

40V Super-GaN FET

40V, 160A, 4.3m Ω , Super-GaN FET in FCQFN 3x4

Features

GaN-on-Silicon E-mode HEMT technology

Very low gate charge

Ultra-low on resistance

Very small footprint

Applications

High frequency DC-DC converter

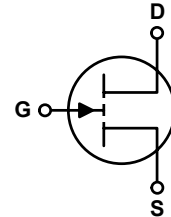
Point of Load

RF envelope tracking

PC charger

Mobile power bank

Motor driver



Pin information

Pin	Pin description	Pin function
1, 2, 24, 25	Gate	Driver Gate
3-7, 9, 11-20, 22	Source	Source
8, 10, 21, 23	Drain	Power Drain

Key performance parameters at T_J = 25 °C

Parameter	Value	Unit
V _{DS,max}	40	V
R _{DS(on),max} @ V _{GS} = 5 V	4.3	m Ω
Q _{G,typ} @ V _{DS} = 20V	6.2	nC
I _{DS,Pulse}	160	A
Q _{OSS} @ V _{DS} = 20V	14	nC

Maximum Ratings at $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

SYMBOL	PARAMETER	MAX	UNIT
V_{DS}	Drain-to-Source Voltage (Continuous)	40	V
I_D	Continuous current	24	A
	Pulsed (25°C , $T_{Pulse} = 300\text{ }\mu\text{s}$)	160	A
V_{GS}	Gate-to-Source Voltage	6	V
	Gate-to-Source Voltage	-4	V
P_{tot}	Power dissipation ($T_{c, bottom} = 25^{\circ}\text{C}$)	43	W
T_J	Operating Temperature	-40 to 150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature	-40 to 150	$^{\circ}\text{C}$

Thermal Characteristics

SYMBOL	PARAMETER	TYP	UNIT	Note/Test Condition
$R_{\theta JC_top}$	Thermal Resistance, Junction to Case (top)	26.2	$^{\circ}\text{C/W}$	
$R_{\theta JC_bot}$	Thermal Resistance, Junction to Case (bottom)	2.9	$^{\circ}\text{C/W}$	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient ¹	45.9	$^{\circ}\text{C/W}$	
T_{sold}	Maximum reflow soldering temperature	260	$^{\circ}\text{C}$	MSL3

Electric Characteristics at $T_J = 25\text{ }^{\circ}\text{C}$, unless specified otherwise

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	TEST CONDITIONS
BV_{DSS}	Drain-to-Source Voltage	40			V	$V_{GS} = 0\text{ V}$, $I_D = 500\text{ }\mu\text{A}$
I_{DSS}	Drain Source Leakage			100	μA	$V_{GS} = 0\text{ V}$, $V_{DS} = 32\text{ V}$
I_{GSS}	Gate-to-Source Forward Leakage		3	80	μA	$V_{GS} = 5\text{ V}$
	Gate-to-Source Forward Leakage		50	500	μA	$V_{GS} = 5\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$
	Gate-to-Source Reverse Leakage		1	20	μA	$V_{GS} = -4\text{ V}$
$V_{GS(TH)}$	Gate Threshold Voltage	0.7		2.4	V	$V_{DS} = V_{GS}$, $I_D = 7\text{ mA}$
$R_{DS(on)}$	Drain-Source On-state Resistance		3	4.3	$\text{m}\Omega$	$V_{GS} = 5\text{ V}$, $I_D = 15\text{ A}$
V_{SD}	Source-Drain Forward Voltage		1.9		V	$I_S = 0.5\text{ A}$, $V_{GS} = 0\text{ V}$

Dynamic characteristics

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	TEST CONDITIONS
C_{iss}	Input Capacitance		805		pF	$V_{GS} = 0\text{ V}$, $V_{DS} = 20\text{ V}$
C_{oss}	Output Capacitance		428			
C_{rss}	Reverse Transfer Capacitance		13			
$C_{oss(er)}$	Energy Related Coss		600			$V_{GS} = 5\text{ V}$, $V_{DS} = 20\text{ V}$, $I_D = 15\text{ A}$
$C_{oss(tr)}$	Time Related Coss		703			
R_G	Gate resistance		1.7		Ω	$f = 1\text{ MHz}$
Q_G	Total Gate Charge		6.2	8.5	nC	$V_{GS} = 5\text{ V}$, $V_{DS} = 20\text{ V}$, $I_D = 15\text{ A}$
Q_{GS}	Gate to Source Charge		1.4			$V_{DS} = 20\text{ V}$, $I_D = 15\text{ A}$
Q_{GD}	Gate to Drain Charge		0.8			
$Q_{G(TH)}$	Gate Charge at Threshold		0.9			
Q_{oss}	Output Charge		14			$V_{GS} = 0\text{ V}$, $V_{DS} = 0\text{ V}$ to 20 V

Electric Characteristics Diagrams at $T_J = 25\text{ }^{\circ}\text{C}$, unless specified otherwise

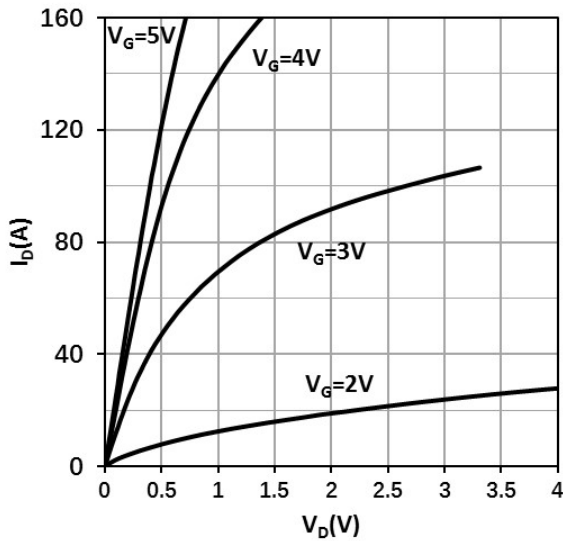
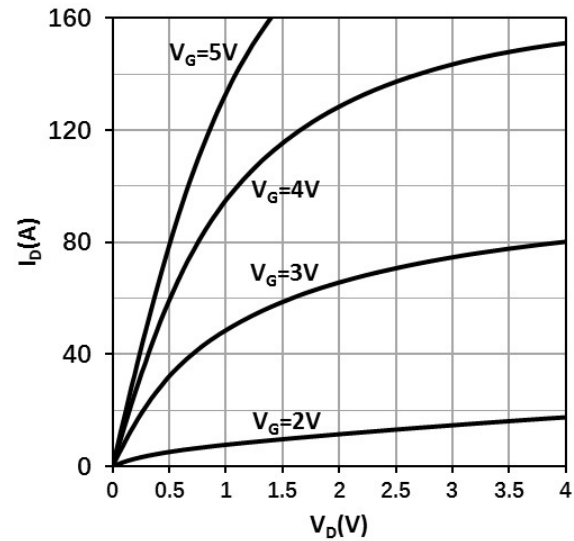
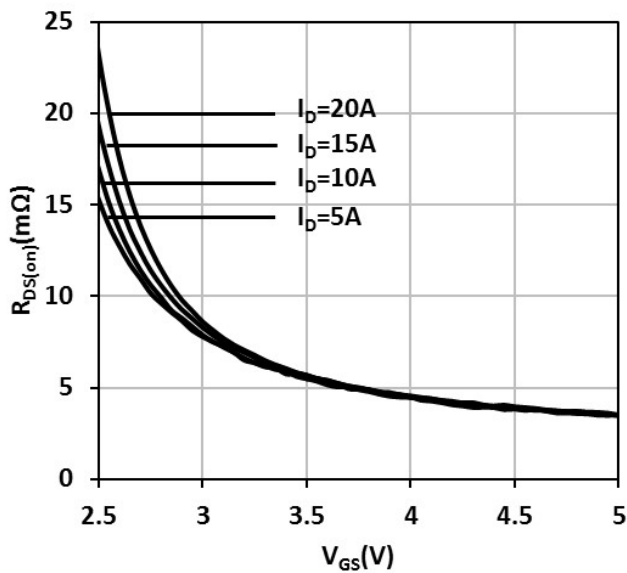
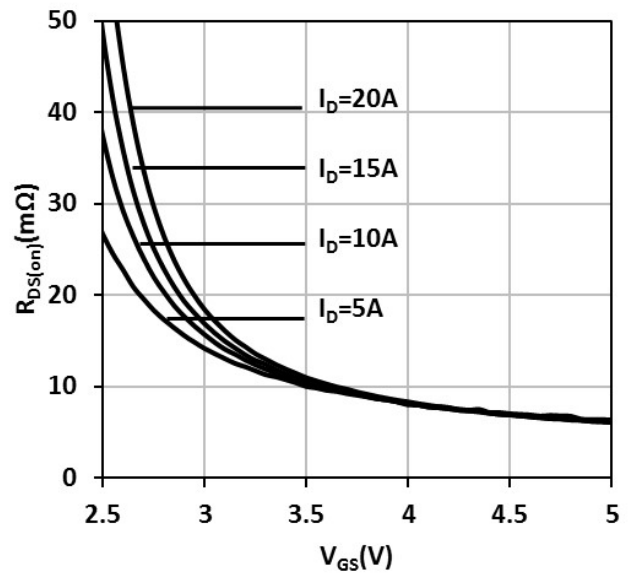
Figure 1 Typical Output Characteristics ($T_J = 25\text{ }^{\circ}\text{C}$)Figure 2 Typical Output Characteristics ($T_J = 125\text{ }^{\circ}\text{C}$)Figure 3 Typ. Drain On-state Resistance ($T_J = 25\text{ }^{\circ}\text{C}$)Figure 4 Typ. Drain On-state Resistance ($T_J = 125\text{ }^{\circ}\text{C}$)

Figure 5 Typical On Resistance vs. Temperature

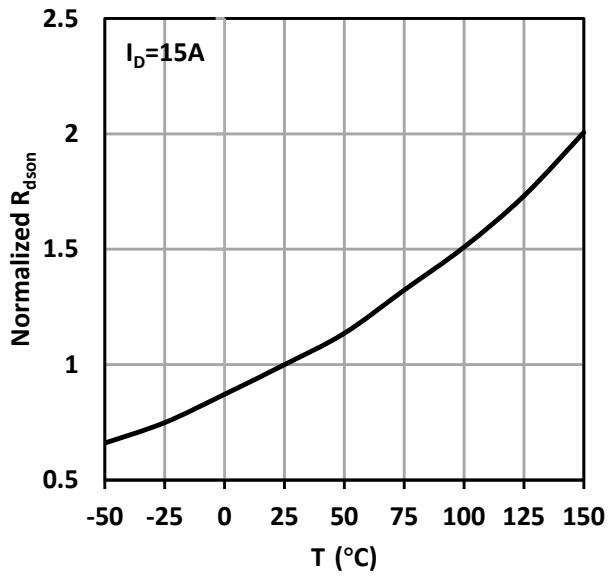


Figure 6 Typical Transfer Characteristics

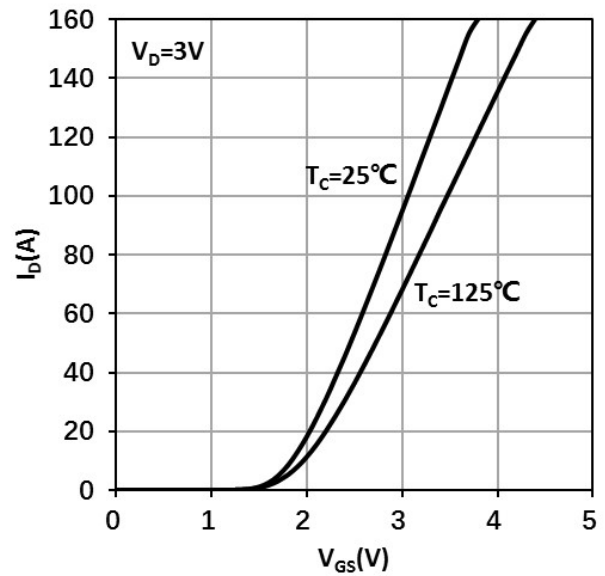


Figure 7 Typ. Reverse Drain ($V_{GS} \leq 0$, $T_J = 25^\circ C$)

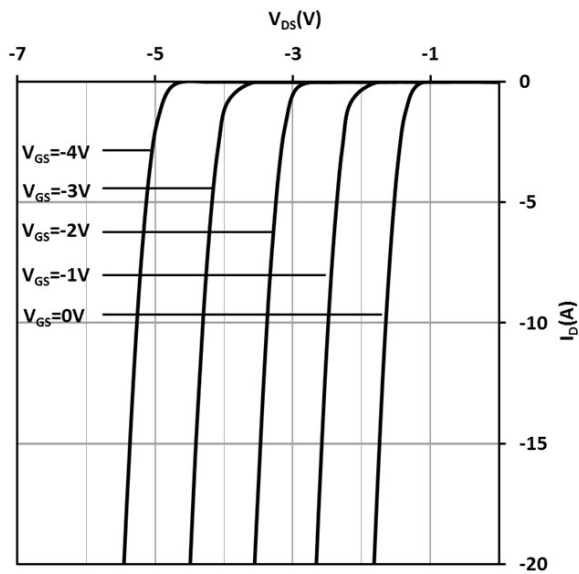


Figure 8 Typ. Reverse Drain ($V_{GS} \geq 0$, $T_J = 25^\circ C$)

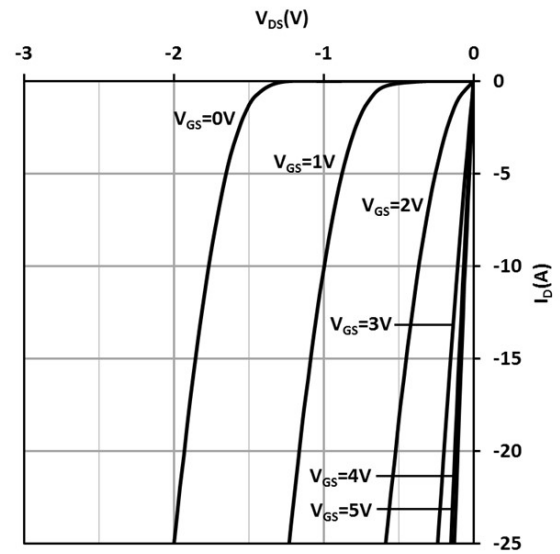


Figure 9 Typ. Reverse Drain-Source Characteristics ($V_{GS} \leq 0$, $T_J = 125^\circ\text{C}$)

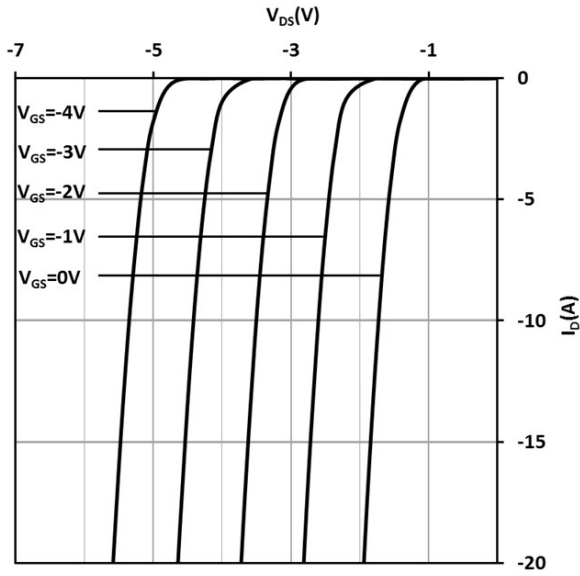


Figure 10 Typ. Reverse Drain-Source Characteristics ($V_{GS} \geq 0$, $T_J = 125^\circ\text{C}$)

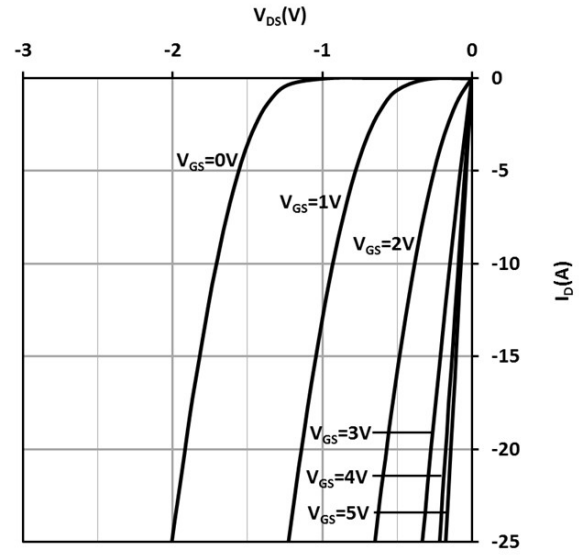


Figure 11 Typ. Capacitances Characteristics

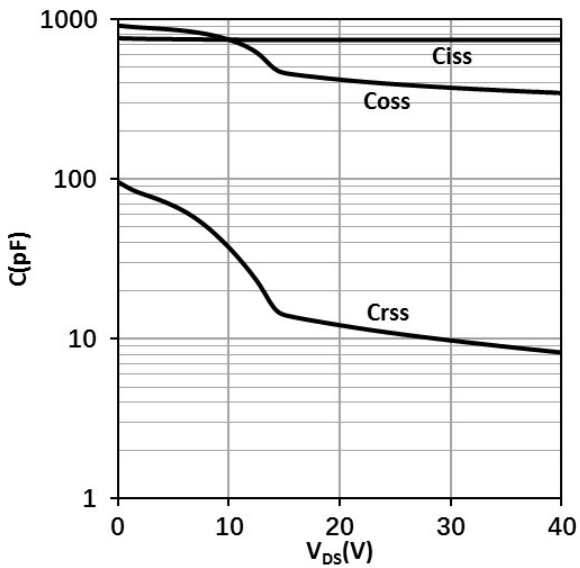


Figure 12 Typ. Gate Charge

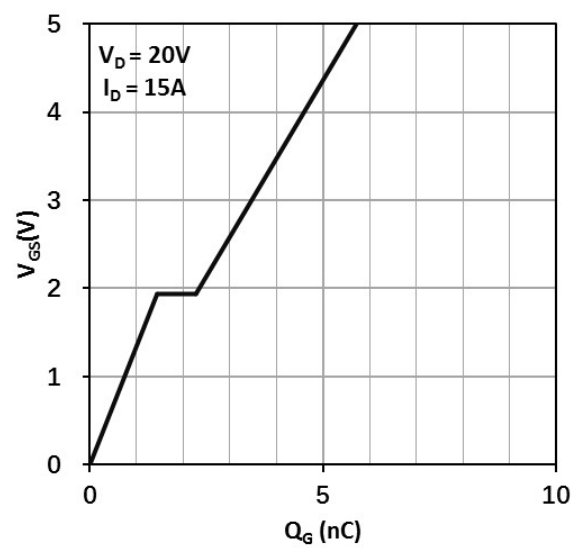


Figure 13 Normalized Threshold Voltage vs. Temp.

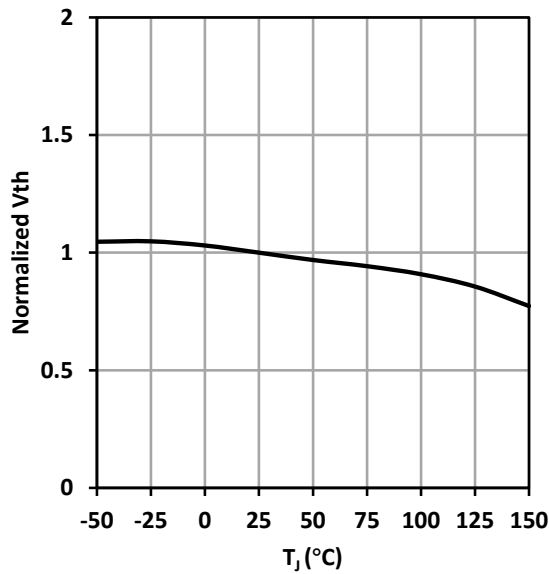


Figure 14 Output Charge

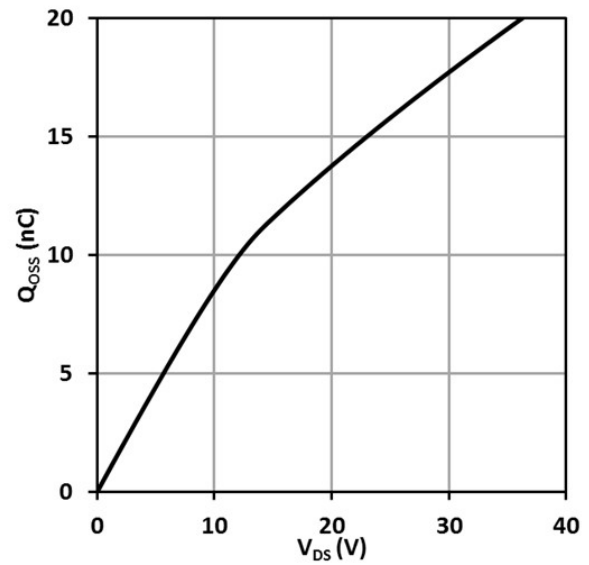


Figure 15 Output Capacitance Stored Energy

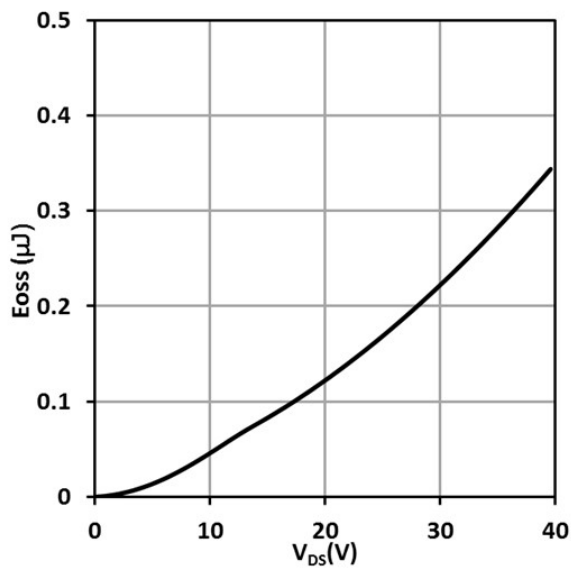


Figure 16 Power Dissipation

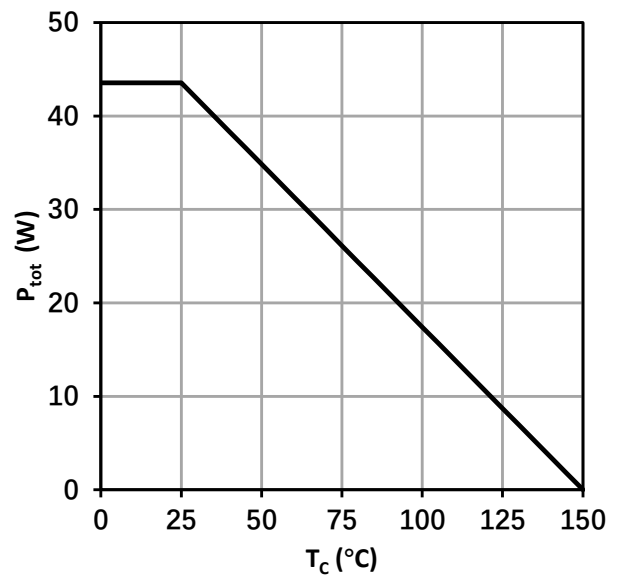


Figure 17 Safe Operating Area

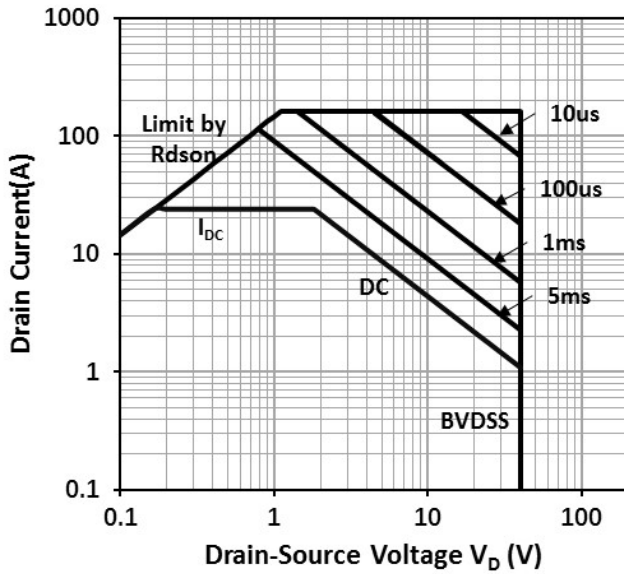
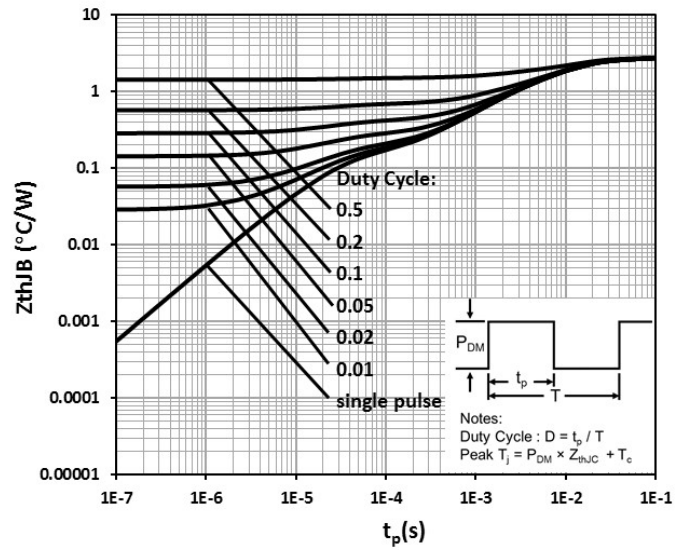
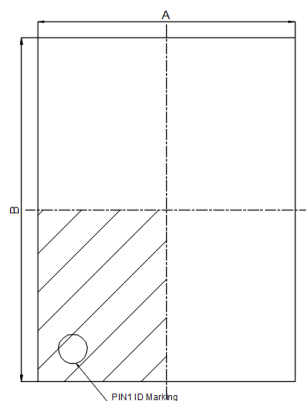


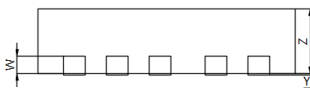
Figure 18 Max. Transient Thermal Impedance



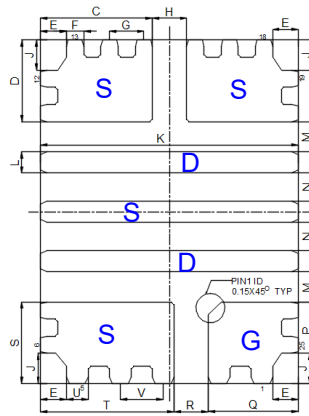
Package Outlines



TOP VIEW



SIDE VIEW



BOTTOM VIEW

NOTE:

- 1) ALL DIMENSION ARE IN MILLIMETERS.
- 2) BOTTOM VIEW IS FT TESTER SIDE VIEW.
- 3) LEAD COPLANARITY SHALL BE 0.08 MILLIMETERS MAX.
- 4) COMPLIES WITH JEDEC MO-220.
- 5) DRAWING IS NOT TO SCALE.

SYMBOL	MILLIMETER			NOTE
	MIN	NOM	MAX	
A	2.9	3.0	3.1	
B	3.9	4.0	4.1	
C	1.2	1.3	1.4	2X
D	0.85	0.95	1.05	2X
E		0.3 REF		4X
F	0.15	0.2	0.25	14X
G		0.4 BASIC		8X
H	0.35	0.4	0.45	
J		0.35 REF		4X
K	2.9	3.0	3.1	3X
L	0.20	0.25	0.30	3X
M	0.3	0.35	0.4	4X
N	0.275	0.325	0.375	2X
P	0.85	0.95	1.05	
Q	0.95	1.05	1.15	
R	0.35	0.4	0.45	
S	0.85	0.95	1.05	
T	1.45	1.55	1.65	
U	0.2	0.25	0.3	5X
V		0.5 BASIC		3X
W		0.203 REF		
Y	0	0.02	0.05	
Z	0.65	0.75	0.85	