



N+P-Channel Enhancement MOSFET

Description

The AP4G03MI6 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

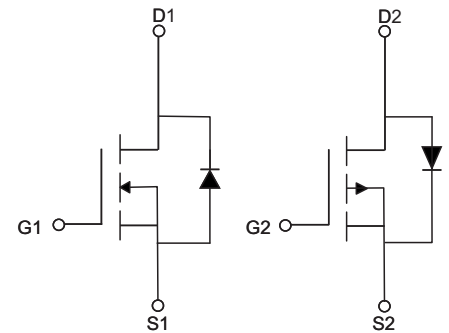
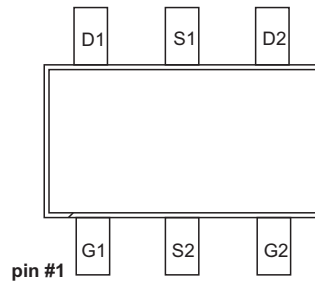
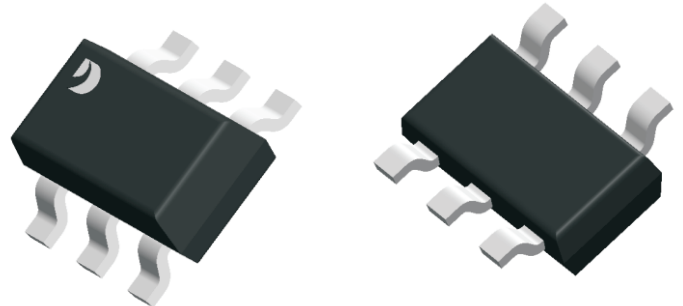
General Features

$V_{DS}=30V, I_D=5.5A$
 $R_{DS(ON)}<32m\Omega @ V_{GS}=10V$
 $V_{DS}=-30V, I_D=4.0A$
 $R_{DS(ON)}<45m\Omega @ V_{GS}=10V$

Application

Battery protection
 Load Switch
 Uninterruptible power supply

SOT-26



Absolute Maximum Ratings (Tc=25°C, unless otherwise specified)

Parameter	Symbols	N-channel	P-channel	Units
Drain-Source Voltage	V_{DSS}	30	-30	V
Gate-Source Voltage	V_{GSS}	± 12	± 12	V
Continuous Drain Current	I_D	5.0	-3.5	A
Pulsed Drain Current	I_{DM}	30	-30	A
Continuous Source-Drain Current(Diode Conduction)	I_S	2.5	-1.7	A
Power Dissipation	P_D	1.15	1.15	W
Thermal Resistance from Junction to Ambient (t \leq 10s)	$R_{\theta JA}$	125	125	$^{\circ}C/W$
Operation Junction Temperature and Storage Temperature	T_j, T_{stg}	-55~+150	-55~+150	$^{\circ}C$



N-Channel Electrical Characteristics (T_J=25°C, unless otherwise noted)

Parameter	Symbols	Test conditions	Min	Typ	Max	Units
Drain-Source breakdown voltage	V _{(BR)DSS}	V _{GS} =0V, I _D =250uA	30			V
Gate -Source threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250uA	0.6		1.4	V
Gate -Body leakage current	I _{GSS}	V _{DS} =0V, V _{GS} =±12V			±100	nA
Zero gate voltage drain current	I _{DSS}	V _{DS} =30V, V _{GS} =0V			1	uA
Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =3.4A		28	32	mΩ
		V _{GS} =4.5V, I _D =3A		32	38	mΩ
		V _{GS} =2.5V, I _D =2.8A		39	50	mΩ
Forward transconductance	g _{fs}	V _{DS} =5V, I _D =5A		8		S
Diode forward voltage	V _{SD}	I _S =1A, V _{GS} =0V		0.8	1.3	V
Maximum Body-Diode Continuous current	I _S				2.5	A
Input Capacitance	C _{iss}	V _{DS} =15V V _{GS} =0V f=1Mhz		390		pF
Output Capacitance	C _{oss}			54.5		pF
Reverse Transfer Capacitance	C _{rss}			41		pF
Total Gate Charge	Q _g	V _{DS} =15V V _{GS} =10V I _D =4A		4.5		nC
Gate-Source Charge	Q _{gs}			1.4		nC
Gate-Drain Charge	Q _{gd}			0.6		nC
Gate resistance	R _g	f=1MHz		3		Ω
Turn-On delay time	t _{d(on)}	V _{DS} =15V R _L =5Ω I _D =4A V _{GS} =10V R _g =6Ω		4		ns
Rise Time	t _r			2		ns
Turn-Off delay time	t _{d(off)}			22		ns
Fall Time	t _f			3		ns
Body Diode Reverse Recovery Time	T _{rr}	IF=4A, dI/dt=100A/us		11		ns
Body Diode Reverse Recovery Charge	Q _{rr}	IF=4A, dI/dt=100A/us		5.5		nC

Notes:

1. Repetitive Rating:Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,t<10 sec.
3. Pulse Test:Pulse Width≤300us,Duty Cycle≤2%.
4. Guaranteed by design, not subject to production testing



P-Channel Electrical Characteristics (T_J=25°C, unless otherwise noted)

Parameter	Symbols	Test conditions	Min	Typ	Max	Units
Drain-Source breakdown voltage	V _{(BR)DSS}	V _{GS} =0V, I _D =-250uA	-30			V
Gate -Source threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250uA	-0.6		-1.4	V
Gate -Body leakage current	I _{GSS}	V _{DS} =0V, V _{GS} =±12V			±100	nA
Zero gate voltage drain current	I _{DSS}	V _{DS} =-24V, V _{GS} =0V			-1	uA
Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-2.5A		40	45	mΩ
		V _{GS} =-4.5V, I _D =-2A		45	50	mΩ
		V _{GS} =-2.5V, I _D =1A		50	70	mΩ
Forward transconductance	g _{fs}	V _{DS} =-5V, I _D =-4A		8		S
Diode forward voltage	V _{SD}	I _S =-1A, V _{GS} =0V		-0.8	-1.2	V
Maximum Body-Diode Continuous current	I _S				-1.7	A
Input Capacitance	C _{iss}	V _{DS} =-15V V _{GS} =0V f=1Mhz		409		pF
Output Capacitance	C _{oss}			55		pF
Reverse Transfer Capacitance	C _{rss}			42		pF
Total Gate Charge	Q _g	V _{DS} =-15V V _{GS} =-10V I _D =-4A		4.8		nC
Gate-Source Charge	Q _{gs}			1.4		nC
Gate-Drain Charge	Q _{gd}			0.72		nC
Gate resistance	R _g	f=1MHz		12		Ω
Turn-On delay time	t _{d(on)}	V _{DS} =-15V R _L =4.4Ω I _D =-4A V _{GS} =-10V R _g =3Ω		13		ns
Rise Time	t _r			10		ns
Turn-Off delay time	t _{d(off)}			28		ns
Fall Time	t _f			13		ns
Body Diode Reverse Recovery Time	T _{rr}	IF=-4A, dI/dt=100A/us		26		ns
Body Diode Reverse Recovery Charge	Q _{rr}	IF=-4A, dI/dt=100A/us		15.6		nC

Notes:

1. Repetitive Rating:Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,t<10 sec.
3. Pulse Test:Pulse Width≤300us,Duty Cycle≤2%.
4. Guaranteed by design, not subject to production testing



N Channel Typical Characteristics

Figure1: Typical Output Characteristics

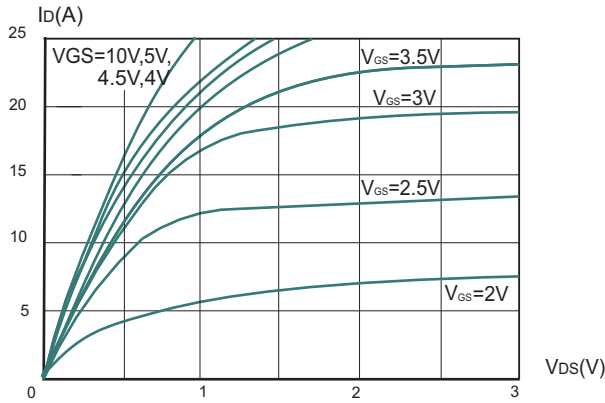


Figure 2: Normalized Threshold Voltage vs. Temperature

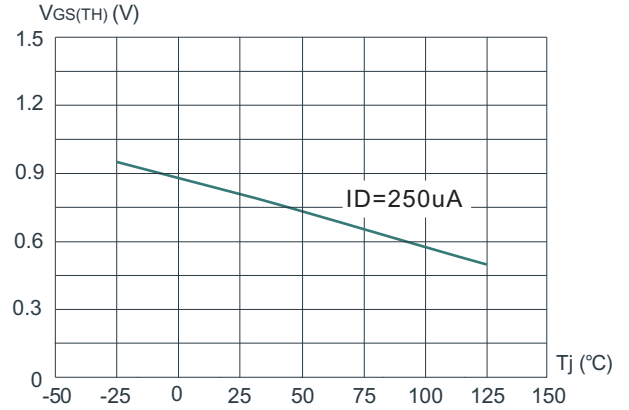


Figure3: Typical Transfer Characteristics

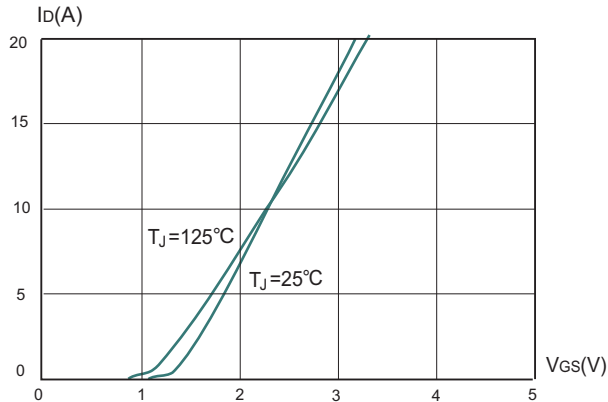


Figure 4: On-resistance vs. Drain Current and Gate

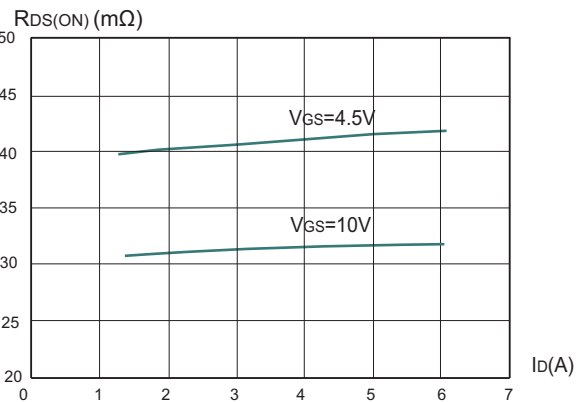


Figure5 : Typical Source-Drain Diode Forward Voltage

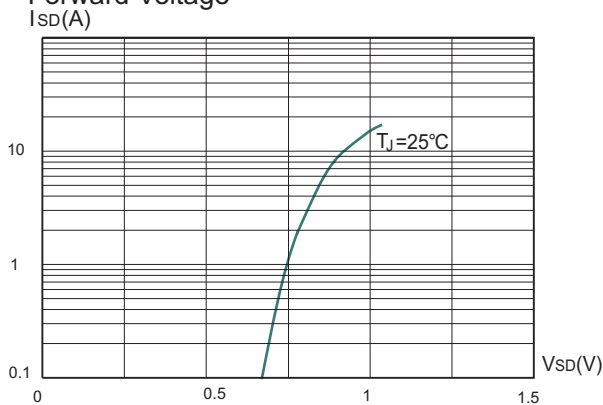
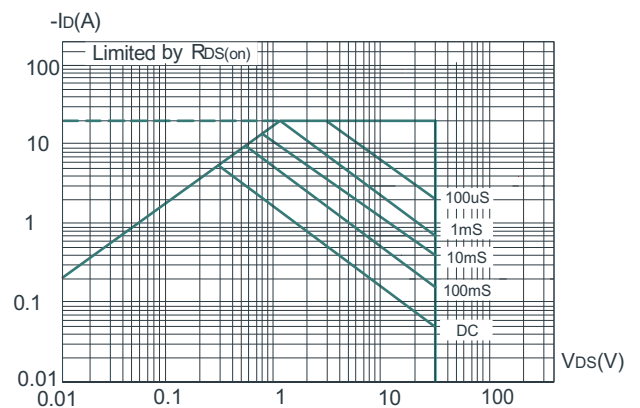


Figure 6: Maximum Safe Operating Area





N Channel Typical Characteristics

Figure 7: Typical Capacitance Vs. Drain-Source Voltage

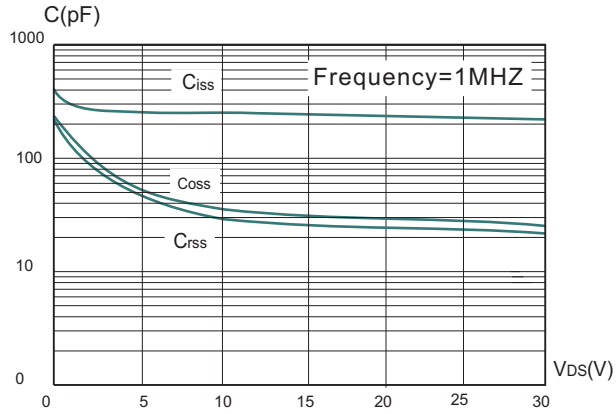
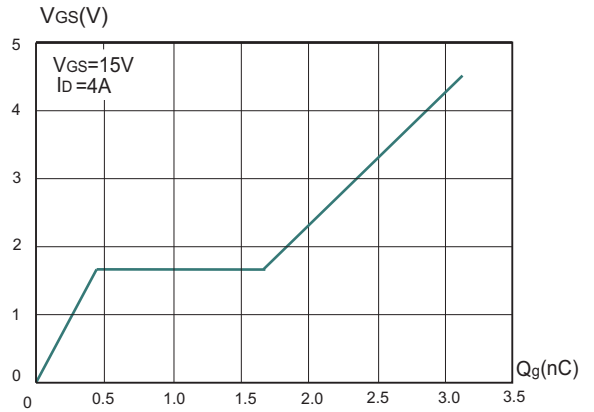


Figure 8: Typical Gate Charge Vs. Gate-Source Voltage





P Channel Typical Characteristics

Figure9: Typical Output Characteristics

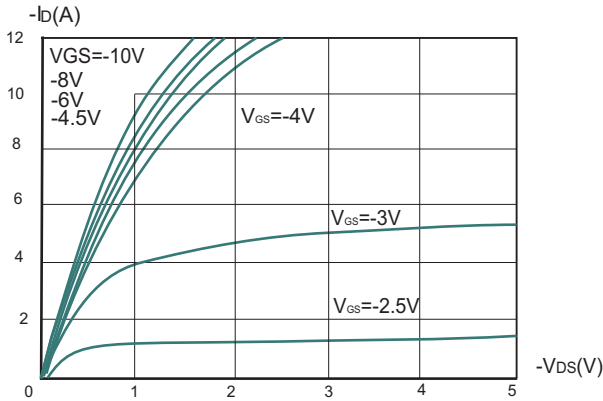


Figure10: Normalized Threshold Voltage vs. Temperature

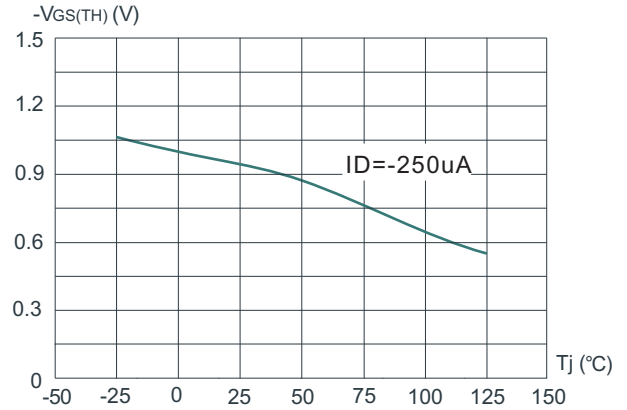


Figure11: Typical Transfer Characteristics

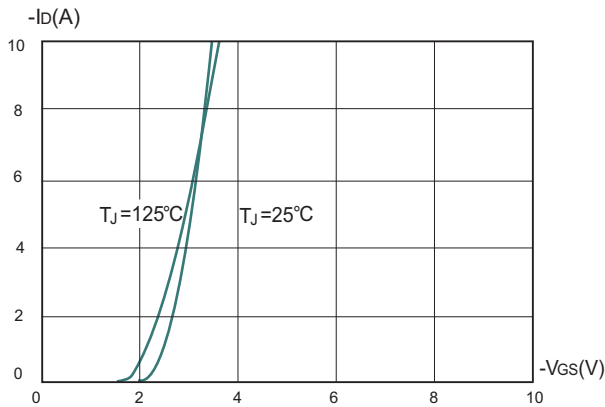


Figure12: On-resistance vs. Drain Current and Gate

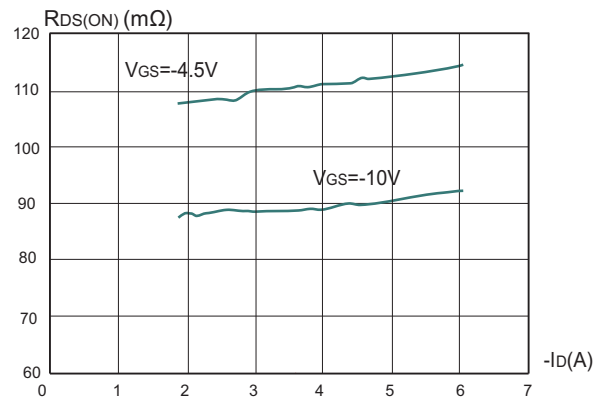


Figure13: Typical Source-Drain Diode Forward Voltage

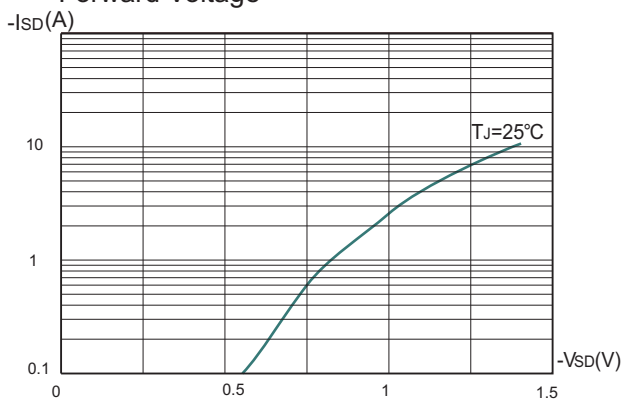
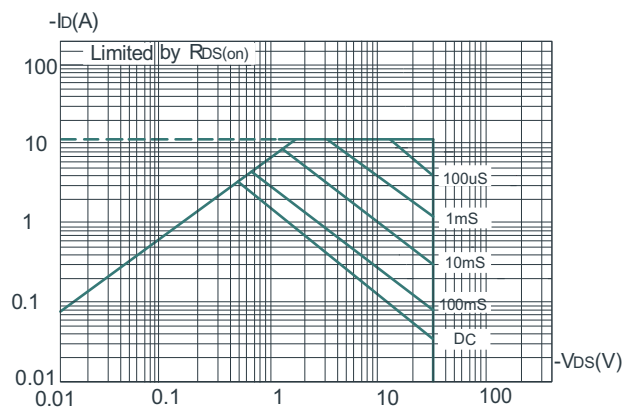


Figure14: Maximum Safe Operating Area





P Channel Typical Characteristics

Figure15: Typical Capacitance
Vs. Drain-Source Voltage

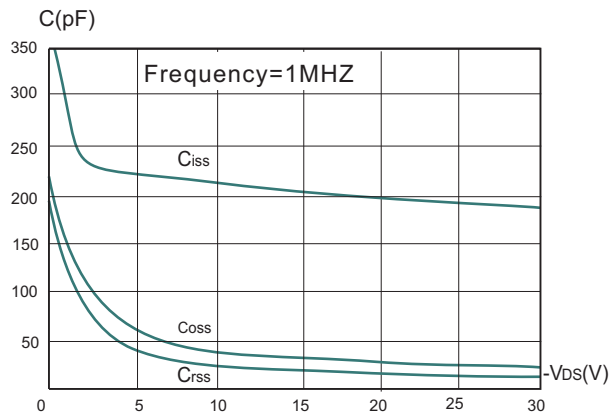
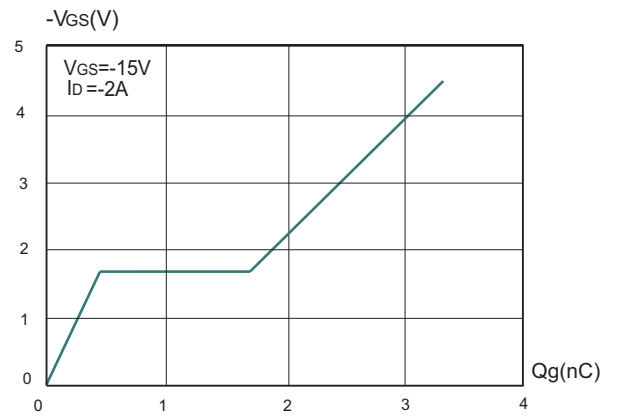
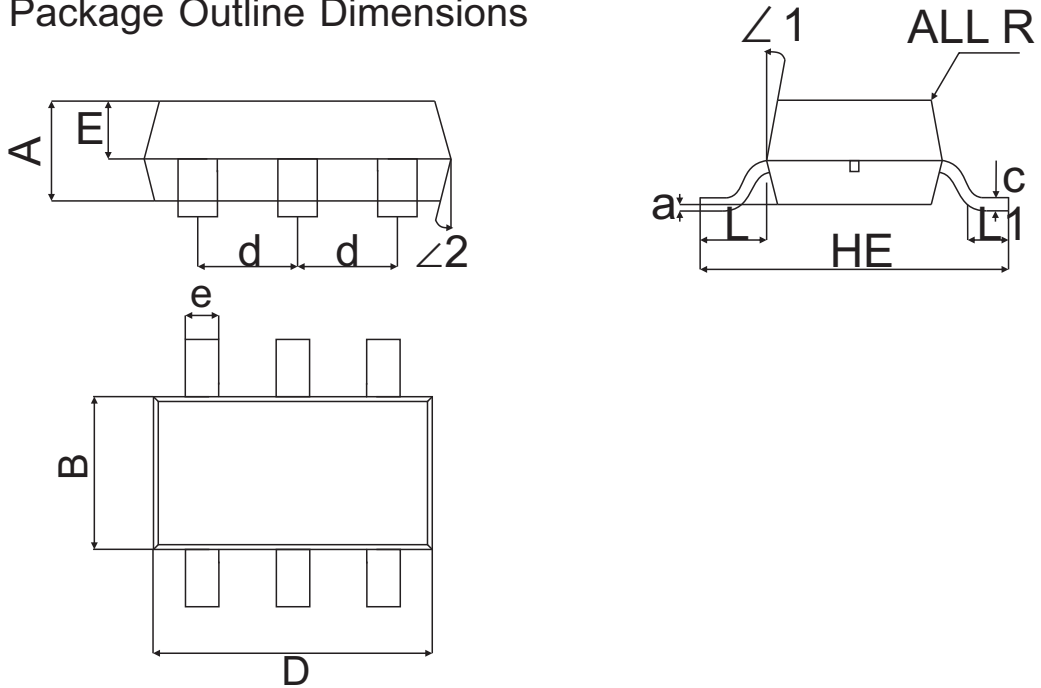


Figure16: Typical Gate Charge
Vs. Gate-Source Voltage



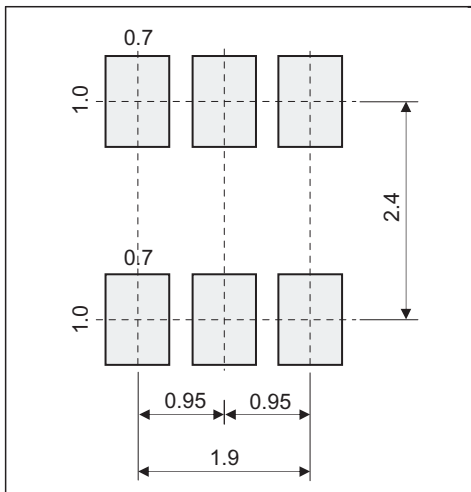


SOT-26 Package Outline Dimensions



Unit		A	B	C	HE	D	d	E	e	L	L1	a	R	∠1	∠2
mm	max	1.05	1.80	0.20	2.90	3.12	1.00	0.65	0.40	0.70	0.60	0.2 (ref)	R0.1 (ref)	12°	10°
	typ	0.95	1.60	0.15	2.80	2.92	0.95	0.55	0.35	0.60	/				
	min	0.85	1.40	0.10	2.70	2.72	0.90	0.45	0.30	0.50	0.20				
mil	max	41	71	8	114	123	39	26	16	28	24	8 (ref)	R4 (ref)	12°	10°
	typ	37	63	6	110	115	37	22	14	24	/				
	min	33	55	4	106	107	35	18	12	20	8				

The recommended mounting pad size



Marking

Type number	Marking code
NPM3400	3400