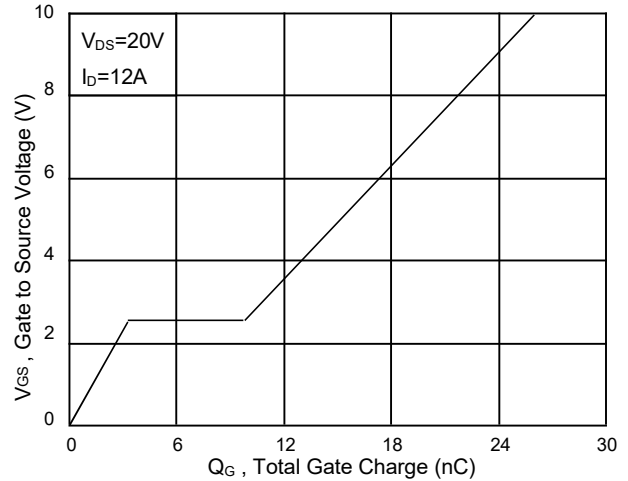


Fig.4 Gate-Charge Characteristics

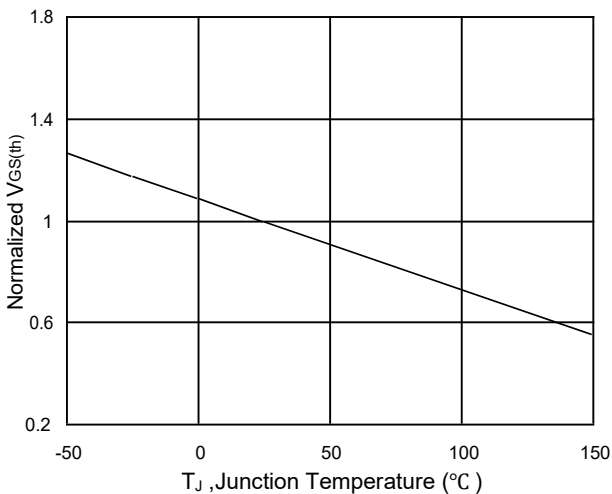


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

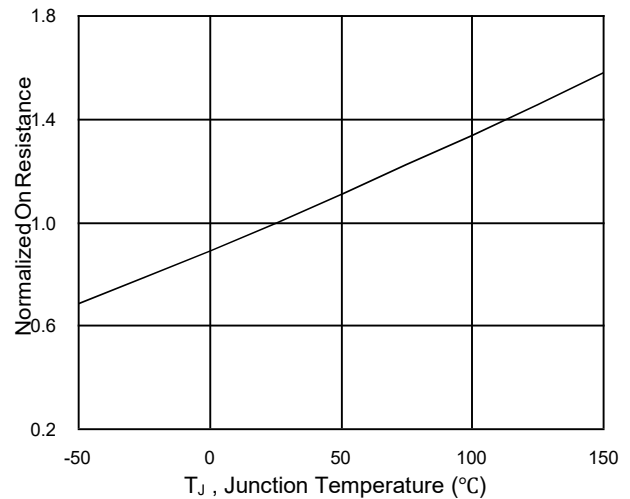


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

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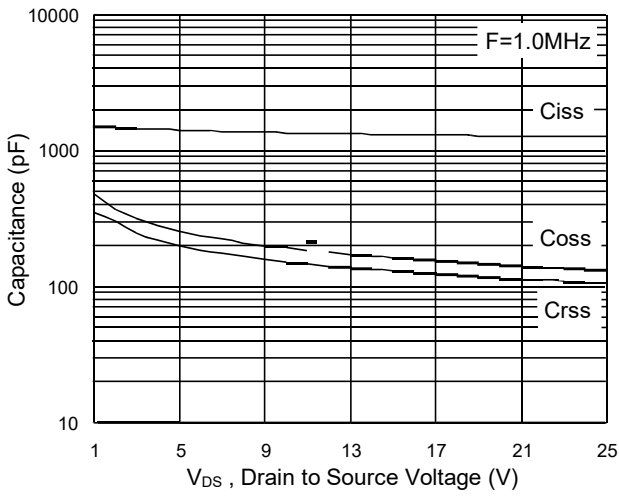


Fig.7 Capacitance

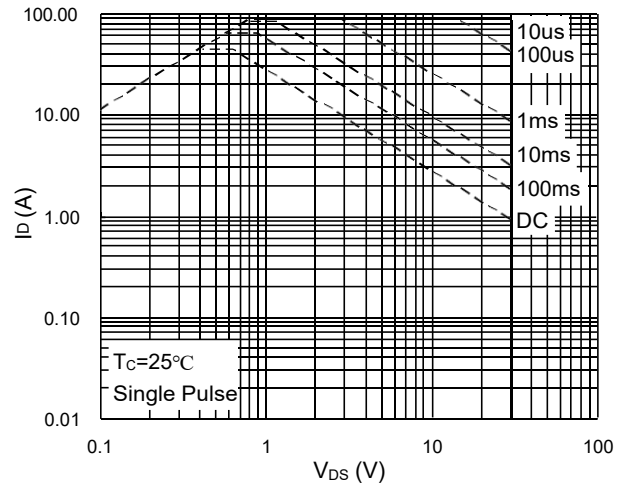


Fig.8 Safe Operating Area

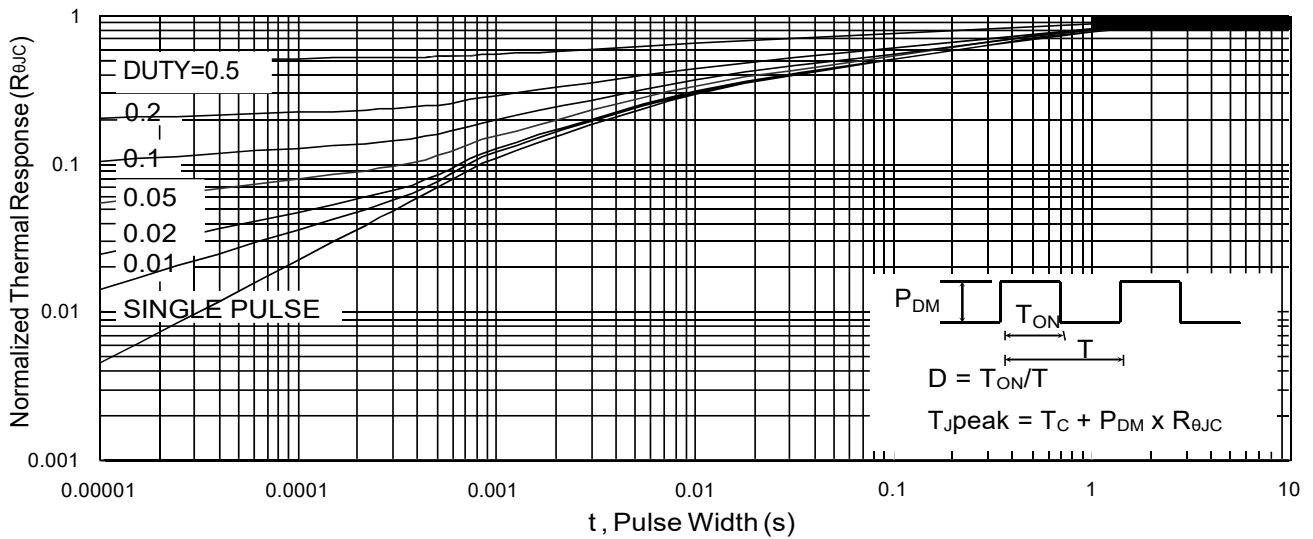


Fig.9 Normalized Maximum Transient Thermal Impedance

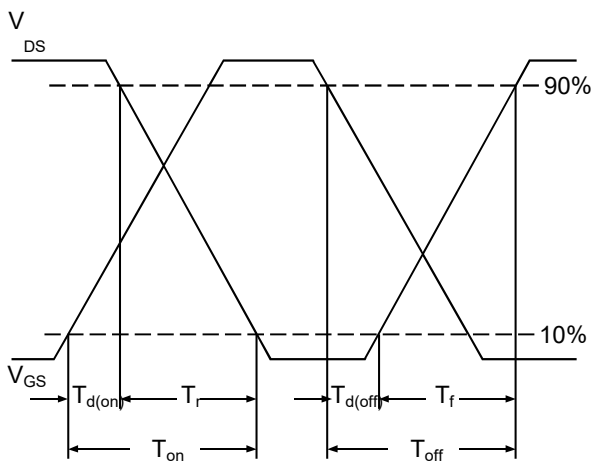


Fig.10 Switching Time Waveform

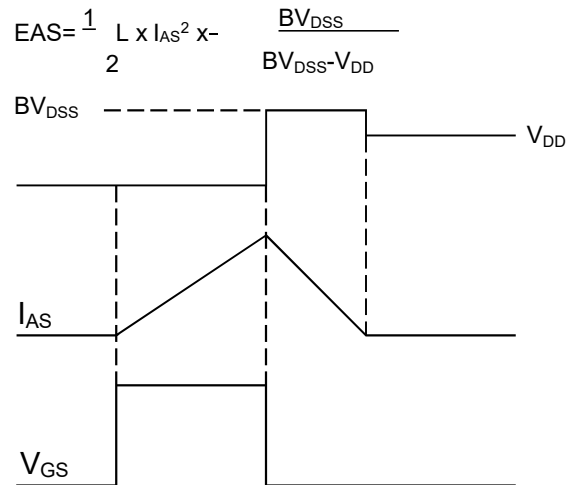


Fig.11 Unclamped Inductive Switching Waveform

Typical Performance Characteristics-P

Figure 1: Output Characteristics

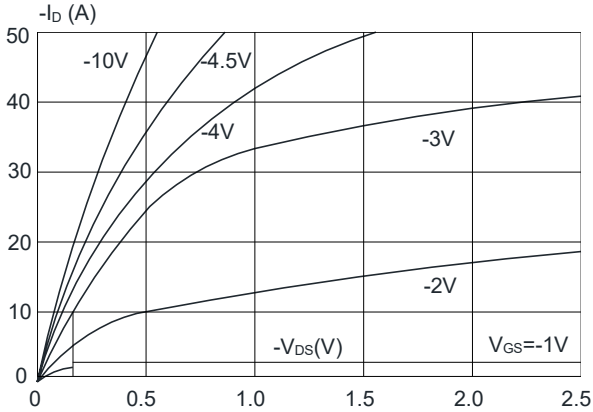


Figure 2: Typical Transfer Characteristics

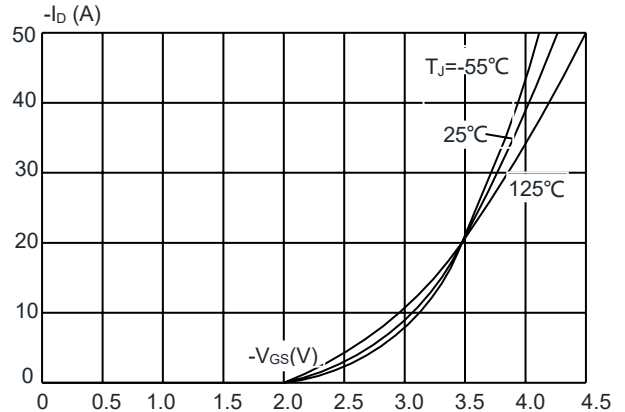


Figure 3: On-resistance vs. Drain Current

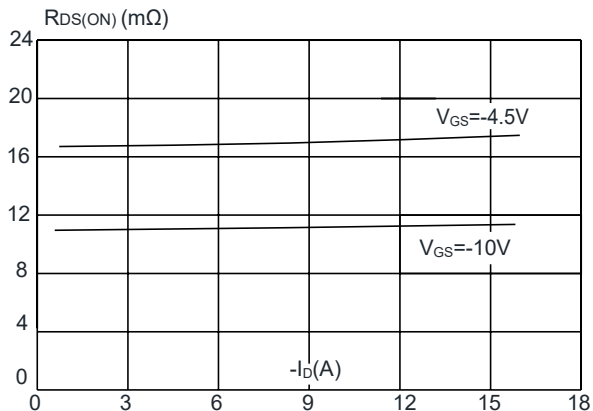


Figure 4: Body Diode Characteristics

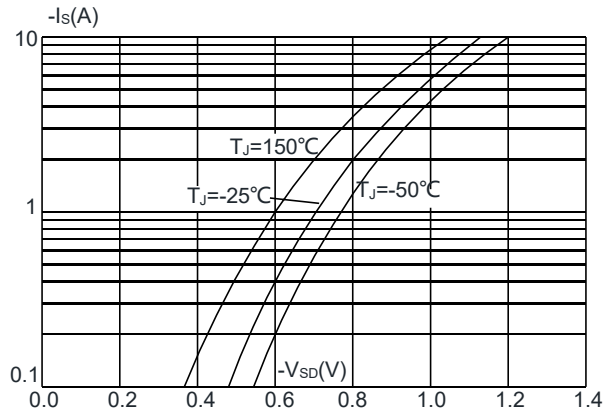


Figure 5: Gate Charge Characteristics

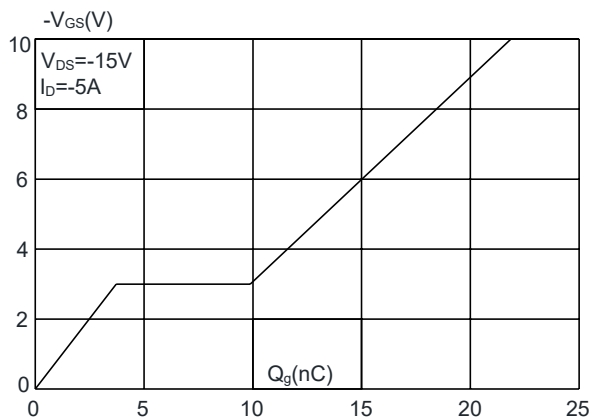
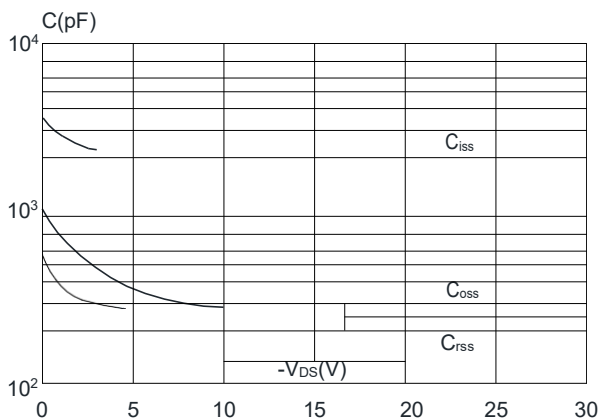


Figure 6: Capacitance Characteristics



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Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

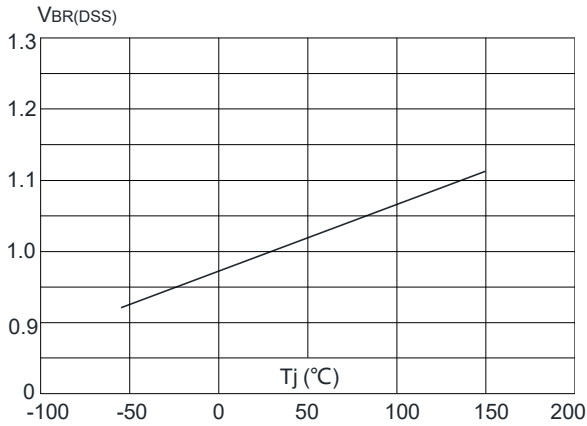


Figure 8: Normalized on Resistance vs. Junction Temperature

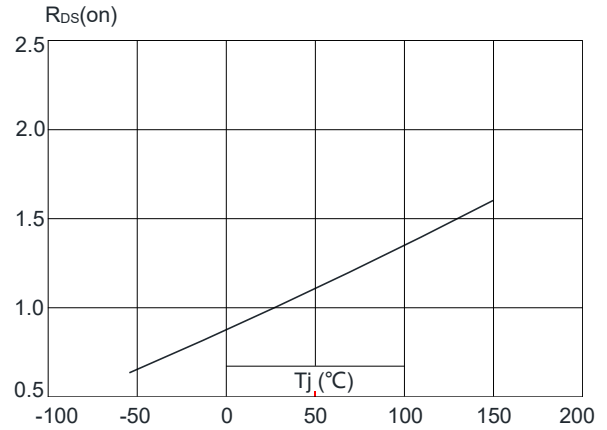


Figure 9: Maximum Safe Operating Area

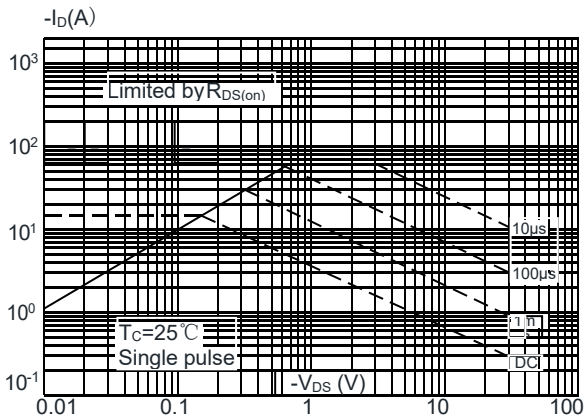


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

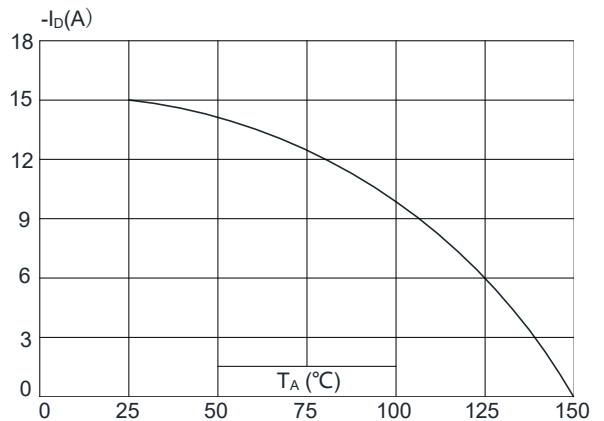
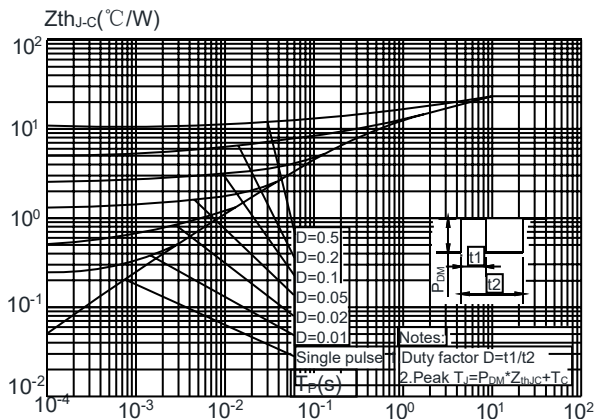
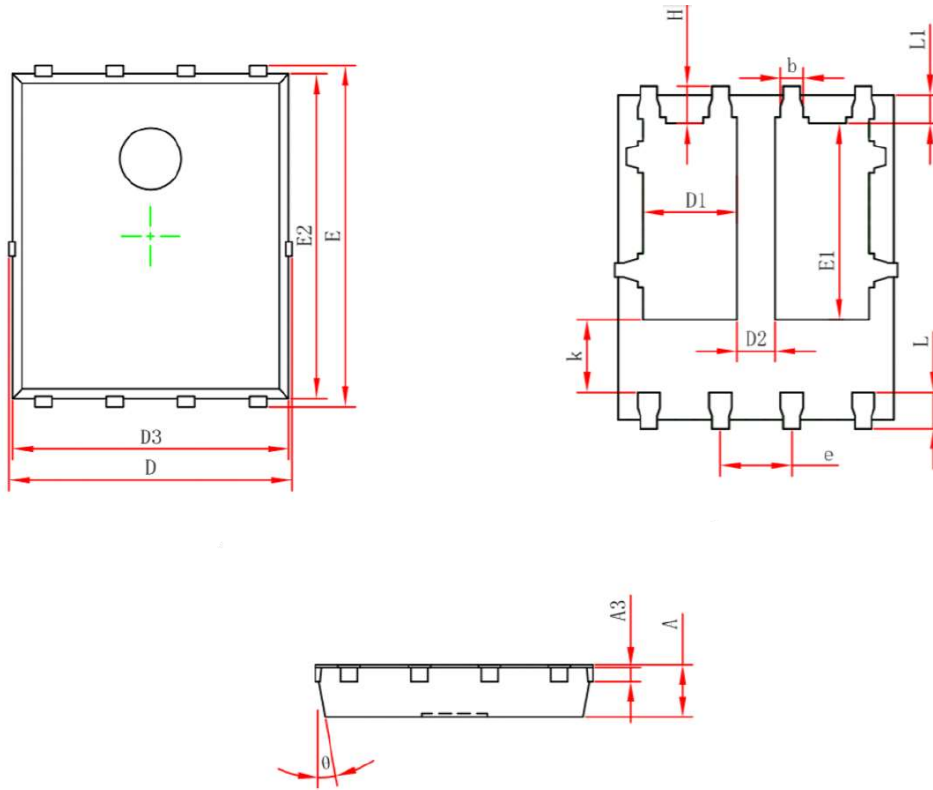


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



Package Mechanical Data:DFN5x6-8L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.154REF.		0.006REF.	
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	1.270TYP.		0.050TYP.	
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
theta	10°	12°	10°	12°