

## Product Highlight

### Features

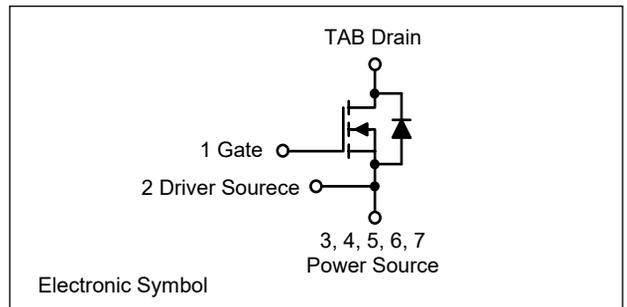
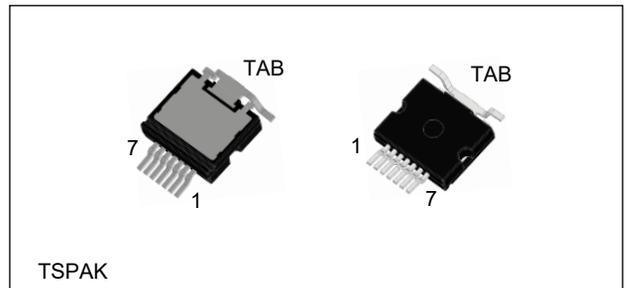
- High switching speed with a low gate charge
- Isolated substrate / High dielectric strength
- Isolation rating of 3.6kVrms
- 100% Avalanche Tested
- Pb-free, Halogen Free, and RoHS Compliant
- AEC Q101 Qualified

### Benefits

- Top-side-cooling package
- Longer clearance / creepage distance
- Kelvin source connection
- Higher frequency applicability
- Easy heatsink assembly with thermal grease

### Applications

- Automotive applications (OBC, e-Comp, DC/DC)
- Solar inverter
- EV charging station
- UPS, Industrial power supply



### Key Parameters

$BV_{DSS, Tc=25^{\circ}C}$	$I_{D, Tc=25^{\circ}C}$	$R_{DS(on), typ}$	$Q_{g, typ}$
1200 V	40 A	60 mΩ	40 nC

## Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
AMSUN120R060T2RH	N120R060T2	TSPAK	Tape and Reel	600 units

## Absolute Maximum Ratings ( $T_C = 25^{\circ}C$ unless otherwise noted)

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain to Source Voltage	1200	V
$V_{GS}$	Gate to Source Voltage (DC)	-10 / +22	V
$V_{GSop}$	Recommended Operation Value	-5...-3 / +18	V
$I_D$	Drain Current	Continuous ( $T_C = 25^{\circ}C$ )	40*
		Continuous ( $T_C = 100^{\circ}C$ )	29*
$I_{DM}$	Drain Current	Pulsed (Note1)	101*
$P_D$	Power Dissipation	( $T_C = 25^{\circ}C$ )	211
		Derate Above 25°C	1.4
$T_J$	Operating Temperature Range	-55 to 175	°C

\*Limited by maximum junction temperature.

Note 1. Repetitive rating: pulse-width limited by maximum junction temperature.

Note 2. LF discoloration and Picker Circle Printing allowed.

## 1. Package

### Temperature Ratings

Symbol	Parameter	Value	Unit
$T_{STG}$	Storage Temperature Range	-55 to 175	°C
$T_L$	Maximum Lead Temperature for Soldering, 1/8" from Case for 10 Seconds	260	°C

### Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.71	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	

## 2. MOSFET

Electrical Characteristics ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain to Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	1200			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$		1	100	$\mu\text{A}$
		$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}, T_J = 175^\circ\text{C}$		10		
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS} = +22\text{ V}, V_{DS} = 0\text{ V}$			+100	nA
		$V_{GS} = -10\text{ V}, V_{DS} = 0\text{ V}$			-100	
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 7.5\text{ mA}$ (tested after $V_{GS} = 22\text{ V}, 1\text{ ms pulse}$ )	2.0	3.0	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 18\text{ V}, I_D = 22\text{ A}$		60.0	81.0	m $\Omega$
		$V_{GS} = 18\text{ V}, I_D = 22\text{ A}, T_J = 175^\circ\text{C}$		96.0		
		$V_{GS} = 15\text{ V}, I_D = 22\text{ A}$		80.0		
$g_{fs}$	Transconductance	$V_{DS} = 20\text{ V}, I_D = 22\text{ A}$		14.6		S
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}, f = 250\text{ kHz}$		1090		$\mu\text{F}$
$C_{oss}$	Output Capacitance			70		
$C_{riss}$	Reverse Capacitance			3		
$E_{oss}$	Stored Energy in Output Capacitance	$V_{DS} = 0\text{ V to } 800\text{ V}, V_{GS} = 0\text{ V}$		29		$\mu\text{J}$
$C_{o(er)}$	Energy Related Output Capacitance			92		$\mu\text{F}$
$C_{o(tr)}$	Time Related Output Capacitance			157		
$Q_{g(tot)}$	Total Gate Charge	$V_{DS} = 800\text{ V}, I_D = 22\text{ A},$ $V_{GS} = -3\text{ V} / 18\text{ V},$ Inductive load		40		nC
$Q_{gs}$	Gate to Source Charge			13		
$Q_{gd}$	Gate to Drain "Miller" Charge			11		
$R_G$	Internal Gate Resistance	$f = 1\text{ MHz}, V_{AC} = 30\text{ mV}$		3.9		$\Omega$
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{DS} = 800\text{ V}, I_D = 22\text{ A},$ $V_{GS} = -3\text{ V} / 18\text{ V}, R_G = 6.8\ \Omega,$ Inductive load		15		ns
$t_r$	Turn-On Rise Time			10		
$t_{d(off)}$	Turn-Off Delay Time			26		
$t_f$	Turn-Off Fall Time			7		
$E_{on}$	Turn-on Switching Energy			129		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			55		
$E_{tot}$	Total Switching Energy			184		

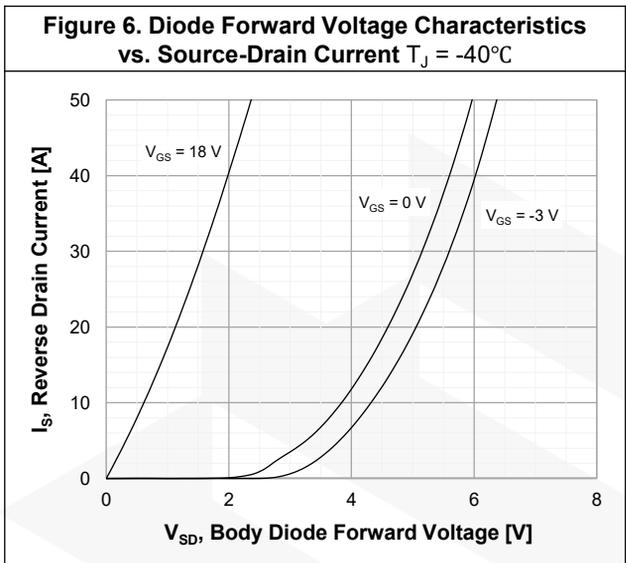
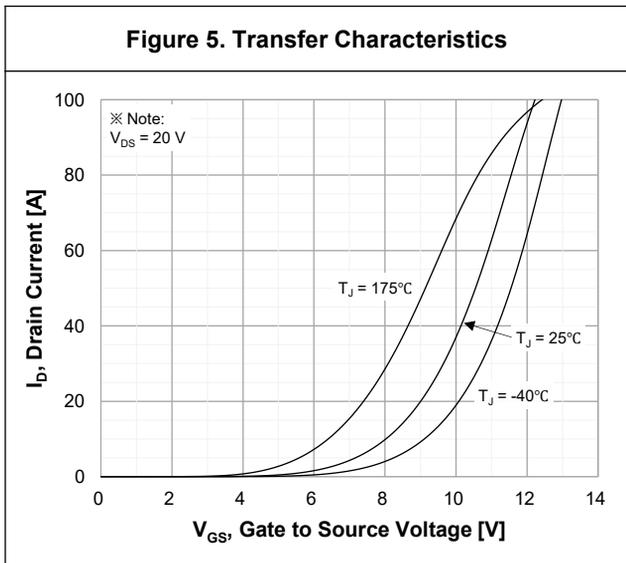
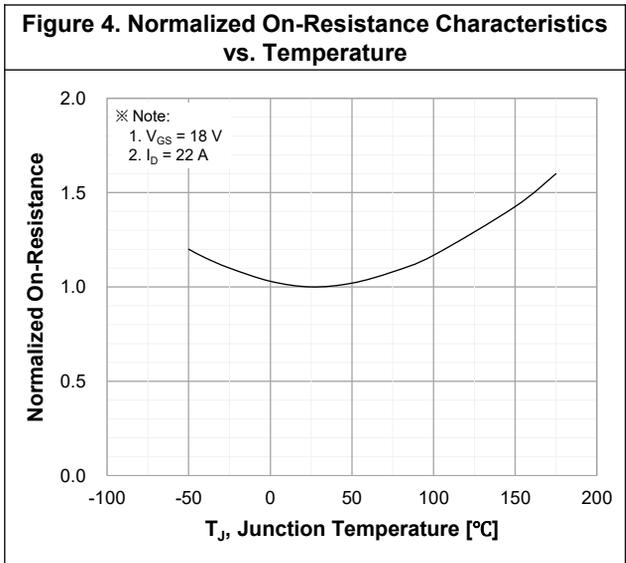
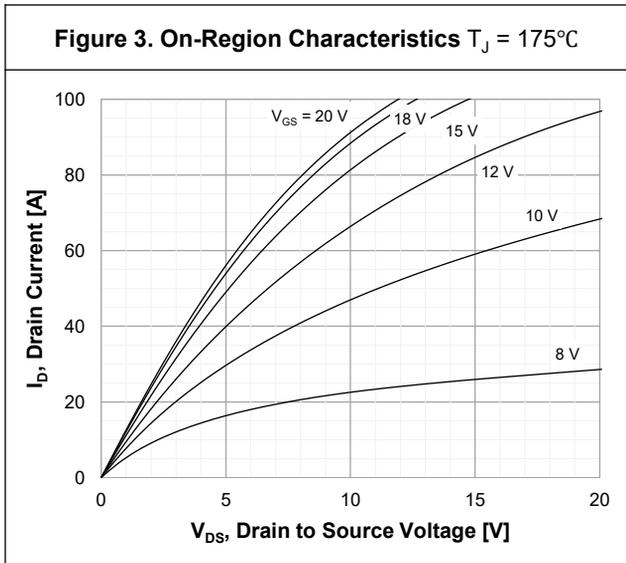
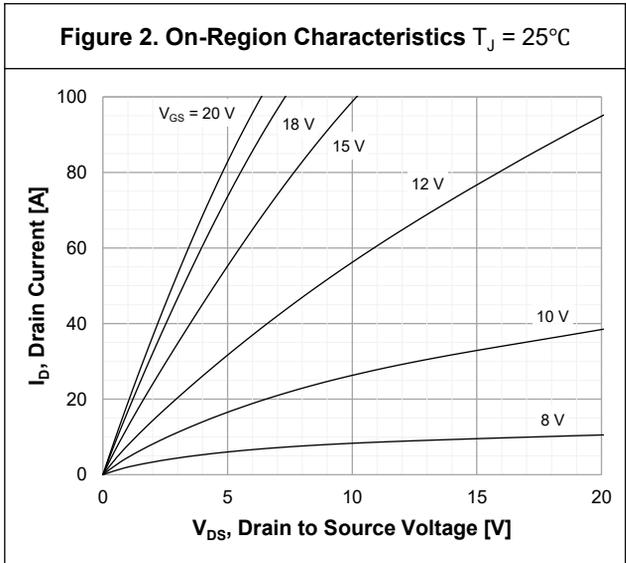
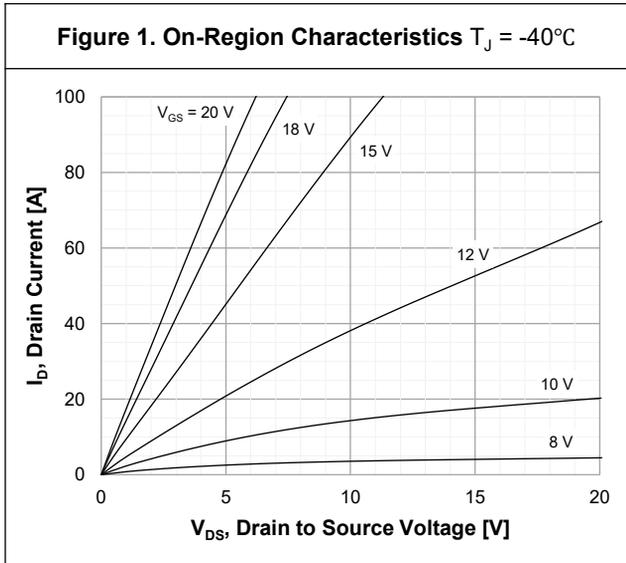
### 3. Body Diode

#### Electrical Characteristics ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

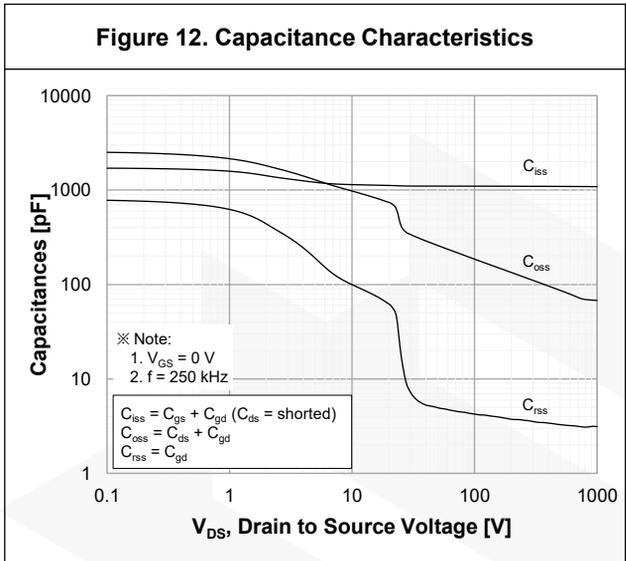
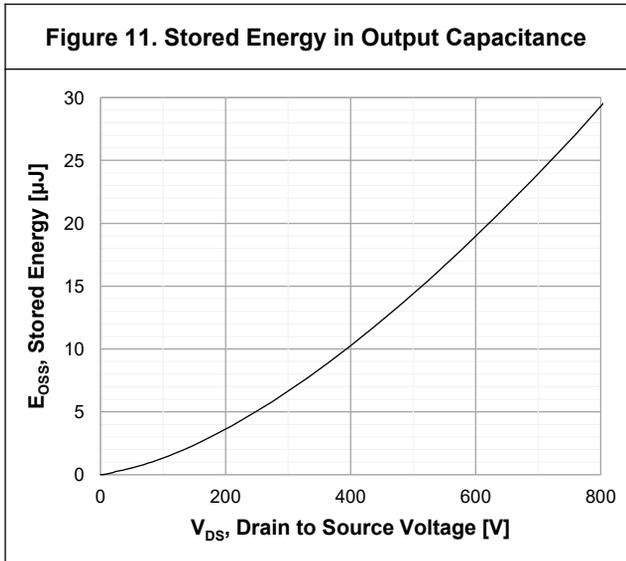
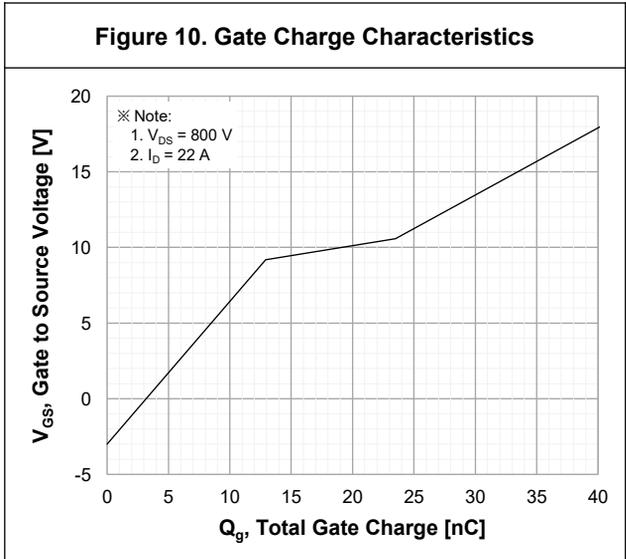
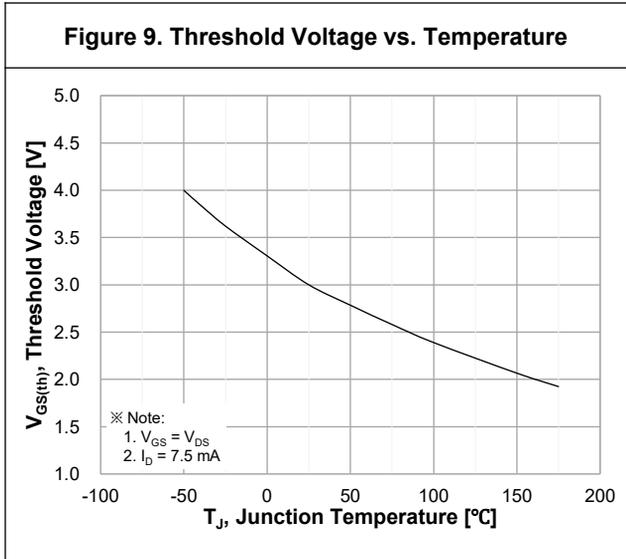
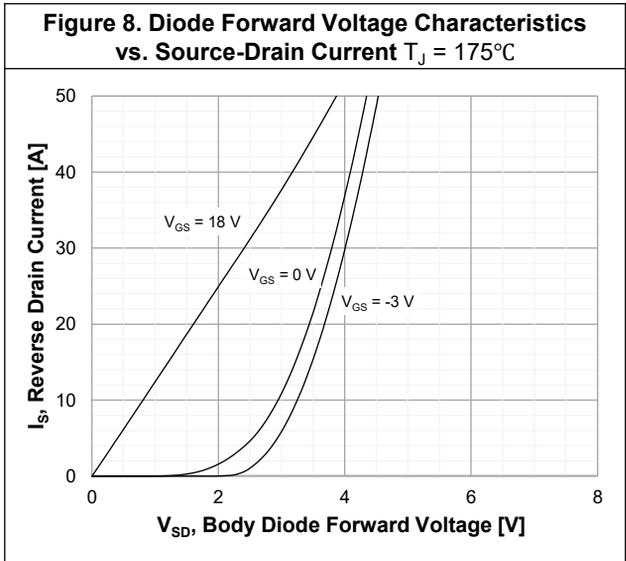
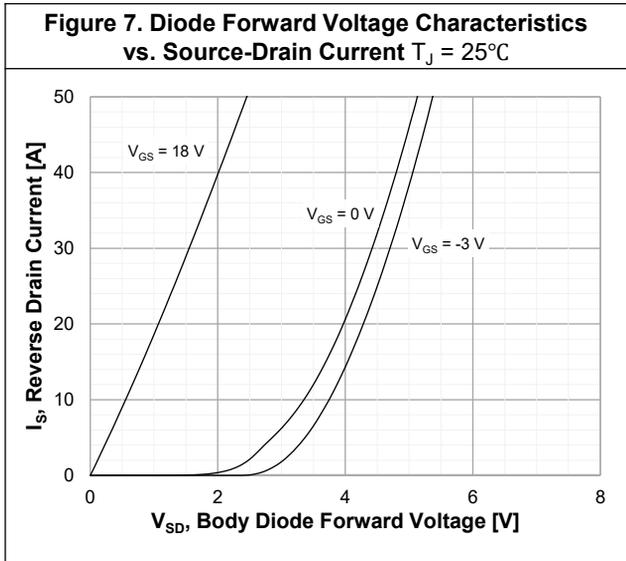
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>Source-Drain Diode Characteristics</b>						
$I_S$	Continuous Diode Forward Current	$V_{GS} = -3\text{ V}$			40*	A
$I_{SM}$	Pulsed Diode Forward Current	$V_{GS} = -3\text{ V}$ (Note 1)			101*	
$V_{SD}$	Diode Forward Voltage	$V_{GS} = -3\text{ V}, I_{SD} = 22\text{ A}$		4.3		V
$t_{rr}$	Reverse Recovery Time	$V_{DD} = 800\text{ V}, I_{SD} = 22\text{ A},$ $di_F/dt = 3000\text{ A}/\mu\text{s}$		13		ns
$Q_{rr}$	Reverse Recovery Charge			145		nC
$I_{rrm}$	Peak Reverse Recovery Current			18		A

\*Limited by maximum junction temperature.

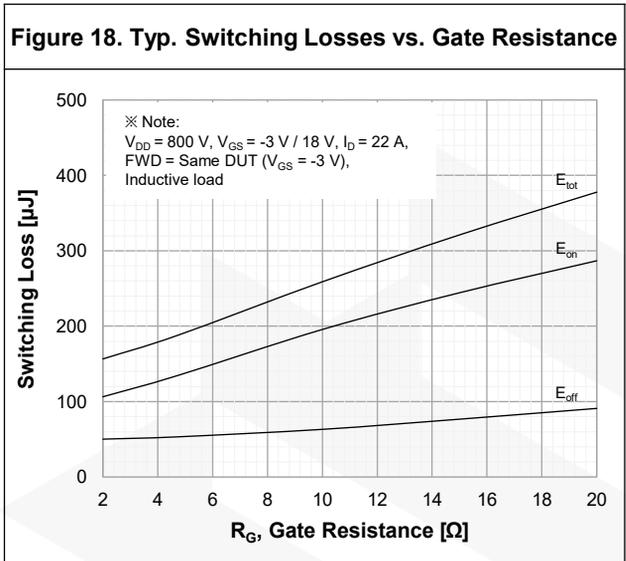
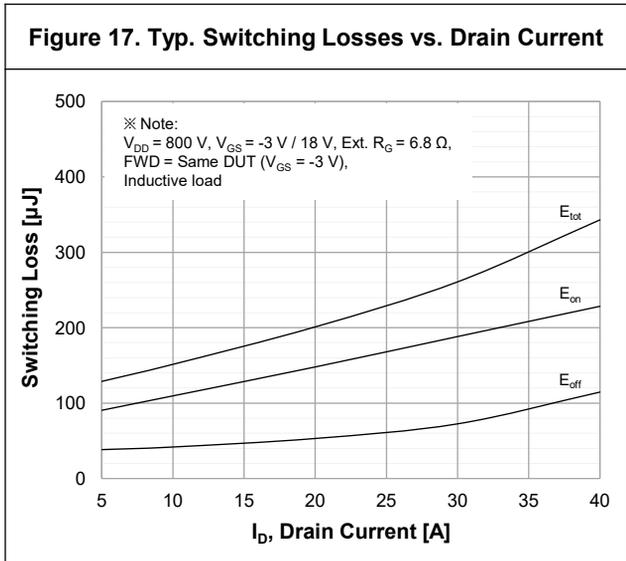
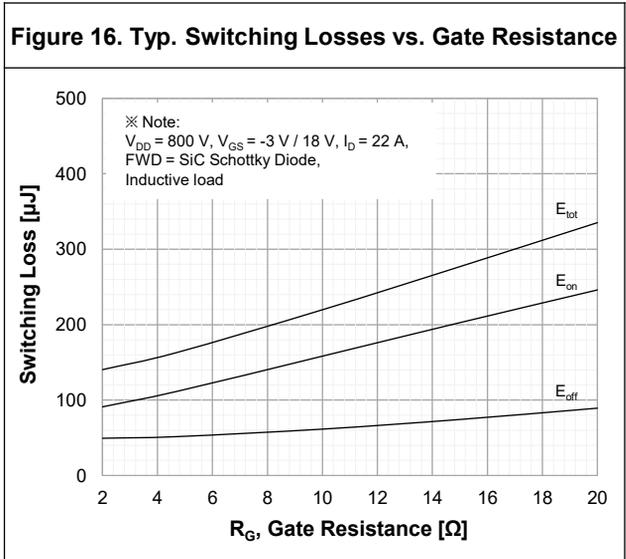
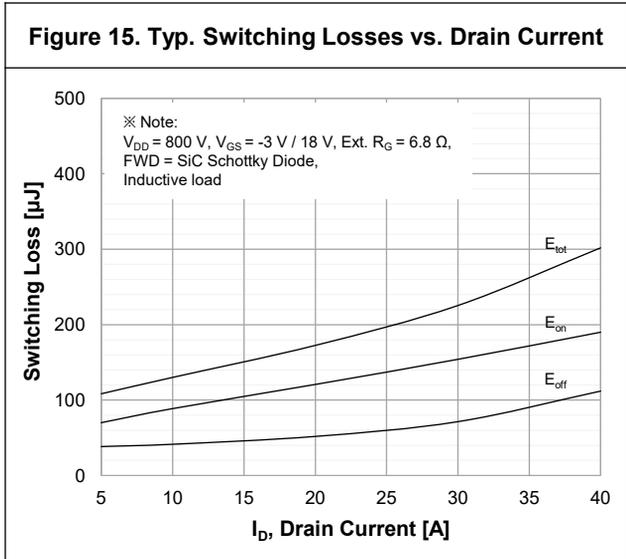
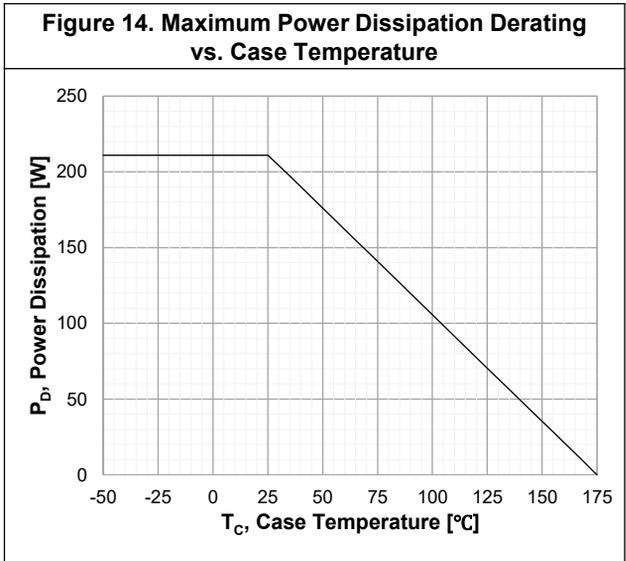
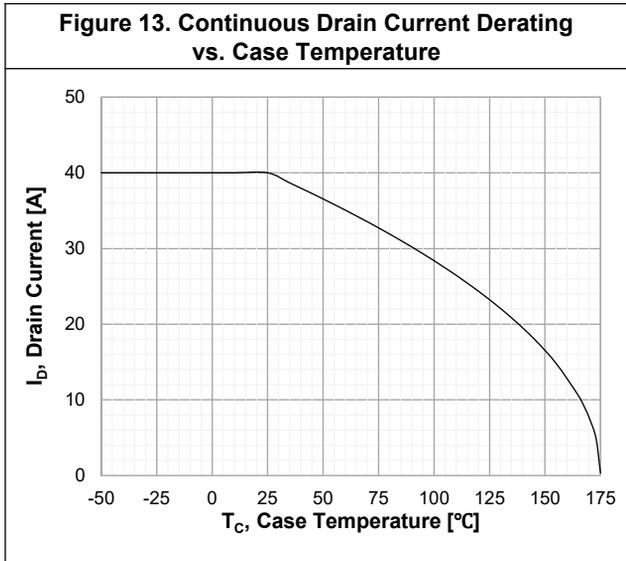
4. Typical Performance Characteristics



4. Typical Performance Characteristics



4. Typical Performance Characteristics



4. Typical Performance Characteristics

Figure 19. Maximum Safe Operating Area

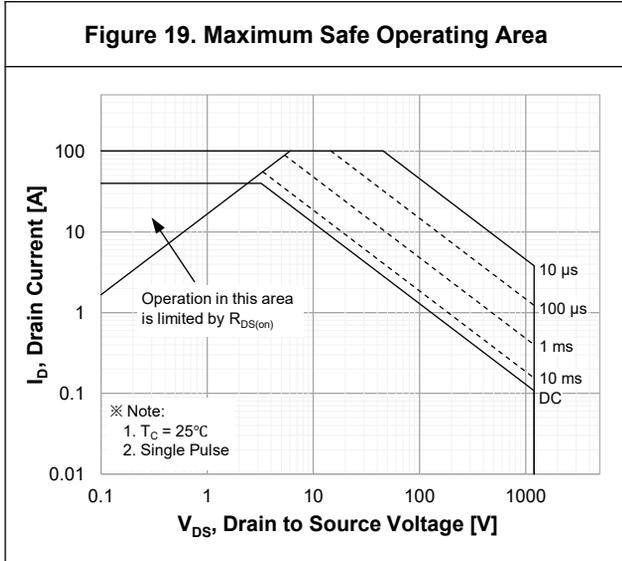
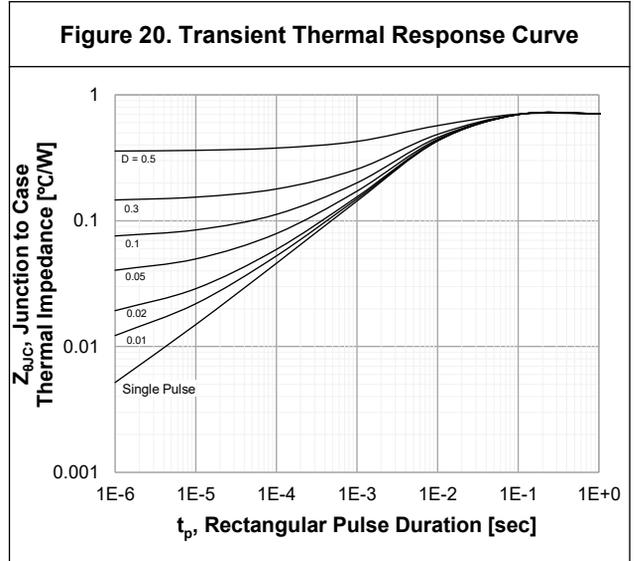


Figure 20. Transient Thermal Response Curve



5. Testing conditions

Figure 21. Inductive Load Switching Test Circuit and Waveforms

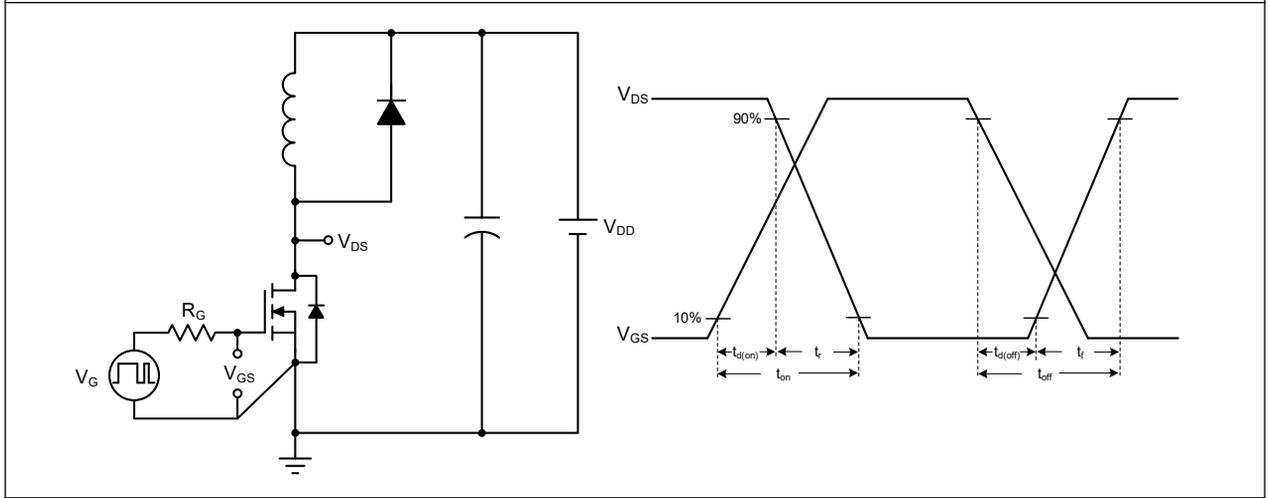
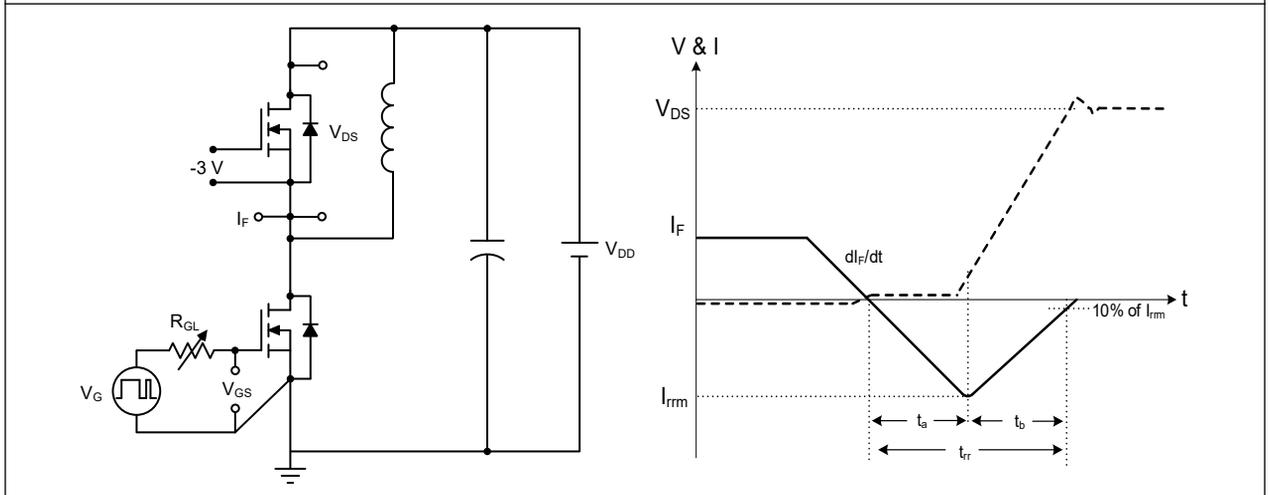
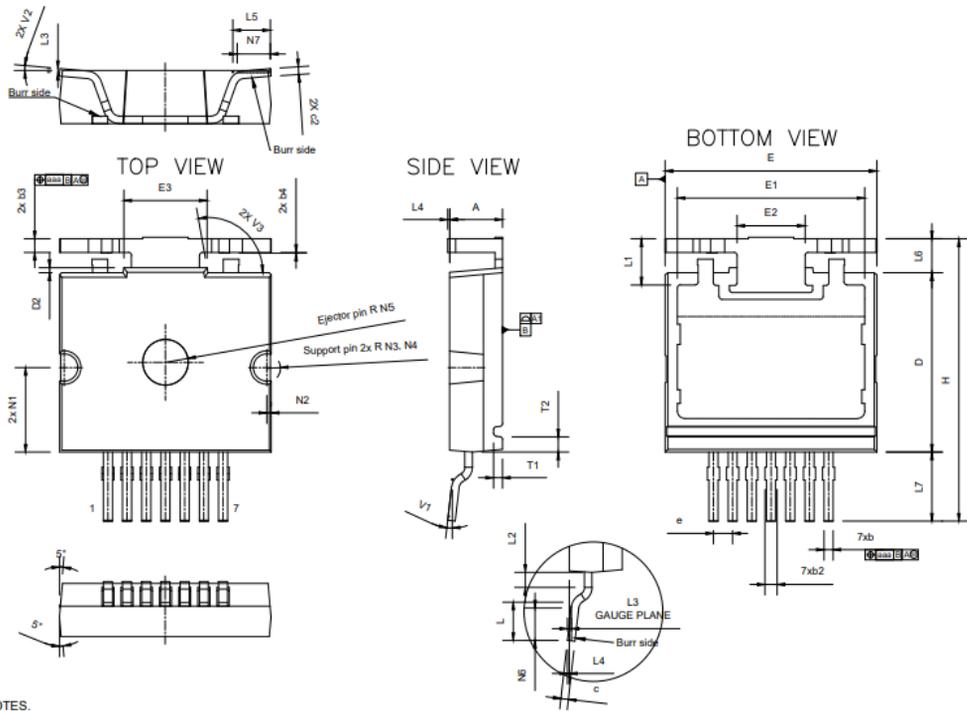


Figure 22. Peak Diode Recovery  $dv/dt$  Test Circuit and Waveforms



6. Package Outlines – TSPAK

\* Dimensions in millimeters



NOTES.  
 1. DIMENSION AND TOLERANCE CONFORM TO ASME Y14.5M  
 2. CONTROLLING DIMENSIONS : MILLIMETER. CONVERTED INCH. DIMENSION ARE NOT NECESSARILY EXACT.  
 3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.  
 4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

SYMBOL	Common		
	DIMENSIONS MILLIMETER		
	MIN.	NOM.	MAX.
A	3.40	3.50	3.60
A1		0.05	
b	0.50	0.60	0.70
b2	0.70	0.80	0.90
b3	0.80	0.90	0.98
b4	Ref only. 0.05mm		
c	0.40	0.50	0.60
c2	0.40	0.50	0.60
D	11.70	11.80	11.90
D1	7.78	7.88	7.98
D2	0.24	0.34	0.44
E	13.90	14.00	14.10
E1	12.30	12.40	12.50
E2	4.45	4.50	4.55
E3	5.45	5.50	5.55
e		1.27	
H	18.00	18.58	19.00
L	2.42	2.52	2.62
L1		3.04	
L2	0.90	1.00	1.10
L3		0.26	
L4	0.075	0.125	0.175
L5	2.38	2.48	2.58
L6	2.14	2.24	2.34
L7	4.44	4.54	4.64
N1	5.46	5.56	5.66
N2	0.25	0.30	0.35
N3	0.80	0.90	1.00
N4	1.00	1.10	1.20
N5	1.40	1.50	1.60
N6	2.185	2.285	2.385
N7	2.10	2.20	2.30
T1		0.60	
T2		1.00	
T3	0.60	0.70	0.80
V1	0°	5°	8°
V2	0°	6°	8°
V3		100°	
aaa		0.1	

7. Footprint Guide – TSPAK

\* Dimensions in millimeters

