

## IV2Q171R0D7Z – 1700V 1000mΩ SiC MOSFET

### Features

- High blocking voltage with low on-resistance
- High speed switching with low capacitance
- High operating junction temperature capability
- Very fast and robust intrinsic body diode
- AEC-Q101 qualified

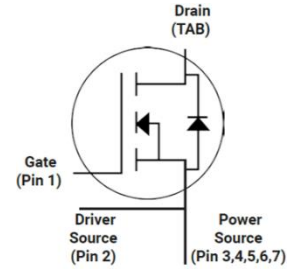
### Applications

- Solar inverters
- Switch mode power supplies
- Auxiliary power supplies
- Smart meters

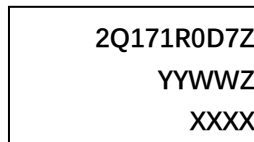
### Outline:



TO263-7



### Marking Diagram:



2Q171R0D7Z = Specific Device Code  
 YY = Year  
 WW = Work Week  
 Z = Assembly Location  
 XXXX = Lot Traceability

### Absolute Maximum Ratings ( $T_c=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
$V_{DS}$	Drain-Source voltage	1700	V	$V_{GS}=0V, I_D=10\mu A$	
$V_{GSmax}(DC)$	Maximum DC voltage	-5 to 20	V	Static (DC)	
$V_{GSmax}(Spike)$	Maximum spike voltage	-8 to 22	V	<1% duty cycle, and pulse width<200ns	
$V_{GSon}$	Recommended turn-on voltage	15 to 18	V		
$V_{GSoff}$	Recommended turn-off voltage	-3.5 to -2	V		
$I_D$	Drain current (continuous)	5	A	$V_{GS}=18V, T_c=25^\circ\text{C}$	Fig. 21
		3.7	A	$V_{GS}=18V, T_c=100^\circ\text{C}$	
$I_{DM}$	Drain current (pulsed)	12	A	Pulse width limited by SOA	Fig. 24
$P_{TOT}$	Total power dissipation	39	W	$T_c=25^\circ\text{C}$	Fig. 22
$T_{stg}$	Storage temperature range	-55 to 175	$^\circ\text{C}$		
$T_J$	Operating junction temperature	-55 to 175	$^\circ\text{C}$		
$T_L$	Solder Temperature	260	$^\circ\text{C}$	wave soldering only allowed at leads, 1.6mm from case for 10 s	

### Thermal Data

Symbol	Parameter	Value	Unit	Note
$R_{\theta(j-c)}$	Thermal Resistance from Junction to Case	3.8	$^\circ\text{C}/\text{W}$	

**Electrical Characteristics** ( $T_c=25^\circ\text{C}$  unless otherwise specified)

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
$I_{DSS}$	Zero gate voltage drain current		1	10	$\mu\text{A}$	$V_{DS}=1700\text{V}, V_{GS}=0\text{V}$	
$I_{GSS}$	Gate leakage current			$\pm 100$	$\text{nA}$	$V_{DS}=0\text{V}, V_{GS}=-5\sim 20\text{V}$	
$V_{TH}$	Gate threshold voltage	1.8	3.0	5.0	$\text{V}$	$V_{GS}=V_{DS}, I_D=380\mu\text{A}$	Fig. 8, 9
			2.0		$\text{V}$	$V_{GS}=V_{DS}, I_D=380\mu\text{A}$ @ $T_J=175^\circ\text{C}$	
$R_{ON}$	Static drain-source on-resistance	520	700	850	$\text{m}\Omega$	$V_{GS}=18\text{V}, I_D=1\text{A}$ @ $T_J=25^\circ\text{C}$	Fig. 4, 5, 6, 7
		950	1280	1540		@ $T_J=175^\circ\text{C}$	
		700	900	1100	$\text{m}\Omega$	$V_{GS}=15\text{V}, I_D=1\text{A}$ @ $T_J=25^\circ\text{C}$	
		1050	1320	1600		@ $T_J=175^\circ\text{C}$	
$C_{iss}$	Input capacitance		285		$\text{pF}$	$V_{DS}=1000\text{V}, V_{GS}=0\text{V},$ $f=1\text{MHz}, V_{AC}=25\text{mV}$	Fig. 16
$C_{oss}$	Output capacitance		15.3		$\text{pF}$		
$C_{rss}$	Reverse transfer capacitance		2.2		$\text{pF}$		
$E_{oss}$	$C_{oss}$ stored energy		11		$\mu\text{J}$		Fig. 17
$Q_g$	Total gate charge		16.5		$\text{nC}$	$V_{DS}=1000\text{V}, I_D=1\text{A},$ $V_{GS}=-5$ to $18\text{V}$	Fig. 18
$Q_{gs}$	Gate-source charge		2.7		$\text{nC}$		
$Q_{gd}$	Gate-drain charge		12.5		$\text{nC}$		
$R_g$	Gate input resistance		13		$\Omega$	$f=1\text{MHz}$	
$E_{ON}$	Turn-on switching energy		44.5		$\mu\text{J}$	$V_{DS}=1000\text{V}, I_D=2\text{A},$ $V_{GS}=-3.5\text{V}$ to $18\text{V},$ $R_{G(\text{ext})}=22\Omega,$ $L=300\mu\text{H}$	
$E_{OFF}$	Turn-off switching energy		16.8		$\mu\text{J}$		
$t_{d(\text{on})}$	Turn-on delay time		7.1		ns		
$t_r$	Rise time		14.1				
$t_{d(\text{off})}$	Turn-off delay time		16.8				
$t_f$	Fall time		54.4				

**Reverse Diode Characteristics** ( $T_c=25^\circ\text{C}$  unless otherwise specified)

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
$V_{SD}$	Diode forward voltage		3.7		$\text{V}$	$I_{SD}=1\text{A}, V_{GS}=0\text{V}$	Fig. 10, 11, 12
			3.5		$\text{V}$	$I_{SD}=1\text{A}, V_{GS}=0\text{V},$ $T_J=175^\circ\text{C}$	

## Typical Performance (curves)

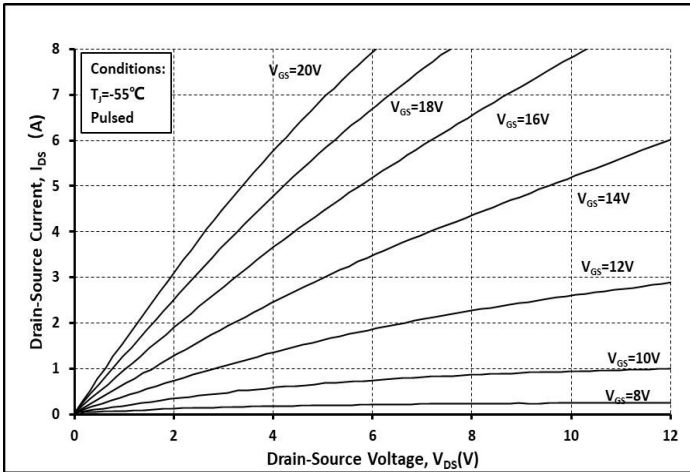


Fig. 1 Output Curve @  $T_j = -55^\circ\text{C}$

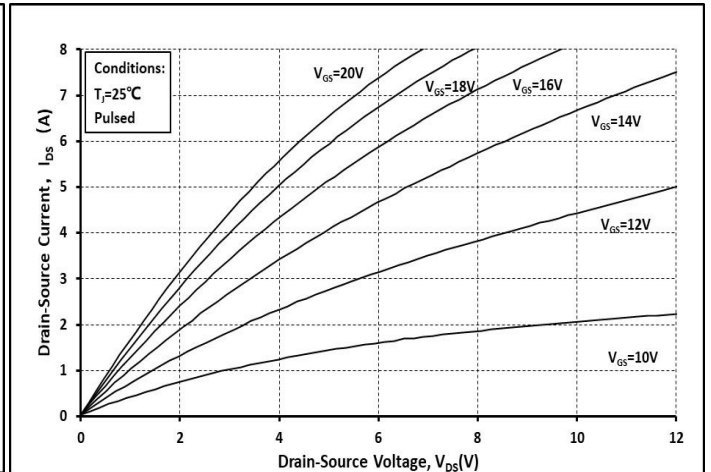


Fig. 2 Output Curve @  $T_j = 25^\circ\text{C}$

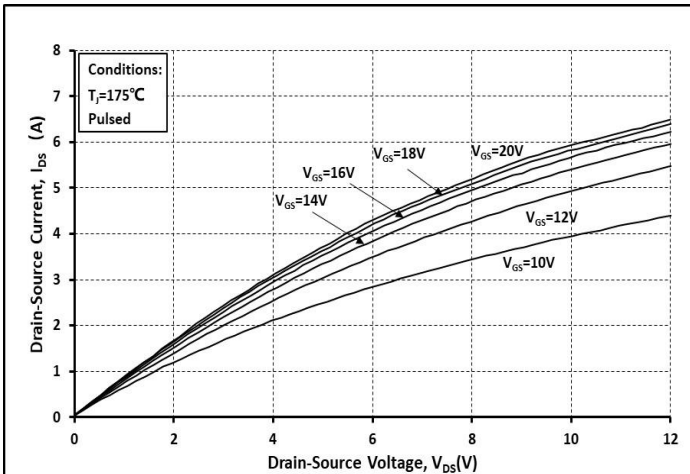


Fig. 3 Output Curve @  $T_j = 175^\circ\text{C}$

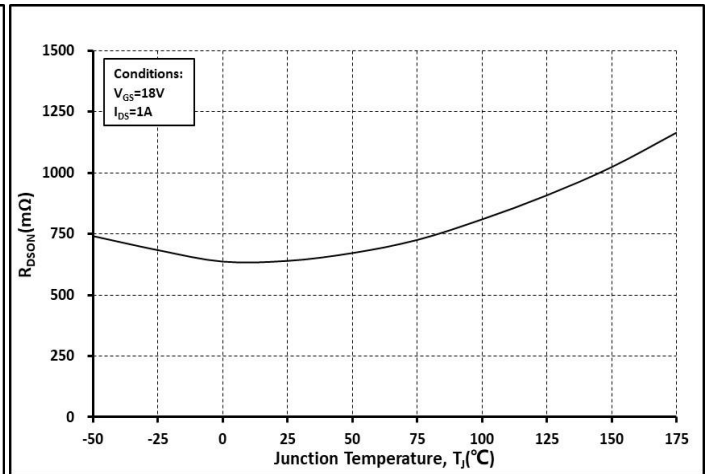


Fig. 4  $R_{on}$  vs. Temperature

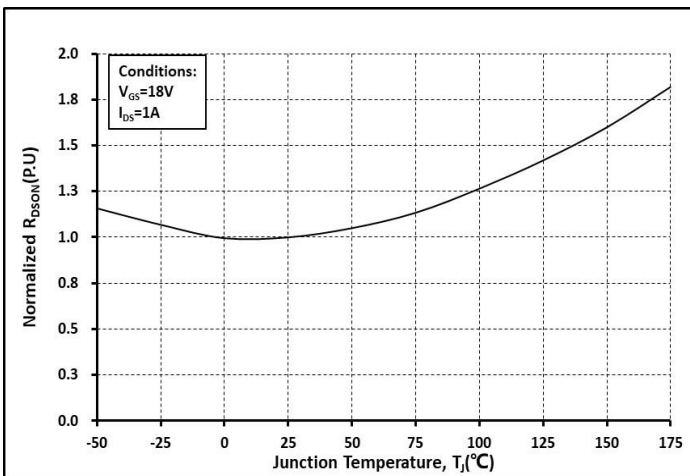


Fig. 5 Normalized  $R_{on}$  vs. Temperature

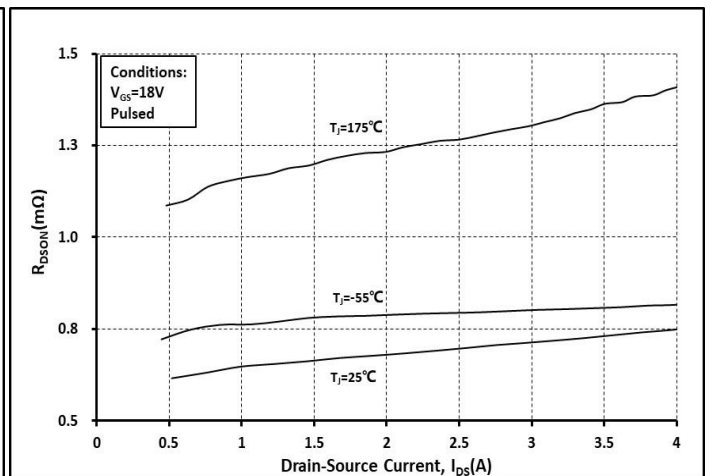


Fig. 6  $R_{on}$  vs.  $I_{DS}$  @ Various Temperature

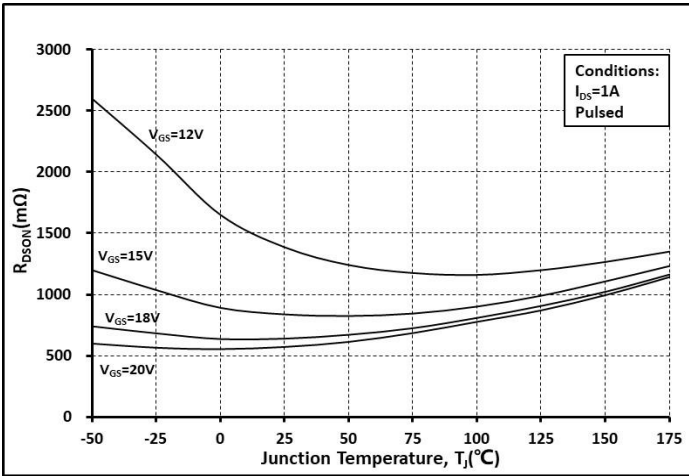


Fig. 7 Ron vs. Temperature @ Various  $V_{GS}$

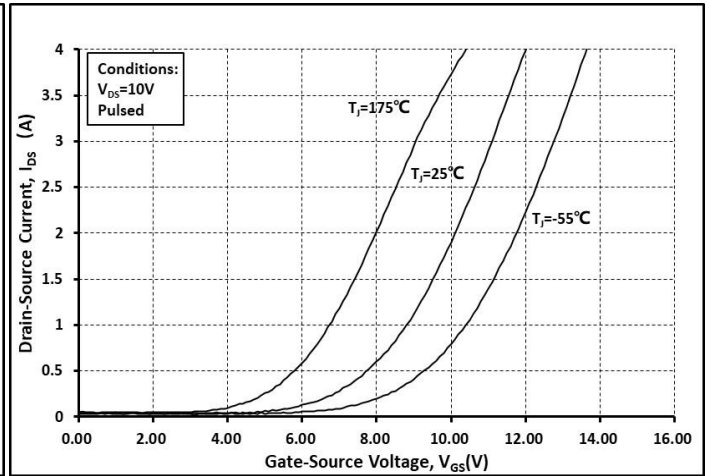


Fig. 8 Transfer Curves @ Various Temperature

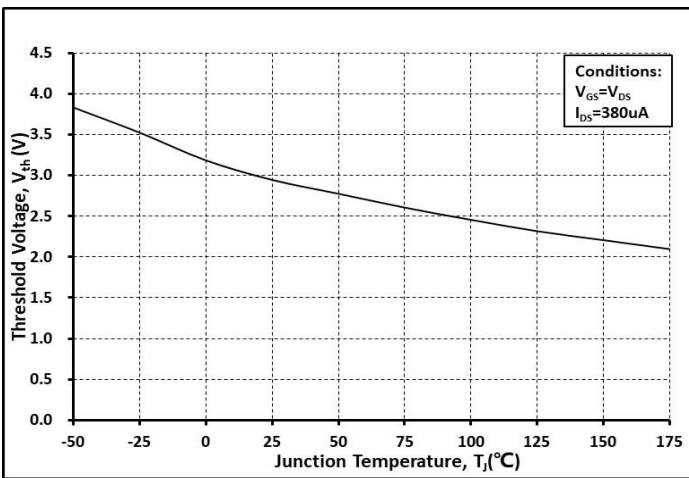


Fig. 9 Threshold Voltage vs. Temperature

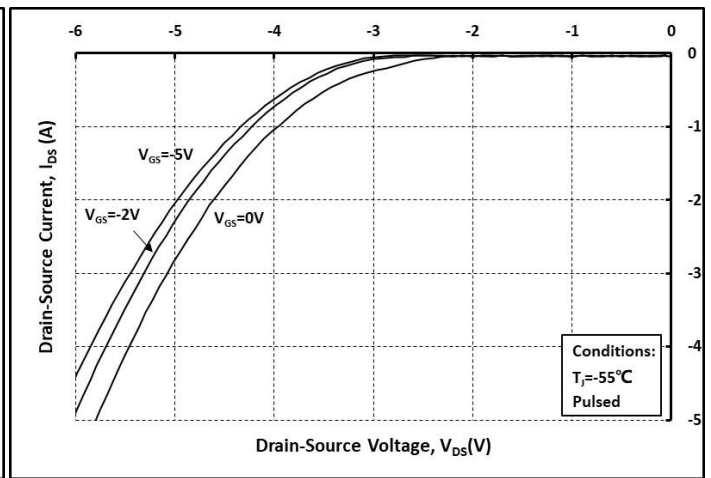


Fig. 10 Body Diode Curves @  $T_J = -55^\circ\text{C}$

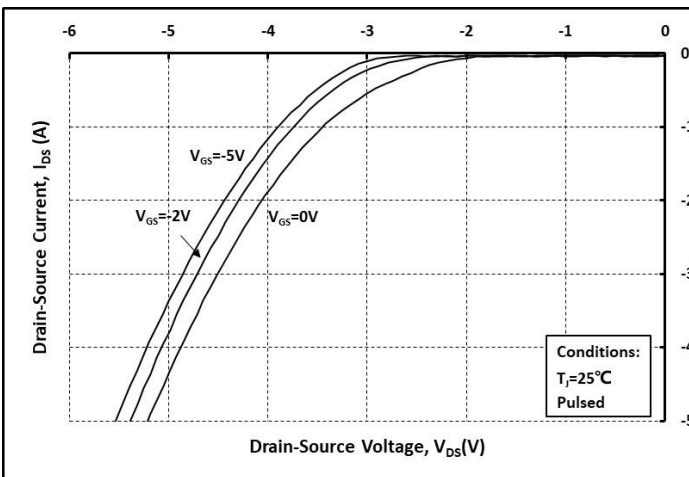


Fig. 11 Body Diode Curves @  $T_J = 25^\circ\text{C}$

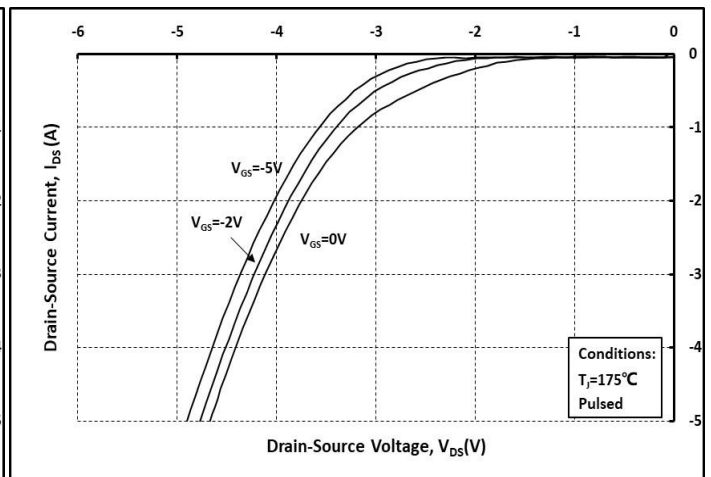


Fig. 12 Body Diode Curves @  $T_J = 175^\circ\text{C}$

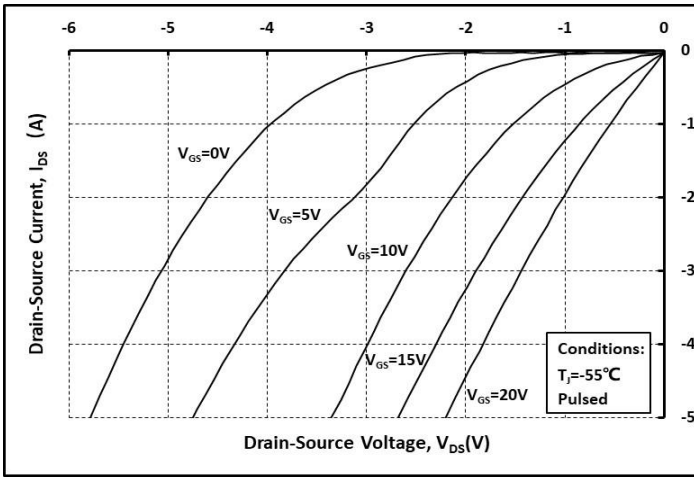


Fig. 13 3<sup>rd</sup> Quadrant Curves @  $T_j = -55^\circ\text{C}$

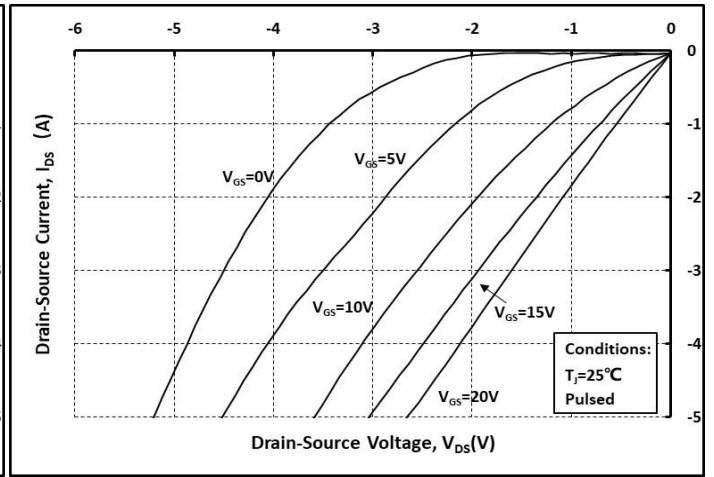


Fig. 14 3<sup>rd</sup> Quadrant Curves @  $T_j = 25^\circ\text{C}$

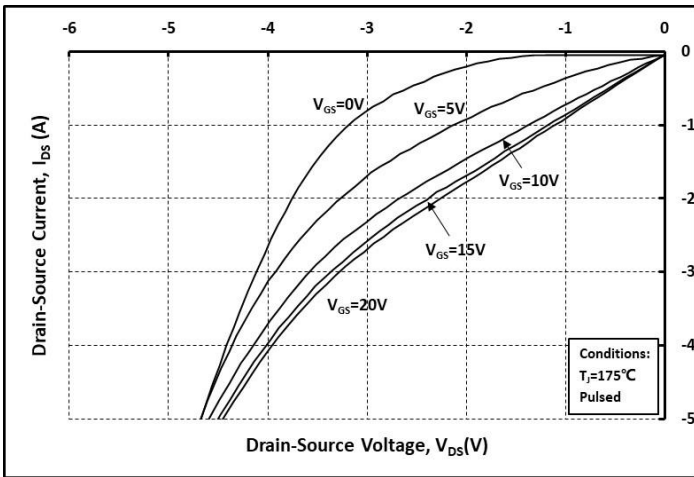


Fig. 15 3<sup>rd</sup> Quadrant Curves @  $T_j = 175^\circ\text{C}$

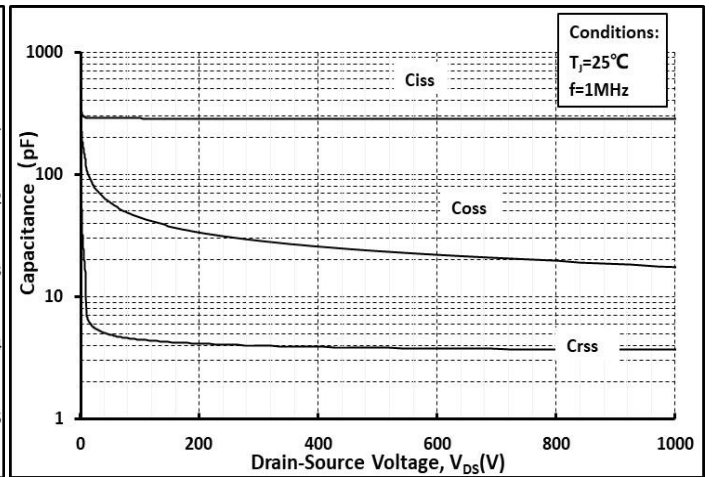


Fig. 16 Capacitance vs.  $V_{DS}$

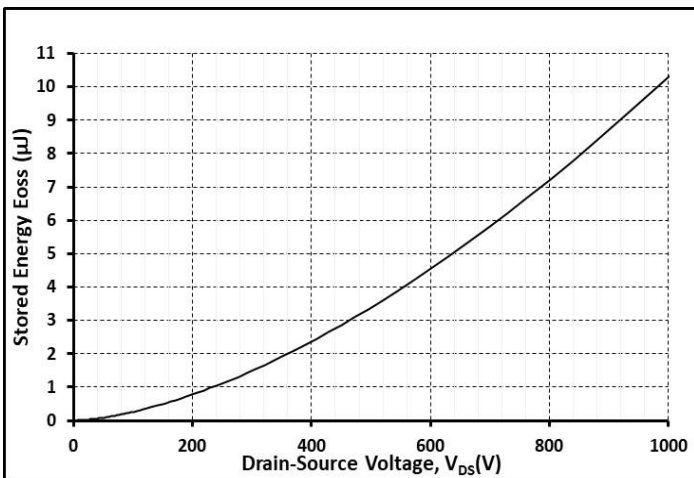


Fig. 17 Output Capacitor Stored Energy

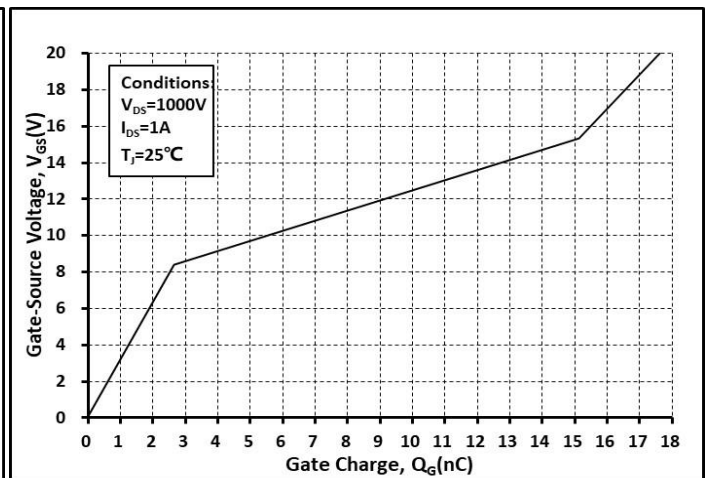


Fig. 18 Gate Charge Characteristics

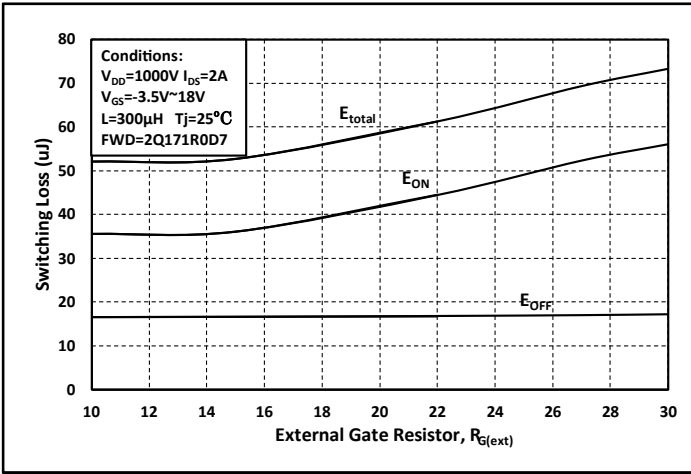


Fig. 19 Switching Energy vs.  $R_{G(ext)}$

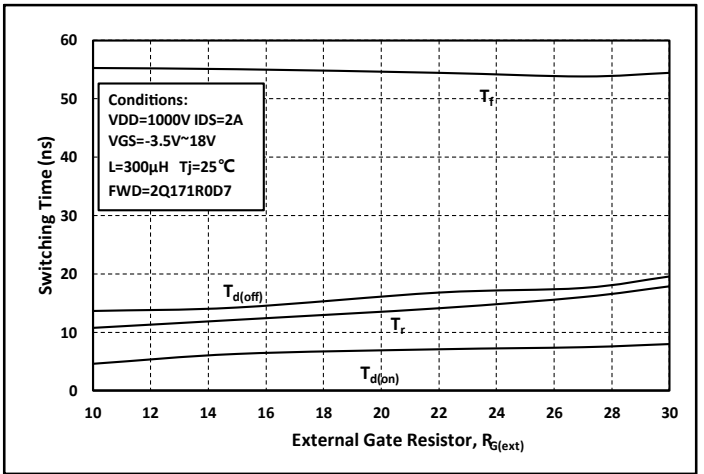


Fig. 20 Switching Times vs.  $R_{G(ext)}$

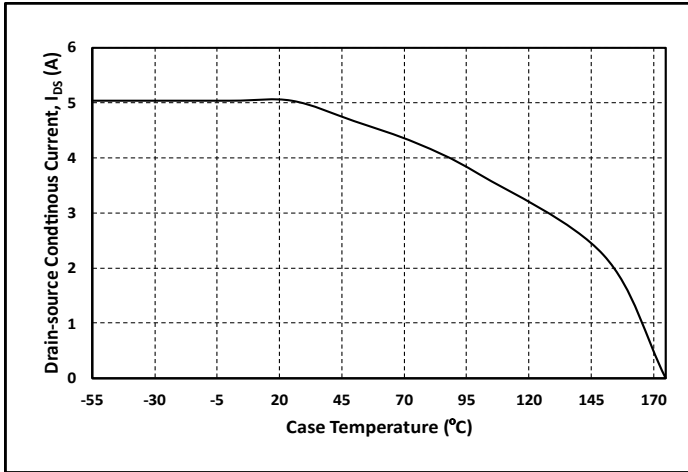


Fig. 21 Continuous Drain Current vs. Case Temperature

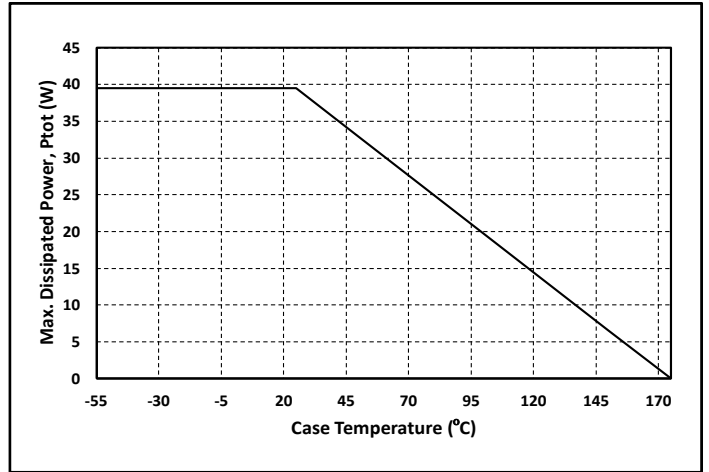


Fig. 22 Max. Power Dissipation Derating vs. Case Temperature

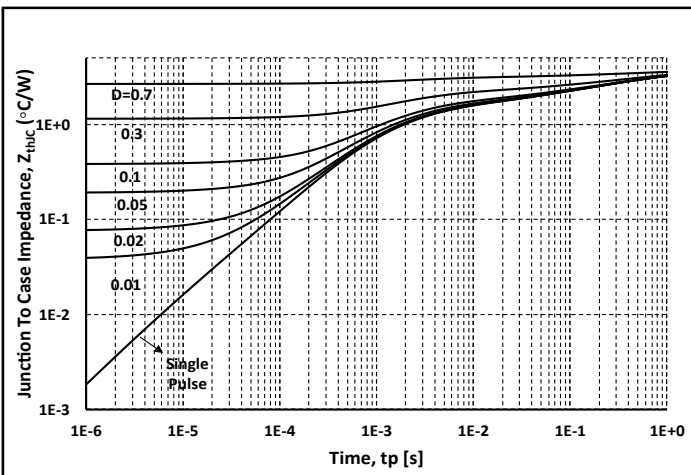


Fig. 23 Thermal Impedance

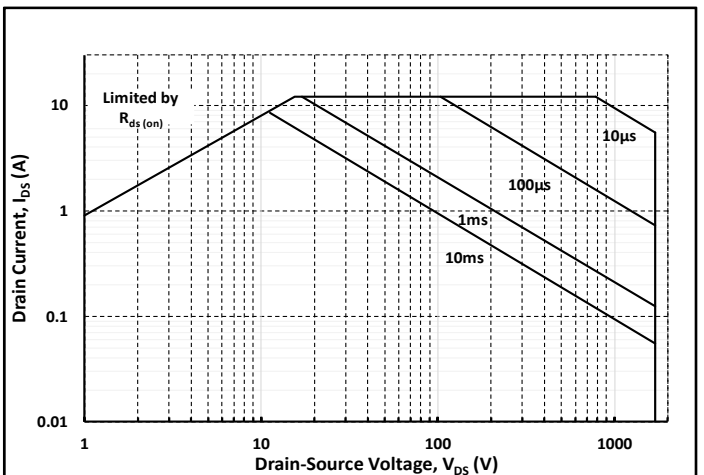
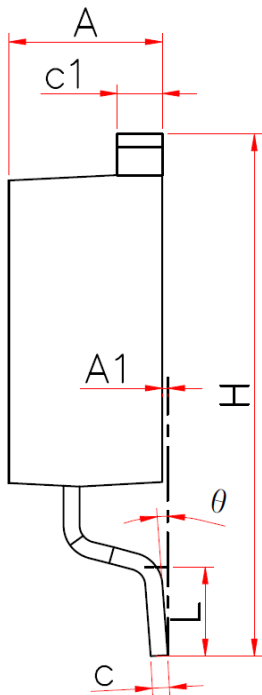
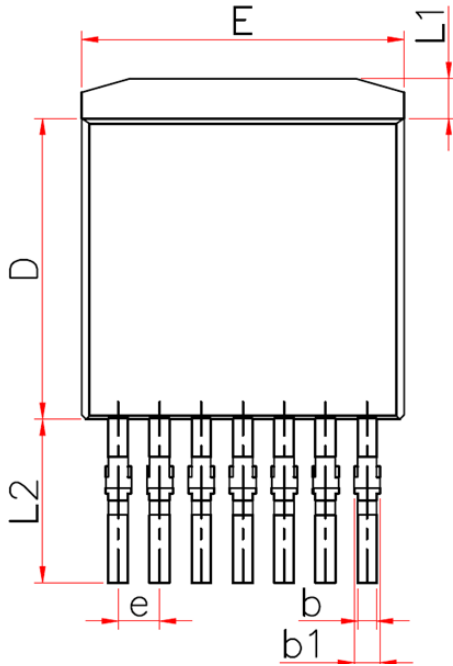
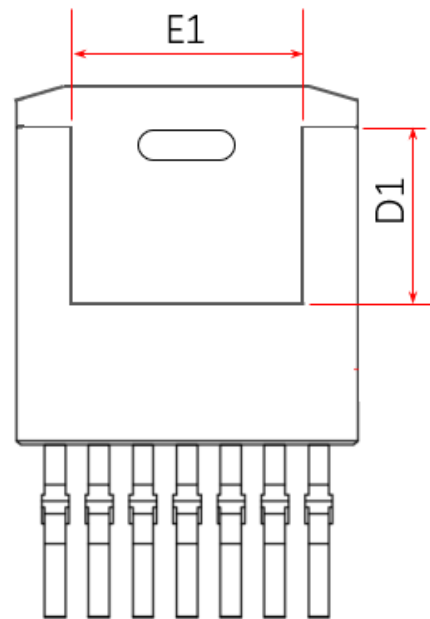


Fig. 24 Safe Operating Area

## Package Dimensions



Symbol	Dimensions In Millimeters	
	Min.	Max.
A	4.300	4.560
A1	—	0.250
b	0.500	0.700
b1	0.600	0.900
c	0.450	0.600
c1	1.200	1.400
D	8.930	9.230
D1	4.650	4.950
E	10.08 0	10.28 0
E1	6.820	7.620
e	1.27 REF.	
H	15.00 0	16.00 0
L	1.900	2.500
L1	0.980	1.420
L2	4.350	5.890
$\theta$	0°	7°



### Note:

1. Package Reference: JEDEC TO263, Variation AD
2. All Dimensions are in mm
3. Subject to Change Without Notice

## Notes

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## Revision History

<b>Version</b>	<b>Changes</b>	<b>Date</b>
V0.5	Preliminary evaluation data	Otc. 10 2022
V1.0	Update thermal resistance data and switching characterization data	Nov. 17 2022

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