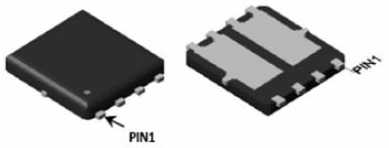
WGN40G06NF

Features:

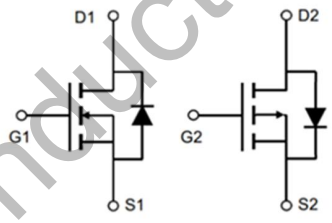
- ☐ Advanced Trench Technology.
- ☐ Excellent Switching Characteristics.
- ☐ Extended Safe Operating Area.
- ☐ V_{DS} = 60V I_D =50 A
- ☐ $R_{DS(ON)}$ < 16 mΩ @ V_{GS}=10V (Typ.: 12 mΩ)
- ☐ V_{DS} = -60V I_D =-34 A
- ☐ $R_{DS(ON)}$ < 31.2 mΩ @ V_{GS}=10V (Typ.: 24m Ω)

PDFN5x6

RoHS COMPLIANT



Top View Bottom View



WildGoose Semiconductor

Absolute Maximum Ratings* (Tc=25℃ Unless otherwise noted)

Symbol	Parameter	Rating		Units
		N-Ch	P-Ch	
V_{DS}	Drain-Source Voltage	60	-60	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D@T_C=25℃	Continuous Drain Current, V_{GS} @ 10V	50	-34	A
I_D@T_C=100℃	Continuous Drain Current, V_{GS} @ 10V	31	-31	A
I_{DM}	Pulsed Drain Current (1)	180	-180	A
E_{AS}	Single Pulsed Avalanche Energy	56 (2)	273 (3)	mJ
P_D@T_C=25℃	Total Power Dissipation	50	50	W
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	-55 to 150	℃
$R_{\theta JA}$	Thermal Resistance Junction-Ambient (4)	39		℃/W
$R_{\theta JC}$	Thermal Resistance Junction-Case	1.25		℃/W

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2. E_{AS} condition: Starting T_J=25℃, V_{DD}=30V, V_G=10V, R_G=25ohm, L=0.5mH, I_{AS}=15A
3. E_{AS} condition: Starting T_J=25℃, V_{DD}=-20V, V_G=-10V, R_G=25ohm, L=0.5mH, I_{AS}=-18A
4. $R_{\theta JA}$ is measured with the device mounted on a 1inch^2 pad of 2oz copper FR4 PCB

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	60	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 60V, V_{GS} = 0V	-	-	1.0	μA
I_{GSS}	Gate-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	1.1	1.6	2.5	V
$R_{DS(ON)}$	Static Drain-Source ON-Resistance(5)	V_{GS} = 10V, I_D = 30A	-	12	16	mΩ
		V_{GS} = 4.5V, I_D = 20A	-	14	18	mΩ
Dynamic Characteristics						
R_g	Gate Resistance	f = 1MHz	-	1.7	-	Ω
C_{iss}	Input Capacitance	V_{GS} = 0V, V_{DS} = 30V, f = 1MHz	1900	2699	3591	pF
C_{oss}	Output Capacitance		85	143	161	pF
C_{rss}	Reverse Transfer Capacitance		69	108	130	pF
Q_g	Total Gate Charge	V_{GS} = 0 to 10V V_{DS} = 30V, I_D = 30A	36	50	68	nC
Q_{gs}	Gate Source Charge		7	10	14	nC
Q_{gd}	Gate Drain("Miller") Charge		7	9	12	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On DelayTime	V_{GS} = 10V, V_{DD} = 30V I_D= 30A, R_{GEN} = 3Ω	-	9	-	ns
t_r	Turn-On Rise Time		-	31	-	ns
$t_{d(off)}$	Turn-Off DelayTime		-	44	-	ns
t_f	Turn-Off Fall Time		-	8	-	ns
Body Diode Characteristics						
I_S	Maximum Continuous Body Diode Forward Current		-	-	50	A
I_{SM}	Maximum Pulsed Body Diode Forward Current		-	-	180	A
V_{SD}	Body Diode Forward Voltage	V_{GS} = 0V, I_S = 30A	-		1.2	V
trr	Body Diode Reverse Recovery Time	I_F = 30A, di/dt = 100A/us	16	22	30	ns
Qrr	Body Diode Reverse Recovery Charge		-	25.2	-	nC

Notes:

5. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%.

WildGoose Semiconductor

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=-250μA	-60	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-60V,V_{GS}=0V	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=-250μA	-1	-1.8	-2.5	V
Drain-Source On-State Resistance(6)	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-20A	-	24	31.2	mΩ
Forward Transconductance	g_{FS}	V_{DS}=-5V,I_D=-20A	-	25	-	S
Dynamic Characteristics						
Input Capacitance	C_{lss}	V_{DS}=-30V,V_{GS}=0V, F=1.0MHz	-	3016.8	-	PF
Output Capacitance	C_{oss}		-	180	-	PF
Reverse Transfer Capacitance	C_{rss}		-	126	-	PF
Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=-30V, R_L=1.5Ω, V_{GS}=-10V,R_G=3Ω	-	12	-	nS
Turn-on Rise Time	t_r		-	15	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	38	-	nS
Turn-Off Fall Time	t_f		-	15	-	nS
Total Gate Charge	Q_g	V_{DS}=-30,I_D=-20A, V_{GS}=-10V	-	49.8		nC
Gate-Source Charge	Q_{gs}		-	10.6		nC
Gate-Drain Charge	Q_{gd}		-	13.6		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	V_{GS}=0V,I_S=-20A	-		-1.2	V
Diode Forward Current	I_S		-	-	-50	A
Reverse Recovery Time	t_{rr}	TJ = 25°C, IF =- 20A di/dt = -100A/μs(Note3)	-	47		nS
Reverse Recovery Charge	Qrr		-	53		nC

Notes:

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

WildGoose Semiconductor

Typical Performance Characteristics N-Channel

Figure 1: Power De-rating

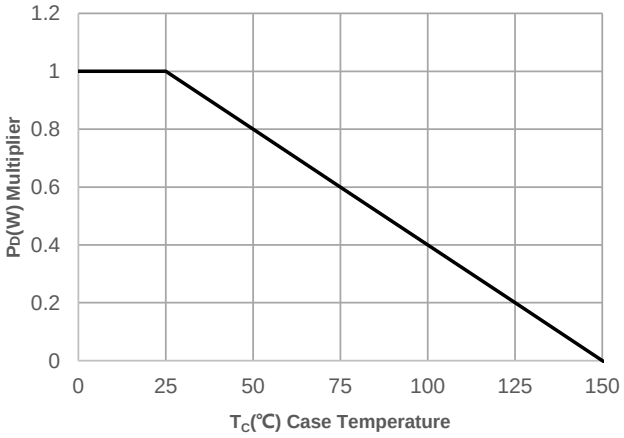


Figure 2: Current De-rating

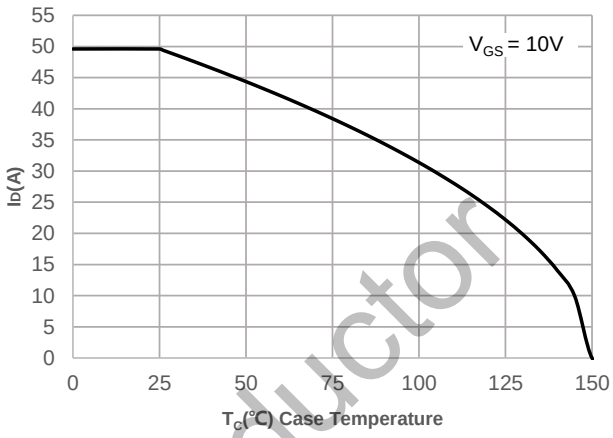


Figure 3: Normalized Maximum Transient Thermal Impedance

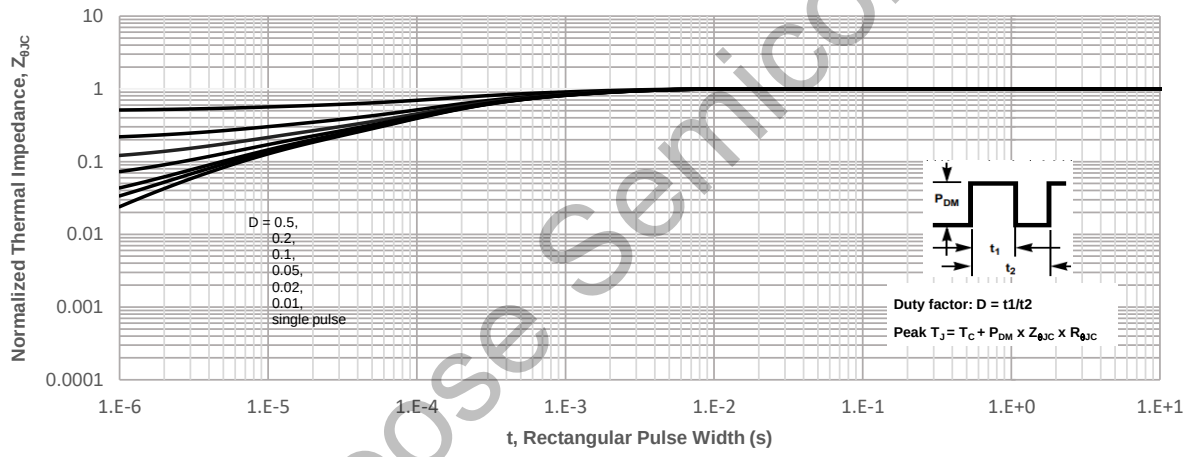
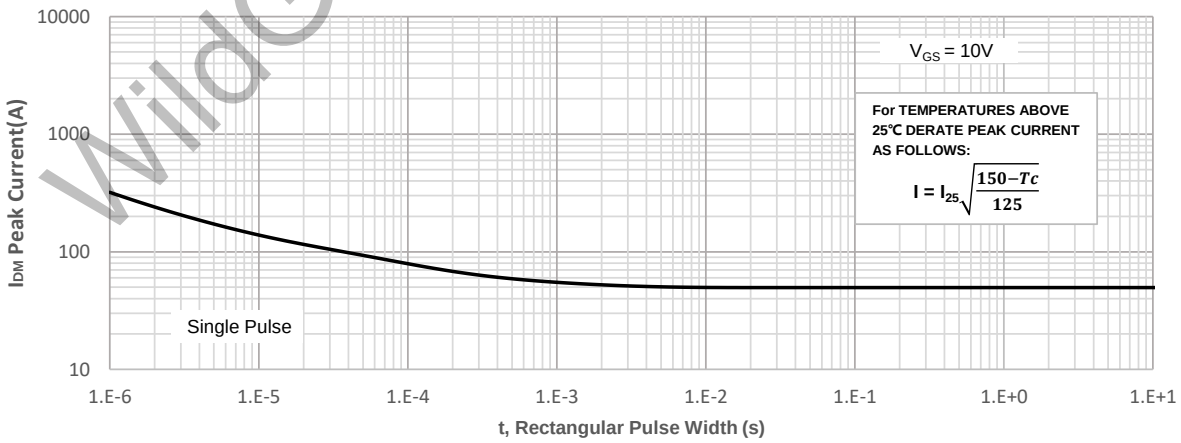


Figure 4: Peak Current Capacity



WildGoose Semiconductor

Typical Performance Characteristics N-Channel

Figure 5: Output Characteristics

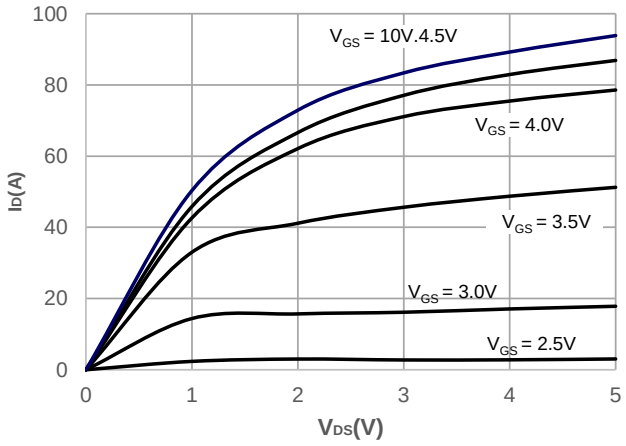


Figure 6: Typical Transfer Characteristics

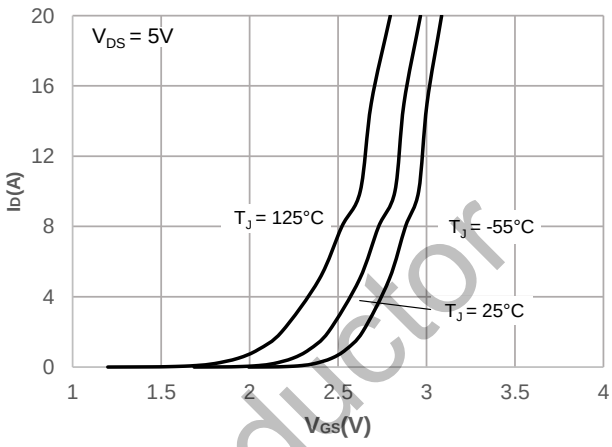


Figure 7: On-resistance vs. Drain Current

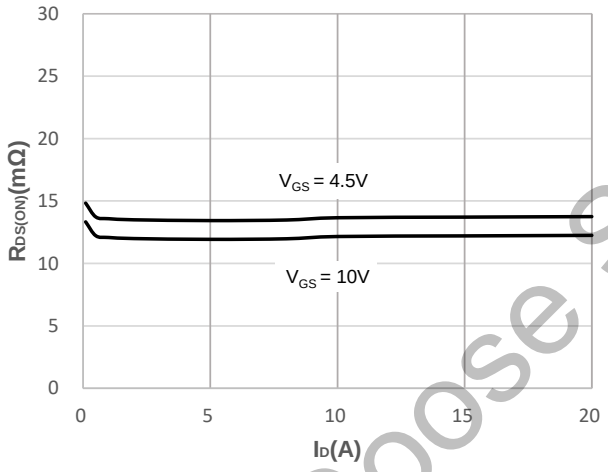


Figure 8: Body Diode Characteristics

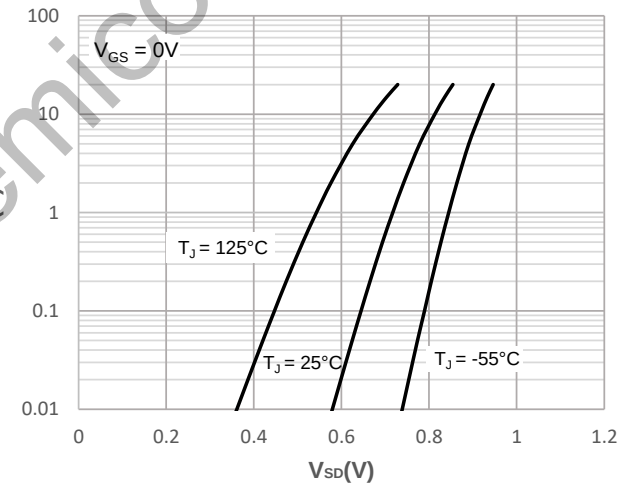


Figure 9: Gate Charge Characteristics

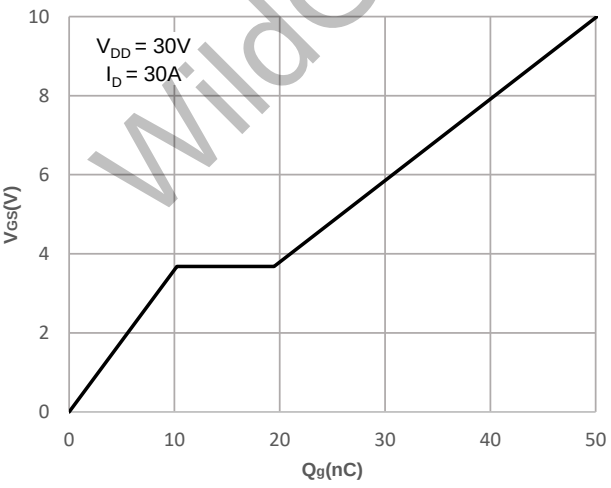
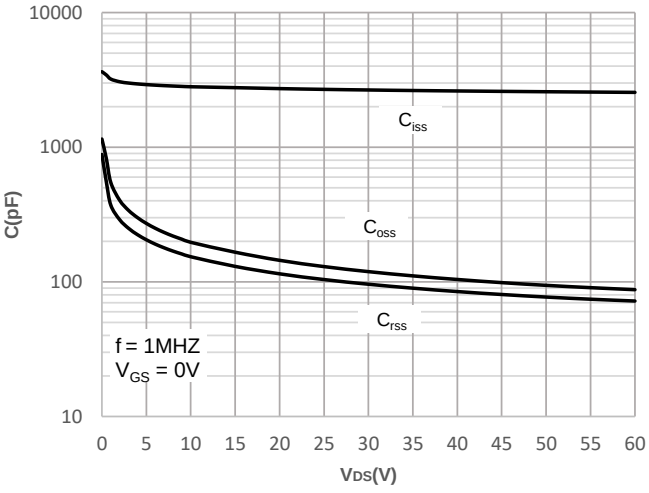


Figure 10: Capacitance Characteristics



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Typical Performance Characteristics N-Channel

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

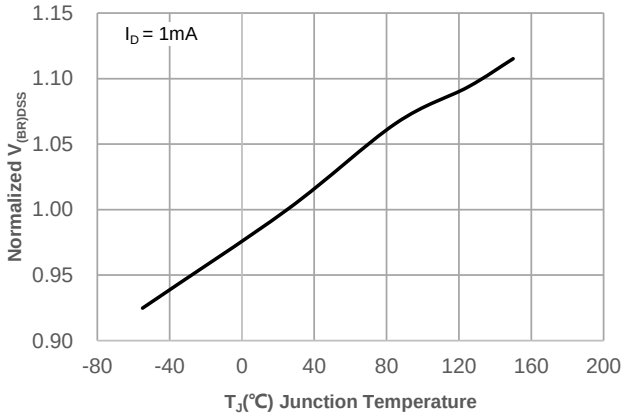


Figure 12: Normalized on Resistance vs. Junction Temperature

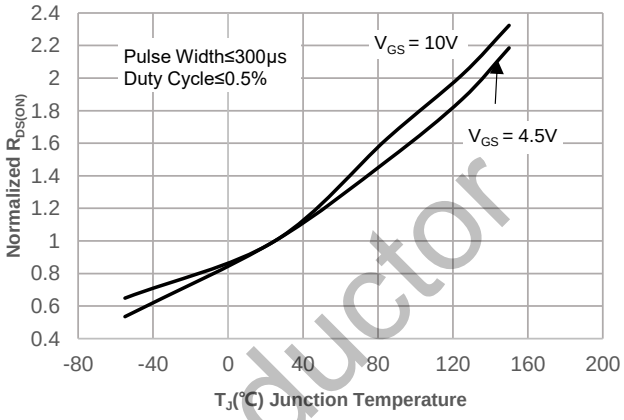


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

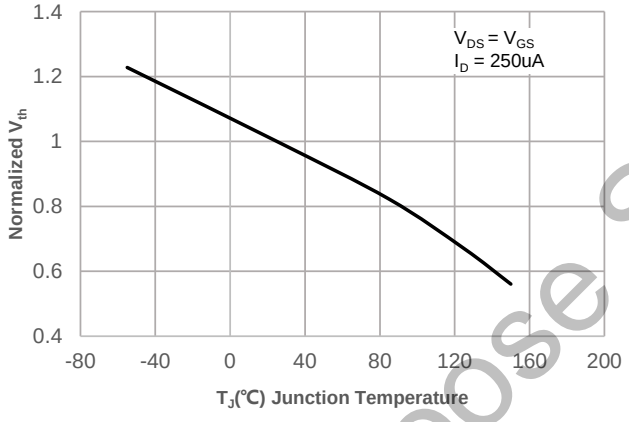


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

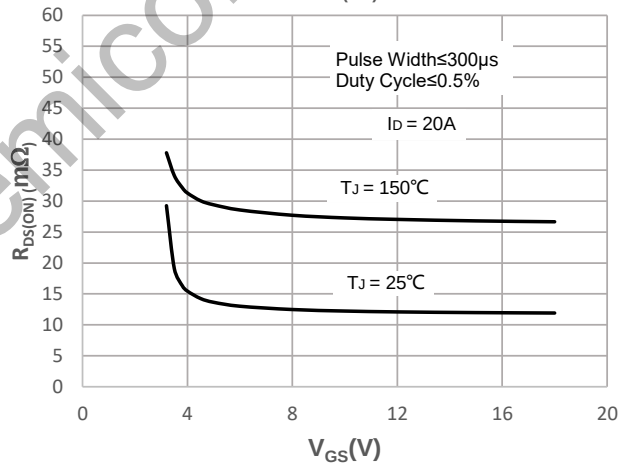
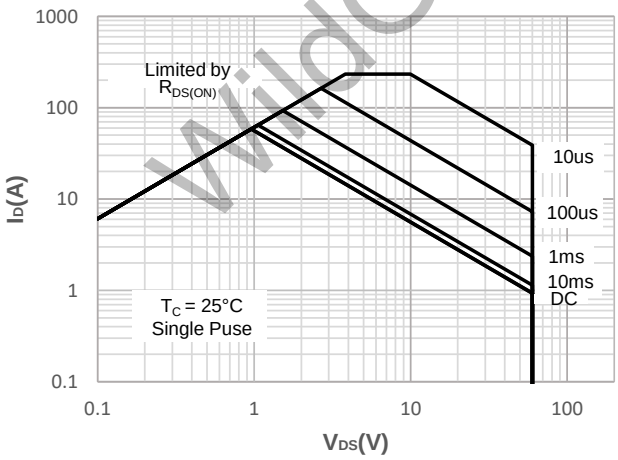


Figure 15: Maximum Safe Operating Area



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Test Circuit N-Channel

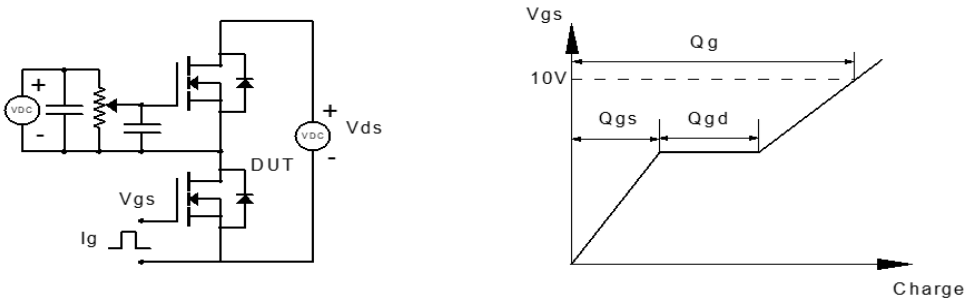

Figure 1: Gate Charge Test Circuit & Waveform

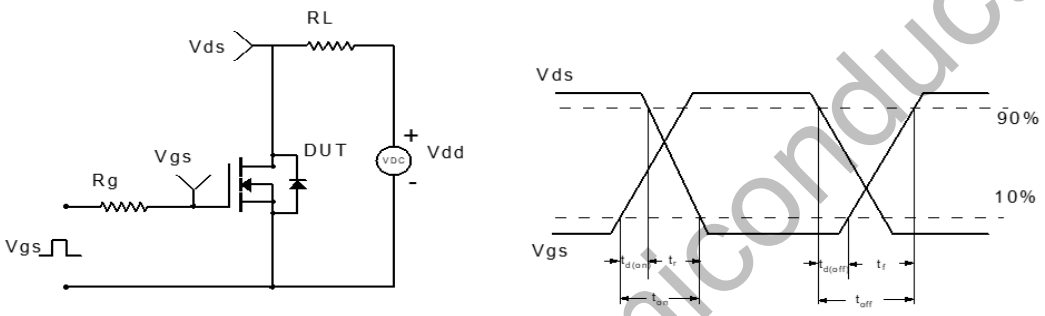

Figure 2: Resistive Switching Test Circuit & Waveform

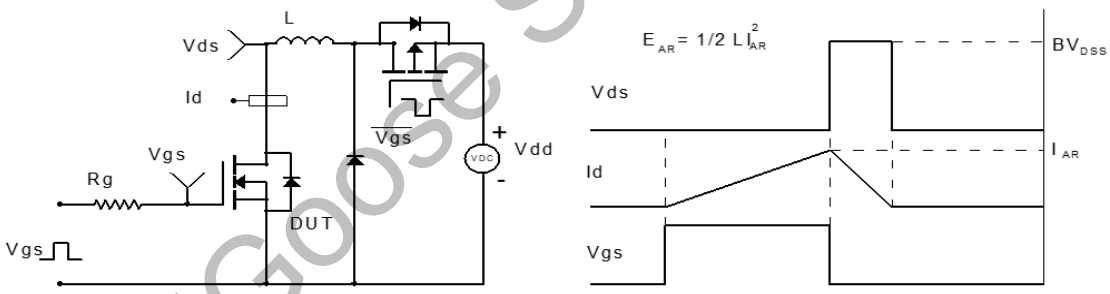

Figure 3: Unclamped Inductive Switching Test Circuit& Waveform

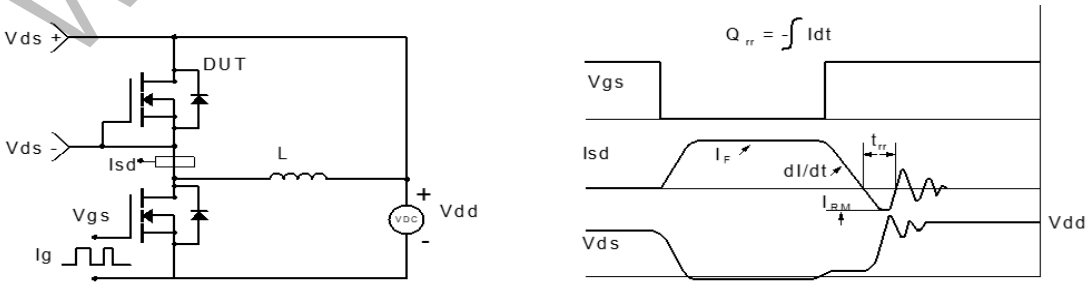

Figure 4: Diode Recovery Test Circuit & Waveform

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Typical Performance Characteristics P-Channel

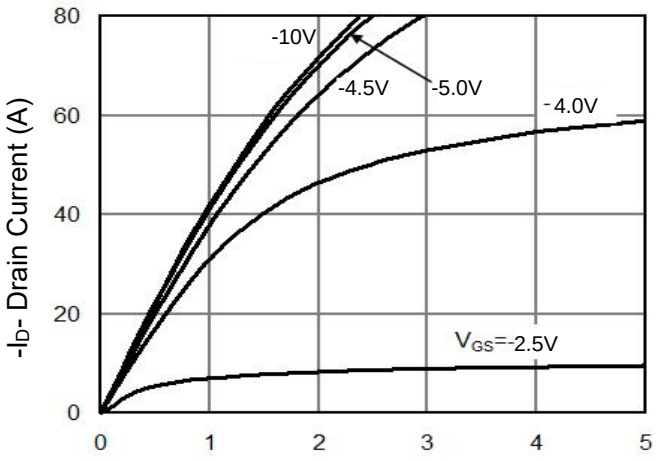

Figure 1 Output Characteristics

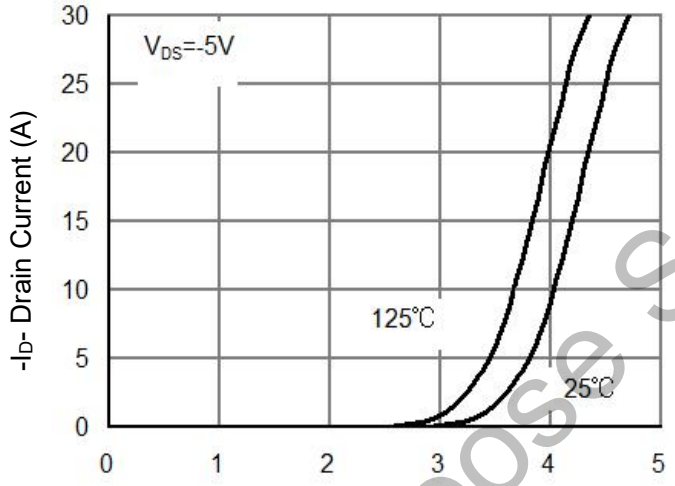

Figure 2 Transfer Characteristics

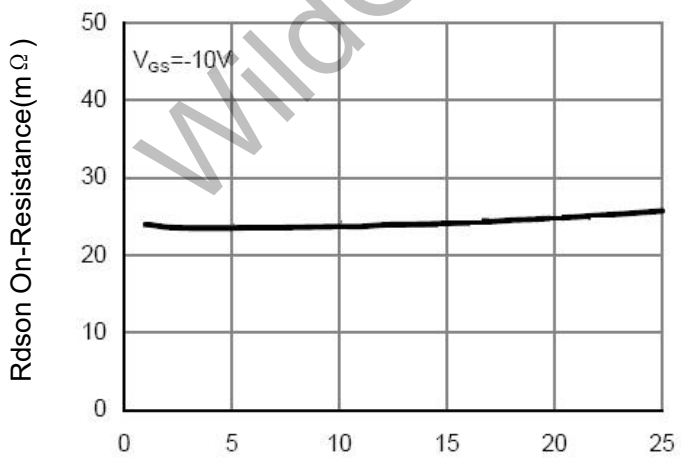

Figure 3 Rdson- Drain Current

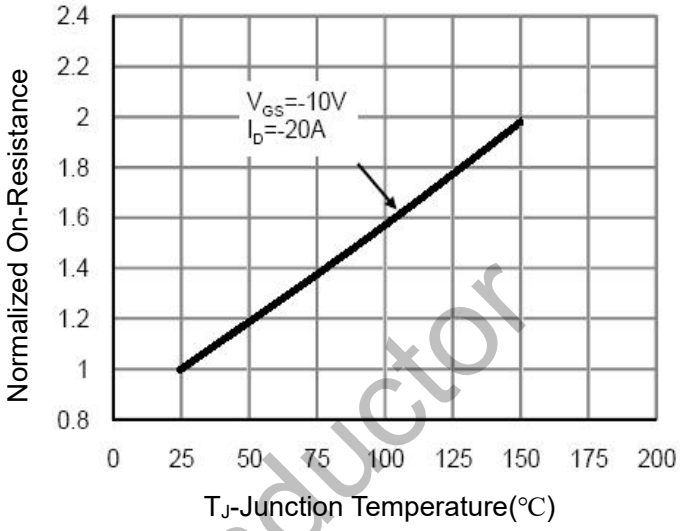

Figure 4 Rdson-Junction Temperature

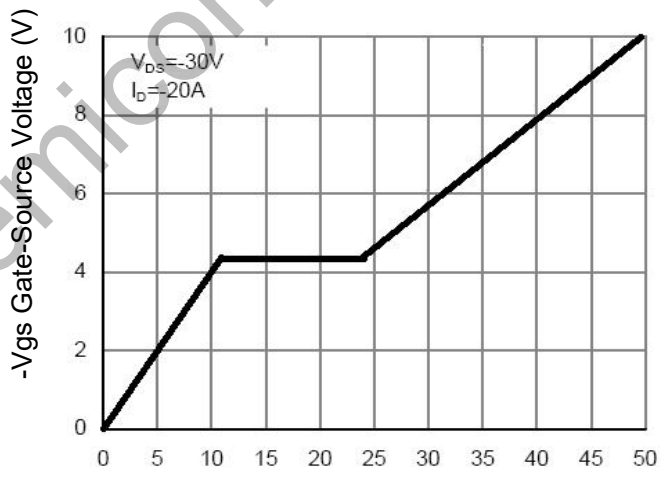

Figure 5 Gate Charge

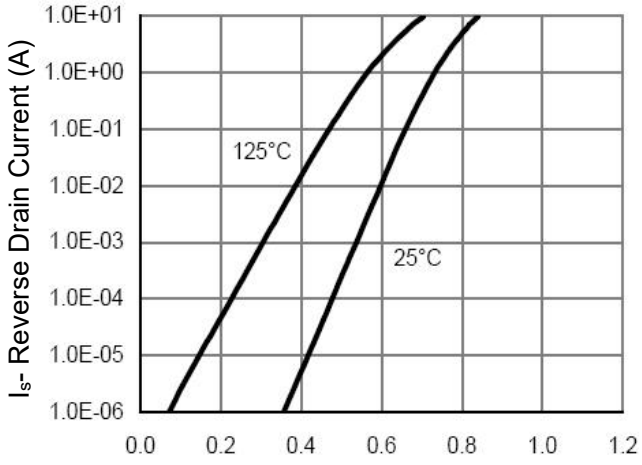

Figure 6 Source- Drain Diode Forward

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Typical Performance Characteristics P-Channel

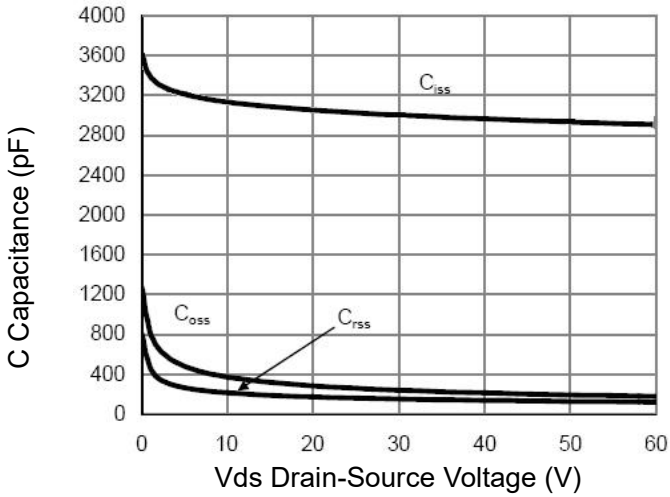
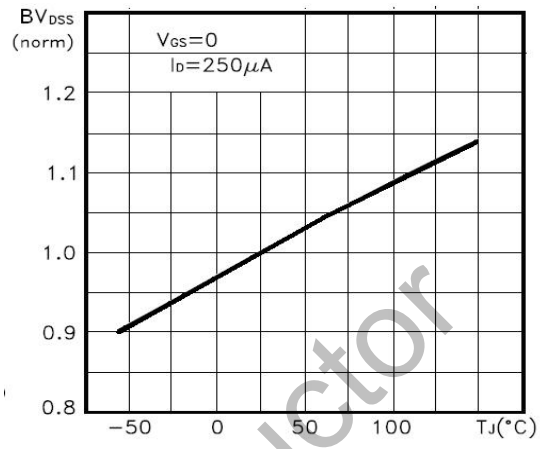
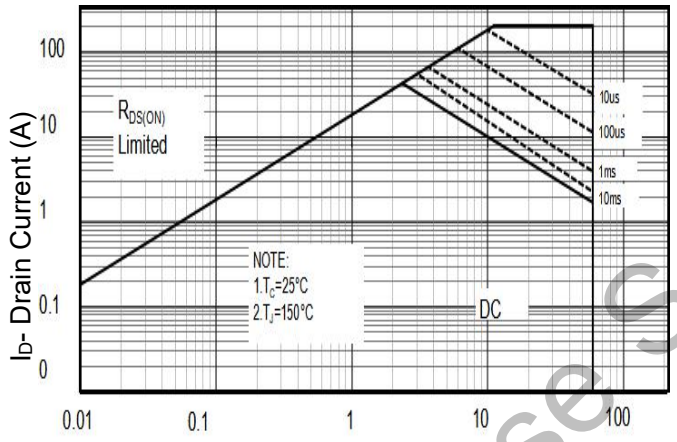


Figure 7 Capacitance vs Vds



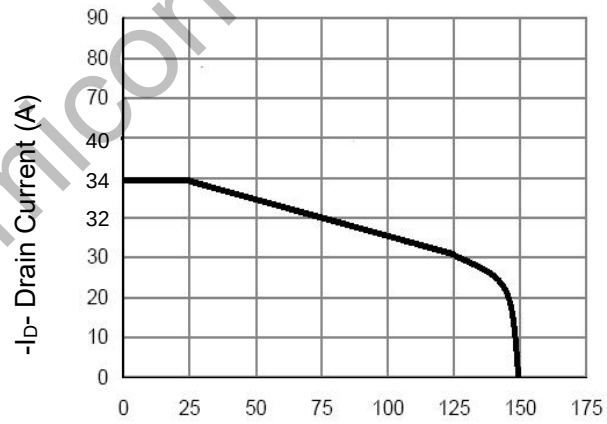
T_J-Junction Temperature(℃)

Figure 9 BV_{DSS} vs Junction Temperature



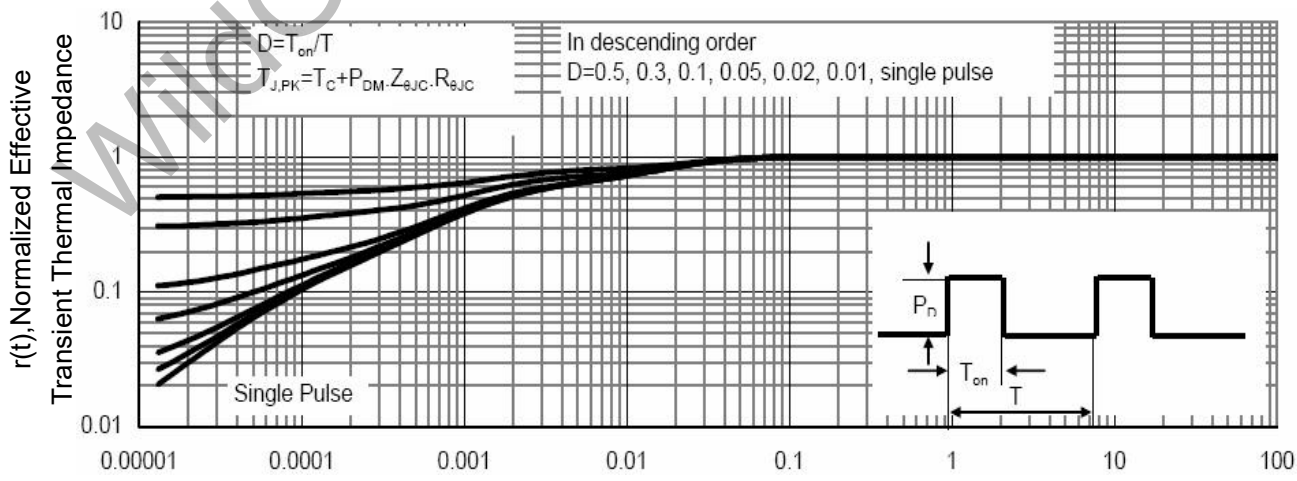
-Vds Drain-Source Voltage (V)

Figure 8 Safe Operation Area



T_J-Junction Temperature(℃)

Figure 10 ID Current De-rating



Square Wave Pluse Duration(sec)

Figure 11 Normalized Maximum Transient Thermal Impedance

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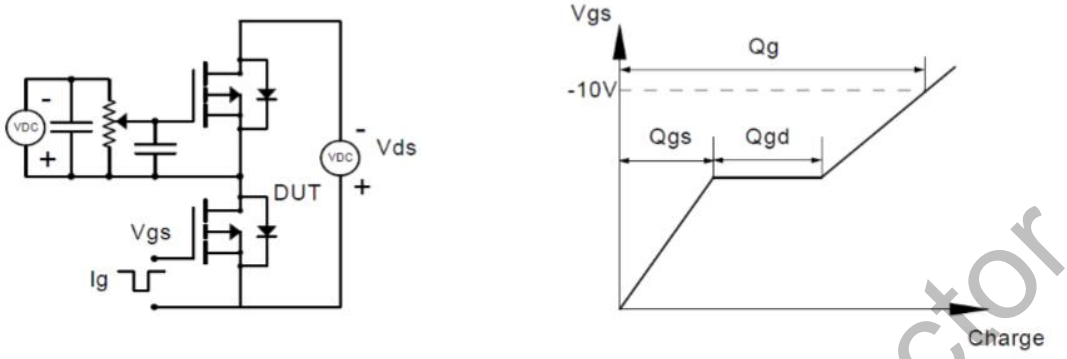
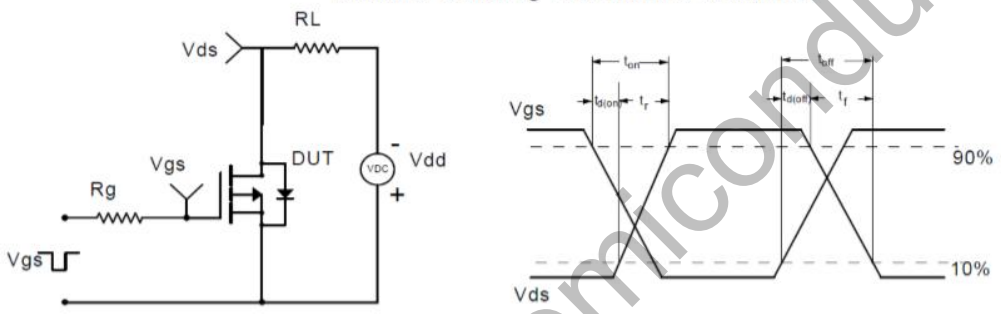
Test Circuit P-Channel

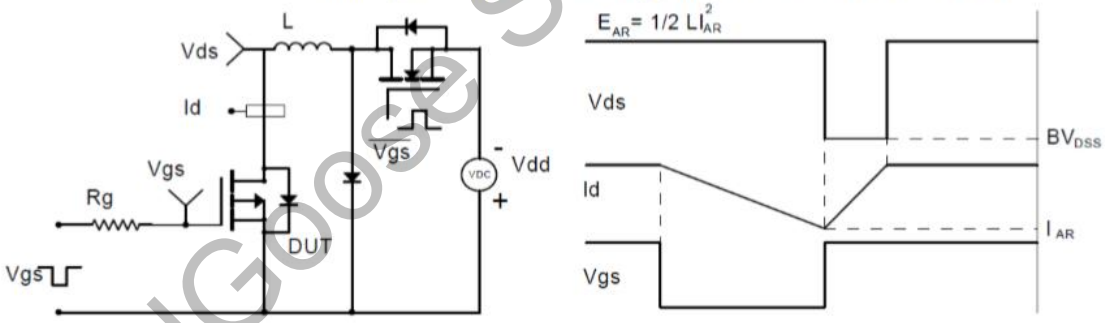
Gate Charge Test Circuit & Waveform



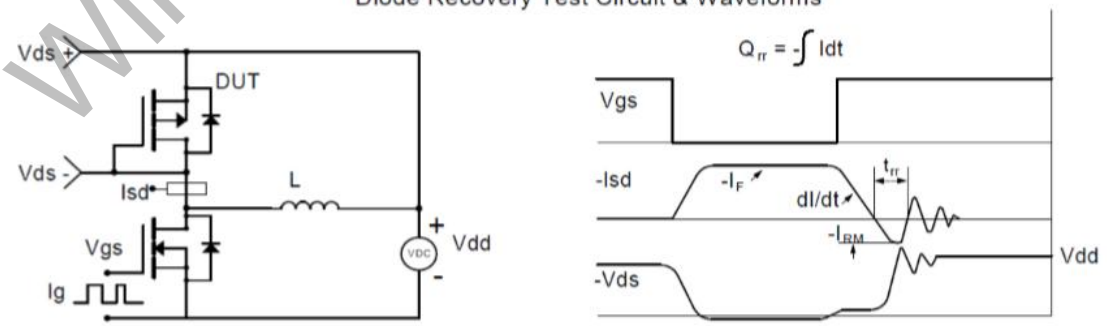
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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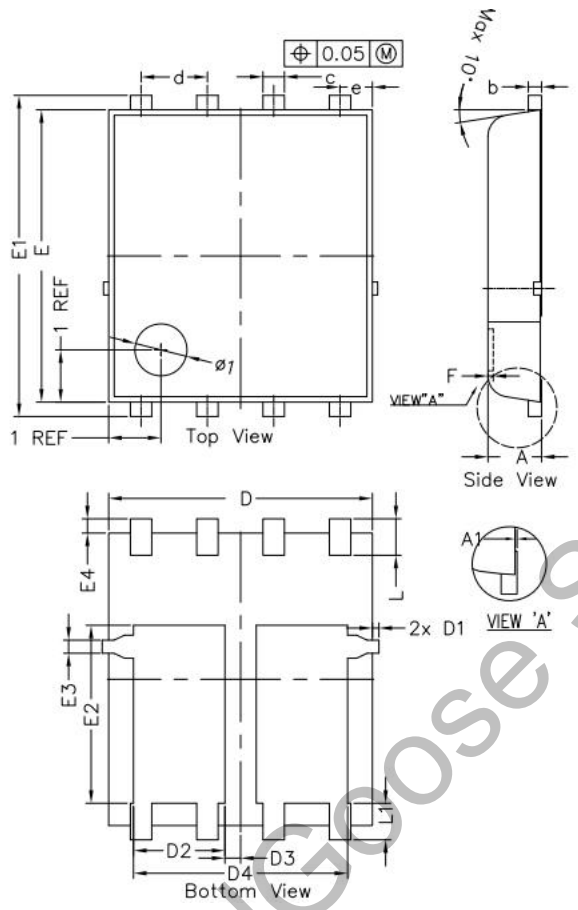
Package Dimension

PDFN5x6

Unit: mm



SYMBOLS	DIMENSION IN MM			DIMENSION IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
* A	0.900	1.000	1.100	0.035	0.039	0.043
A1	0.000	---	0.050	0.000	----	0.002
b	0.246	0.254	0.312	0.010	0.010	0.012
* c	0.310	0.410	0.510	0.012	0.016	0.020
d		1.27 BSC			0.050 BSC	
* D	4.950	5.050	5.150	0.195	0.199	0.203
*D1	---	---	0.125	---	---	0.005
*D2	1.650	1.750	1.850	0.065	0.069	0.073
D3	0.200	0.300	0.400	0.008	0.012	0.016
D4	4.000	4.100	4.200	0.157	0.161	0.165
e		0.62 BSC			0.024 BSC	
* E	5.500	5.600	5.700	0.217	0.220	0.224
* E1	6.050	6.150	6.250	0.238	0.242	0.246
E2	3.310	3.410	3.510	0.130	0.134	0.138
E3	0.150	0.250	0.350	0.006	0.010	0.014
* E4	0.175	0.275	0.375	0.007	0.011	0.015
F	-	-	0.100	-	-	0.004
* L	0.500	0.600	0.700	0.02	0.02	0.03
L1	0.600	0.700	0.800	0.02	0.03	0.03

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