

Product Summary

Part #	V_{DS}	$R_{DS(on)}$	I_D ($T_c=25^\circ\text{C}$)
DPM120R040K3G1	1200V	33m Ω	74A

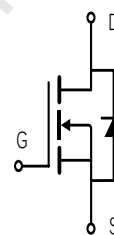
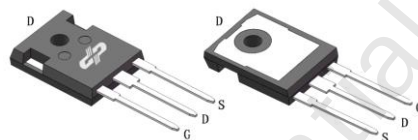
Features

- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low $R_{DS(on)}$
- Easy to parallel
- RoHS Compliant

Applications

- General purpose drives
- Energy storage systems
- String inverter
- Uninterruptible power supplies

TO247-3L



Package Marking and Ordering Information

Part #	Marking	Package	Packing
DPM120R040K3G1	M120R040	TO247-3L	Tube



Halogen-Free

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	1200	V
Continuous drain current ($V_{GS}=18\text{V}$)	I_D	74	A
$T_c = 25^\circ\text{C}$		53	
$T_c = 100^\circ\text{C}$			
Pulsed drain current ($T_c = 25^\circ\text{C}$, t_p limited by T_{jmax})	$I_{D \text{ pulse}}$	222	A
Gate-source voltage, max. transient voltage	V_{GSmax}	-8/+22	V
Gate-source voltage, max. static voltage	V_{GSop}	-4/+18	V
Power dissipation ($T_c = 25^\circ\text{C}$)	P_{tot}	313	W
Power dissipation ($T_c = 100^\circ\text{C}$)		156	
Operating junction temperature	T_j	-40...+175	$^\circ\text{C}$
Storage temperature	T_{stg}	-40...+175	$^\circ\text{C}$

Thermal Resistance

Parameter	Symbol	Max	Unit
Thermal resistance, junction – case. Max	R_{thJC}	0.5	°C/W

Electrical Characteristic (at $T_j = 25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		

Static Characteristic

Drain-source breakdown voltage	BV_{DSS}	1200	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{GS(th)}$	2	2.8 2.2	4	V	$V_{DS}=V_{GS}, I_D=10mA$ $T_j=25^\circ\text{C}$ $T_j=175^\circ\text{C}$
Zero gate voltage drain current	I_{DSS}	-	-	1	μA	$V_{DS}=1200V, V_{GS}=0V$ $T_j=25^\circ\text{C}$
Gate-source leakage current	I_{GSS}	-	-	250	nA	$V_{GS}=18V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	33 42	43	m Ω	$V_{GS}=18V, I_D=40A$ $T_j=25^\circ\text{C}$ $T_j=175^\circ\text{C}$
Gate resistance	R_g	-	2.6	-	Ω	$V_{GS}=0V, V_{DS}=0V,$ $f=1MHz$

Dynamic Characteristic^[2]

Input Capacitance	C_{iss}	-	1835	-	pF	$V_{GS}=0V, V_{DS}=1000V,$ $f=1MHz$
Output Capacitance	C_{oss}	-	85	-		
Reverse Transfer Capacitance	C_{rss}	-	6.5	-		
Gate Total Charge	Q_g	-	115	-	nC	$V_{GS}=-4/18V, V_{DS}=800V,$ $I_D=40A, f=1MHz$
Gate-Source charge	Q_{gs}	-	32	-		
Gate-Drain charge	Q_{gd}	-	26	-		
Turn-on delay time	$t_{d(on)}$	-	21	-	ns	$V_{GS}=-4/18V, I_D=40A,$ $V_{DD}=800V, R_{G_ext}=2.5\Omega$ $L=200\mu H$
Rise time	t_r	-	29	-		
Turn-off delay time	$t_{d(off)}$	-	42	-		
Fall time	t_f	-	11	-		
Turn-On Energy	E_{on}	-	440	-	μJ	
Turn-Off Energy	E_{off}	-	72	-		

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	-	4 3.4	5.2	V	$V_{GS} = -4V, I_{SD} = 20A$ $T_j = 25^\circ C$ $T_j = 175^\circ C$
Diode continuous forward current	I_s		45 20	- -	A	$V_{GS} = -4V$ $T_C = 25^\circ C$ $T_C = 100^\circ C$
Diode Peak reverse recovery Current	I_{rrm}	-	-3.4	-	A	
Body Diode Reverse Recovery Time ^[2]	t_{rr}	-	36	-	ns	$V_{GS} = -4V, V_R = 400V$ $I_{SD} = 25A, dI/dt = 500A/\mu s$
Body Diode Reverse Recovery Charge ^[2]	Q_{rr}	-	71	-	nC	

[2]. Defined by design. Not subject to production test

Typical Performance Characteristics

Fig 1: Output Characteristics
 $T_j = -55^\circ\text{C}$

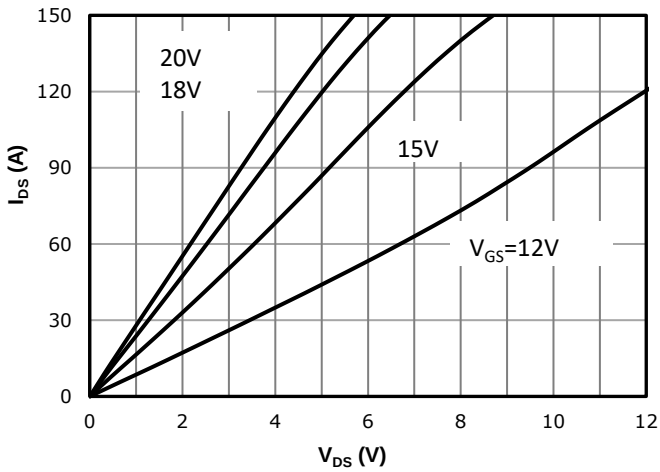


Fig 2: Output Characteristics
 $T_j = 25^\circ\text{C}$

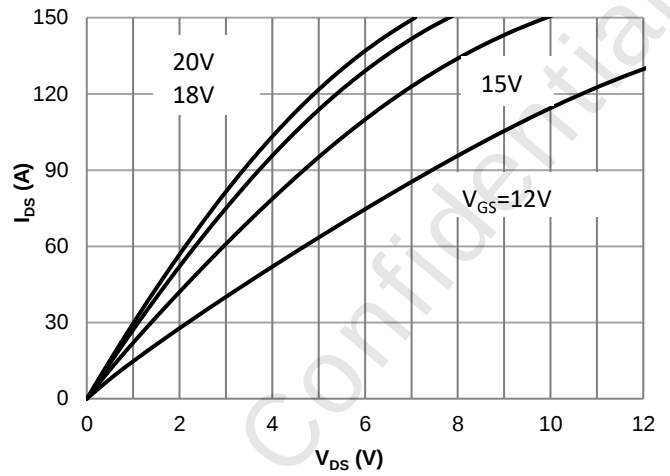


Fig 3: Output Characteristics
 $T_j = 175^\circ\text{C}$

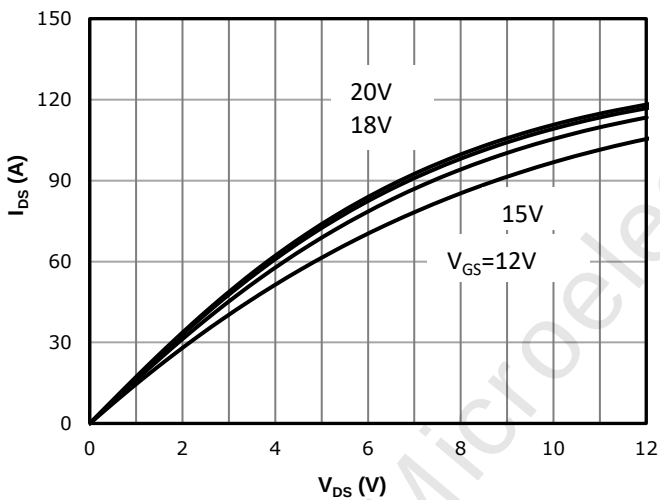


Fig 4: $R_{ds(on)}$ vs Drain Current for various Temperature

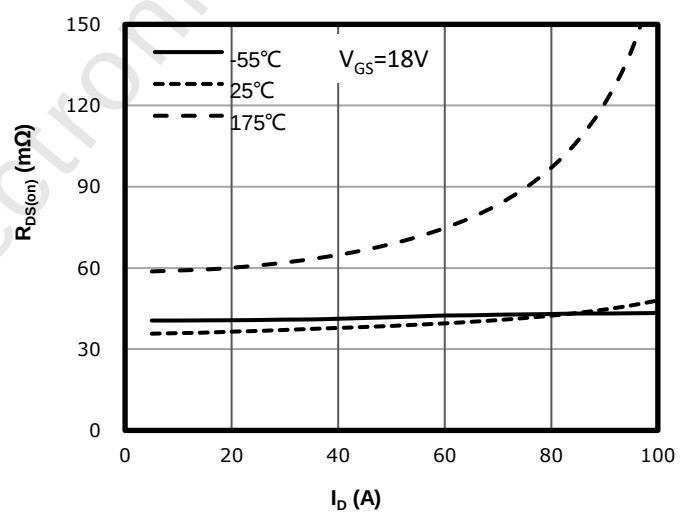


Fig 5: $R_{ds(on)}$ vs Temperature

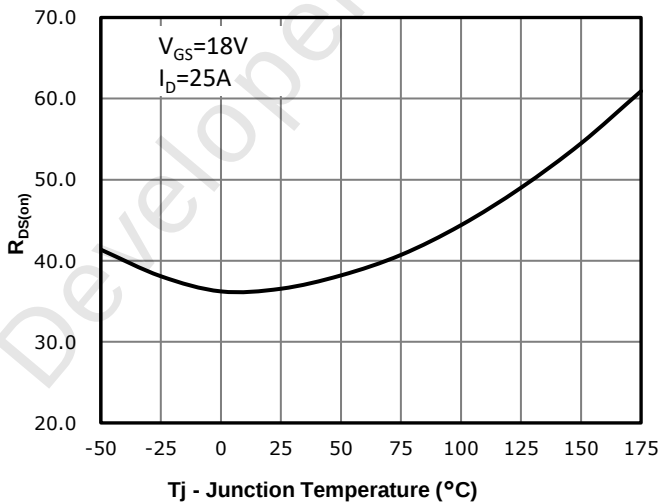
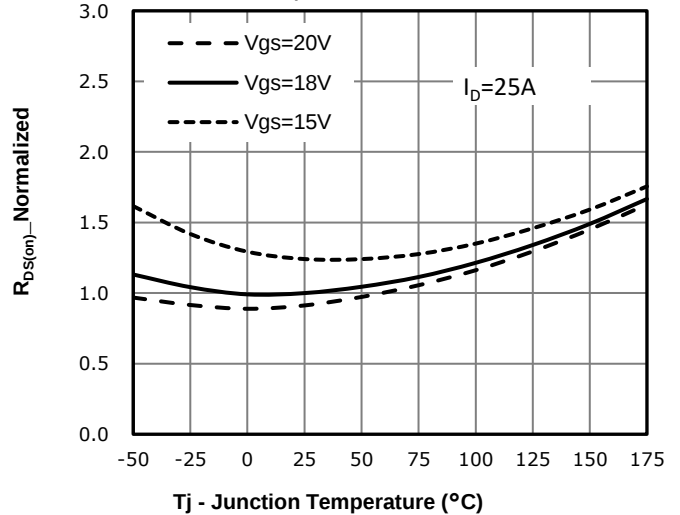


Fig 7: $R_{ds(on)}$ vs. Gate Voltage at Temperature



Typical Performance Characteristics

Fig 7: Transfer Characteristics

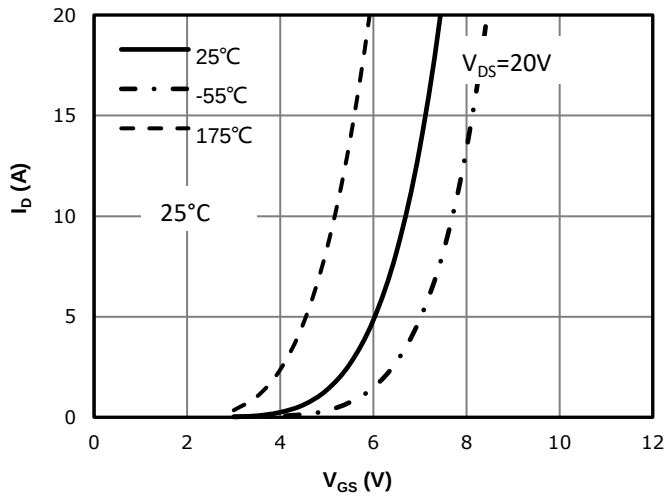


Fig 8: Body Diode Characteristic $T_j=-55^{\circ}C$

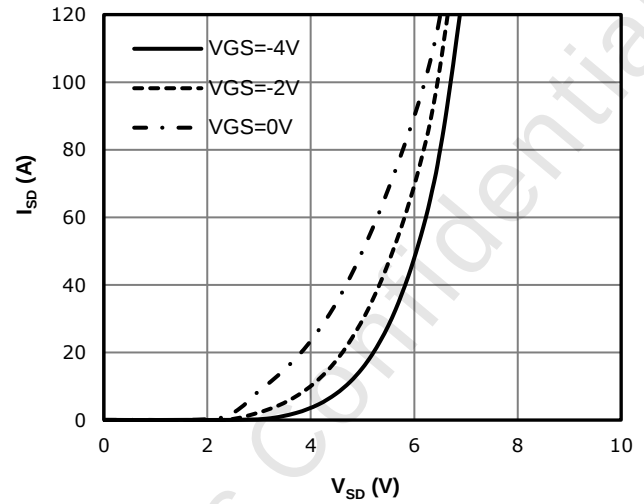


Fig 9: Body Diode Characteristic
 $T_j=25^{\circ}C$

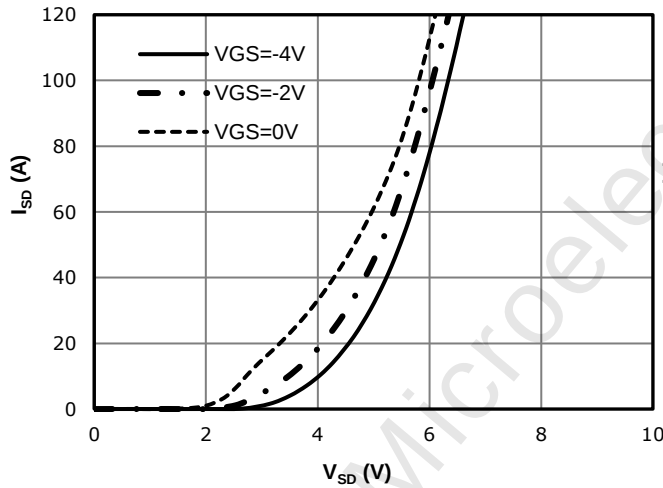


Fig 10: Body Diode Characteristic
 $T_j=175^{\circ}C$

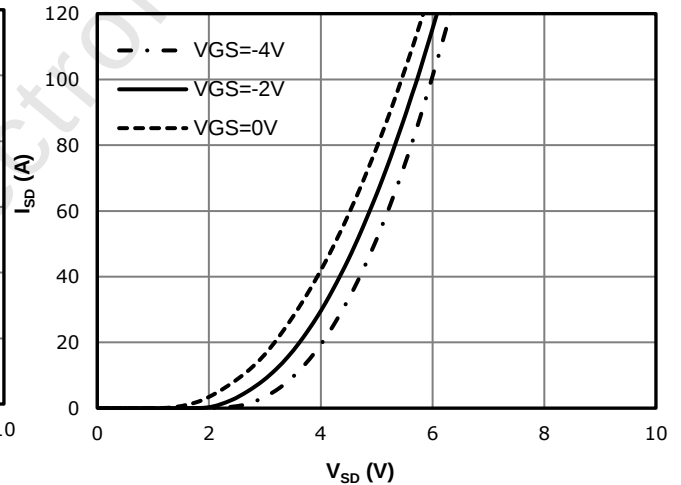


Fig 11: Threshold Voltage vs. Temperature

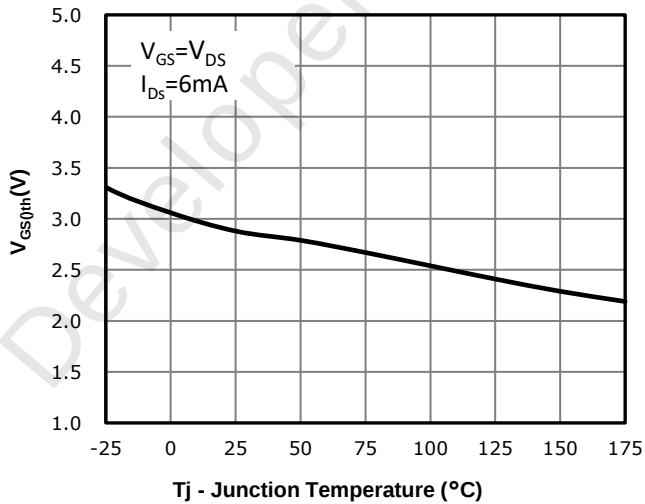


Fig 12: Capacitance Characteristics

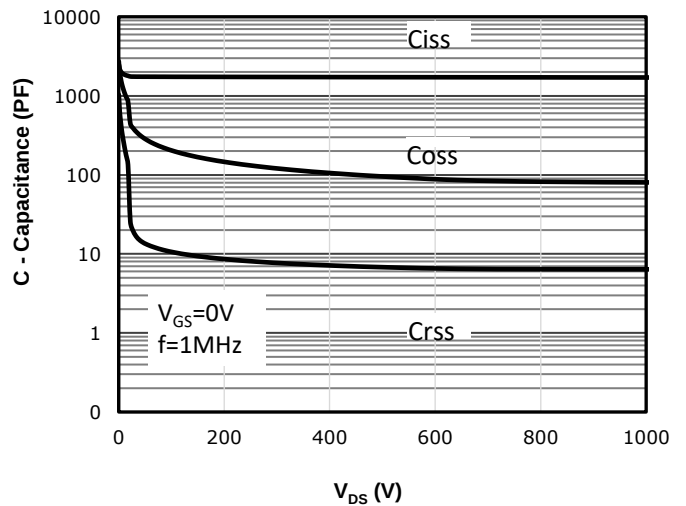


Fig 13: Gate Charge Characteristics

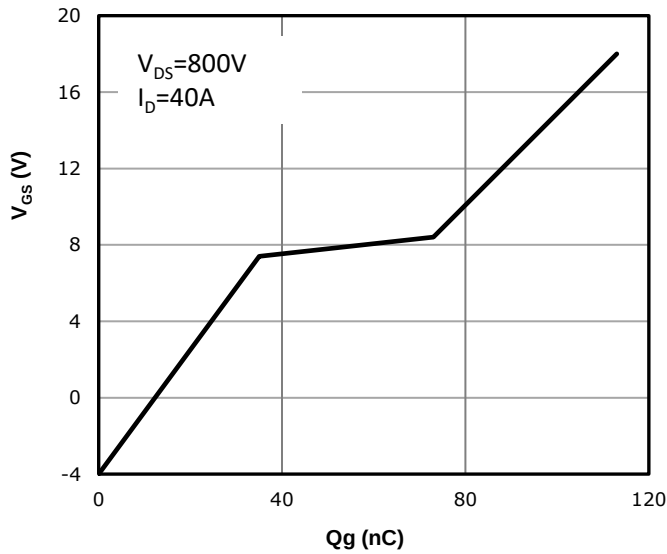


Fig 14: Clamped Inductive Switching energy vs R_g

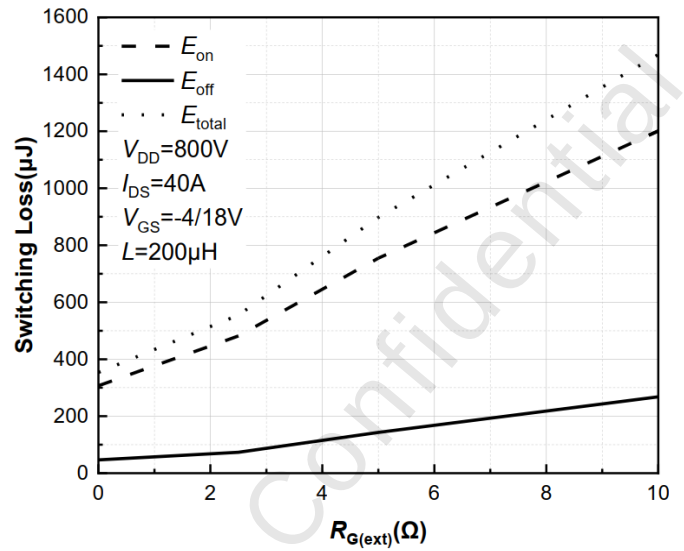


Fig 15: Power Dissipation

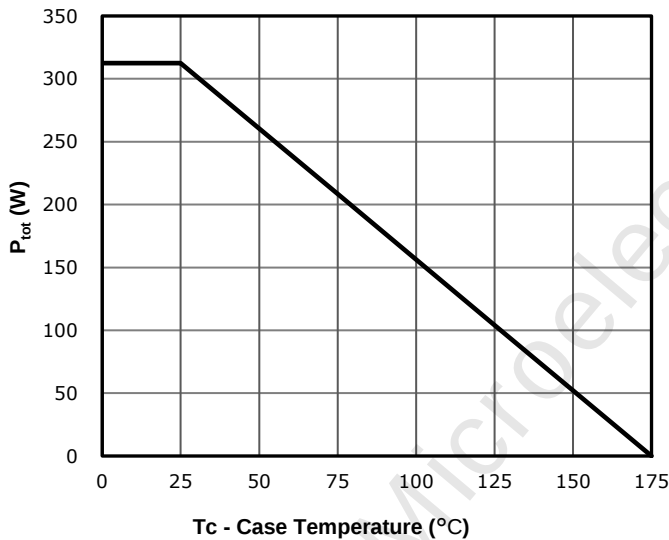


Fig 16: Drain Current Derating

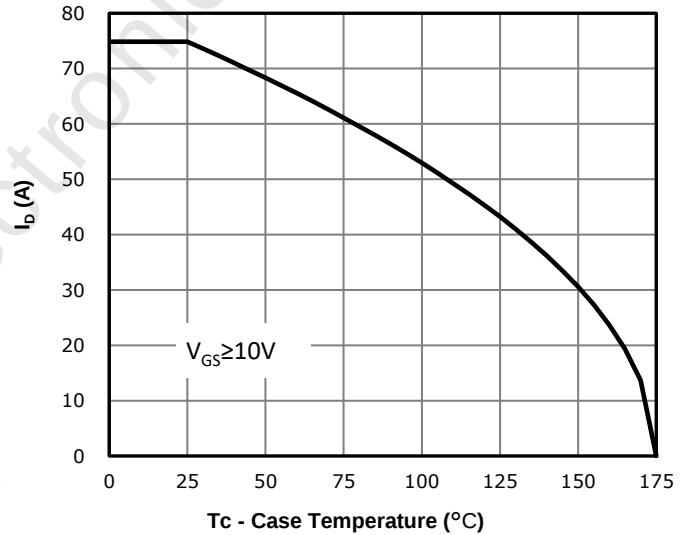


Fig 17: Safe Operating Area

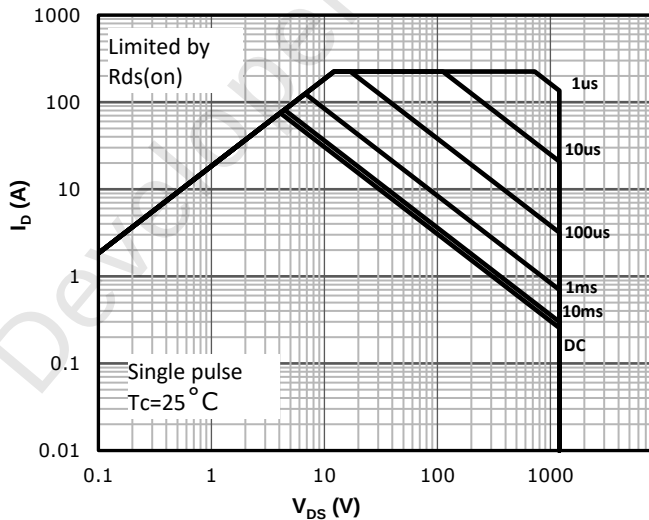
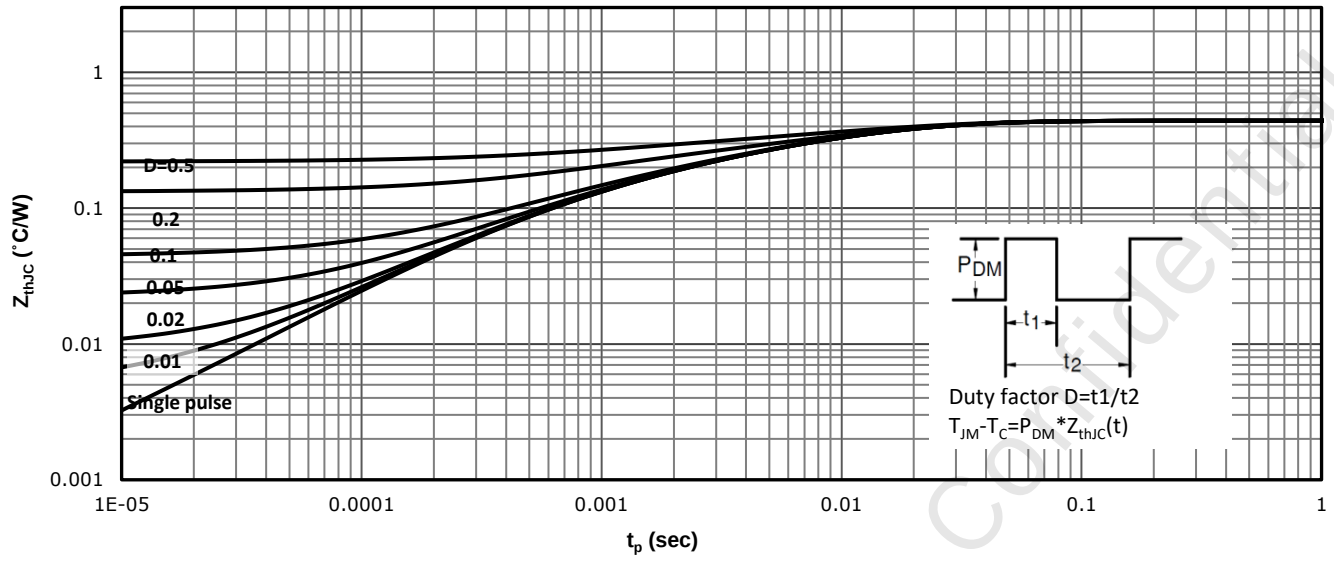
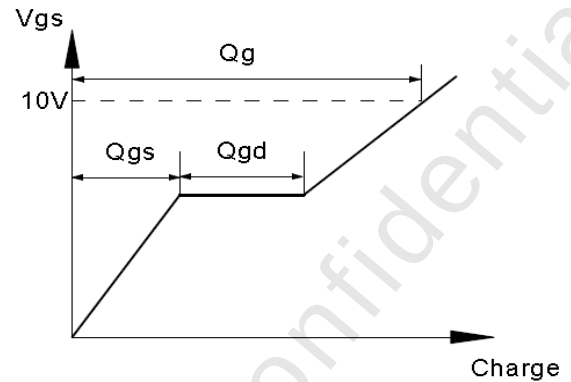
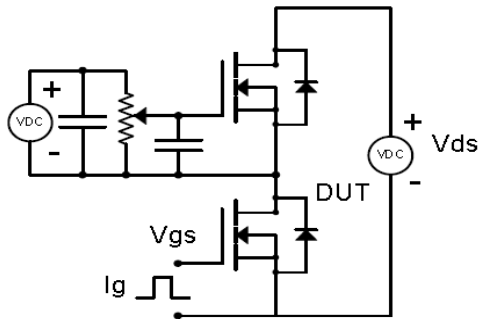


Fig 18: Max. Transient Thermal Impedance

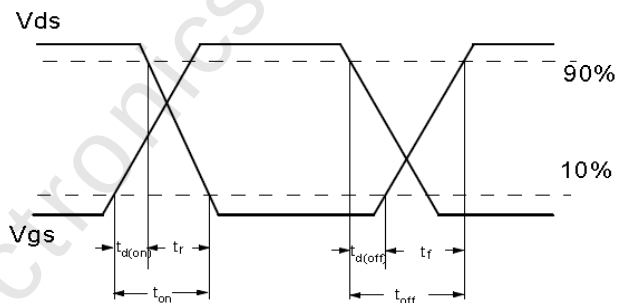
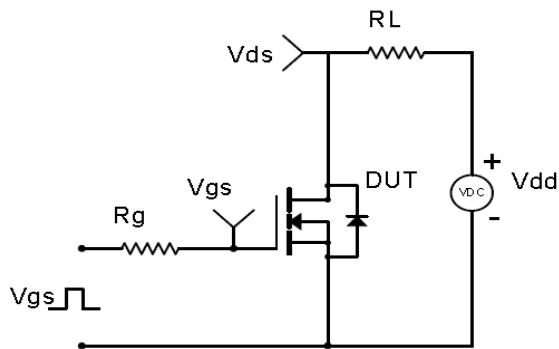


Test Circuit & Waveform

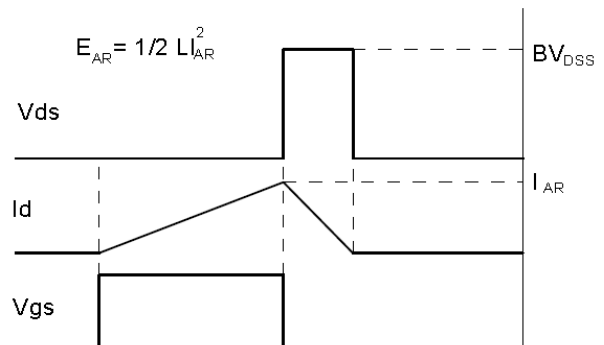
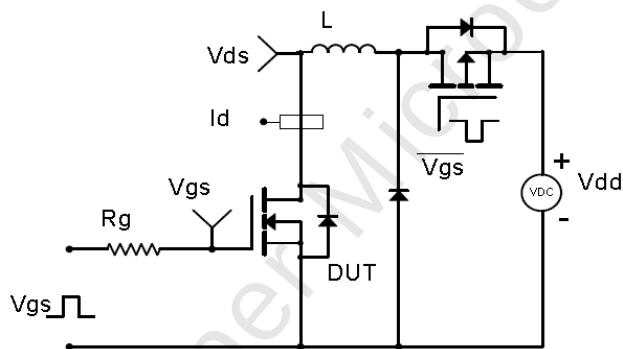
Gate Charge Test Circuit & Waveform



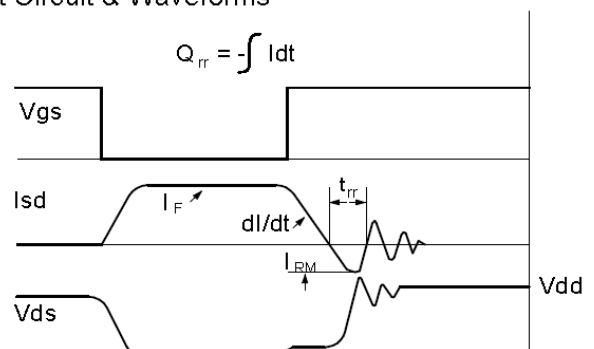
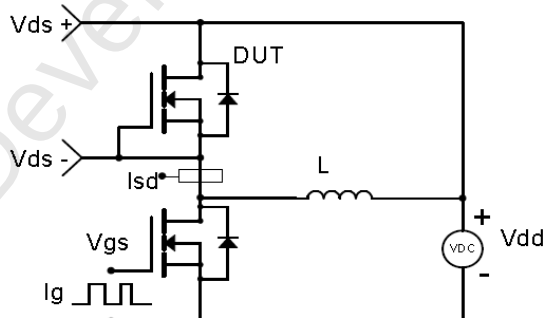
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

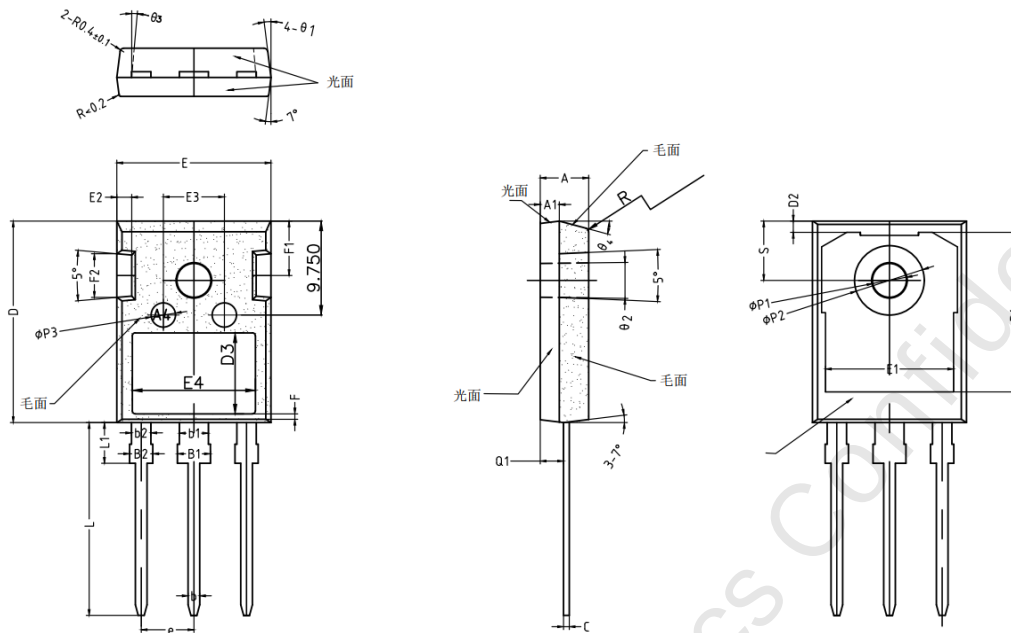


Diode Recovery Test Circuit & Waveforms



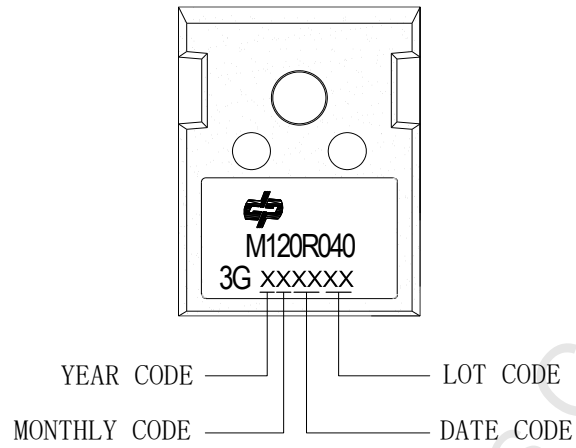


Package Outline: TO247-3L



Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	4.90	5.00	5.10
A1	1.90	2.00	2.10
b	1.15	1.20	1.25
b1	2.95	3.00	3.05
b2	1.95	2.00	2.05
B1	3.00	3.10	3.20
B2	1.90	2.00	2.10
c	0.55	0.60	0.65
D	20.90	21.00	21.10
D1	16.45	16.55	16.65
D2	1.07	1.17	1.27
D3	8.15	8.20	8.25
E	15.70	15.80	15.90
E1	13.16	13.26	13.36
E2	2.40	2.50	2.60
E3	6.10	6.20	6.30
E4	12.70	12.80	12.90
F	0.75	0.85	0.95
F1	5.70	5.80	5.90
F2	4.90	5.00	5.10
F3	9.90	10.00	10.10
e	5.44 BSC		
L	19.72	19.92	20.12
L1	4.03	4.13	4.23
theta1	5°	7°	9°
theta2	1°	2°	3°
theta3	4°	5°	6°
theta4	13°	15°	17°
phi P1	3.50	3.60	3.70
phi P2	7.09	7.19	7.29
phi P3	2.40	2.50	2.60
Q1	2.31	2.41	2.51
S	6.05	6.15	6.25
R	0.30	0.40	0.50

Part Marking Information



Revision History

Revision	Major changes
1.20	Release for formal version1.2

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