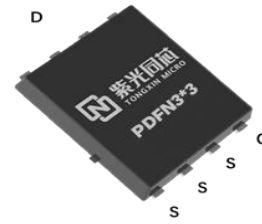


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Product Summary

Parameter	Value	Unit
V_{DS}	60	V
$V_{GS(th)}_{Typ}$	1.7	V
I_D (@ $V_{GS} = 10V$) ⁽¹⁾	37	A
$R_{DS(ON)}_{Typ}$ (@ $V_{GS} = 10V$)	10.0	m Ω

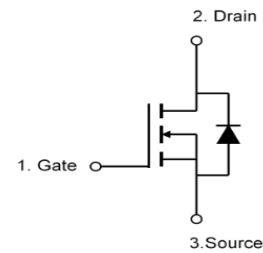
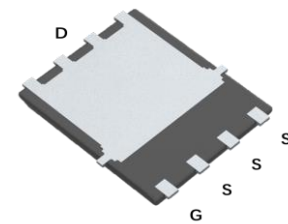


Features

- Fast Switching
- Very low on-resistance
- Enhancement mode
- 100% Avalanche Tested
- 100% ΔV_{ds} Tested
- Halogen-free and RoHS-compliant
- Humidity Sensitivity Class: MSL1

Typical Applications

- Load Switch
- PWM Application
- Power Management



Product Validation

- Qualified for Automotive Applications. Product validation according to AEC-Q101

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Ordering Information

Device	Package	Quantity of Pins	Marking	MSL	T _J (°C)
THF012S60LRN1A	PDFN3x3-8L	8	012S60LRN1A	1	-55 to 175

Absolute Maximum Ratings (@ T_A = 25°C unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V _{DS}	60	V
Gate-to-Source Voltage	V _{GS}	±20	V
Continuous Drain Current ⁽¹⁾	I _D	T _C = 25°C	37
		T _C = 100°C	26
Pulsed Drain Current ⁽²⁾	I _{DM}	148	A
Avalanche Current ⁽³⁾	I _{AS}	15	A
Avalanche Energy ⁽³⁾	E _{AS}	178	mJ
Power Dissipation ⁽⁴⁾	P _D	T _C = 25°C	28
		T _C = 100°C	14
Junction & Storage Temperature Range	T _J , T _{STG}	-55 to 175	°C

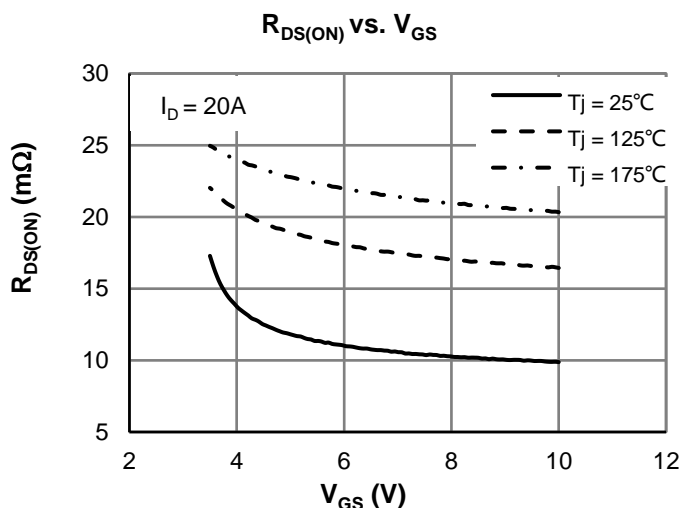


Figure 1: R_{DS(ON)} VS. V_{GS}

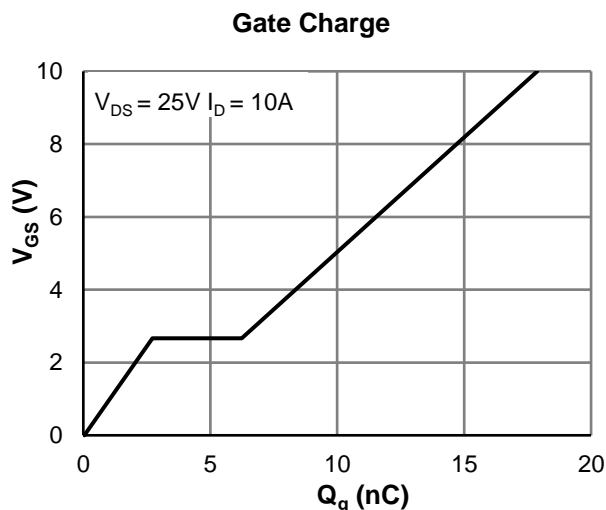


Figure 2: Gate Charge Curve

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
STATIC PARAMETERS						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	60	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 60\text{V}, V_{GS} = 0\text{V}$	-	-	1.0	μA
Gate-Body Leakage Current	I_{GSS}	$V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$	-	-	100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	1.0	1.7	2.5	V
Static Drain-Source ON-Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{V}, I_D = 20\text{A}$	-	10.0	12.0	m Ω
		$V_{GS} = 4.5\text{V}, I_D = 20\text{A}$	-	12.8	15.4	
Diode Forward Voltage	V_{SD}	$I_S = 20\text{A}, V_{GS} = 0\text{V}$	-	0.7	1.0	V
Diode Continuous Current	I_S	$T_C = 25^\circ\text{C}$	-	-	40	A
DYNAMIC PARAMETERS ⁽⁵⁾						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{V},$ $V_{DS} = 30\text{V},$ $f = 1\text{MHz}$	-	1080	-	pF
Output Capacitance	C_{oss}		-	194	-	pF
Reverse Transfer Capacitance	C_{rss}		-	6	-	pF
Gate Resistance	R_g	$V_{GS} = 0\text{V}, V_{DS} = 0\text{V}, f = 1\text{MHz}$	-	1.5	-	Ω
SWITCHING PARAMETERS ⁽⁵⁾						
Total Gate Charge (@ $V_{GS} = 10\text{V}$)	Q_g	$V_{GS} = 0 \text{ to } 10\text{V}$ $V_{DS} = 30\text{V}, I_D = 20\text{A}$	-	18	-	nC
Gate Source Charge	Q_{gs}		-	3.0	-	nC
Gate Drain Charge	Q_{gd}		-	4.0	-	nC
Turn-On DelayTime	$t_{D(on)}$	$V_{GS} = 10\text{V}, V_{DS} = 30\text{V}$ $R_L = 1.5\Omega, R_{GEN} = 6\Omega$	-	20.1	-	ns
Turn-On Rise Time	t_r		-	22.0	-	ns
Turn-Off DelayTime	$t_{D(off)}$		-	1.8	-	ns
Turn-Off Fall Time	t_f		-	5.4	-	ns
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 15\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$	-	29.8	-	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	34.8	-	nC

Thermal Performance

Parameter	Symbol	Typ.	Max.	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	65	78	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	4.5	5.4	$^\circ\text{C}/\text{W}$

Notes:

1. Computed continuous current assumes the condition of T_{J_Max} while the actual continuous current depends on the thermal & electro-mechanical application board design.
2. This single-pulse measurement was taken under T_{J_Max} .
3. This single-pulse measurement was taken under the following condition [$L = 0.3\text{mH}, V_{GS} = 10\text{V}, V_{DS} = 50\text{V}$] while its value is limited by T_{J_Max} .
4. The power dissipation P_D is based on T_{J_Max} .
5. This value is guaranteed by design hence it is not included in the production test.

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Typical Electrical & Thermal Characteristics

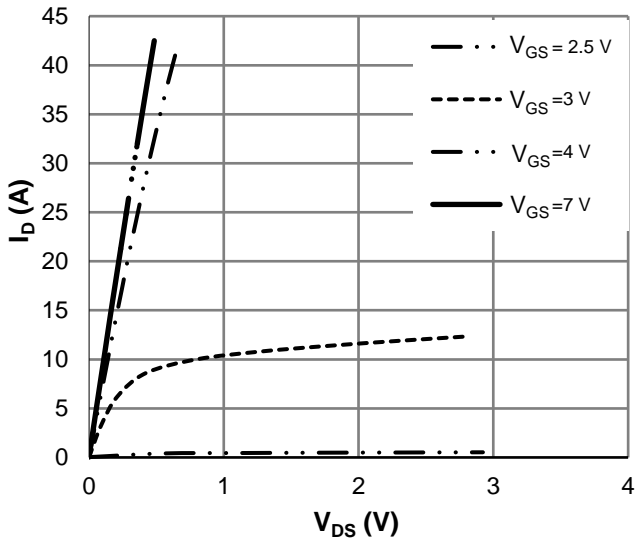


Figure 3: Saturation Characteristics

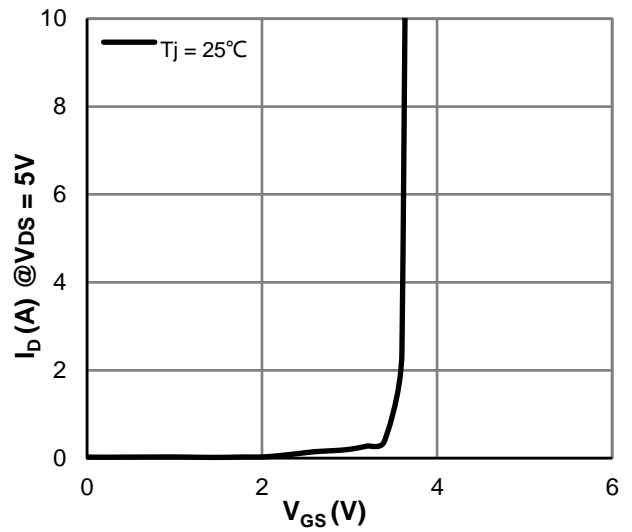


Figure 4: Transfer Characteristics

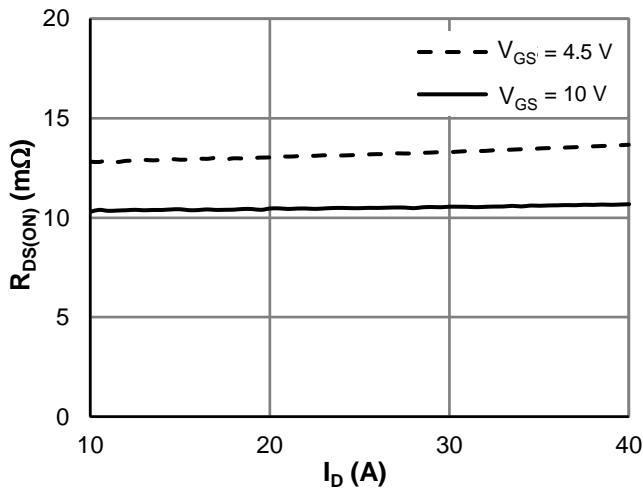


Figure 5: R_DS(ON) vs. Drain Current

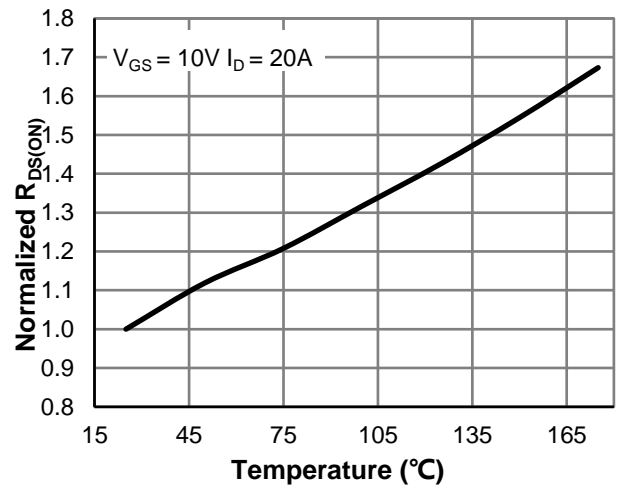


Figure 6: R_DS(ON) vs. Junction Temperature

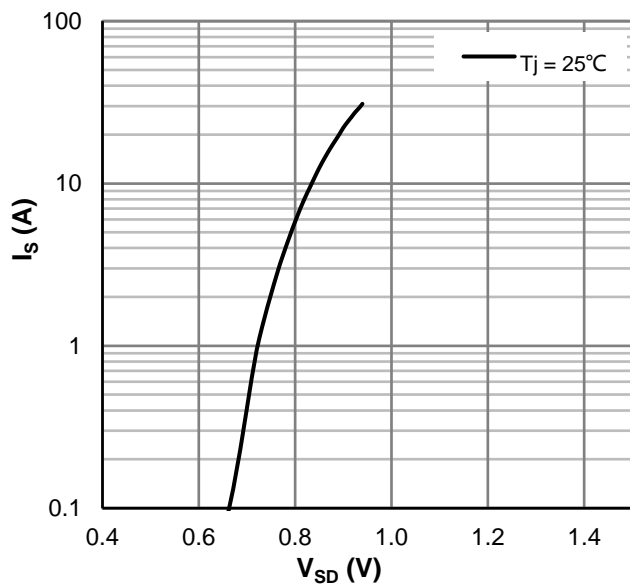


Figure 7: Body-Diode Characteristics

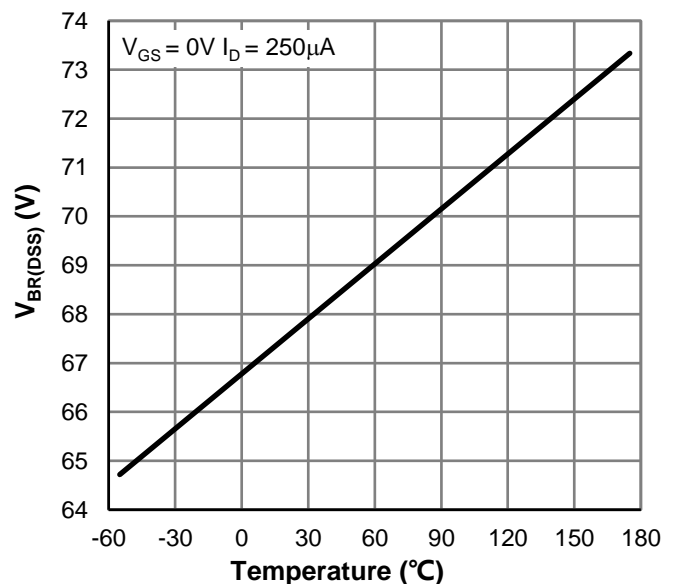


Figure 8: $V_{BR(DSS)}$ vs. Junction Temperature

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Typical Electrical & Thermal Characteristics

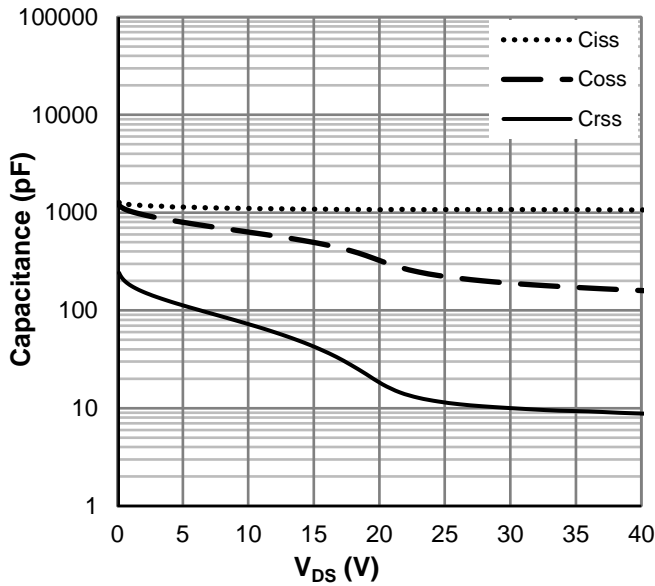


Figure 9: Capacitance Characteristics

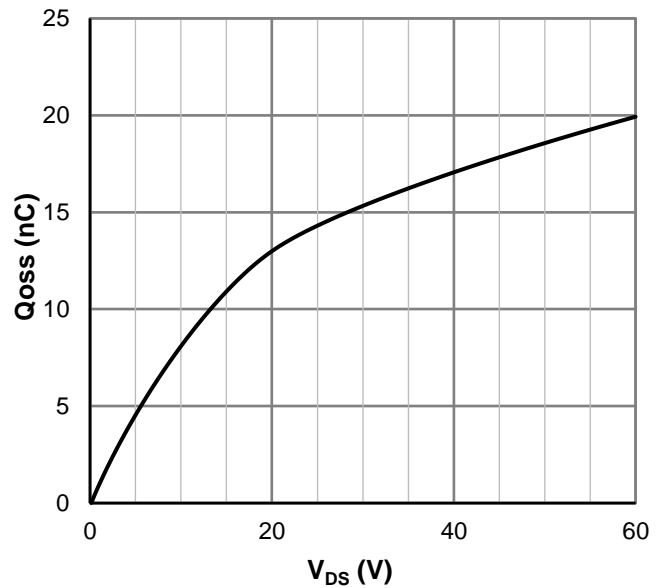


Figure 10: Coss Stored Energy

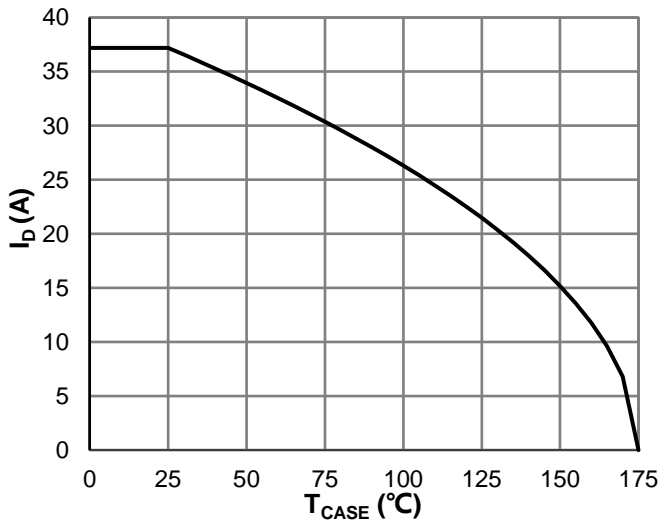


Figure 11: Current De-rating

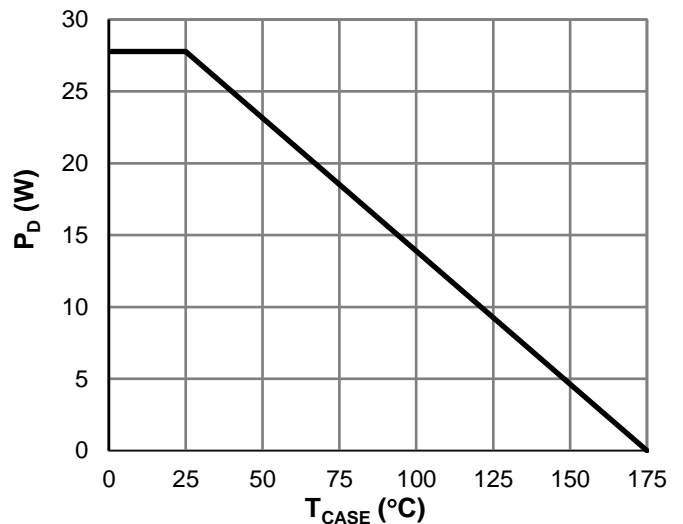


Figure 12: Power De-rating

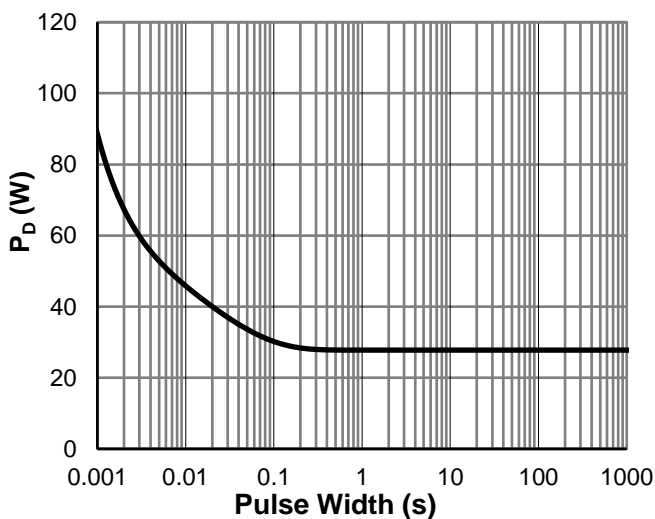


Figure 13: Single Pulse Power Rating, Junction-to-Case

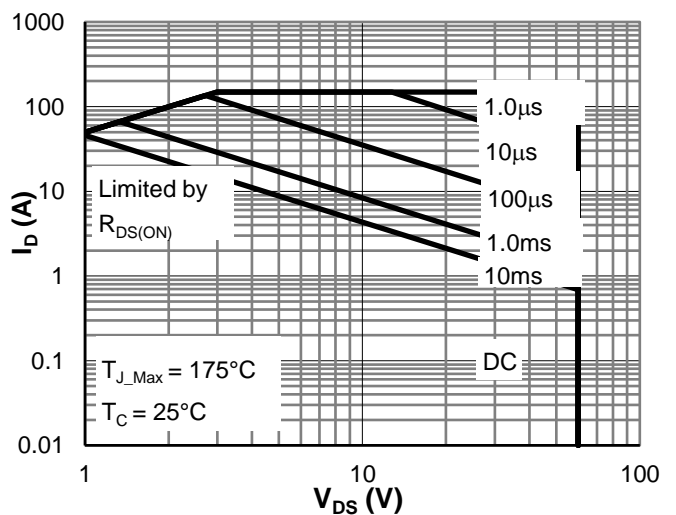


Figure 14: Maximum Safe Operating Area

Typical Electrical & Thermal Characteristics

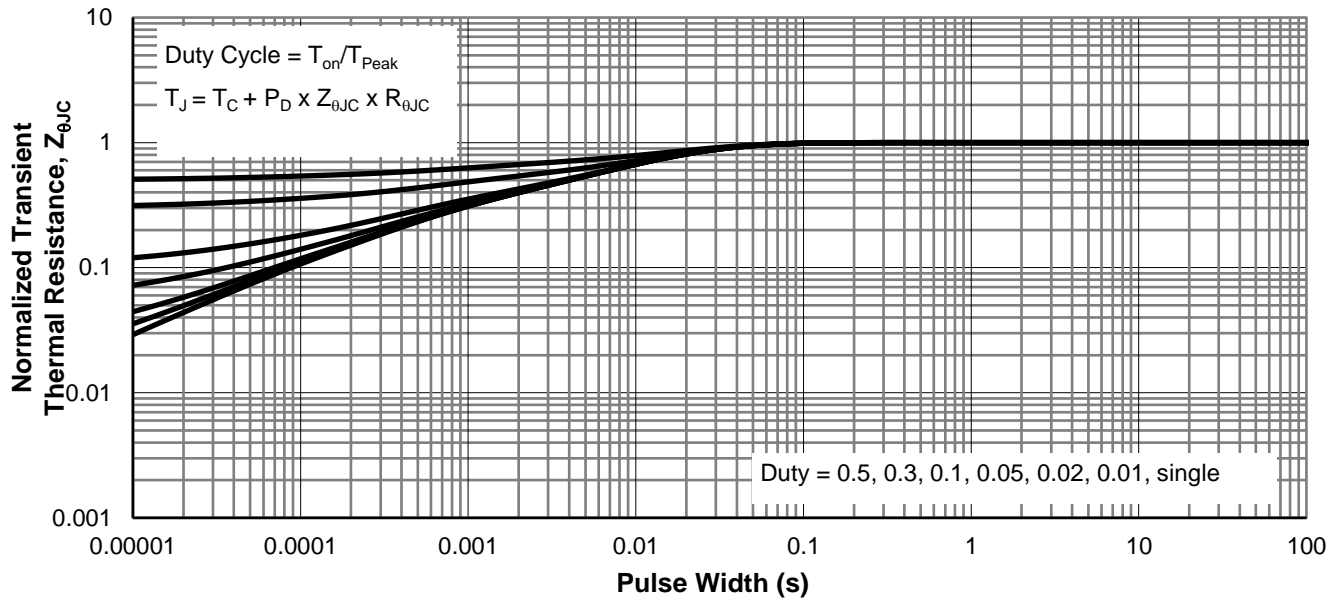


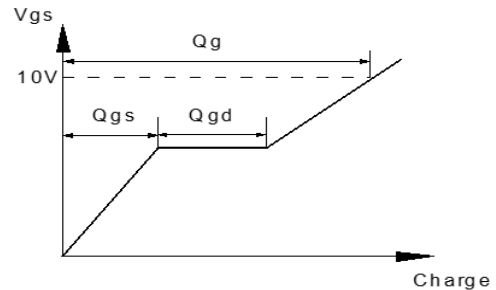
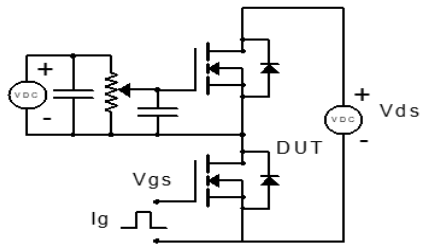
Figure 15: Normalized Maximum Transient Thermal Impedance

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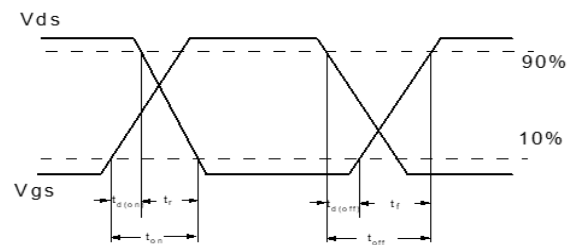
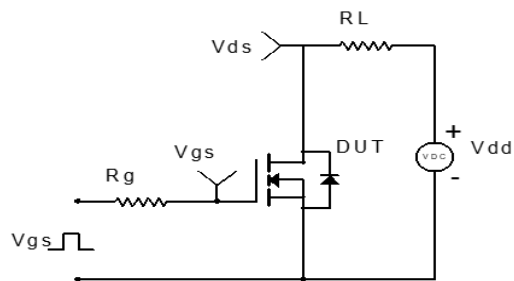
Datasheet

Test Condition

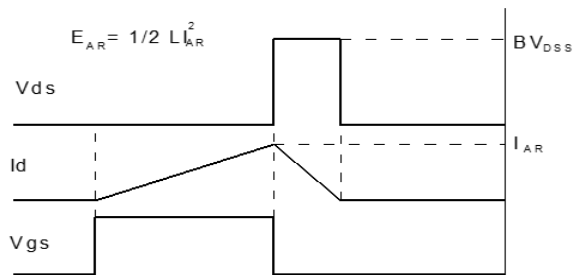
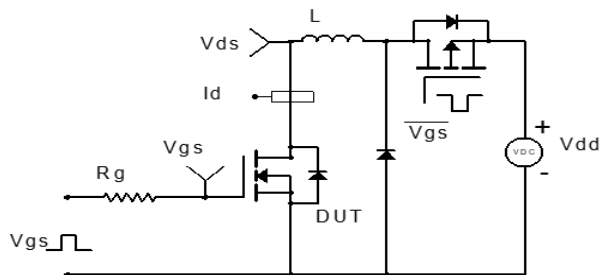
Gate Charge Test Circuit & Wave Form



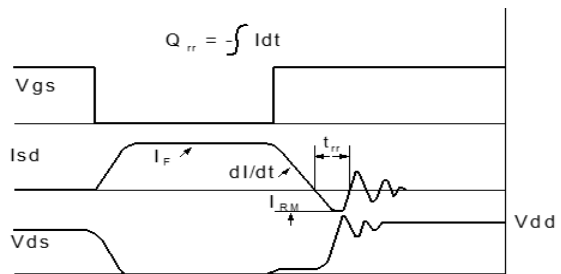
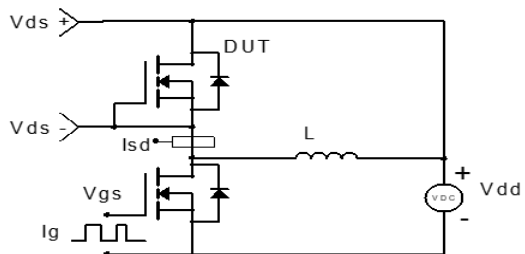
Resistive Switching Test Circuit & Wave Form



Unclamped Inductive Switching (UIS)



Diode Recovery Test Circuit & Wave Form

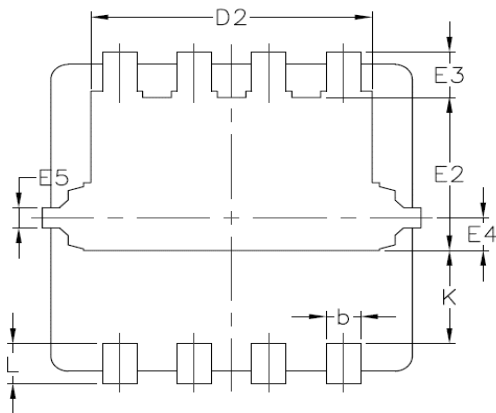
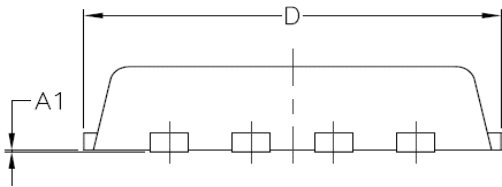
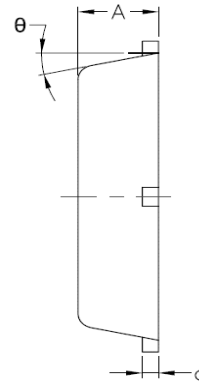
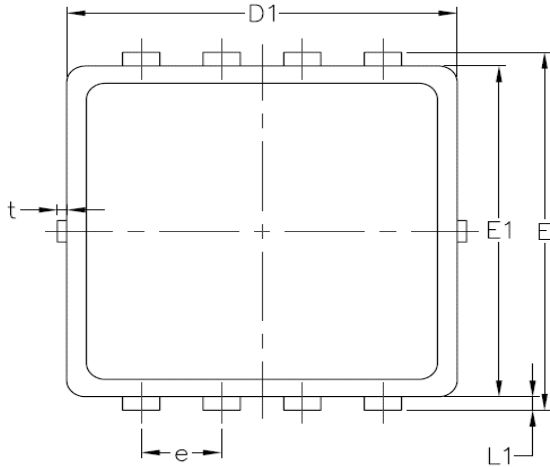


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Datasheet

Package Outlines

Package Drawing PDFN3*3



SYMBOL	COMMON		
	MM		
	MIN	NOM	MAX
A	0.70	0.75	0.85
A1	/	/	0.05
b	0.20	0.30	0.40
c	0.10	0.152	0.25
D	3.15	3.30	3.45
D1	3.00	3.15	3.25
D2	2.29	2.45	2.65
E	3.15	3.30	3.45
E1	2.90	3.05	3.20
E2	1.32	1.52	1.72
E3	0.28	0.46	0.65
E4	0.18	0.33	0.48
E5	0.10	0.20	0.30
e	0.60	0.65	0.70
K	0.78	0.93	1.13
L	0.30	0.40	0.50
L1	0.06	0.125	0.20
t	0	0.075	0.13
θ	10°	12°	14°

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Datasheet



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Revision History

Version	date	Change Description
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