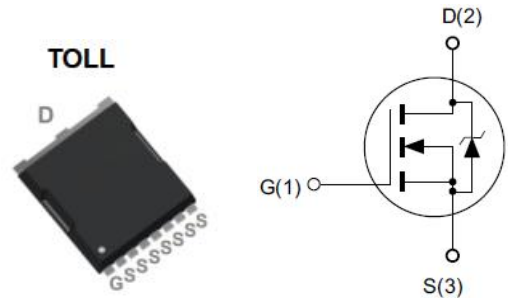


Features

- ◆ 650V, 59A, $R_{DS(ON)}(Typ.) = 39m\Omega @ V_{GS} = 10V$.
- ◆ Advanced Super junction Technology
- ◆ Low drain-source on-resistance
- ◆ Easy to control Gate switching



Application

- ◆ PFC stages, hard switching PWM stages
- ◆ Resonant switching PWM
- ◆ PC, Silver box, Adaptor, LCD & PDP TV, Lighting
- ◆ Server power, Telecom power and UPS application.

Absolute Maximum Ratings $T_c = 25^\circ C$ unless otherwise noted

Symbol	Parameter	Rating	Unit
V_{DS}	Drain-Source Voltage ^a	650	V
V_{GS}	Gate-Source Voltage	± 30	V
I_D	Drain Current-Continuous, $T_c = 25^\circ C$	59	A
I_{DM}	Drain Current-Pulsed ^b	236	A
P_D	Maximum Power Dissipation @ $T_J = 25^\circ C$	347	W
dv/dt	Peak Diode Recovery dv/dt ^c	15	V/ns
E_{AS}	Single Pulsed Avalanche Energy ^d	414	mJ
T_J, T_{STG}	Operating and Store Temperature Range	150, -55 to 150	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.36	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	46.2	$^\circ C/W$

Electrical Characteristics $T_J = 25^\circ C$ unless otherwise noted

■ Off Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	650	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 650V, V_{GS} = 0V$	-	-	3	μA
I_{GSS}	Forward Gate Body Leakage Current	$V_{DS} = 0V, V_{GS} = \pm 30V$	-	-	± 100	nA

■ On Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	3.2	3.9	4.5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance ^c	$V_{GS} = 10V, I_D = 29A$	-	39	46	m Ω

■ Dynamic Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
R_g	Gate Resistance	$f = 1.0MHz$	-	3.5	-	Ω
C_{iss}	Input Capacitance	$V_{DS} = 100V,$ $V_{GS} = 0V,$ $f = 10KHz$	-	5309	-	pF
C_{oss}	Output Capacitance		-	101.8	-	pF
C_{rss}	Reverse Transfer Capacitance		-	10.73	-	pF

■ On Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 400V,$ $I_D = 44A,$ $V_{GS} = 13V,$ $R_G = 1.8\Omega$	-	14.4	-	ns
t_r	Turn-On Rise Time		-	35.1	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	86.2	-	ns
t_f	Turn-Off Fall Time		-	6.4	-	ns
Q_g	Total Gate Charge	$V_{DS} = 480V,$ $I_D = 44A,$ $V_{GS} = 0 \text{ to } 10V$	-	111	-	nC
Q_{gs}	Gate-Source Charge		-	28.0	-	nC
Q_{gd}	Gate-Drain Charge		-	48.3	-	nC

■ Drain-Source Diode Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0V, I_F = 1A$	-	0.65	-	V
T_{rr}	Body Diode Reverse Recovery Time	$I_F = 44A, V_R = 400V$ $di_F/dt = 100A/\mu s$	-	168.9	-	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F = 44A, V_R = 400V$ $di_F/dt = 100A/\mu s$	-	1.44	-	μC
I_{rrm}	Peak reverse recovery current	$I_F = 44A, V_R = 400V$ $di_F/dt = 100A/\mu s$	-	15.67	-	A

Notes:

- $T_J = +25^\circ C$ to $+150^\circ C$
- Repetitive rating; pulse width limited by maximum junction temperature.
- Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$
- $L = 10mH, V_{DD} = 50V, I_{AS} = 9.1A, R_G = 25\Omega$ Starting $T_J = 25^\circ C$

Characteristic Curve

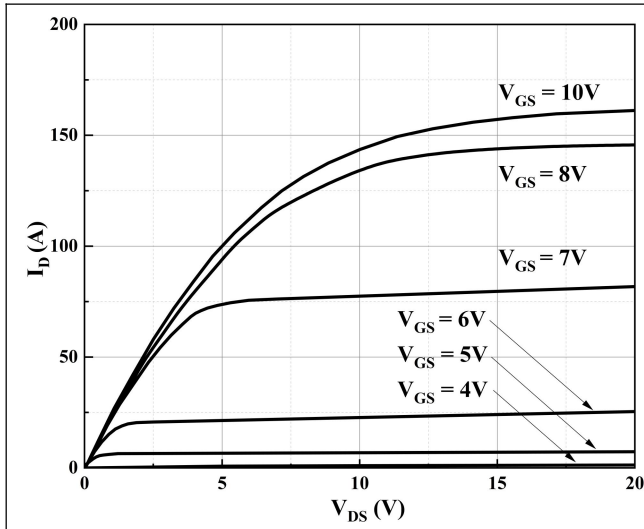


Figure 1. Typical Output Characteristics

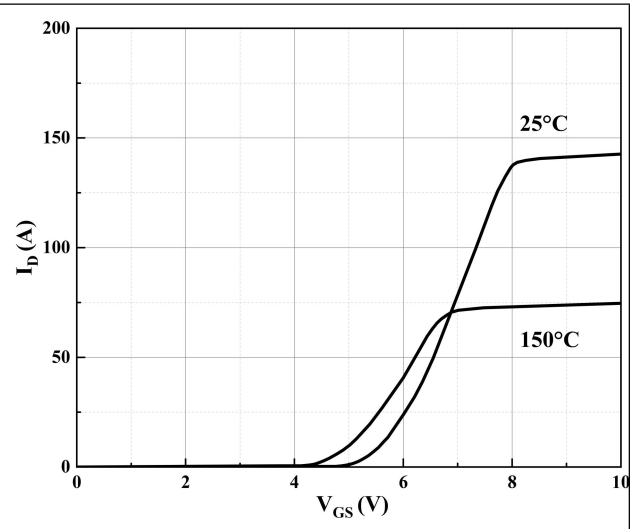


Figure 2. Typical Transfer Characteristics

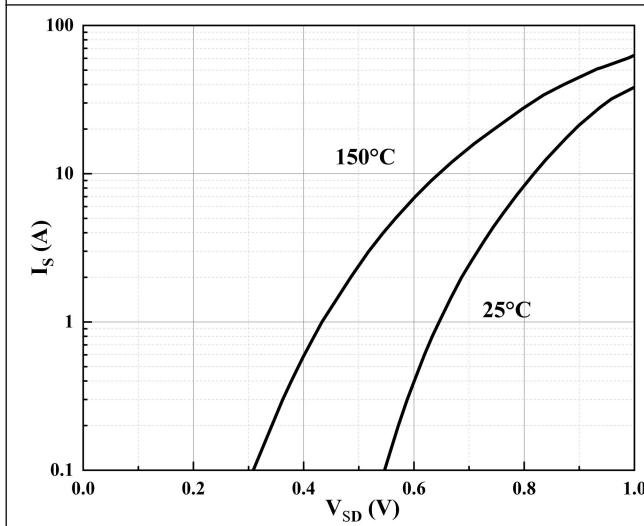


Figure 3. Typical Body-Diode Characteristics

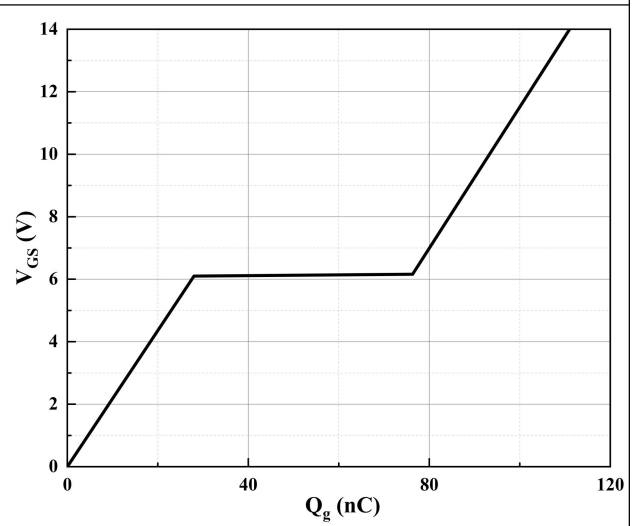


Figure 4. Gate-Charge Characteristics

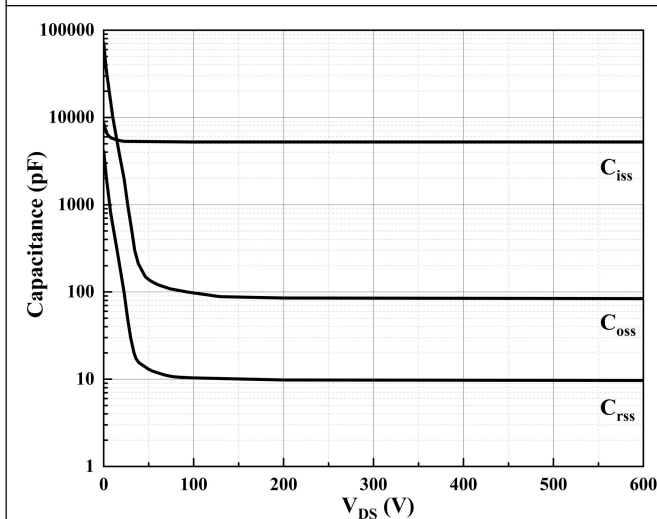


Figure 5. Capacitance Characteristics

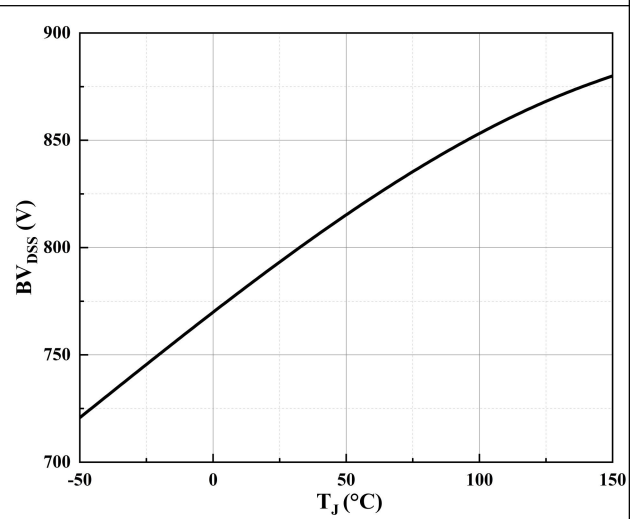


Figure 6. Drain-source Breakdown Voltage

■ Characteristic Curve

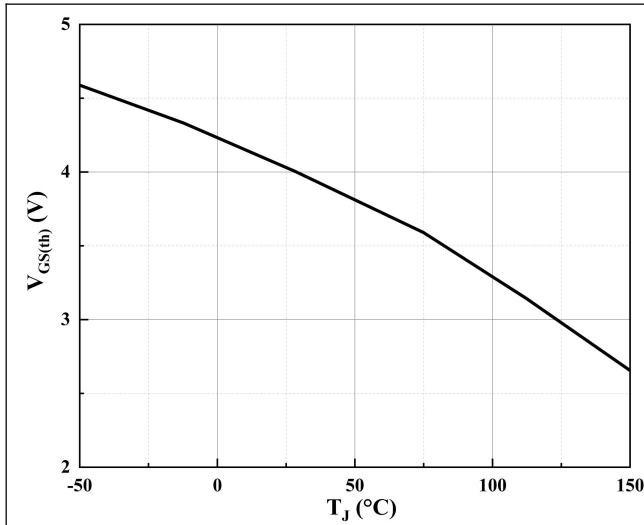


Figure 7. Typical Threshold voltage

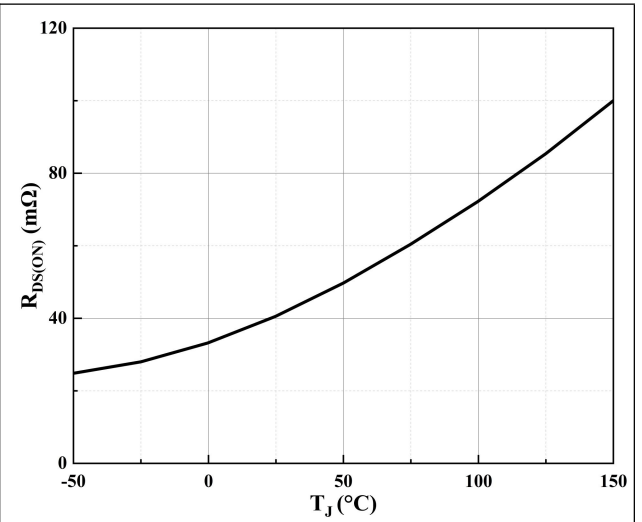


Figure 8. Typical $R_{DS(ON)}$ -Junction Temperature

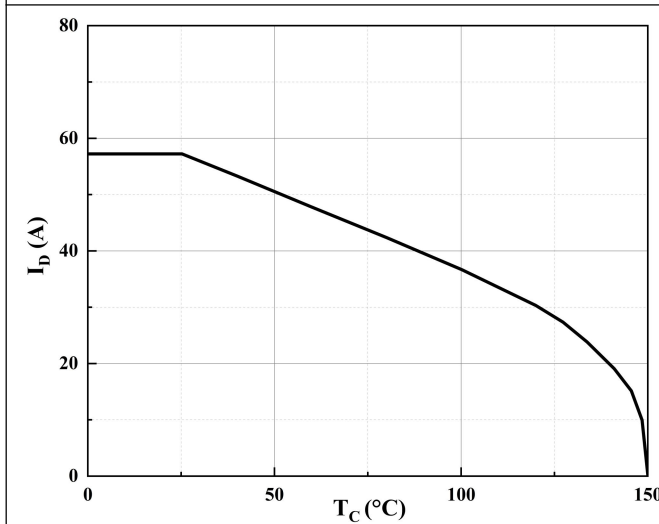


Figure 9. Typical Drain Current De-rating

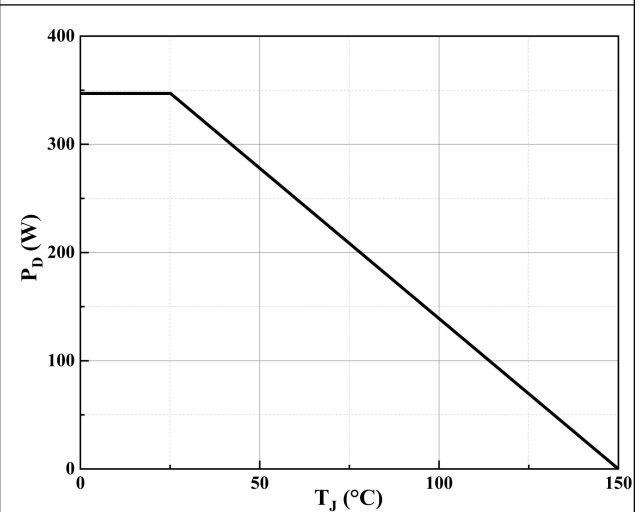


Figure 10. Typical Power Dissipation

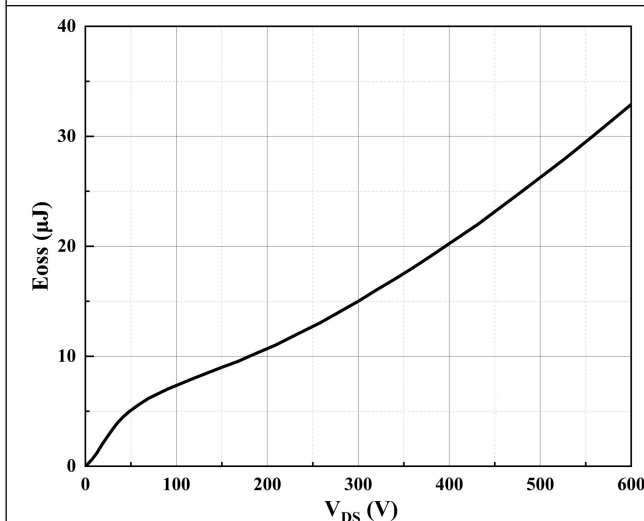


Figure 11. Typical C_{OSS} Stored Energy

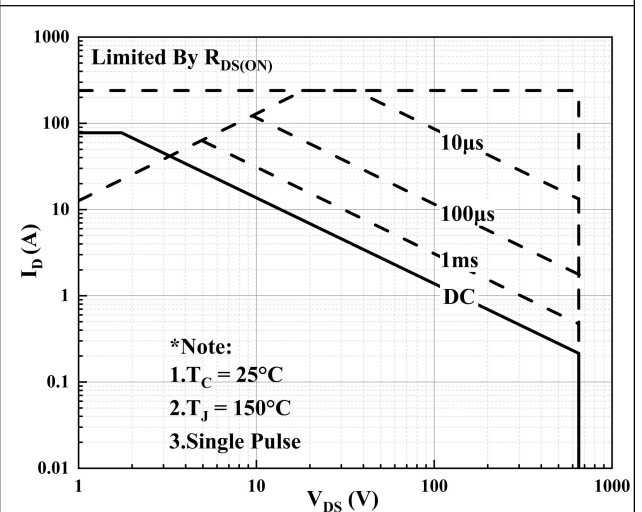
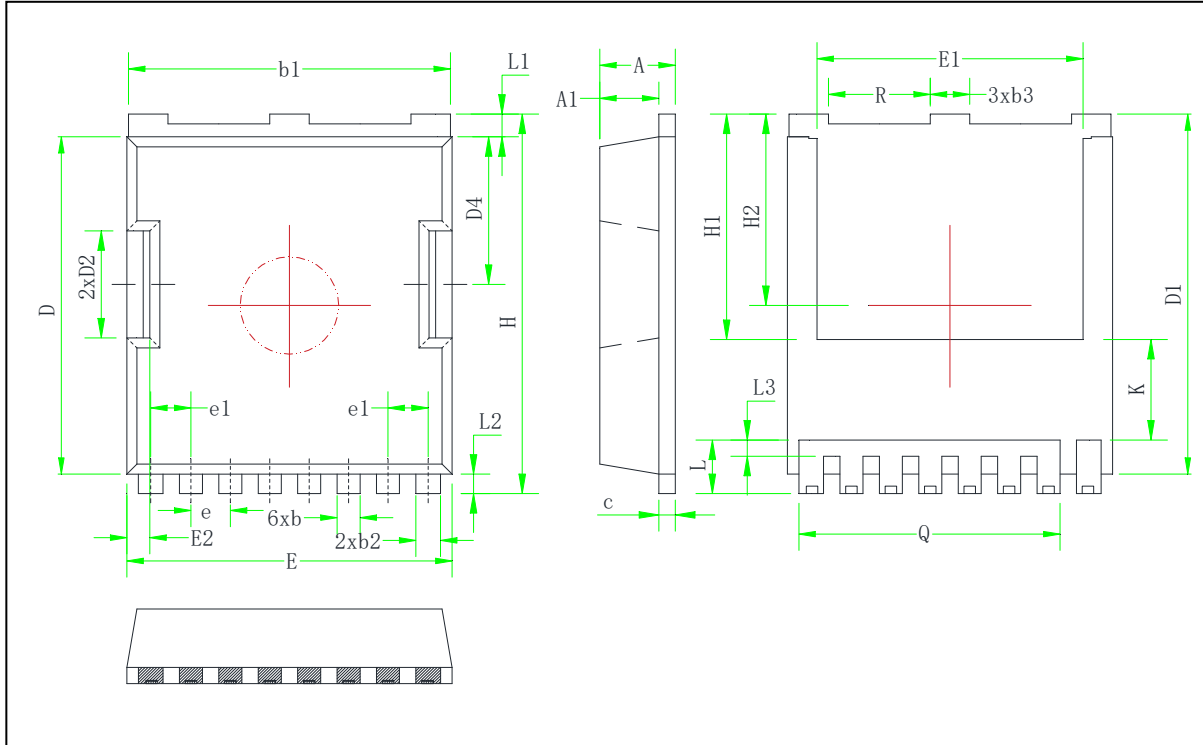


Figure 12. Typical Maximum Safe Operating Area

■ Package Information

TOLL-8L



Symbol	Min.	Typ.	Max.
A	2.25	2.30	2.35
A1	1.75	1.80	1.85
b	0.65	0.70	0.75
b1	9.75	9.80	9.85
b2	0.70	0.75	0.80
b3	1.15	1.20	1.25
c	0.45	0.50	0.55
D	10.35	10.40	10.45
D1	11.00	11.10	11.20
D2	3.25	3.30	3.35
D4	4.50	4.55	4.60
e	1.20 BSC		
e1	1.225 BSC		
Symbol	Min.	Typ.	Max.
E	9.85	9.90	9.95
E1	8.00	8.10	8.20
E2	0.65	0.70	0.75
H	11.60	11.70	11.80
H1	6.95 BSC		
H2	5.90 BSC		
K	3.10 REF		
L	1.55	1.65	1.75
L1	0.65	0.70	0.75
L2	0.50	0.60	0.70
L3	0.40	0.50	0.60
Q	7.95 REF		
R	3.00	3.10	3.20