

FEATURES

High Speed Switching
High Blocking Voltage with Low $R_{DS(on)}$
Easy to Parallel
Simple to Drive
RoHS Compliant

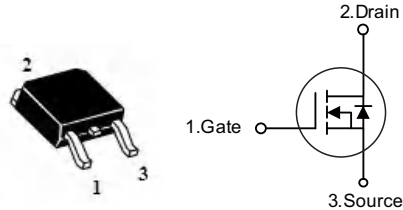
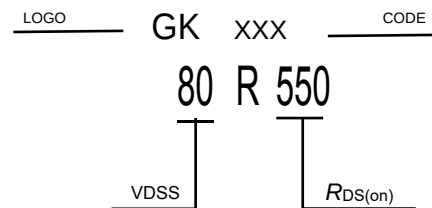
APPLICATION

Increased Power Density
Faster Operating Frequency
Reduction of Heat Sink Requirements
Higher Efficiency
Reduced EMI

APPLICATION

Power Factor Correction Modules
Switch Mode Power Supplies
DC-AC Inverters
High Voltage DC/DC Converters

V_{DS} 800 V
 I_D 7 A
 $R_{DS(on)}$ 550 m Ω



ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise specified)

Symbol	Parameter	Test conditions	Value	Unit
V_{DS}	Drain-Source Voltage		800	V
I_D	Continuous Drain Current	$V_{GS}=18\text{V}$ $T_c=25^\circ\text{C}$ $T_c=100^\circ\text{C}$	7 5	A
I_{DM}	Peak Drain Current	Pulse width t_p limited by T_{jmax}	14	A
V_{GSmax}	Gate-Source Voltage, max. Transient Voltage	$t_p \leq 0.5\mu\text{s}$, $D < 0.001$	-8/+22	V
V_{GSmax}	Gate-Source Voltage		-8/+22	V
V_{GSop}	Recommend Gate-Source Voltage		-4/+18	V
P_{tot}	Power Dissipation	$T_c=25^\circ\text{C}$ $T_c=100^\circ\text{C}$	35 17	W
E_{AS}	Non-Repetitive Avalanche Switching Energy	$V_{DD}=50\text{V}$, $L=1\text{mH}$, $I_D=7\text{A}$	24.5	mJ
E_{AR}	Repetitive Avalanche Energy	$V_{DD}=50\text{V}$, $L=500\mu\text{H}$, $I_D=9\text{A}$	22.5	mJ
t_{SC}	Short-Circuit Withstand Time	$V_{DD}=400\text{V}$, $V_{GS}=18\text{V}$, $V_{DS,peak} < 800\text{V}$	2.5	μs
T_j	Operating Junction Temperature		-40~175	$^\circ\text{C}$
T_{stg}	Storage Temperature		-40~150	$^\circ\text{C}$
T_{sold}	Soldering Temperature	1.6mm (0.063") from case for 10s	260	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_C=25^{\circ}\text{C}$, unless otherwise specified)

Static Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$I_D=100\mu\text{A}$, $V_{GS}=0\text{V}$	800			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=800\text{V}$, $V_{GS}=0\text{V}$		1	10	μA
I_{GSS}	Gate-Source Leakage Current	$V_{DS}=0\text{V}$, $V_{GS}=18\text{V}$			250	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=1\text{mA}$ $T_j=25^{\circ}\text{C}$ $T_j=175^{\circ}\text{C}$	2	3.0 2.2	4	V
$R_{DS(on)}$	Drain-Source On-State Resistance	$V_{GS}=15\text{V}$, $I_D=3.3\text{A}$ $T_j=25^{\circ}\text{C}$ $T_j=175^{\circ}\text{C}$		750 710	1030	$\text{m}\Omega$
		$V_{GS}=18\text{V}$, $I_D=3.3\text{A}$ $T_j=25^{\circ}\text{C}$ $T_j=175^{\circ}\text{C}$		550 650	740	$\text{m}\Omega$
g_{fs}	Forward Transconductance	$V_{DS}=20\text{V}$, $I_D=3.3\text{A}$		2.1		S

Dynamic Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	$V_{DS}=600\text{V}$, $f=1\text{MHz}$, $V_{GS}=0\text{V}$		116		pF
C_{oss}	Output Capacitance			18		pF
C_{rss}	Reverse Transfer Capacitance			2.8		pF
E_{oss}	C_{oss} Stored Energy			2.4		μJ
$R_{G(int)}$	Internal Gate Resistance	$f=1\text{MHz}$		38		Ω
Q_g	Total Gate Charge	$V_{DS}=400\text{V}$, $I_D=3.3\text{A}$, $V_{GS}=-4\text{V}/18\text{V}$		7		nC
Q_{gs}	Gate to Source Charge			1.3		nC
Q_{gd}	Gate to Drain Charge			4.2		nC

Thermal Characteristics

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
$R_{th(j-c)}$	Thermal Resistance from Junction to Case		4.3		$^{\circ}\text{C/W}$

ELECTRICAL CHARACTERISTICS ($T_c=25^\circ\text{C}$, unless otherwise specified)

Switching Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-On Delay Time	$V_{DD}=400\text{V}$, $I_D=3.3\text{A}$, $V_{GS}=-4\text{V}/18\text{V}$, $R_{G(ext)}=2.5\Omega$, $L=200\mu\text{H}$, $T_j=25^\circ\text{C}$		3		ns
t_r	Rise Time			12		ns
$t_{d(off)}$	Turn-Off Delay Time			9		ns
t_f	Fall Time			18		ns
E_{on}	Turn-On Energy			24		μJ
E_{off}	Turn-Off Energy			4		μJ
$t_{d(on)}$	Turn-On Delay Time	$V_{DD}=400\text{V}$, $I_D=3.3\text{A}$, $V_{GS}=-4\text{V}/18\text{V}$, $R_{G(ext)}=2.5\Omega$, $L=200\mu\text{H}$, $T_j=175^\circ\text{C}$		3		ns
t_r	Rise Time			11		ns
$t_{d(off)}$	Turn-Off Delay Time			10		ns
t_f	Fall Time			19		ns
E_{on}	Turn-On Energy			22		μJ
E_{off}	Turn-Off Energy			4		μJ

Reverse Diode Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
V_{SD}	Diode Forward Voltage	$V_{GS}=-4\text{V}$, $I_{SD}=1.7\text{A}$ $T_j=25^\circ\text{C}$ $T_j=175^\circ\text{C}$		4.8 4.3		V
I_S	Continuous Diode Forward Current	$V_{GS}=-4\text{V}$ $T_c=25^\circ\text{C}$ $T_c=100^\circ\text{C}$		7 3		A

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$, unless otherwise specified)

Reverse Diode Characteristics (Continued)

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
t_{rr}	Reverse Recovery Time	$V_{GS} = -4\text{V}$, $I_{SD} = 1.7\text{A}$, $V_R = 400\text{V}$, $di/dt = 1990\text{A}/\mu\text{s}$, $T_J = 25^\circ\text{C}$		45		ns
Q_{rr}	Reverse Recovery Charge			54		nC
I_{rrm}	Peak Reverse Recovery Current			2		A
t_{rr}	Reverse Recovery Time	$V_{GS} = -4\text{V}$, $I_{SD} = 1.7\text{A}$, $V_R = 400\text{V}$, $di/dt = 1990\text{A}/\mu\text{s}$, $T_J = 175^\circ\text{C}$		48		ns
Q_{rr}	Reverse Recovery Charge			52		nC
I_{rrm}	Peak Reverse Recovery Current			2.3		A

RATING AND CHARACTERISTIC CURVES

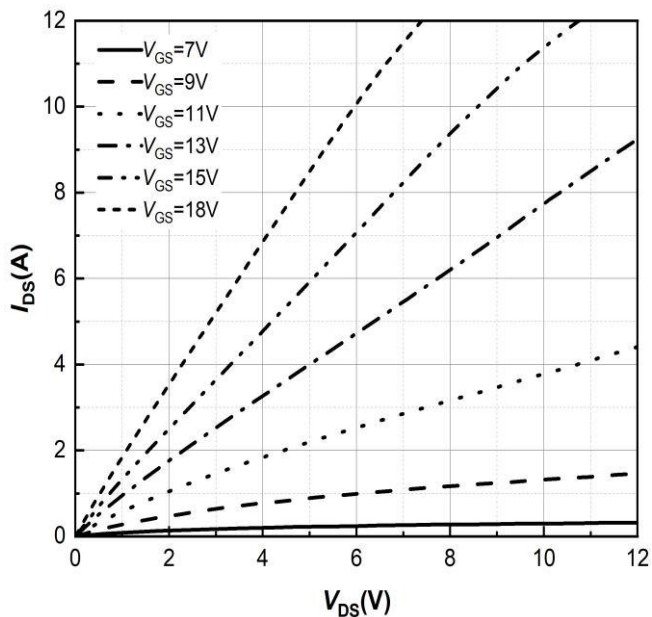


Figure 1. Output Characteristics
 $T_j = -40^\circ\text{C}$

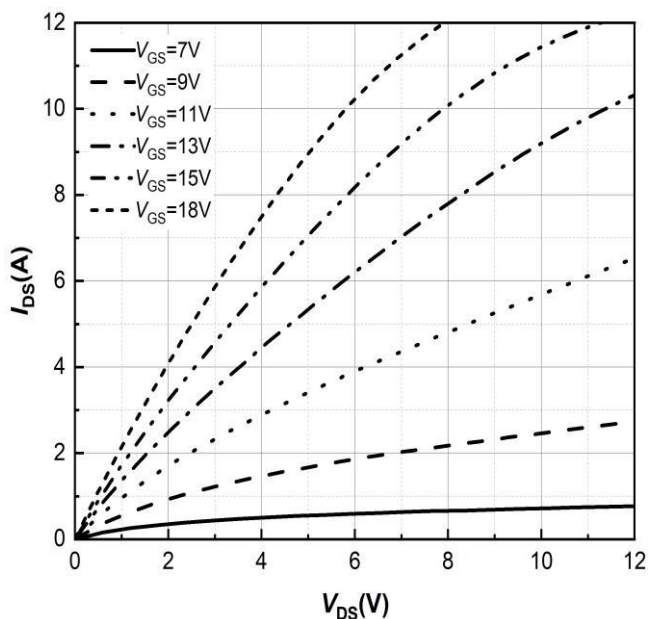


Figure 2. Output Characteristics
 $T_j = 25^\circ\text{C}$

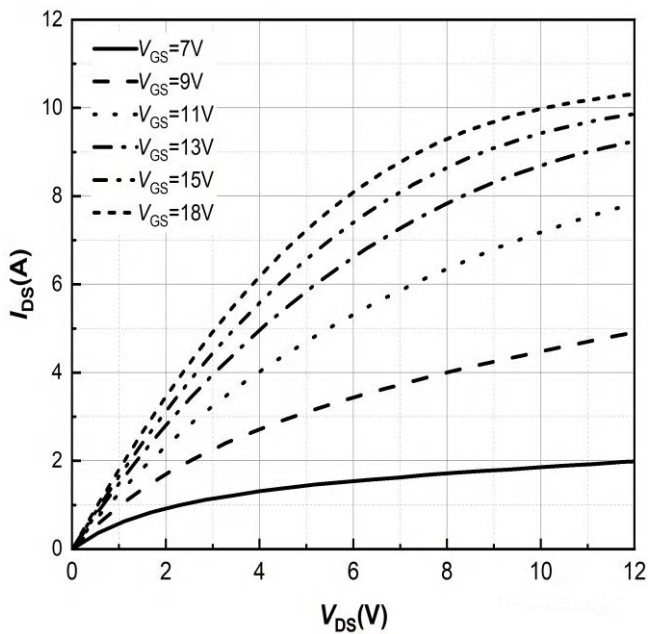


Figure 3. Output Characteristics
 $T_j = 175^\circ\text{C}$

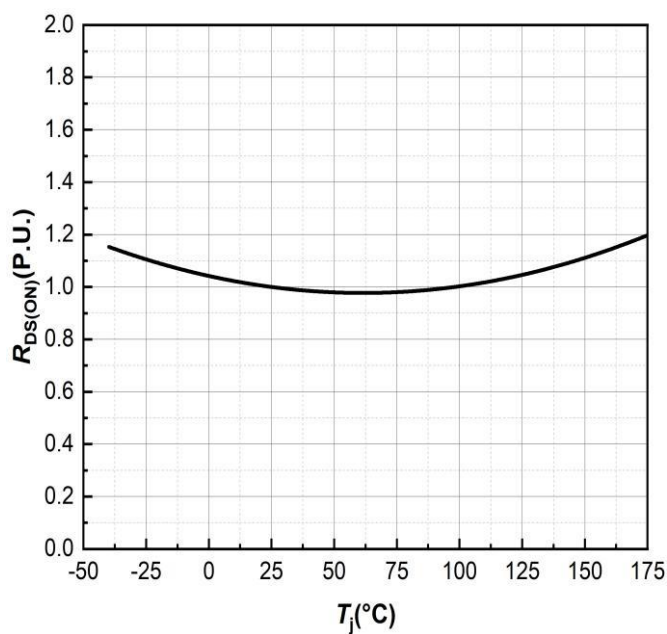


Figure 4. Normalized On-Resistance vs.
Temperature

RATING AND CHARACTERISTIC CURVES

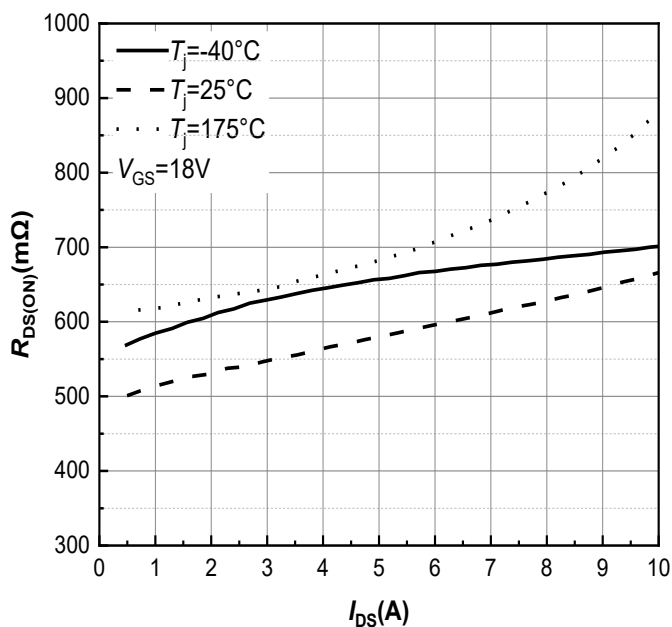


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

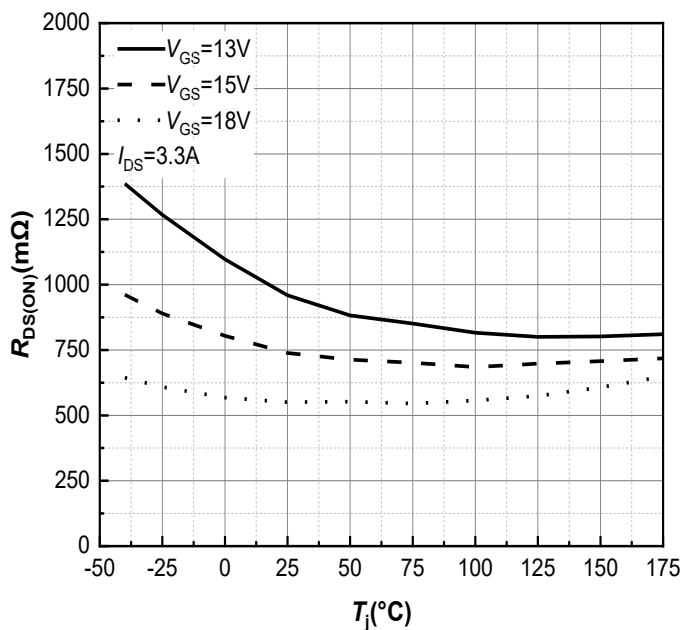


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

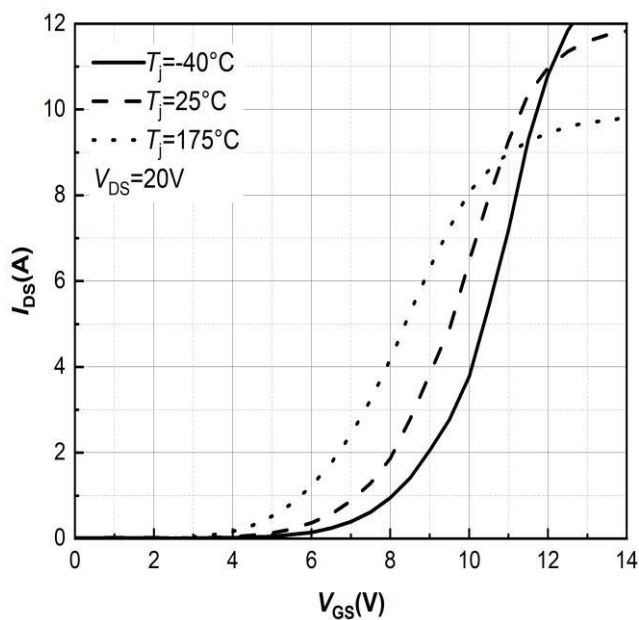


Figure 7. Transfer Characteristic for Various Junction Temperatures

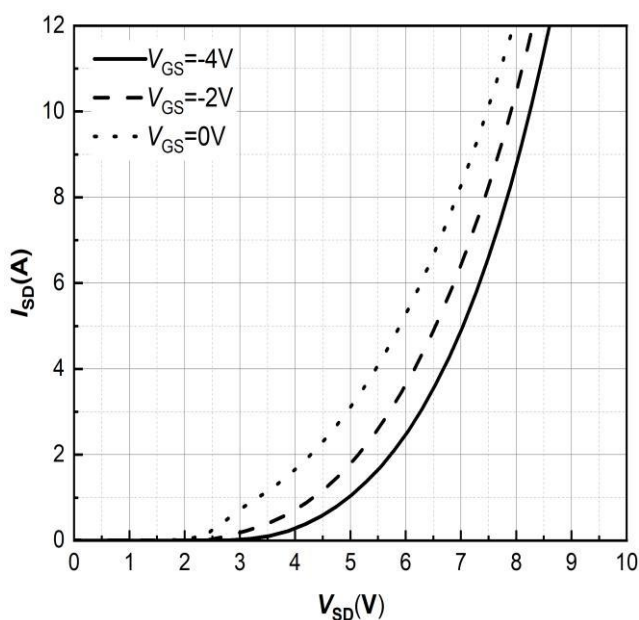


Figure 8. Body Diode Characteristic $T_j = -40^\circ\text{C}$

RATING AND CHARACTERISTIC CURVES

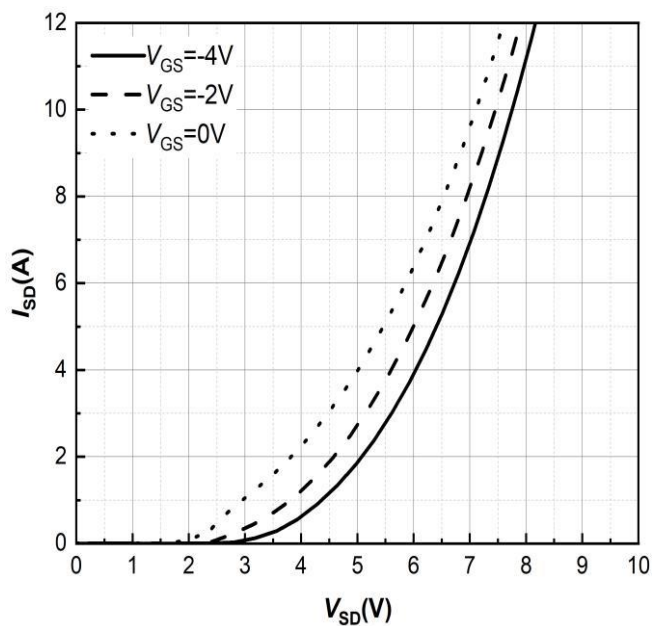


Figure 9. **Body Diode Characteristic**
 $T_j = 25^\circ\text{C}$

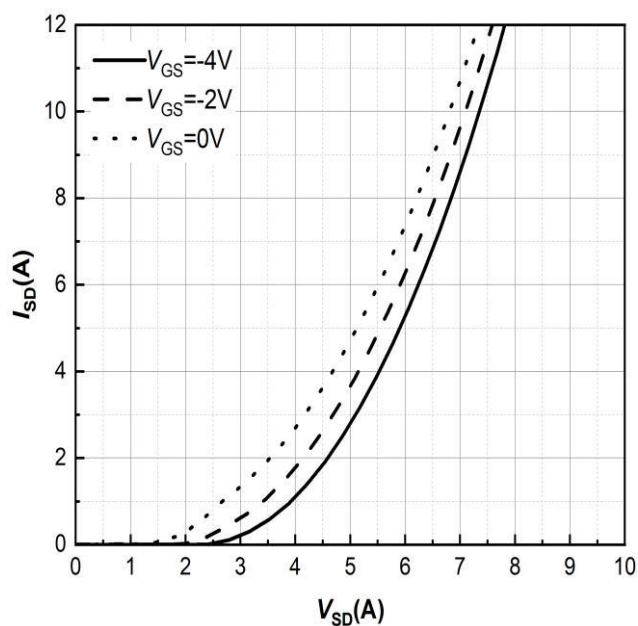


Figure 10. **Body Diode Characteristic**
 $T_j = 175^\circ\text{C}$

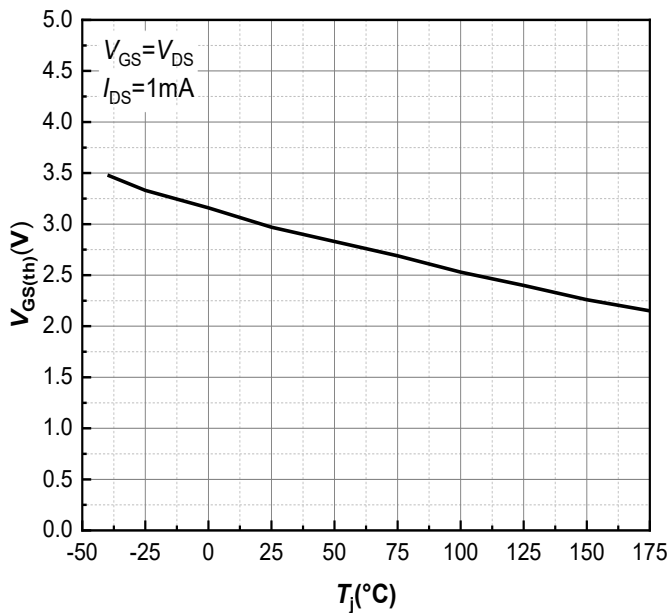


Figure 11. **Threshold Voltage vs. Temperature**

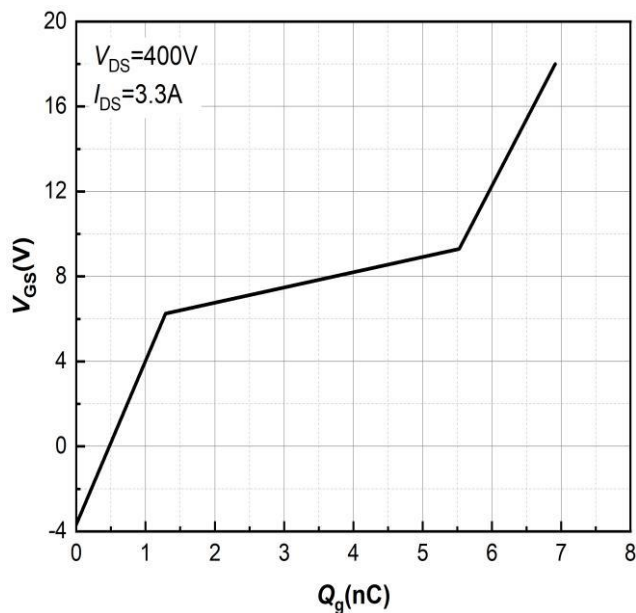


Figure 12. **Gate Charge Characteristics**

RATING AND CHARACTERISTIC CURVES

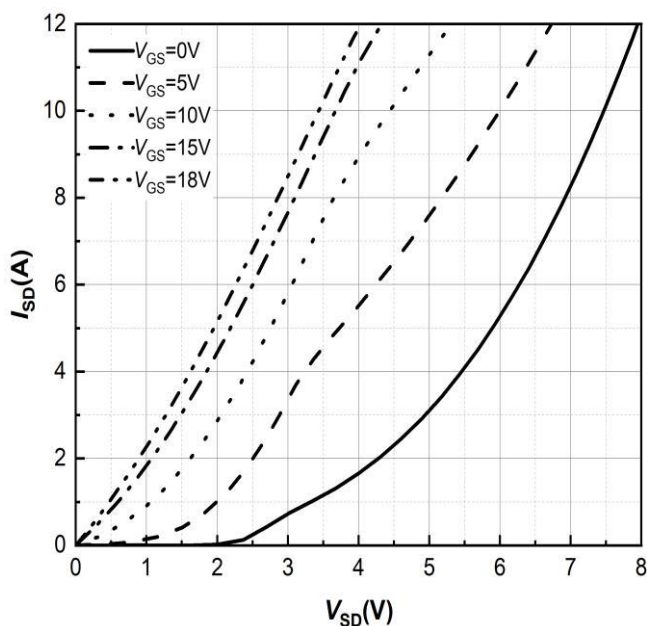


Figure 13. 3rd Quadrant Characteristic
 $T_j = -40^\circ\text{C}$

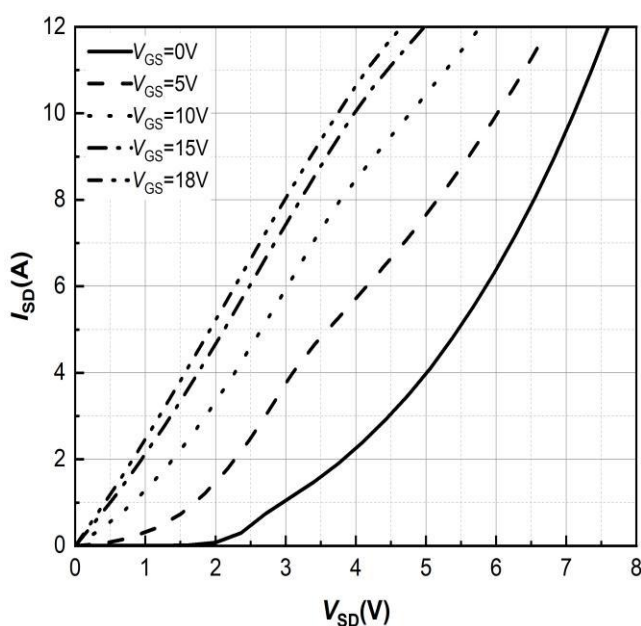


Figure 14. 3rd Quadrant Characteristic
 $T_j = 25^\circ\text{C}$

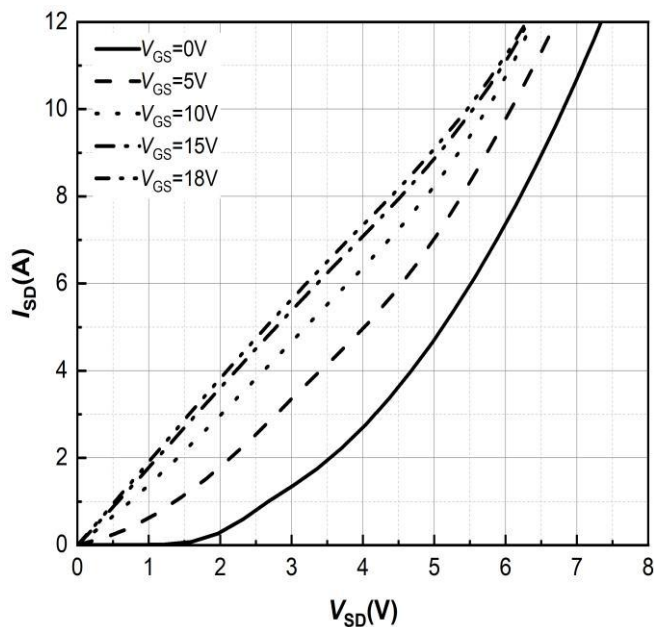


Figure 15. 3rd Quadrant Characteristic
 $T_j = 175^\circ\text{C}$

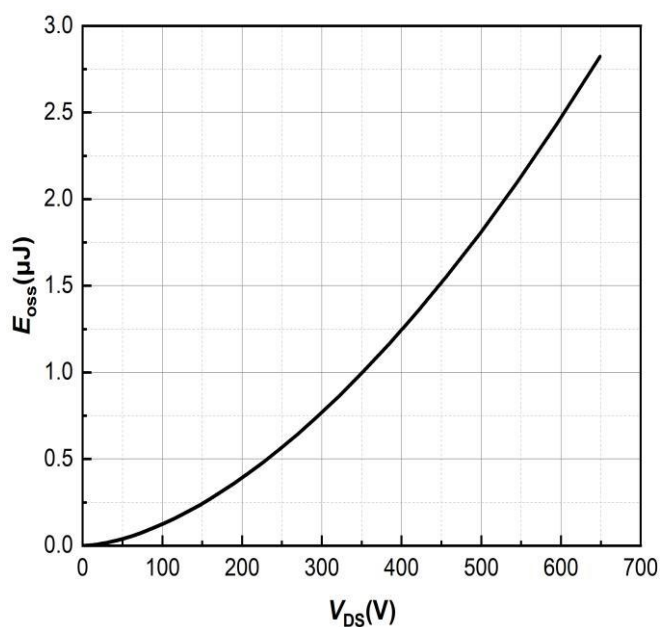


Figure 16. Output Capacitor Stored Energy

RATING AND CHARACTERISTIC CURVES

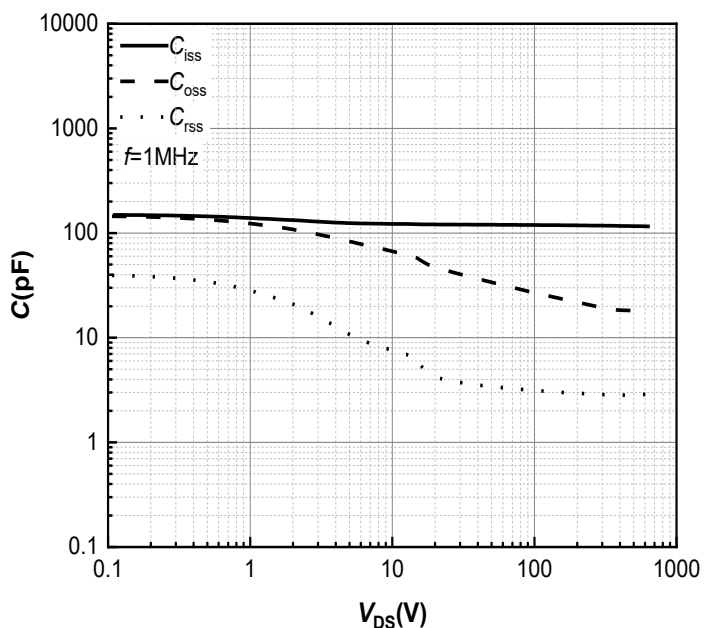


Figure 17. Capacitances vs. Drain-Source

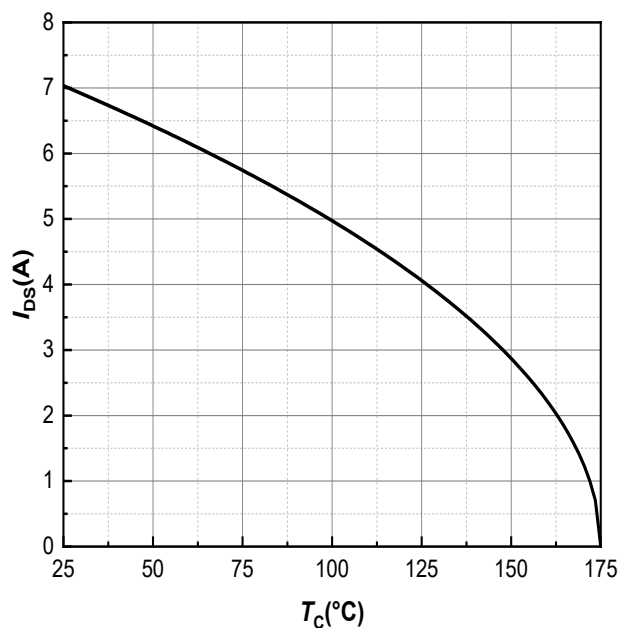


Figure 18. Continuous Drain Current Derating vs. Case Temperature

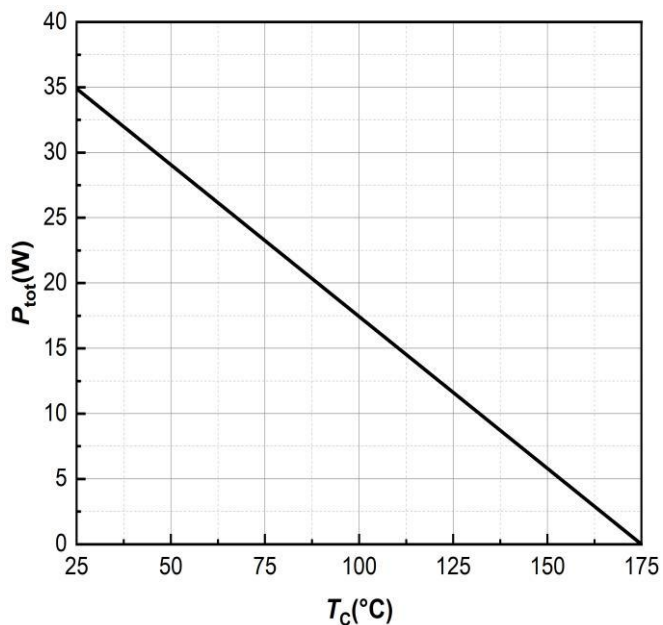


Figure 19. Maximum Power Dissipation Derating vs. Case Temperature

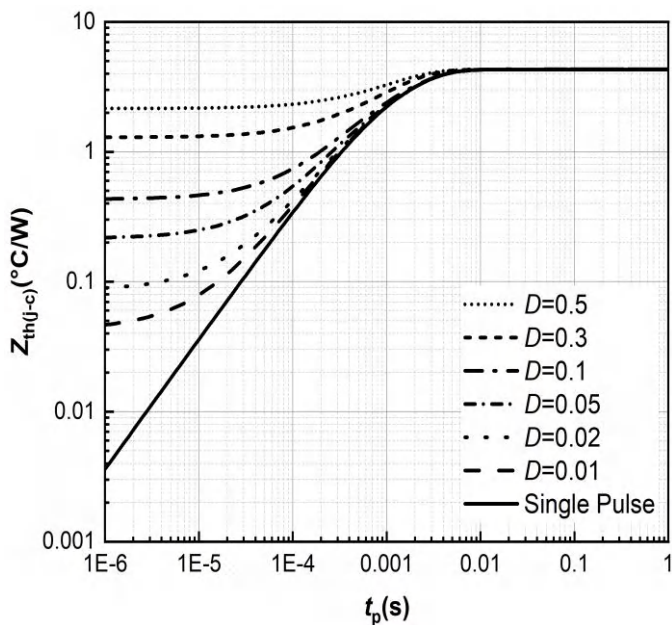


Figure 20. Transient Thermal Impedance

RATING AND CHARACTERISTIC CURVES

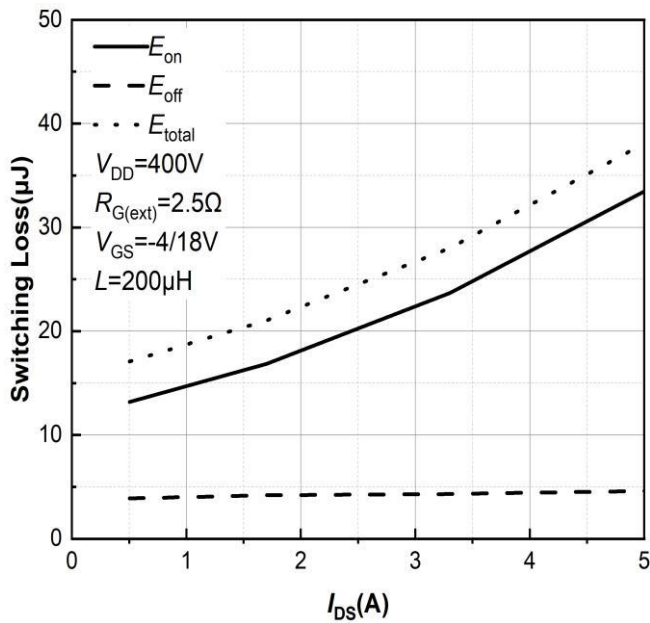


Figure 21. Clamped Inductive Switching
Energy vs. Drain Current
 $T_j=25^{\circ}\text{C}$

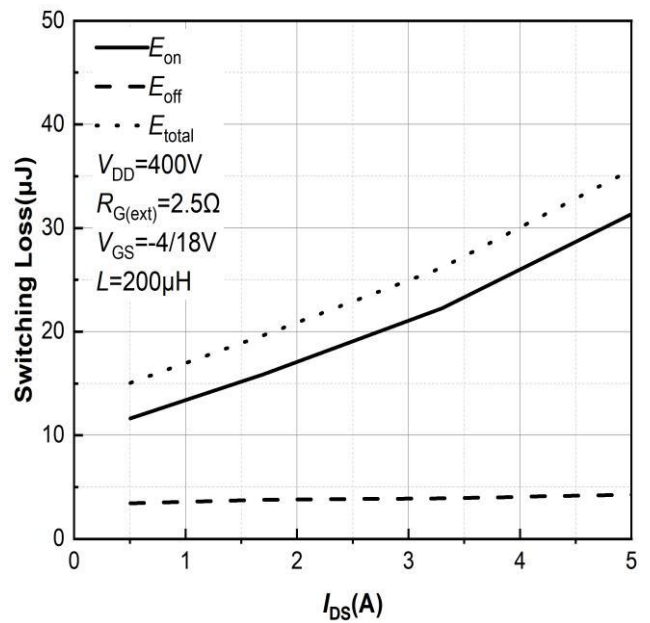


Figure 22. Clamped Inductive Switching
Energy vs. Drain Current
 $T_j=175^{\circ}\text{C}$

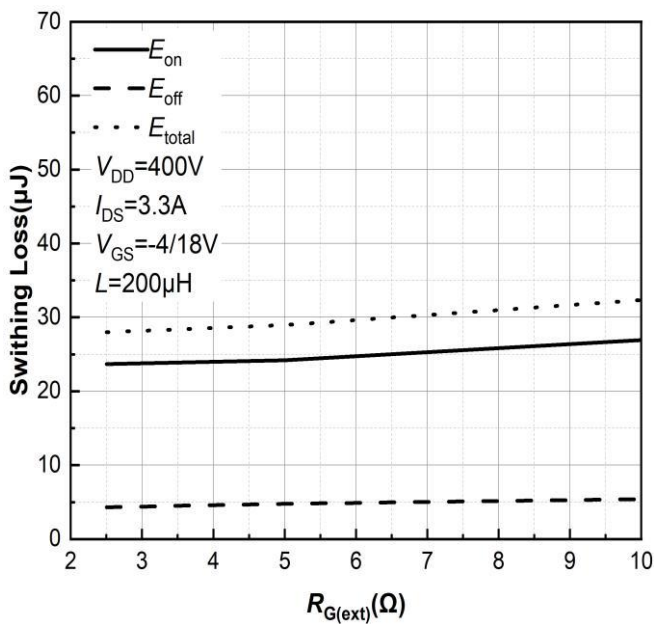


Figure 23. Clamped Inductive Switching
Energy vs. $R_{G(\text{ext})}$
 $T_j=25^{\circ}\text{C}$

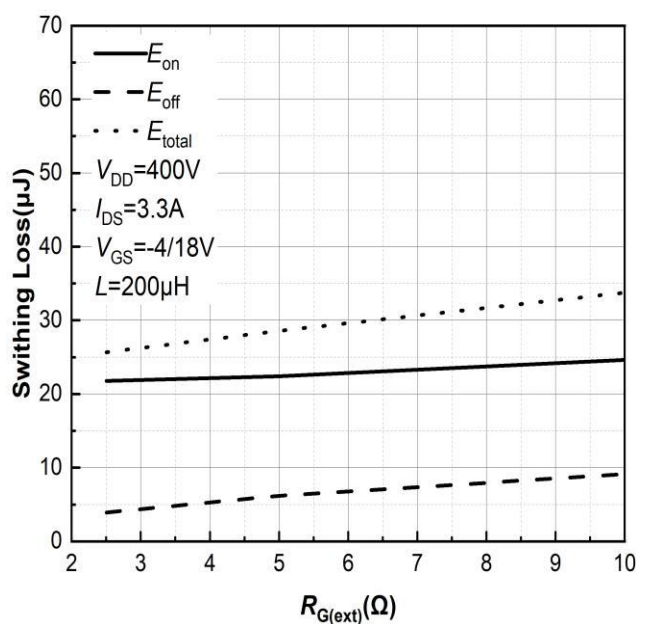


Figure 24. Clamped Inductive Switching
Energy vs. $R_{G(\text{ext})}$
 $T_j=175^{\circ}\text{C}$

RATING AND CHARACTERISTIC CURVES

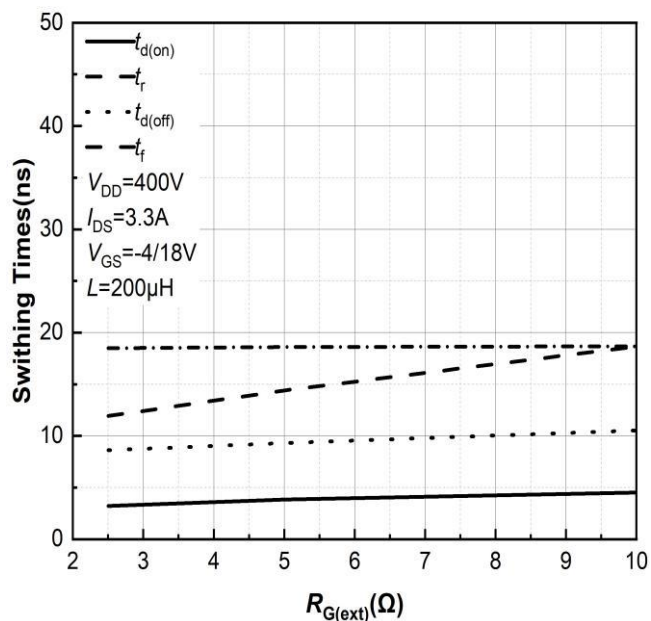


Figure 25. **Switching Times vs. $R_{G(ext)}$**
 $T_J = 25^\circ\text{C}$

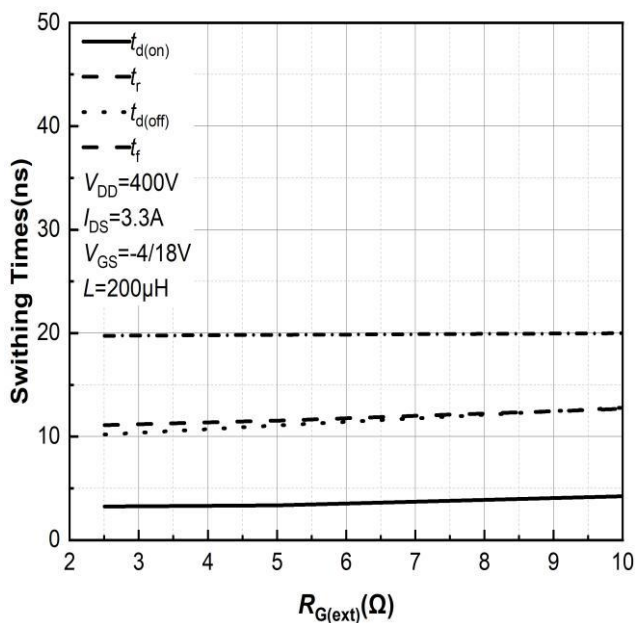


Figure 26. **Switching Times vs. $R_{G(ext)}$**
 $T_J = 175^\circ\text{C}$

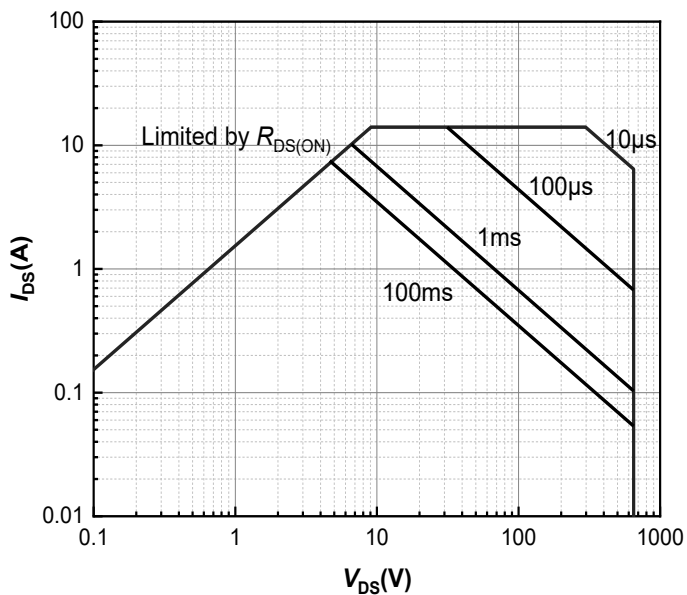
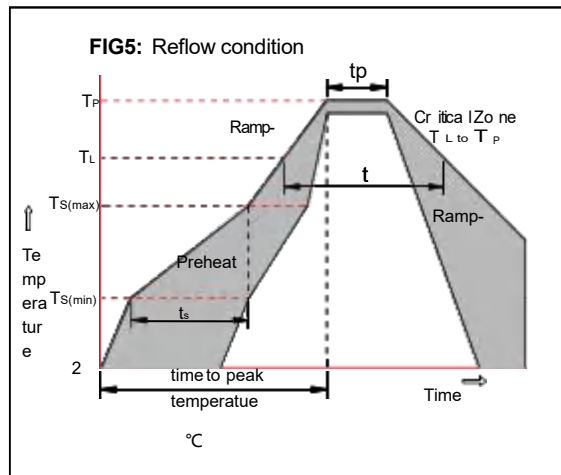


Figure 27. **Safe Operating Area**

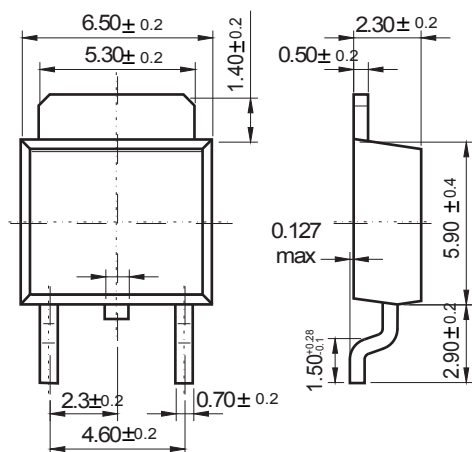
Soldering parameters

Reflow Condition		Pb-Free assembly (see as below)
Pre Heat	-Temperature Min ($T_{s(min)}$)	+150 °C
	-Temperature Max($T_{s(max)}$)	+200 °C
	-Time (Min to Max) (ts)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3 °C/sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3 °C/sec. Max
Reflow	-Temperature(T_L)(Liquid us)	+217 °C
	-Temperature(t_L)	60-150 secs.
Peak Temp (T_P)		+260(+0/-5) °C
Time within 5 °C of actual Peak Temp (t_P)		30 secs. Max
Ramp-down Rate		6 °C/sec. Max
Time 25 °C to Peak Temp (T_P)		8 min. Max
Do not exceed		+260 °C

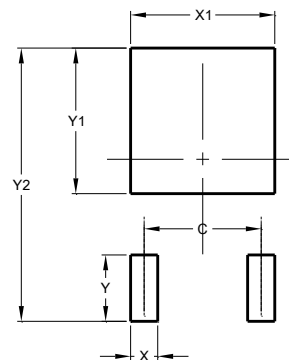


Package Dimensions & Suggested Pad Layout

TO-252

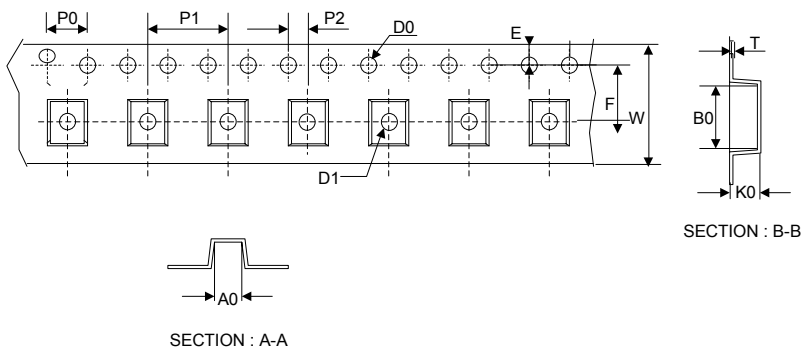
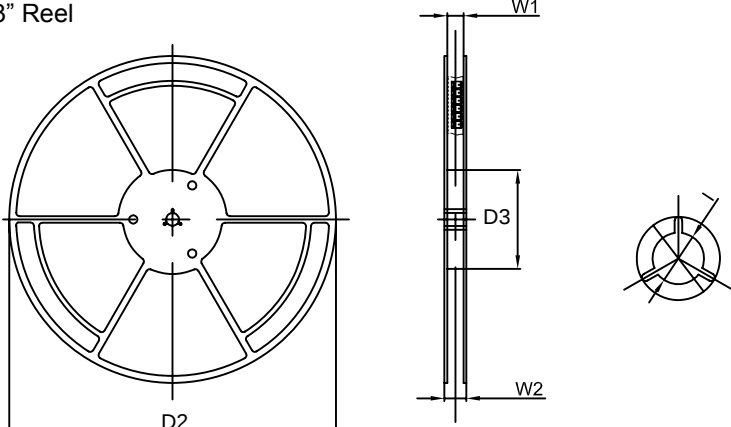


Dimensions in inches and (millimeters)



Dimensions	Value (in mm)
C	4.55
X	1.50
X1	5.80
Y	2.70
Y1	6.00
Y2	10.90

Tape & reel specification

Tape		Symbol	Dimension (mm)
		P0	4.00±0.20
		P1	8.00±0.20
		P2	2.00±0.20
		D0	1.55±0.15
		D1	1.55±0.20
		E	1.75±0.20
		F	7.50±0.20
		W	16.00±0.20
		A0	7.10±0.20
		B0	10.50±0.20
		K0	2.70±0.20
		T	0.30±0.10
13" Reel		Symbol	Dimension (mm)
		D2	330.0±5.0
		D3	100.0±4.0
		W1	20.0±5.0
		W2	25.0±5.0
		I	13.0±2.0
		Quantity: 2500PCS	