

## Features

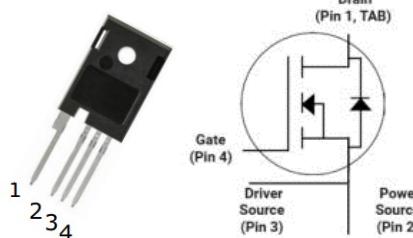
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Avalanche Ruggedness

## Product Summary

$V_{DS}$	1200V
$R_{DS(on)}_{typ}$	320mΩ
$I_D$	7.6A

## Applications

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



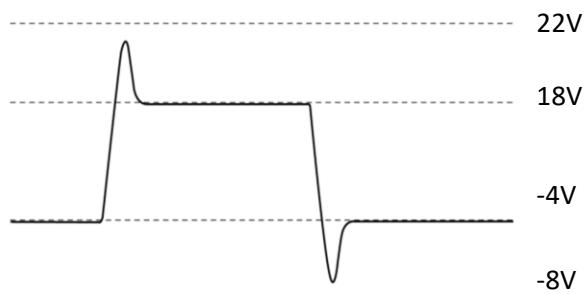
## Package Marking and Ordering Information

Part #	Marking	Package
T1M320120K	1M320120K	TO-247-4

## Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	1200	V
Continuous drain current	$I_D$	7.6	A
$T_C = 25^\circ\text{C}$ , $V_{GS} = 18\text{V}$		5.5	
$T_C = 100^\circ\text{C}$ , $V_{GS} = 18\text{V}$			
Pulsed drain current ( $T_C = 25^\circ\text{C}$ , $t_p$ limited by $T_{jmax}$ )	$I_D$ pulse	20	A
Gate-Source voltage	$V_{GS}$	-4/+18	V
Gate-Source voltage (Absolute maximum values)	$V_{GSmax}$	-8/+22	V
Power dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{tot}$	60	W
Operating junction and storage temperature	$T_j$ , $T_{stg}$	-55...+175	°C

- Example of acceptable  $V_{GS}$  waveform



**Thermal Resistance**

Parameter	Symbol	Value	Unit
Thermal resistance, junction – case. Max	$R_{thJC}$	2.50	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction – ambient. Max	$R_{thJA}$	40	

**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	$\text{BV}_{\text{DSS}}$	1200	-	-	V	$\text{V}_{\text{GS}}=0\text{V}, \text{I}_{\text{D}}=100\text{uA}$
Gate threshold voltage	$\text{V}_{\text{GS(th)}}$	2	3.1	4	V	$\text{V}_{\text{DS}}=\text{V}_{\text{GS}}, \text{I}_{\text{D}}=1\text{mA}$
Zero gate voltage drain current	$\text{I}_{\text{DSS}}$	-	1	20	$\mu\text{A}$	$\text{V}_{\text{DS}}=1200\text{V}, \text{V}_{\text{GS}}=0\text{V}$
		-	5	-		$\text{T}_{\text{C}}=25^{\circ}\text{C}$
Gate-source leakage current	$\text{I}_{\text{GSS}}$	-		100	nA	$\text{V}_{\text{GS}}=18\text{V}, \text{V}_{\text{DS}}=0\text{V}$
Drain-source on-state resistance	$\text{R}_{\text{DS(on)}}$	-	320	450	$\text{m}\Omega$	$\text{V}_{\text{GS}}=18\text{V}, \text{I}_{\text{D}}=3.6\text{A}, \text{T}_{\text{J}}=25^{\circ}\text{C}$
		-	480	-		$\text{T}_{\text{J}}=175^{\circ}\text{C}$
Transconductance	$\text{g}_{\text{fs}}$	-	3	-	S	$\text{V}_{\text{DS}}=20\text{V}, \text{I}_{\text{D}}=3.6\text{A}$

**Dynamic Characteristic**

Input Capacitance	$C_{iss}$	-	324	-	pF	$V_{DS} = 1000V$ $V_{GS} = 0V$ $T_J = 25^\circ C$ $V_{AC} = 25mV$ $f = 1MHz$
Output Capacitance	$C_{oss}$	-	24	-		
Reverse Transfer Capacitance	$C_{rss}$	-	4	-		
Gate Total Charge	$Q_G$	-	23.5	-	nC	$V_{DS} = 800V$ $V_{GS} = 0/18V$ $I_D = 3.6A$ $I_G = 10mA$
Gate-Source charge	$Q_{gs}$	-	3.2	-		
Gate-Drain charge	$Q_{gd}$	-	14	-		
Turn-On Switching Energy	$E_{ON}$	-	9	-	$\mu J$	$V_{DD}=800V$ , $V_{GS}=-4/18V$ $R_G=5\Omega$ , $I_D=3.6A$ Inductive Load, $T_J=25^\circ C$
Turn-Off Switching Energy	$E_{OFF}$	-	140	-		
Turn-on delay time	$t_{d(on)}$	-	10.9	-		
Rise time	$t_r$	-	16.2	-	ns	
Turn-off delay time	$t_{d(off)}$	-	11.2	-		
Fall time	$t_f$	-	30.4	-		
Gate resistance	$R_G$	-	5.9	-	$\Omega$	$V_{AC} = 25mV, f=1MHz$

**Body Diode Characteristic**

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	$V_{SD}$		3.6		V	$V_{GS} = 0V, I_{SD} = 4A$ , $T_J = 25^\circ C$
			3.2			$V_{GS} = 0V, I_{SD} = 4A$ , $T_J = 175^\circ C$
Body Diode Reverse Recovery Time	$t_{rr}$	-	12.3	-	ns	$V_R = 800V, V_{GS} = 0V$ $I_D = 3.6A$
Body Diode Reverse Recovery Charge	$Q_{rr}$	-	23.5	-	nC	$di/dt = 800A/\mu S$ $T_J = 25^\circ C$

## Typical Performance Characteristics

Fig 1. Output Characteristic ( $T_J = -55^\circ\text{C}$ )

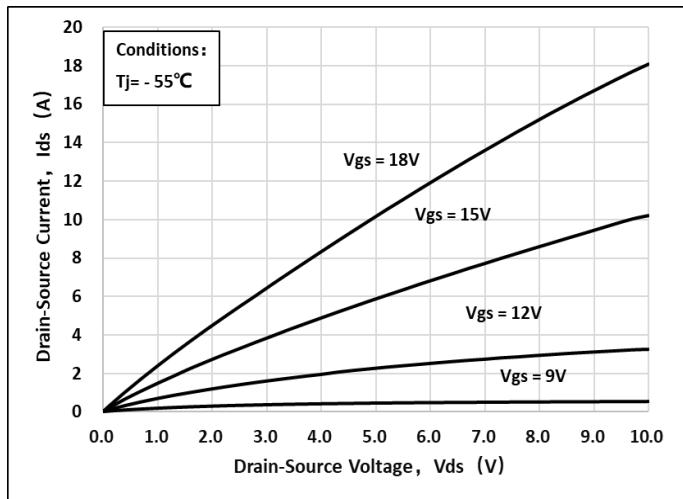


Fig 2. Output Characteristic ( $T_J = 25^\circ\text{C}$ )

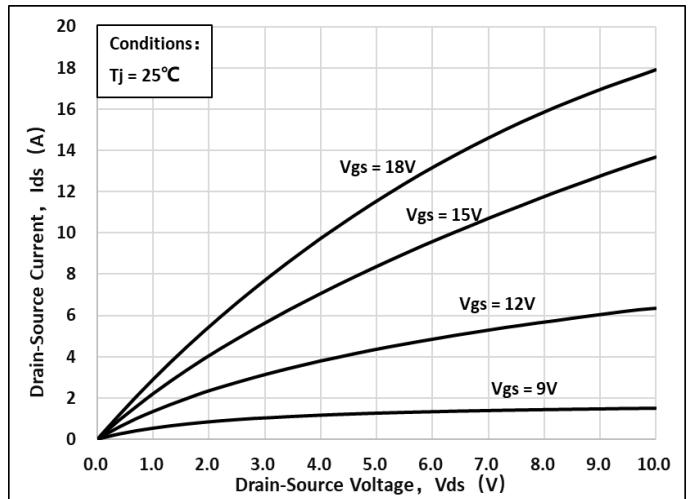


Fig 3. Output Characteristic ( $T_J = 175^\circ\text{C}$ )

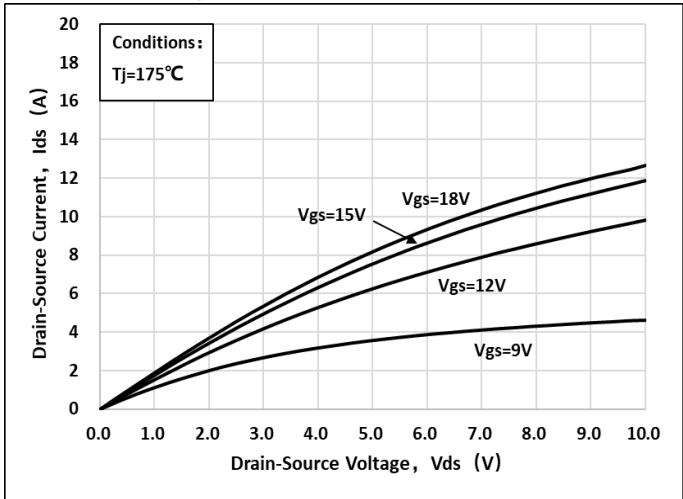


Fig 4:  $R_{DS(on)}$  Vs  $I_{DS}$  Characteristic

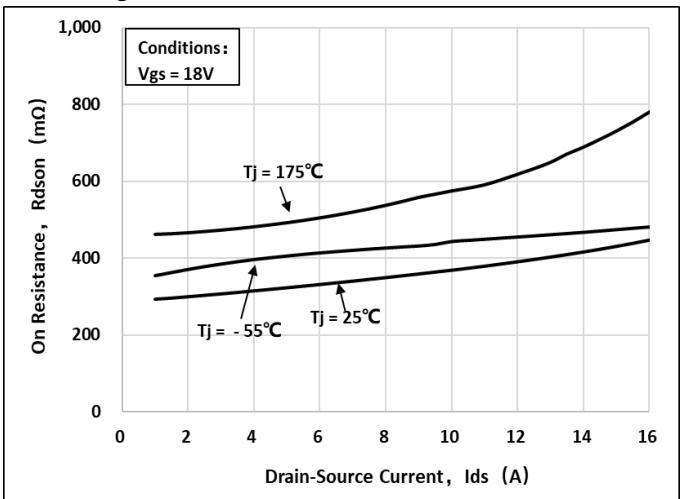


Fig 5:  $R_{DS(on)}$  vs. Temperature

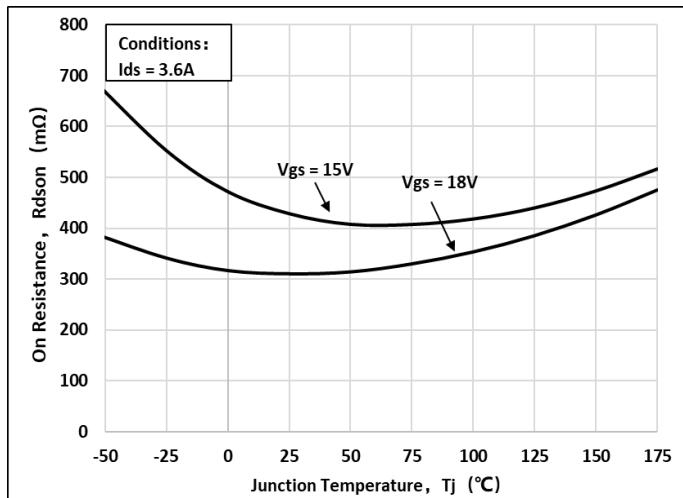


Fig 6: Transfer Characteristic

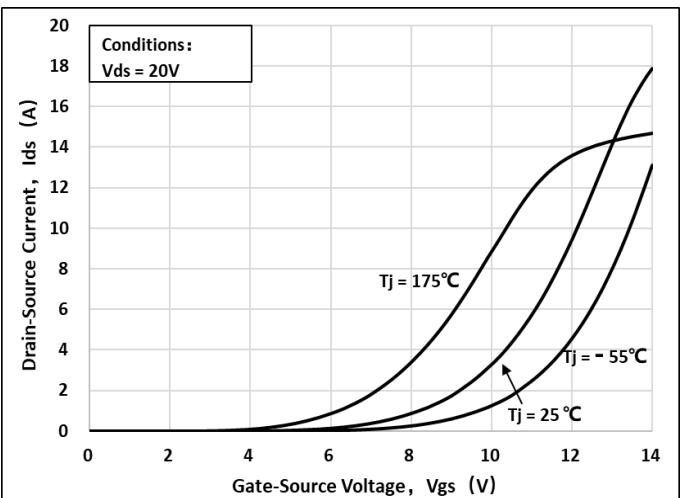


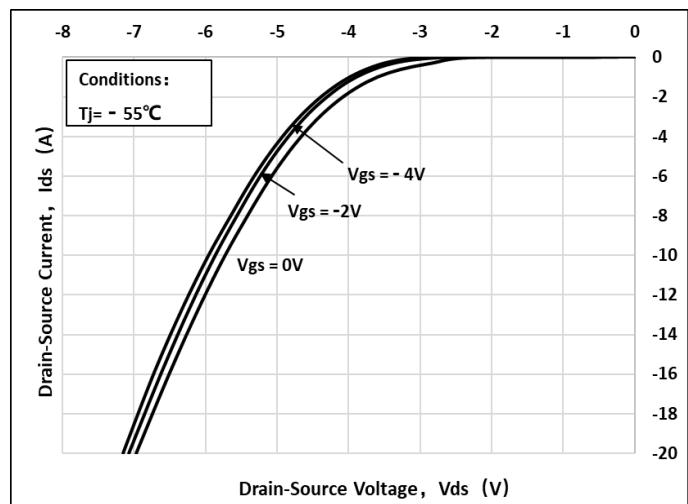
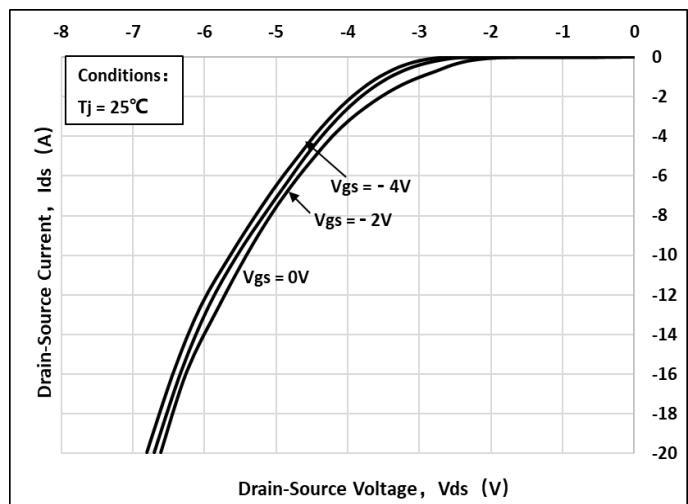
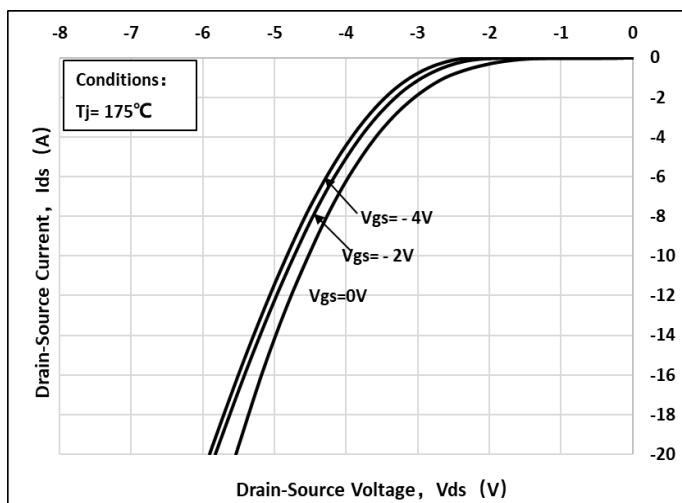
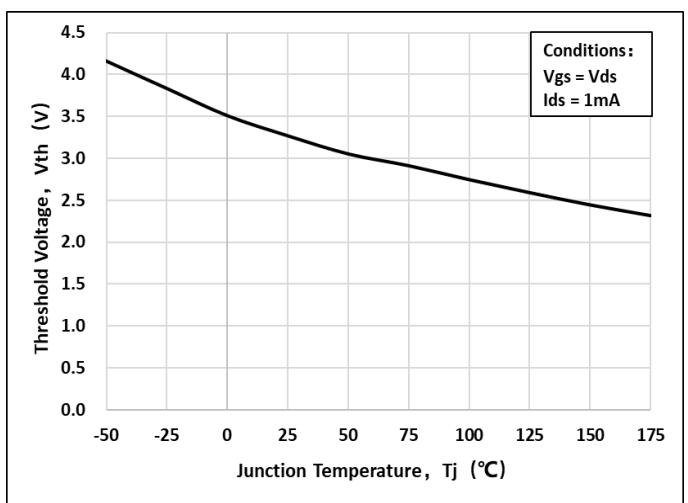
Fig 7: Body-diode Characteristic ( $T_J = -55^\circ\text{C}$ )Fig 8: Body-diode Characteristic ( $T_J = 25^\circ\text{C}$ )Fig 9: Body-diode Characteristic ( $T_J = 175^\circ\text{C}$ )Fig 10:  $V_{TH}$  Vs  $T_J$  Temperature Characteristic

Fig 11: Gate Charge Characteristics

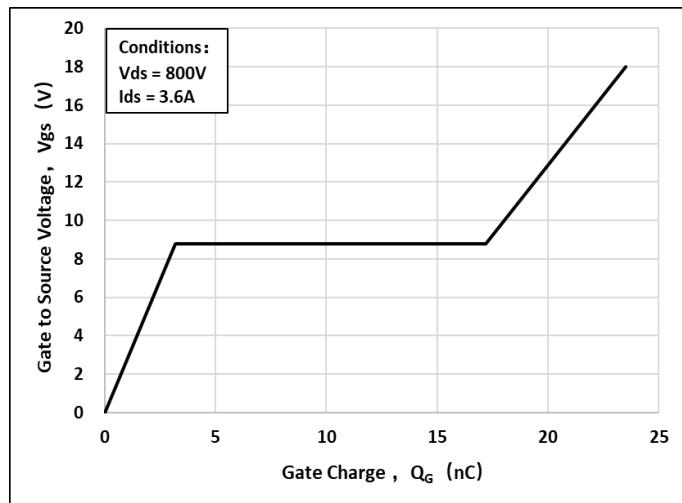
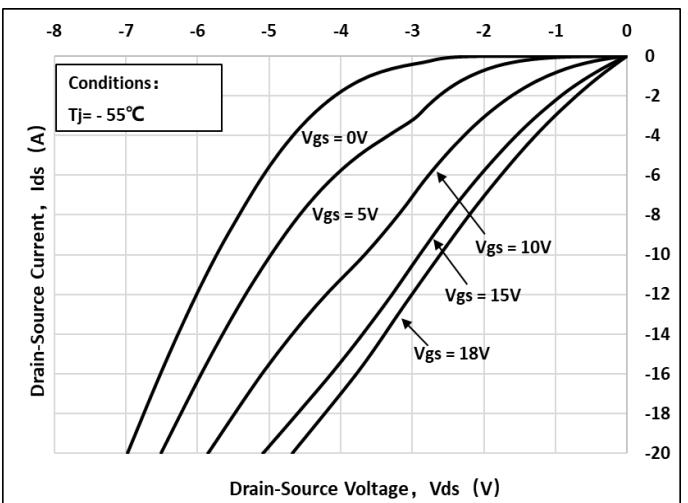
Fig 12: 3rd Quadrant Characteristic ( $T_J = -55^\circ\text{C}$ )

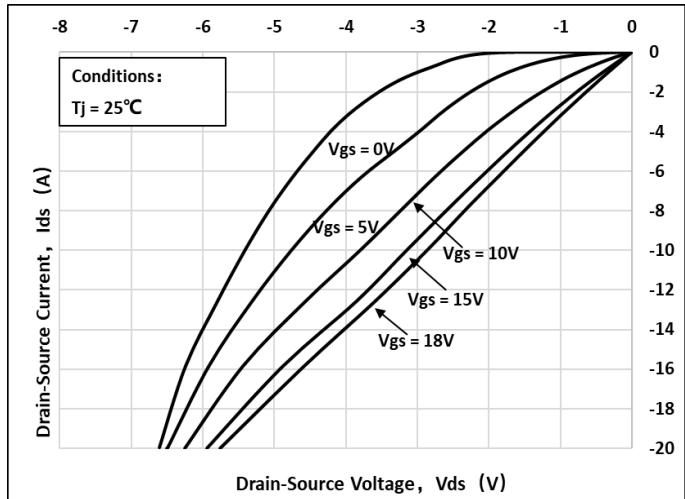
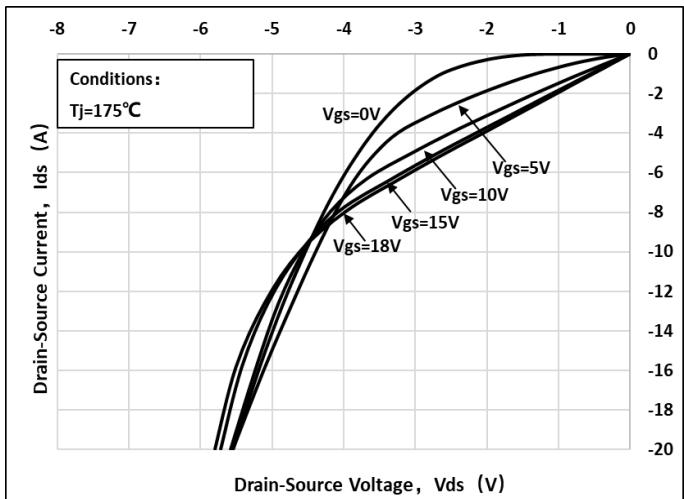
Fig 13: 3rd Quadrant Characteristic( $T_J=25^\circ\text{C}$ )Fig 14: 3rd Quadrant Characteristic( $T_J=175^\circ\text{C}$ )

Fig 15: Capacitance Characteristic

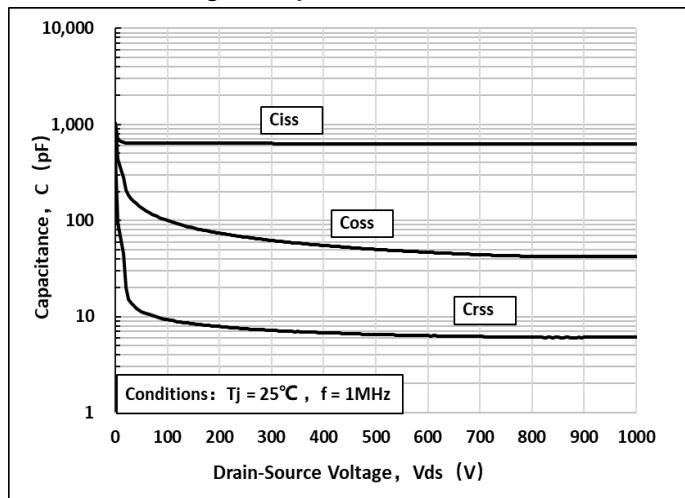


Fig 16: Safe Operating Area

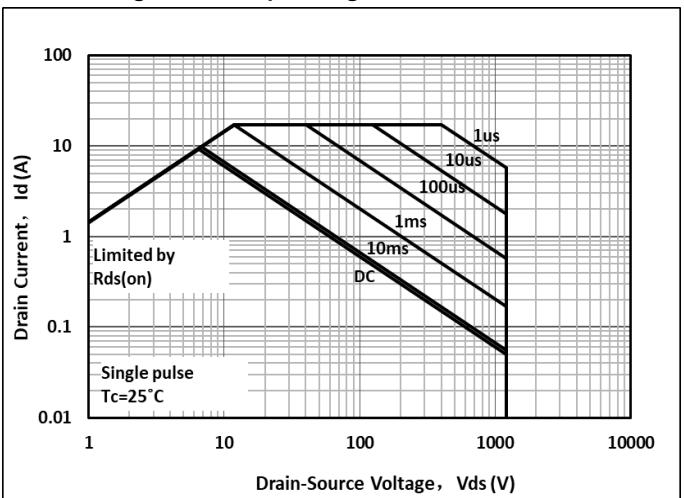
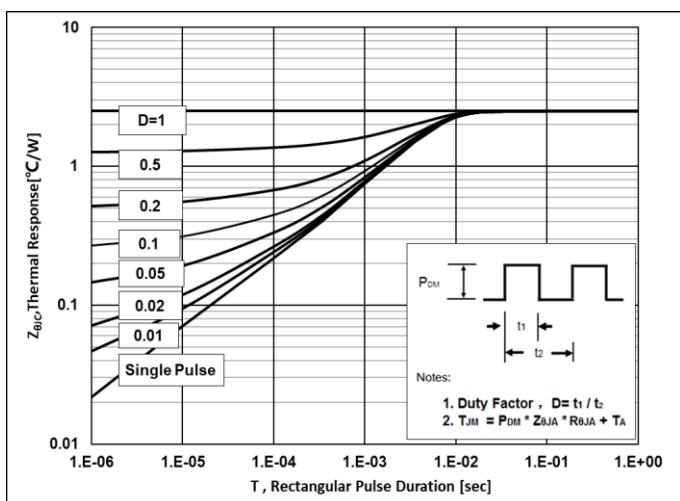


Fig 17: Transient Thermal Impedance



## Test Circuit & Waveform

Figure A. Definition of switching times

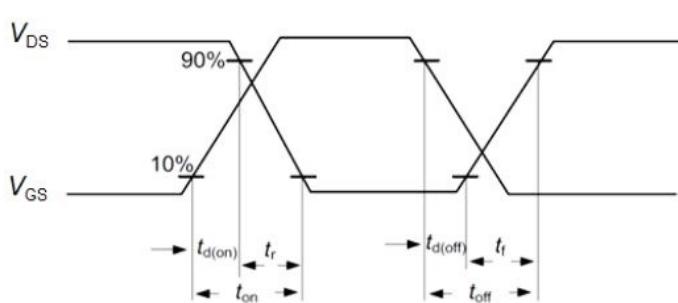


Figure B. Dynamic test circuit

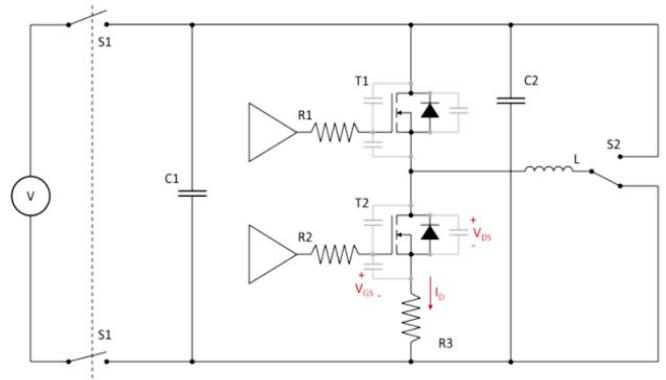


Figure C. Definition of body diodeswitching characteristics

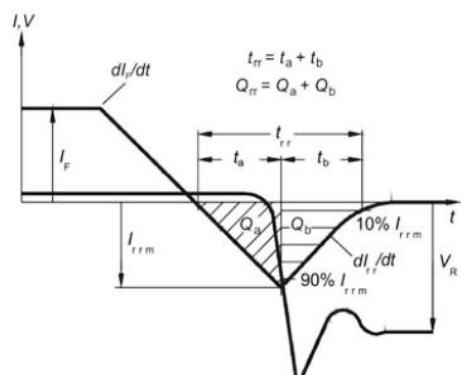
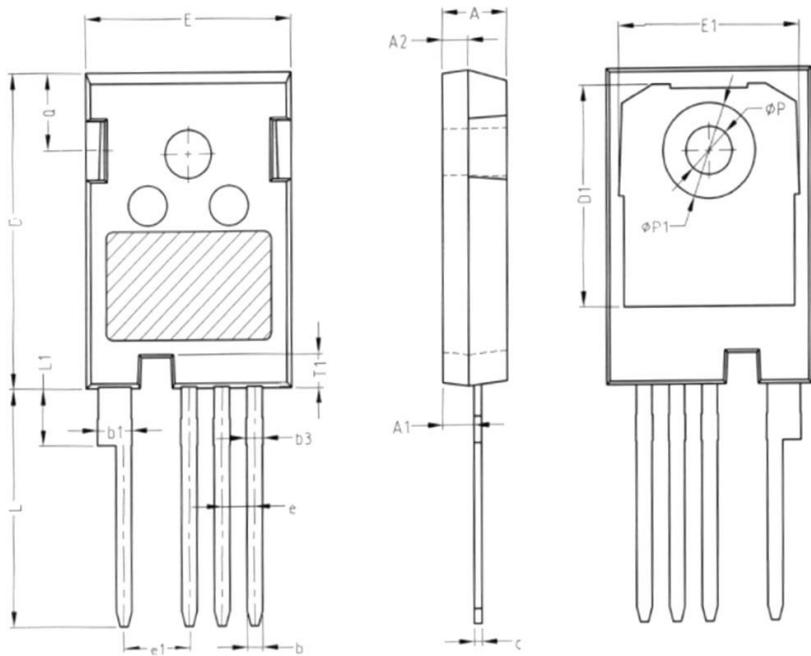


Figure C. Definition of diode switching characteristics

## Package Outline:



COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.80	2.00	2.20
b	1.06	1.21	1.36
b1	2.33	2.63	2.93
b3	1.07	1.30	1.60
c	0.51	0.61	0.75
D	23.30	23.45	23.60
D1	16.25	16.55	16.85
E	15.74	15.94	16.14
E1	13.72	14.02	14.32
T1	2.35	2.50	2.65
e	2.54 BSC		
e1	5.08 BSC		
Q	5.49	5.79	6.09
L	17.27	17.57	17.87
L1	3.99	4.19	4.39
Φp	3.40	3.60	3.80
Φp1	7.19 REF		

## Contact Information

TANI website: <http://www.tanisemi.com> Email: [tani@tanisemi.com](mailto:tani@tanisemi.com)

For additional information, please contact your local Sales Representative.



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### Product Specification Statement

The product specification aims to provide users with a reference regarding various product parameters, performance, and usage. It presents certain aspects of the product's performance in graphical form and is intended solely for users to select product and make product comparisons, enabling users to better understand and evaluate the characteristics and advantages of the product. It does not constitute any commitment, warranty, or guarantee.

The product parameters described in the product specification are numerical values, characteristics, and functions obtained through actual testing or theoretical calculations of the product in an independent or ideal state. Due to the complexity of product applications and variations in test conditions and equipment, there may be slight fluctuations in parameter test values. TANI shall not guarantee that the actual performance of the product when installed in the customer's system or equipment will be entirely consistent with the product specification, especially concerning dynamic parameters. It is recommended that users consult with professionals for product selection and system design. Users should also thoroughly validate and assess whether the actual parameters and performance when installed in their respective systems or equipment meet their requirements or expectations. Additionally, users should exercise caution in verifying product compatibility issues, and TANI assumes no responsibility for the application of the product. TANI strives to provide accurate and up-to-date information to the best of our ability. However, due to technical, human, or other reasons, TANI cannot guarantee that the information provided in the product specification is entirely accurate and error-free. TANI shall not be held responsible for any losses or damages resulting from the use or reliance on any information in these product specifications.

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Users are advised to pay attention to the parameter limit values specified in the product specification and maintain a certain margin in design or application to ensure that the product does not exceed the parameter limit values defined in the product specification. This precaution should be taken to avoid exceeding one or more of the limit values, which may result in permanent irreversible damage to the product, ultimately affecting the quality and reliability of the system or equipment.

The design of the product is intended to meet civilian needs and is not guaranteed for use in harsh environments or precision equipment. It is not recommended for use in systems or equipment such as medical devices, aircraft, nuclear power, and similar systems, where failures in these systems or equipment could reasonably be expected to result in personal injury. TANI shall assume no responsibility for any consequences resulting from such usage.

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