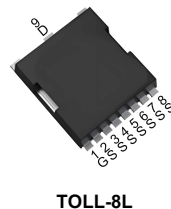
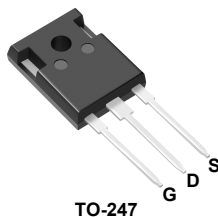


Features

- Very Low FOM ($R_{DS(on)} \times Q_g$)
- Extremely low switching loss
- Excellent stability and uniformity
- 100% Avalanche Tested
- Fast Recovery Time

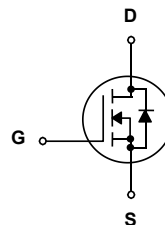


Application

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)
- AC to DC Converters
- Telecom, Solar

Key Parameters

Parameter	Value	Unit
$BV_{DSS} @ T_{j,max}$	650	V
I_D	54	A
$R_{DS(on), max}$	70	mΩ
Q_g, Typ	106	nC



Absolute Maximum Ratings $T_C=25^{\circ}C$ unless otherwise specified

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source Voltage	650	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current - Continuous ($T_C = 25^{\circ}C$)	54.0	A
	Drain Current - Continuous ($T_C = 100^{\circ}C$)	26.6	A
$I_{DM}^{1)}$	Drain Current - Pulsed	126	A
$E_{AS}^{2)}$	Single Pulsed Avalanche Energy	807	mJ
I_{AR}	Avalanche Current	4.1	A
dv/dt	MOSFET dv/dt ruggedness, $V_{DS}=0 \dots 400V$	50	V/ns
dv/dt	Reverse diode dv/dt, $V_{DS}=0 \dots 400V$, $I_{DS} \leq I_D$	15	V/ns
P_D	Power Dissipation ($T_C = 25^{\circ}C$) TO-247	357	W
	Power Dissipation ($T_C = 25^{\circ}C$) TOLL-8L	342	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^{\circ}C$

Thermal Resistance Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.46	$^{\circ}C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	$^{\circ}C/W$

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
On Characteristics						
V _{GS}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 1.82 mA	2.5	-	5.0	V
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 18.7 A	-	61	70	mΩ
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 1mA	650	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 650 V, V _{GS} = 0	-	-	5	μA
		V _{DS} = 650 V, T _C = 150°C	-	580	-	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} = ±20 V, V _{DS} = 0 V	-	-	±1	μA
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 400 V, V _{GS} = 0 V, f = 1.0 MHz	-	4670	-	pF
C _{oss}	Output Capacitance		-	96	-	pF
C _{rss}	Reverse Transfer Capacitance		-	3.5	-	pF
Switching Characteristics						
t _{d(on)}	Turn-On Time	V _{DS} = 300 V, I _D = 23.6 A, R _G = 25 Ω (Note 3,4)	-	78	-	ns
t _r	Turn-On Rise Time		-	34	-	ns
t _{d(off)}	Turn-Off Delay Time		-	351	-	ns
t _f	Turn-Off Fall Time		-	22	-	ns
Q _{g(}	Total Gate Charge	V _{DS} = 480 V, I _D = 23.6 A, V _{GS} = 10 V (Note 3,4)	-	106	-	nC
Q _{gs}	Gate-Source Charge		-	20	-	nC
Q _{gd}	Gate-Drain Charge		-	31	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		-	-	54	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-	-	126	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 23.6 A	-	-	1.3	V
trr	Reverse Recovery Time	V _R = 400 V, I _F = 23.6 A di _F /dt = 100 A/μs	-	170	-	ns
Qrr	Reverse Recovery Charge		-	1.2	-	μC

Notes :

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $I_{AS}=4.1\text{ A}$ $V_{DD}=100\text{ V}$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$
3. Pulse Test : Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$
4. Essentially Independent of Operating Temperature

Typical Characteristics

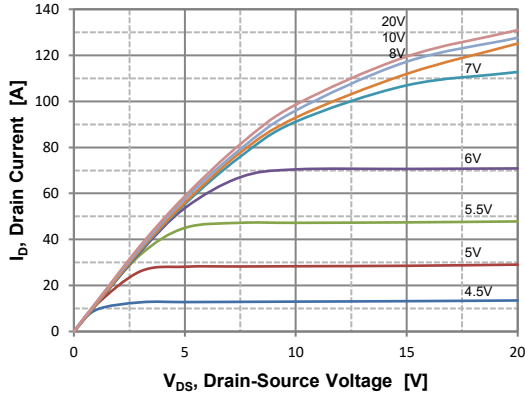


Figure 1. On Region Characteristics

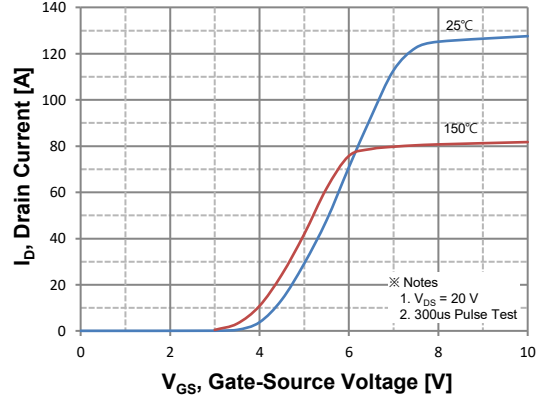


Figure 2. Transfer Characteristics

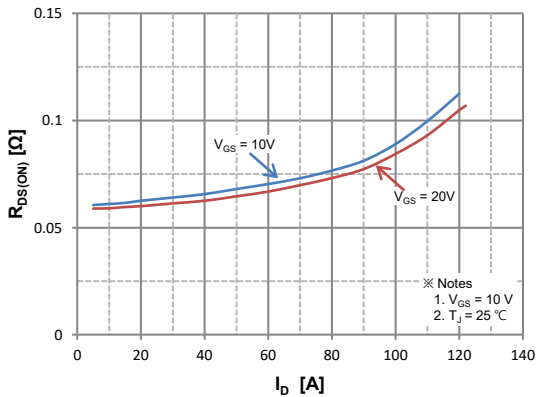


Figure 3. On Resistance Variation vs Drain Current and Gate Voltage

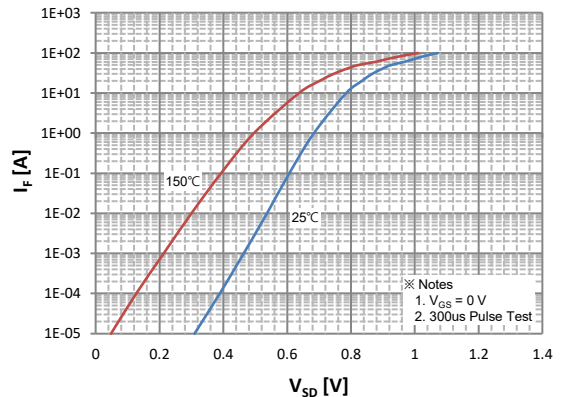


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

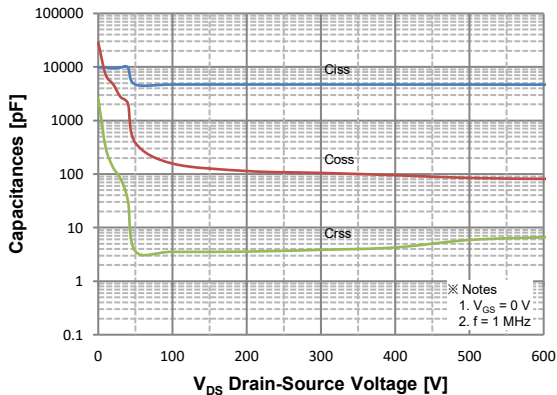


Figure 5. Capacitance Characteristics

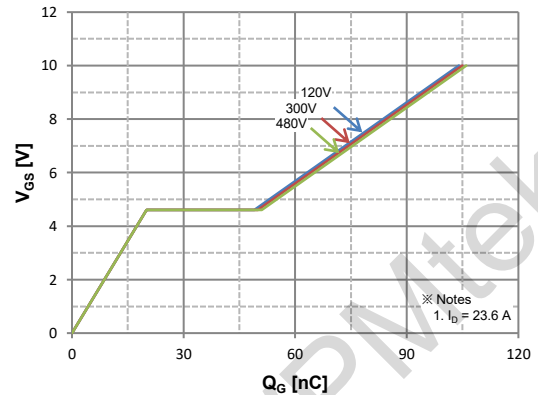


Figure 6. Gate Charge Characteristics

Typical Characteristics

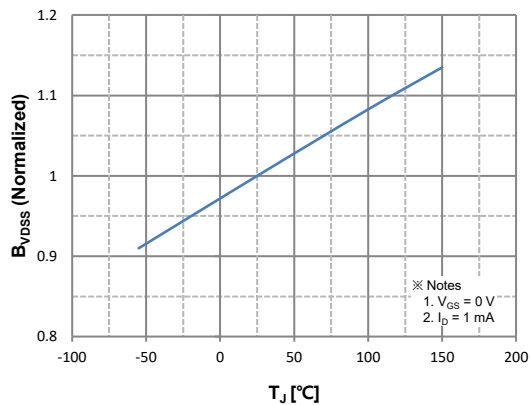


Figure 7. Breakdown Voltage Variation vs. Temperature

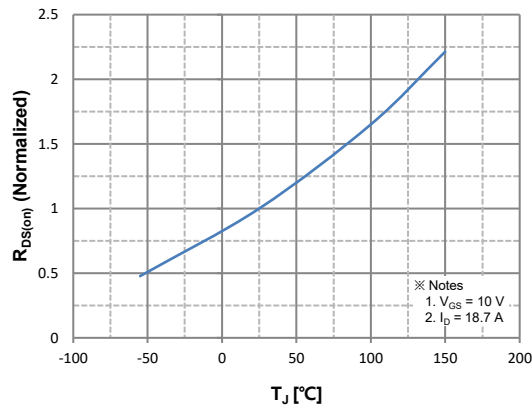


Figure 8. On-Resistance Variation vs. Temperature

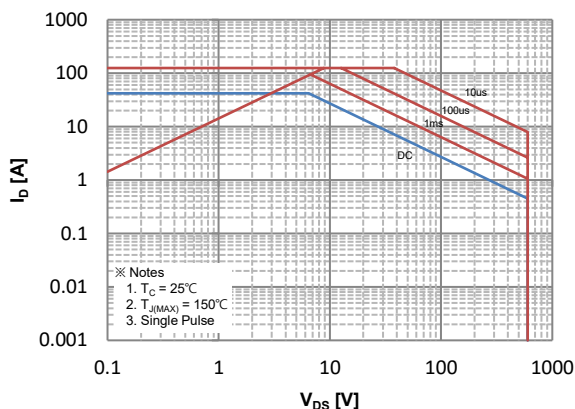


Figure 9. Maximum Safe Operating Area

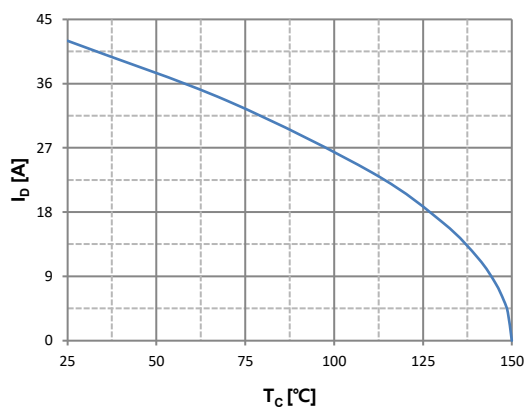


Figure 10. Maximum Drain Current vs. Case Temperature

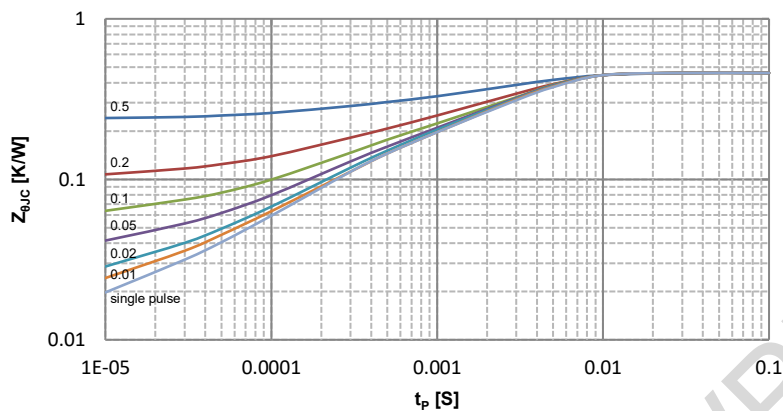


Figure 11. Transient Thermal Response Curve

Fig 12. Gate Charge Test Circuit & Waveform

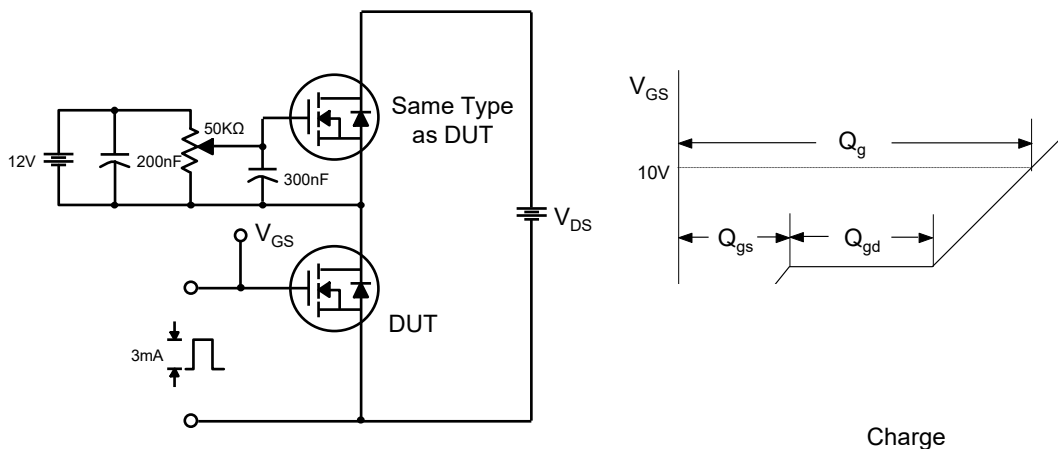


Fig 13. Resistive Switching Test Circuit & Waveforms

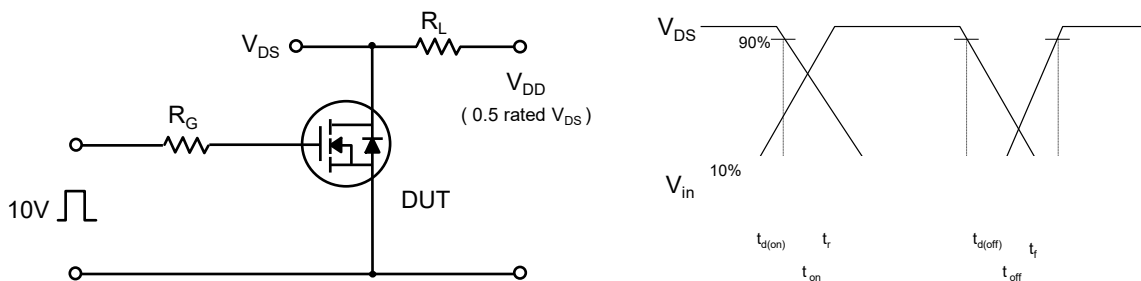


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

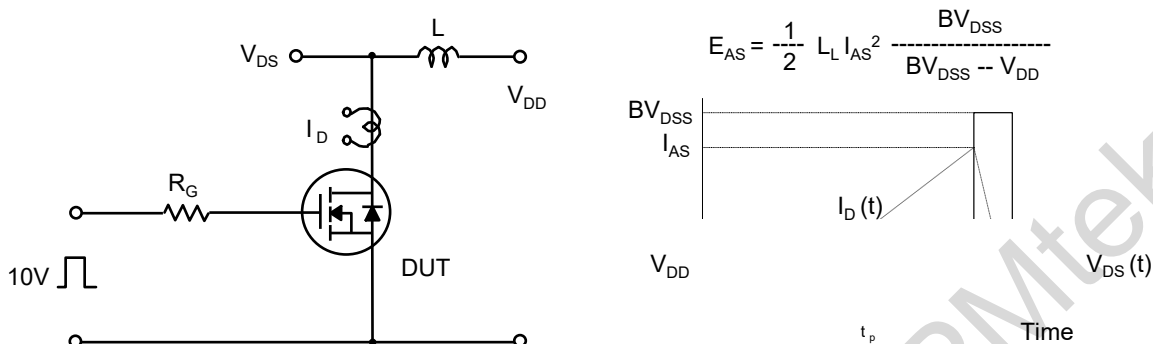
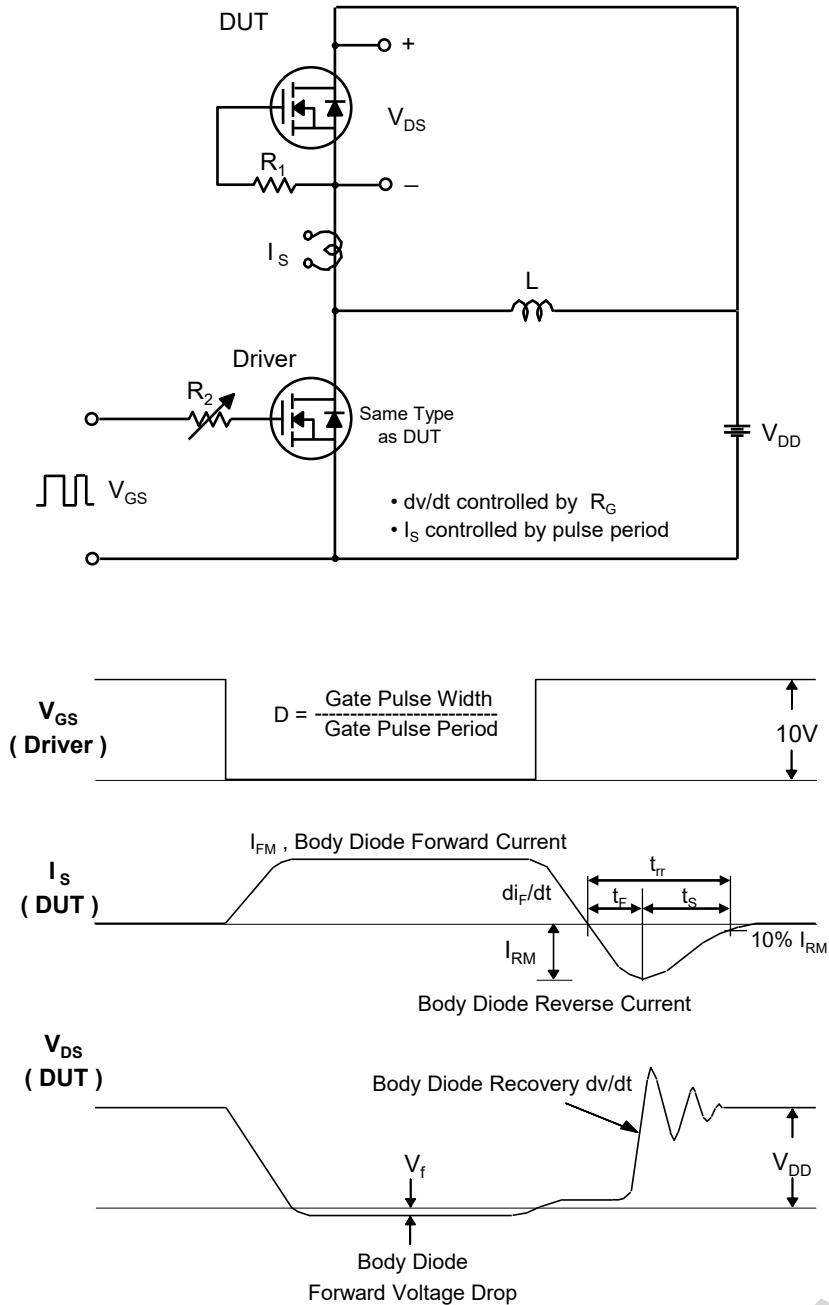
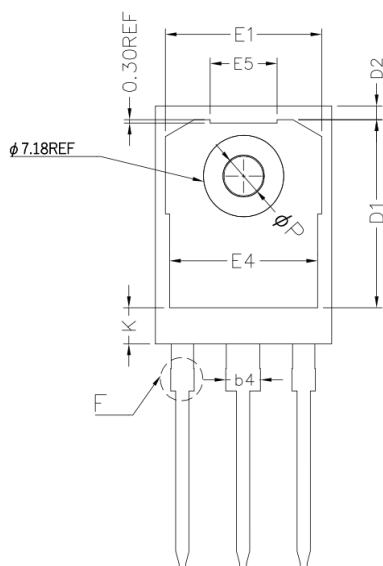


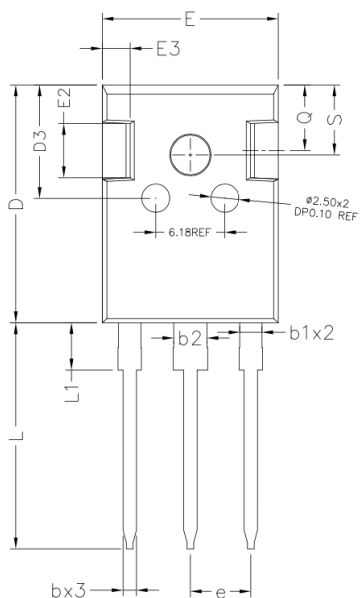
Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



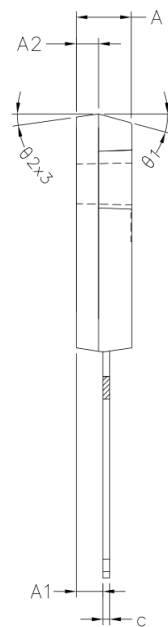
TO-247 Outline



BOTTOM VIEW



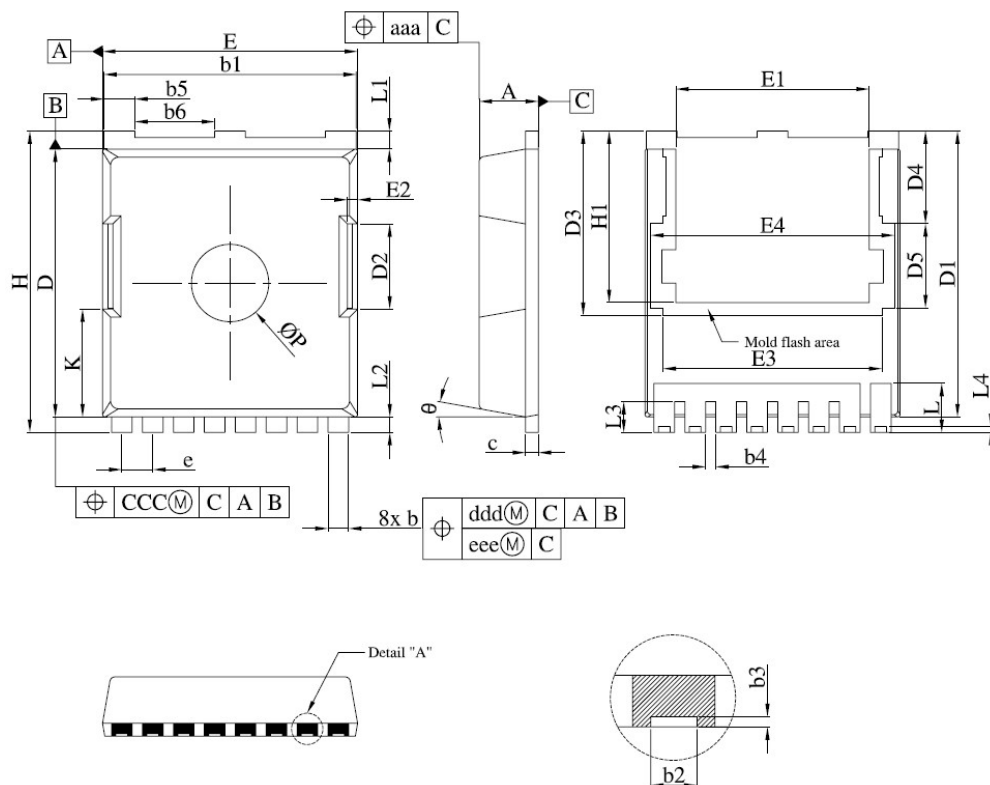
TOP VIEW



SIDE VIEW

COMMON DIMENSIONS (UNITS OF MEASURE IS mm)			
	MIN	NORMAL	MAX
A	4.900	5.000	5.100
A1	2.300	2.400	2.500
A2	1.900	2.000	2.100
b	1.070	1.200	1.330
b1	1.910	2.000	2.160
b2	2.870	3.000	3.160
b3	1.910	2.100	2.410
b4	2.870	3.000	3.380
c	0.550	0.600	0.680
D	20.000	21.000	21.100
D1	16.250	16.950	17.650
D2	1.200REF		
D3	10.000REF		
E	15.700	15.800	15.900
E1	13.100	14.020	14.150
E2	3.680	—	5.100
E3	1.000	—	1.900
E4	12.380	13.260	13.430
E5	5.990REF		
e	5.440BSC		
L	19.810	19.950	20.320
L1	4.100	—	4.400
φP	3.500	—	3.650
Q	5.490	—	6.000
S	6.040	—	6.300
θ1	15.0°REF		
θ2	8.0°REF		
θ3	8.0°REF		
K	3.190REF		

TOLL-8L Outline

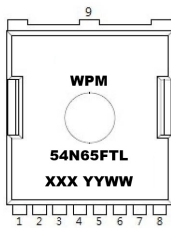


Symbol	Dimensions In Millimeters	
	MIN.	MAX.
A	2.20	2.40
b	0.70	0.90
b1	9.70	9.90
b2	0.36	0.55
b3	0.05	/
b4	0.30	0.50
b5	1.10	1.30
b6	3.00	3.20
c	0.40	0.60
D	10.28	10.55
D1	10.98	11.18
D2	3.20	3.40
D3	7.15	
D4	3.59	
D5	3.26	
e	1.10	1.30
E	9.80	10.00
E1	7.40	7.60

Symbol	Dimensions In Millimeters	
	MIN.	MAX.
E2	7.40	7.60
E3	8.50	
E4	9.46	
H	11.50	11.85
H1	6.55	6.75
K	4.08	4.28
L	1.60	2.10
L1	0.50	0.90
L2	0.50	0.70
L3	1.00	1.30
L4	0.13	0.33
P	2.85	3.15
θ	10°REF	
aaa	0.20	
ccc	0.20	
ddd	0.25	
eee	0.20	

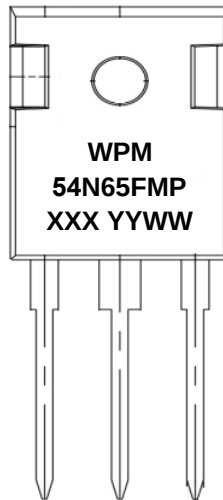
Marking Information

TOLL-8L



WPM=WPMtek's Logo
54N65FTL=Marking
XXX YYWW=Date Code

TO-247



WPM=WPMtek's Logo
54N65FMP=Marking
XXX YYWW=Date Code

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