

Features

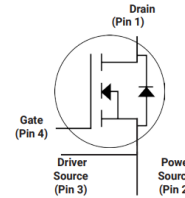
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Avalanche Ruggednes

Applications

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC-DC Converters
- Battery Chargers

Product Summary

V_{DS}	1200V
$R_{DS(on)}_{typ}$	60mΩ
I_D	40A



Package Marking and Ordering Information

Part #	Marking	Package
T1M60120K1	1M60120K1	TO-247-4

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	1200	V
Continuous drain current $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	I_D	40 28	A
Pulsed drain current ($T_C = 25^\circ\text{C}$, t_p limited by T_{jmax})	$I_{D \text{ pulse}}$	80	A
Avalanche energy, single pulse ($L=10\text{mH}$)	E_{AS}	600	mJ
Gate-Source voltage	V_{GS}	-4/+18	V
Gate-Source voltage (Absolute maximum values)	V_{GSmax}	-8/+22	V
Power dissipation ($T_C = 25^\circ\text{C}$)	P_{tot}	214	W
Operating junction and storage temperature	T_j, T_{stg}	-55...+175	$^\circ\text{C}$

- Example of acceptable V_{GS} waveform



Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal resistance, junction – case. Max	R_{thJC}	0.70	°C/W
Thermal resistance, junction – ambient. Max	R_{thJA}	40	

Electrical Characteristic (at $T_J = 25\text{ °C}$, unless otherwise specified)

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

Static Characteristic

Drain-source breakdown voltage	BV_{DSS}	1200	-	-	V	$V_{GS}=0V, I_D=100\mu A$
Gate threshold voltage	$V_{GS(th)}$	2.3	2.8	3.6	V	$V_{DS}=V_{GS}, I_D=5mA$
Zero gate voltage drain current	I_{DSS}	-	1	10	μA	$V_{DS}=1200V, V_{GS}=0V$ $T_C=25\text{ °C}$
		-	5	-		$T_C=175\text{ °C}$
Gate-source leakage current	I_{GSS}	-		100	nA	$V_{GS}=18V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	60	75	mΩ	$V_{GS}=18V, I_D=20A,$ $T_J=25\text{ °C}$
		-	120	-		$T_J=175\text{ °C}$
Transconductance	g_{fs}	-	10	-	S	$V_{DS}=20V, I_D=20A$

Dynamic Characteristic

Input Capacitance	C _{iss}	-	940	-	pF	V _{DS} = 1000V V _{GS} = 0V T _J = 25°C V _{AC} = 25mV f = 1MHz
Output Capacitance	C _{oss}	-	59	-		
Reverse Transfer Capacitance	C _{rss}	-	4.1	-		
Gate Total Charge	Q _G	-	42	-	nC	V _{DS} = 800V V _{GS} = -4/18V I _D = 20A
Gate-Source charge	Q _{gs}	-	8	-		
Gate-Drain charge	Q _{gd}	-	20	-		
Turn-On Switching Energy	E _{ON}	-	330	-	μJ	V _{DD} = 800V V _{GS} = -4/+15V I _D = 20A R _G = 0Ω L = 120uH
Turn-Off Switching Energy	E _{OFF}	-	51	-		
Turn-on delay time	t _{d(on)}	-	21	-	ns	
Rise time	t _r	-	23	-		
Turn-off delay time	t _{d(off)}	-	16	-		
Fall time	t _f	-	19	-		
Gate resistance	R _G	-	1.7	-	Ω	V _{AC} = 25mV, f=1MHz

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V _{SD}		4.3		V	V _{GS} =-4V, I _{SD} =10A, T _J =25°C
			3.8			V _{GS} =-4V, I _{SD} =10A, T _J =175°C
Body Diode Reverse Recovery Time	t _{rr}	-	43	-	ns	V _R = 800V, V _{GS} = -4V I _D = 20A di/dt = 700A/μS T _J = 150°C
Body Diode Reverse Recovery Charge	Q _{rr}	-	413	-	nC	

Typical Performance Characteristics

Fig 1. Output Characteristic ($T_J = -40^\circ\text{C}$)

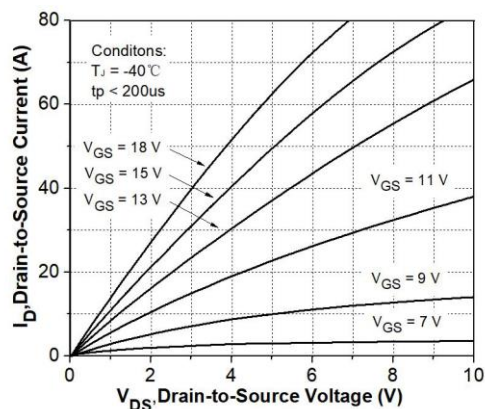


Fig 2. Output Characteristic ($T_J = 25^\circ\text{C}$)

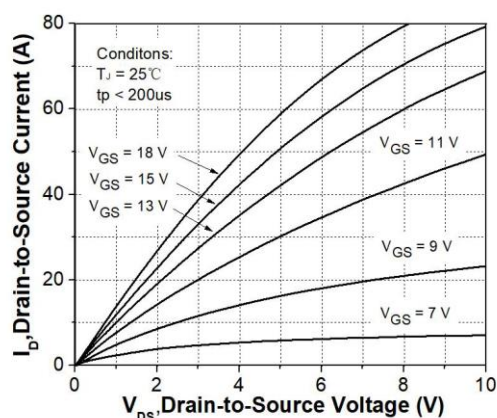


Fig 3. Output Characteristic ($T_J = 175^\circ\text{C}$)

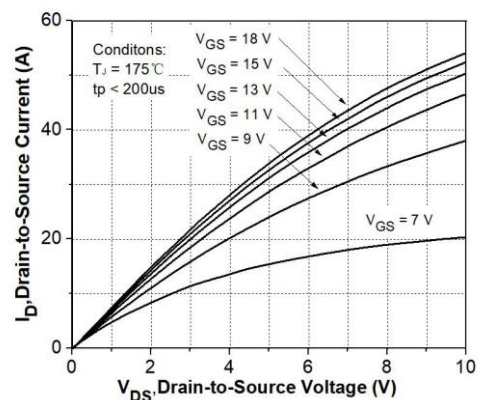


Fig 4: $R_{DS(on)}$ Vs I_{DS} Characteristic

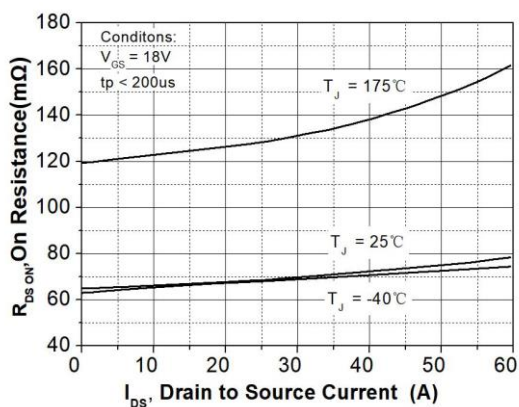


Fig 5: $R_{DS(on)}$ vs. Temperature

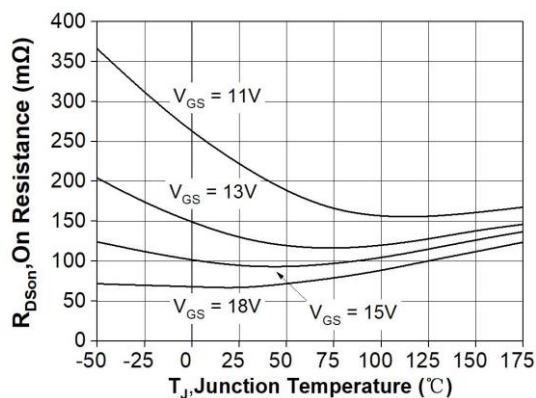


Fig 6: Transfer Characteristic

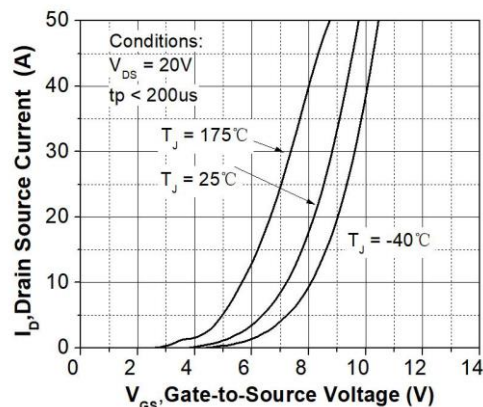


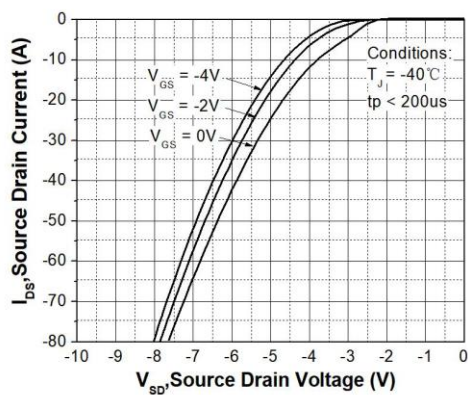
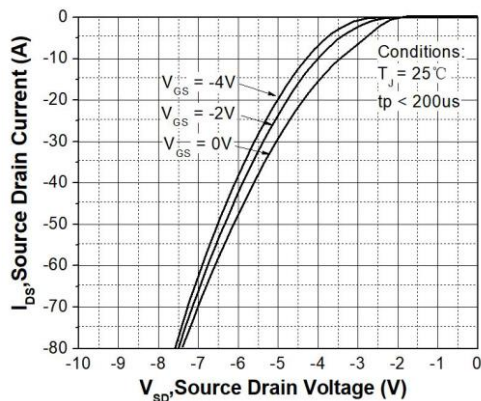
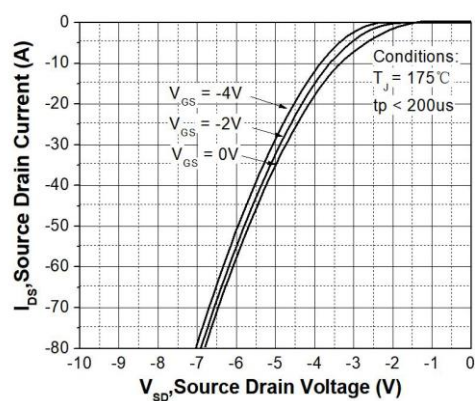
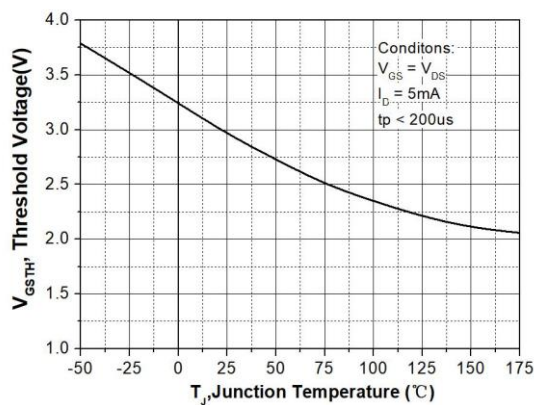
Fig 7: Body-diode Characteristic ($T_J = -40^\circ\text{C}$)Fig 8: Body-diode Characteristic ($T_J = 25^\circ\text{C}$)Fig 9: Body-diode Characteristic ($T_J = 175^\circ\text{C}$)Fig 10: V_{TH} Vs T_J Temperature Characteristic

Fig 11: Gate Charge Characteristics

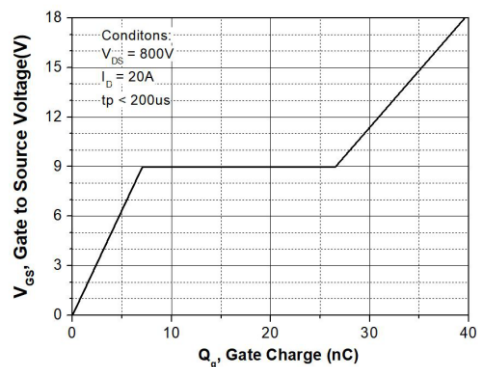
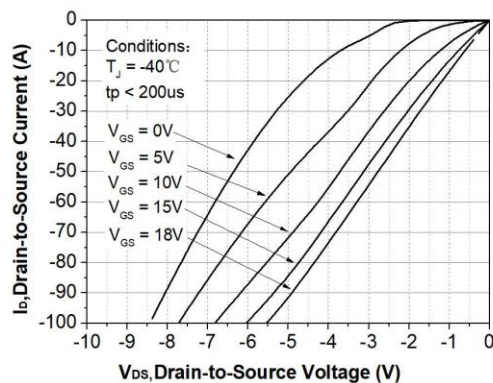
Fig 12: 3rd Quadrant Characteristic ($T_J = -40^\circ\text{C}$)

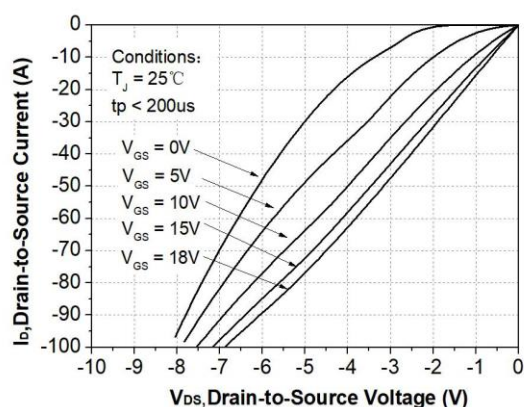
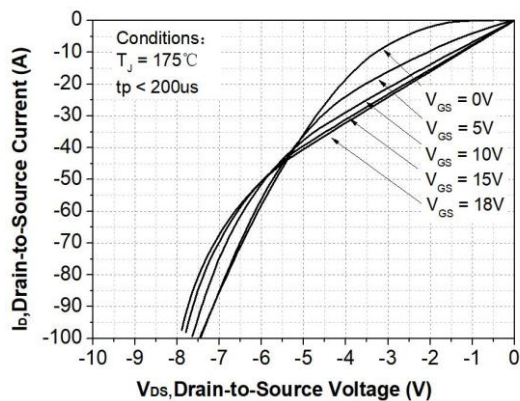
Fig 13: 3rd Quadrant Characteristic($T_J=25^\circ\text{C}$)Fig 14: 3rd Quadrant Characteristic($T_J=175^\circ\text{C}$)

Fig 15: Capacitance Characteristic

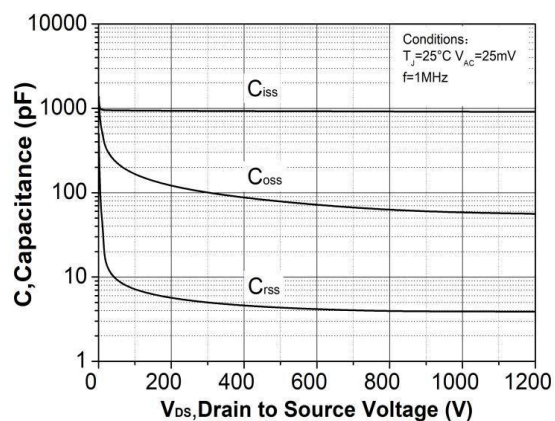


Fig 16: Safe Operating Area

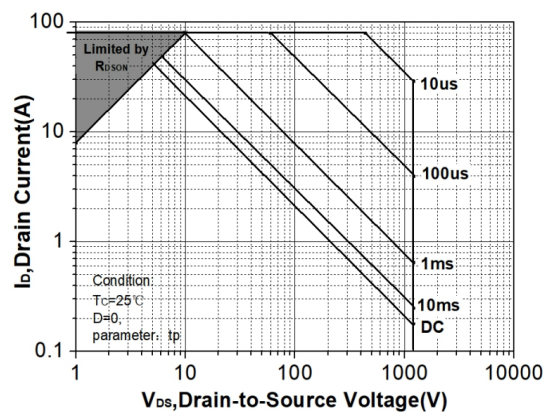
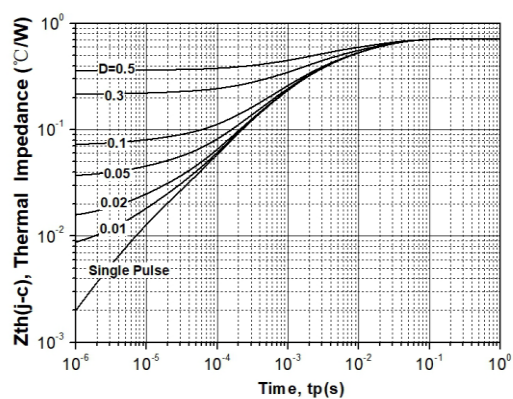


Fig 17: Transient Thermal Impedance



Test Circuit & Waveform

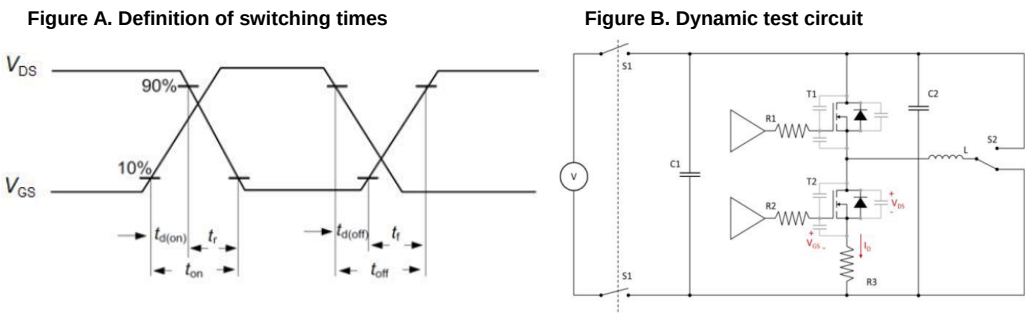
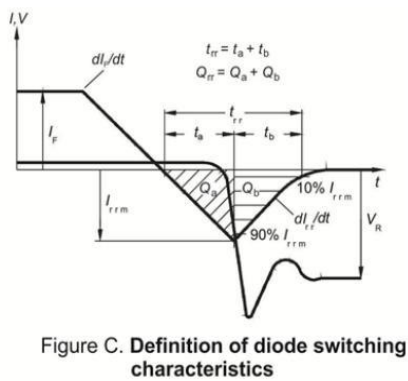
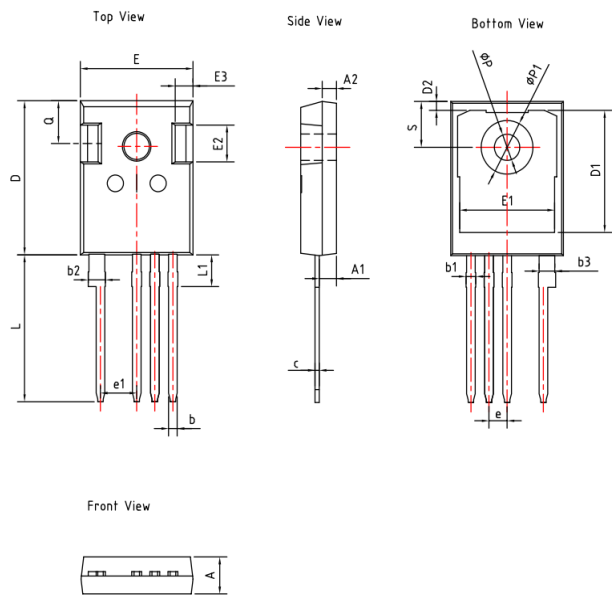


Figure C. Definition of body diodeswitching characteristics



Package Outline:



Dimension unit:[mm]			
SYMBOL	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b1	1.11	1.37	1.57
b2	2.24	2.40	2.60
b3	2.11	2.21	2.36
c	0.51	0.60	0.75
D	20.70	20.90	21.30
D1	15.92	16.22	16.52
D2	1.00	1.20	1.35
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	2.54 BSC		
e1	5.08 BSC		
L	19.62	19.92	20.22
L1	-	-	4.30
ϕP	3.40	3.60	3.80
$\phi P1$	-	-	7.30
Q	5.40	5.80	6.20
S	6.20 BSC		

Contact Information

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For additional information, please contact your local Sales Representative.



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